

Location factors and spatial deconcentration of manufacturing growth in Mexico: What do we know and how do we know it?

Rafael Tamayo Flores *

Resumen

Se analiza la metodología utilizada y la evidencia generada por la literatura empírica sobre los factores que han determinado la evolución del patrón regional del crecimiento manufacturero en México durante las últimas dos décadas —la dispersión de la industria sobre un espacio cada vez más amplio del territorio. Los estudios empíricos *de tipo formal* sobre el tema son pocos y relativamente recientes. No obstante la escasez de estudios y sus diferentes diseños, se cubre el objetivo de extraer inferencias razonables. Por ejemplo, el mercado potencial ha estimulado el crecimiento manufacturero, particularmente en el centro del país, aunque su relevancia declina a partir de los ochenta. Por el contrario, mercados y fuentes de insumos locales no han sido un factor. Las economías de aglomeración, influyentes en los setenta, dejan de serlo en los ochenta, mientras que uno de sus componentes, las economías de localización, adquieren impor-

* Centro de Investigación y Docencia Económicas (CIDE), correo-e: rafael.tamayo@cide.edu.mx

tancia. El acceso a mercados de exportación cobra relevancia desde mediados de los ochenta en ciertas industrias, pero su impacto es ambiguo para el sector en su conjunto. También se infiere acerca del impacto de factores del mercado laboral y de política pública.

Palabras clave: México, manufacturas, crecimiento interregional, factores de localización.

Abstract

Analyzes the methodology used and the evidence produced by the empirical literature on the determinants of changes in the regional pattern of manufacturing growth in Mexico in the past two decades—the dispersion of manufacturing activity over a wide part of the territory. The *formal* empirical studies on this topic are just a few and relatively recent ones. Notwithstanding the scant amount of studies and their different designs, it was possible to accomplish the objective of drawing reasonable inferences. For instance, market potential has been an important stimulant to industrial growth, particularly in the central region, although its relevance declines during the 1980s. In contrast, access to local markets and input sources are not important. Agglomeration economies, an influential factor in the 1970s, were no longer important in the 1980s, whereas a related factor, localization economies, became relevant. Access to export markets became decisive beginning in the mid-1980s for certain industries, yet its impact is ambiguous for the sector as a whole. Inferences on the impact labor market and public policy factors also were drawn.

Keywords: Mexico, manufactures, interregional growth, industrial location factors.

1. Introduction¹

The severe recession of the Mexican economy throughout most of the 1980s was accompanied by an accelerating decline in the traditionally high and still preeminent share of the metropolitan area of Mexico City (MAMC) in manufacturing. Growth of manufactures in the Southern states also remained sluggish. In contrast, amidst the prolonged recession, some Northern cities

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showed an impressive growth performance in that sector. 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 fact, since the early 1970s the high 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 (*i.e.*, 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 State. Maquiladora operations, initiated in the mid-1960s, had shown a stable expansion across the Northern border cities, except for a contraction in the mid-1970s. But it was not until the 1980s that a turning point occurred in the traditional pattern of regional concentration (mainly in the MAMC) that had accompanied the accelerated industrialization of the Mexican economy throughout the period 1940-1970. An unambiguous process of dispersion continues up to the present.

The empirical research analyzing the determinants of interregional shifts of production and business location decisions concentrates overwhelmingly on developed nations, mainly the U.S. For Mexico, the empirical effort in this area of research has remained quite limited. During the last twenty years, it has been confined to a few survey-based and econometric studies, most of which have been accomplished just in the 1990s.

The policy significance of research in this area 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. Thus, most of these studies for developed economies are explicitly designed to evaluate the impact of public policy variables.² Tax and expenditure policies are the traditional means of intervention, although

² 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). Surveys of recent inter-area econometric studies for the U.S. include Newman and Sullivan (1988), Gerking and Morgan (1991), and Wasylenko (1991). All

labor market policies and a variety of direct financial and technical assistance programs are not uncommon.

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 ineffective national policies for industrial deconcentration, and the severe fiscal and financial constraints faced by most state governments, which have kept them from playing more than a minimal role in industrial promotion so far. Nevertheless, the policy significance of and interest in this research field will grow since Mexico's manufacturing space continues expanding, and as the number of governors and majors of important cities and the partisan voices in federal Congress advocating further financial autonomy for local governments continue to grow. In addition, the increasing challenges and opportunities that the far-reaching opening of the Mexican economy poses for local economies, has prompted already an active engagement of a good number of local governments in the enhancement of local competitiveness, mainly among the country's most important cities/regions. Perhaps motivated by these new tendencies and circumstances, most of the few recent studies in this area that analyze the case of Mexico focus on industrial location decisions and inter-area growth determinants outside of the MAMC.

The primary objective of this research paper is to yield policy-relevant insights regarding the determinants of regional industrial growth on the basis of reviewing and evaluating the results and methodologies of these few existing studies. Particular attention is placed on elucidating changes over time in the relative importance of each factor, especially those controlled by the government. These over time variations would provide a clue regarding the determinants of the ongoing process of territorial dispersion and the role of public policy. In general, it proved quite difficult to draw definite conclusions on the basis of the quite limited number of studies, and their quite dissimilar methods and designs; even studies using similar methods do not bear close relationship to each other as they are designed to answer different questions. Nevertheless, preliminary inferences could be drawn on the basis of this analytical review, which by the way appears to be the first one in the subject for Mexico.

of them put a special emphasis on the findings related to the impact of business taxes and/or economic infrastructure on industrial location.

The rest of the paper is organized as follows. The second section consists of a discussion of the conceptual framework for the analysis of inter-area industrial growth, 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. A description of both the major recent changes in the regional pattern of industrial growth and the main elements of the industrial deconcentration policy is elaborated in the third section. The fourth section contains the review of the empirical literature on business location decisions and inter-area industry growth. There, I begin with a discussion on the methodological characteristics of these survey-based and econometric studies, and then proceed to attempt to integrate their principal findings by particular factors. In a final section, conclusions are drawn on the relevance of market and public policy variables for current business location decisions and their implications for regional development policy. As expected, for Mexico the impact of public policy variables on regional industrial growth remains an open question.

2. 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 concise 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 attractiveness for the expansion of industry. 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 type of product.³ A variable effect also should be expected within the same industry depending on firm size and segment of the production process.

2.1. Factors affecting access to output 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.

The access to markets in all other regions that a particular industry may achieve by locating in a particular region (market potential) depends on the distance to these other regions (in terms of transfer costs) and therefore on how well the region in question is connected to the major transportation networks. For a given market size, the larger the distance from the region in question to another region the lower the market potential. Thus, market potential is assumed to have a positive relationship with industry growth, which usually implies an attraction toward areas having the most prominent market.

2.2. Factors affecting costs

Costs are a function of the prices of different inputs used in production (*e.g.*, labor, land, utilities, industrial inputs, and equip-

³ An extreme example is the high-technology industries, typically semiconductors, biotechnology, computers and software, whose locational dynamics has been intensively studied since the early 1980s, and that appear to have been largely avoiding traditional industrial areas in the U.S. Apparently, they show a tendency to arise in small urban areas, sometimes near to a very large Metropolis, and a recent survey on the topic by Towse (1990) indicates that the factors deemed to be decisive for their location include quality of life, business climate, research-oriented universities, accumulation of scientific and technical work force and nearby military and government research establishments.

ment). 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. Thus, 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 regional industry growth because it does not vary significantly across regions.

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. Therefore, an adequate supply of nontransferable inputs is

presumed to enhance the attractiveness of regions for the location of industry. These types of inputs are then hypothesized to have a positive impact on industry growth.

Agglomeration economies confer cost-savings on firms through specialization and scale economies. When firms within a cluster subcontract the production of industrial inputs or components that otherwise they would have to produce themselves, they can 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. In turn, if specialization enables subcontracting firms to realize internal economies of scale, subsequent increases in their rate of output will be accompanied by decreasing average total costs.⁴ As a result of these gains in production efficiency, average total costs for the whole agglomeration also decrease at each rate of output. Likewise, average total costs are reduced insofar as any savings in transfer costs are realized. The size of the agglomeration economies realized through specialization and scale economies will be directly related to the number of firms and the intensity of subcontracting practices in the cluster. Additional sources of economies include the possibility of reduced inventories (*i.e.*, the frozen capital attached to them); an increasing productivity of labor resulting from the progressive specialization of workers; and a larger labor supply and variety of skills.

These sources of cost-savings have also been recognized in the recent literature on territorial organization of production that analyzes the so called industrial clusters. The clusters can be defined, in general, as concentrations of firms characterized by a well defined specialization and a high density of interactions among firms, *specialized networks of firms*. Interactions are not limited to the consumer or supplier types, but rather encompasses a diversity of forms of cooperation such as shared support service facilities, marketing strategies, and development of labor pools with specific skills. Given the marked specialization of clusters, the types and sources of cost-savings for the firms within them are predominantly industry-specific. A sort of localization economies whose type and source differs depending on the clusters' specialization. Of course, firms within a cluster also benefit

⁴ 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.

from the most common proximity-based externalities. Therefore, in general, it is presumed that a particular region would be more attractive for industry the larger the potential cost-savings derived from proximity (agglomeration) and cluster specialization. That is, agglomeration economies whatever the type are hypothesized to have a positive impact on industry growth.

2.3. 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.⁵ 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 firms' operating costs. 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 real wages in exchange for locating in a more attractive

⁵ 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.

environment of superior educational, cultural, health care, and recreation facilities. In other words, to the extent that high amenities increase the supply of labor, they can lead to wage rate reductions. 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; *i.e.*, public expenditures in infrastructure are assumed to have a positive relationship with industry growth.

It may be pertinent to note that public policy instruments can be used to design strategies aimed at promoting industrial deconcentration in general, or fostering specialized clusters and/or strengthening inter-industry linkages in particular regions, etc. Finally, it should be pointed out that the decision to expand and/or relocate in a particular region often implies a compromise, whereby some desired locational attributes are sacrificed in order to attain sufficient levels of other characteristics, the most important for the particular industry or firm.

3. Recent regional shifts of output and deconcentration policy

This section first intends to capture the main features of the change in the regional pattern of manufacturing growth in Mexico between 1970 and 1993, and then to sketch the main elements of the industrial deconcentration policies (which acquired momentum during the 1970s, fell out of favor in the early 1980s, and were eradicated thereafter). Besides delivering a precise definition of these two aspects, the purpose is to provide a context that would help to better understand the impact of market-driven and public policy location factors on regional industrial growth, as assessed in the empirical literature that will be analyzed and scrutinized in section four.

3.1. The observed major interregional shifts of manufacturing output

As for the observed interregional shifts of output in Mexico, between 1970 and 1980 there was a moderate but continuous shift away from the Capital region (Mexico's manufacturing hearthland), and largely toward the Central region (the Capital region's immediate hinterland), as shown in Table 1. Industrial chemicals, machinery & equipment, and automobiles, three large and fast-

growing industries, accounted for most of the relative gains of the Central region, as revealed by a study of these shifts by regions (Tamayo, 1996).

Manufacturing output also shifted visibly toward the East and the South. The latter recorded by far the fastest output growth during 1970-1980, which actually took place in the late 1970s (in the early 1970s the South actually experienced a below-average performance). In contrast, output shifted moderately away from each of the three Northern border regions. In the Northeast and North-central region, the relative decline occurred in the late 1970s, whereas in the Northwest the downward trend was continuous throughout the decade. (See Table 1.)

Table 1
Interregional shifts or real manufacturing value added
1970-1993

<i>Region^a</i>	<i>Percentage share of total</i>					<i>% Change in real valued added</i>	
	1970	1975	1980	1985	1993	1970-80	1980-93
Capital	54.59	51.97	50.81	36.38	37.27	48	38
Central	6.75	8.27	9.52	11.24	9.73	124	92
Central-west	8.60	8.89	8.43	10.88	13.19	55	194
Central-north	2.27	2.03	2.86	3.49	4.20	100	178
Northeast	11.89	12.52	11.16	14.33	11.77	49	98
North-central	5.66	5.92	4.61	7.50	7.23	29	195
Northwest	4.80	4.45	4.13	4.59	5.93	38	170
East	3.68	4.30	5.08	8.63	6.81	119	152
South	0.93	0.70	2.32	2.19	2.83	296	130
Yucatan Pen.	0.83	0.95	1.08	0.77	1.04	107	81
Mexico	100.0	100.0	100.0	100.0	100.0	59	88

Source: Tamayo (1996) and INEGI (1995).

a) Regions (states): Capital (Federal District; Mexico), Central (Hidalgo, Morelos, Puebla, Queretaro, Tlaxcala), Central-west (Colima, Guanajuato, Jalisco, Michoacan), Central-north (Aguascalientes, Durango, San Luis Potosi, Zacatecas), Northeast (Nuevo Leon, Tamaulipas), North-central (Chihuahua, Coahuila), Northwest (Baja California, Baja California Sur, Nayarit, Sinaloa, Sonora), East (Tabasco, Veracruz), South (Chiapas, Guerrero, Oaxaca), Yucatan Pen. (Campeche, Quintana Roo, Yucatan).

In short, during the 1970s, manufacturing production shifted away from the Capital region as well as from the Northern border regions, and largely toward the Central region, the East and the South. Hence, by 1980 the Central region had overtaken the Central-west region as Mexico's third largest manufacturing area. The East overtook the North-central region and the Northwest,

moving from the seventh to the fifth position, which is largely explained by the rapid development of the state-owned oil industry in the former.

Between 1980 and 1985, the shift of manufacturing output away from the Capital region became quite pronounced. Simultaneously, there were important shifts toward most other regions; the exceptions were the lagging South and Yucatán Peninsula. Thus, the process of dispersion unambiguously had reached a wide part of the Mexican territory. The relative gains of the Northern border states, as a whole was particularly notorious; likewise, the gains of the Central region, the Central-west and Central-north altogether were also important. (See Table 1.) However, by the mid-1980s the steep downward trend of the Capital region had abated; its share leveled off thereafter. Simultaneously, manufacturing production kept shifting toward the Central-west, Central-north, and Northwest (*i.e.*, these are the only regions showing a continuous relative gain in output from 1980 to 1993). On the other hand, the shares of the Northeast and North-central region after having increased significantly between 1980 and 1985, experienced a decline thereafter (1985-1993). The same occurred in the Central region and the East. Hence, by 1993 the Central-west had overtaken by far the Northeast and the Central region to become the second largest manufacturing area. (See Table 1.)

In short, between 1985 and 1993, while the process of dispersion (*i.e.*, relative decline in the output share of the preeminent Capital region) clearly abated, important interregional shifts were still observed. Nevertheless, no definite directional pattern could be established. Across the northern border as well as across Central Mexico, some regions recorded relative output gains while others experienced losses.

3.2. Industrial deconcentration policies in Mexico

At this point, a question arises as to the extent in which national industrial deconcentration policy and state-level industrial promotion strategies may have influenced the outcomes just described. In the following paragraphs, the main components of the industrial deconcentration policy in Mexico —implemented with high hopes throughout the 1970s and early 1980s, but eradicated thereafter— will be synthesized. Their impact as assessed by the existing survey-based and econometric studies on business

location decisions and inter-area industry growth in Mexico, will be carefully reviewed and analyzed in section four.

Industrial deconcentration policies in Mexico have 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, and revised subsequently in 1979 and 1984. In general, incentives for private businesses were set as a proportion of new investment or cost of new jobs which depended on the location selected, type of industry and, for relocations, on the location of origin. Invariably, no incentives were granted in the three largest urban-industrial areas (Mexico City, Guadalajara and Monterrey) nor in Mexico City's adjacent municipalities, the *highly congested areas*.

Initially, the definition of the promoted or *high priority zones*, wherein the best packages of incentives were granted, was very vague; but it became more specific with each revision. The fiscal incentives for new plants, relocations and on-site expansions were granted against taxes due on acquisition/import of equipment, business income, and transfer of property. The 1984 decree also introduced a quite intricate industry-specific criteria seeking to promote a proposed regional specialization, in order to determine the extent of the incentives.

There is a general agreement that the different regional divisions and attached incentives suffered from design inconsistencies limiting their effect on deconcentration (Bustamente, 1983; Palacios, 1989; Aguilar, 1993). For instance, it has often been suggested that incentive differentials between the "belt" of municipalities surrounding each of the three highly congested areas, on the one hand, and the high priority zones, on the other, were insufficient to induce any deconcentration beyond the former. However, despite the plausibility of conjectures of that type, there is no solid piece of quantitative research so far to substantiate the effect of the industrial deconcentration strategy. The problem is that the methods used by the existing studies are unable to isolate the effect of the policy.

Besides 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 fiscal incentives in order to set interest rate differentials. The general contention among analysts is that

the magnitude of the interest rate differentials, just like the fiscal incentive differences, was far from sufficient to promote deconcentration in a meaningful way. But again, no empirical support has ever been provided to substantiate that broad assertion.

Created in 1965 to promote the industrialization of the Northern border cities, the maquiladora regime entitles manufacturing plants to duty-free imports of intermediate inputs and equipment provided that a high proportion of their output is exported. Initially, as a regional development policy the application of these incentives was restricted to the 20-kms. strip parallel to the border with the U.S. However, since 1972 the regime was extended to the rest of the country except for the metropolitan areas of Mexico City, Guadalajara, and Monterrey. In practice, however, the establishment of maquiladoras has taken place even in these congested areas. Clearly, it was no longer a regional policy, but rather a sectoral one with important implications for Mexico's future industrial development. Nevertheless, by far most of the growth experienced by the maquiladoras, which has been explosive since the mid-1980s, has concentrated in the Northern border cities, their traditional location. The number of maquiladoras increased from 760 in 1985 to 1703 in 1990, and to 2867 in 1997, of which almost 90 percent are located in Northern border states. Advantages derived from proximity to the U.S. (*e.g.*, savings in transportation costs and hence an improved access to the U.S. market, a faster supply chain upstream to parent firms, a better supply of technical and executive U.S. personnel, etc.), are the main determinants of that locational pattern. The fiscal regime is not a locational factor as it applies all over the Mexican territory, but rather a handsome complement.

In 1971, another important federal program was created to provide adequate industrial space outside of the few main urban-industrial cities so as to facilitate deconcentration (Fidein).⁶ As of 1988, there were 130 industrial parks/towns in Mexico, most of which (101) were established between 1971 and 1982, the period in which regional industrial policy was active. (Garza, 1992).⁷ 58 of these parks/towns are located in Northern border

⁶ In 1982, the federal government transferred to the state governments jurisdiction over the industrial parks/towns it operated directly. Thereafter the function of Fidein was largely limited to the provision of financial and technical advice. In 1989, the structure of Fidein was formally eliminated and integrated as a unit into the Directorate of Investment Projects of NAFINSA.

⁷ That study also reports that according to ownership and administration there were 23 federal government facilities, 48 parks controlled by state governments, 44 under private administration, and 15 public-private partnerships.

states, and 11 in other Northern states. Twenty nine are established in Central-region states (10 in the State of Mexico), and 16 more in the Central-west (6 in the state of Jalisco). In contrast, there are only 16 parks in the whole Southeast, including the Yucatan Peninsula (only one in each of the three Southern states). The available empirical evidence indicates that the program's contribution to deconcentration has been quite limited. Aguilar (1993) and Garza (1992) are probably the only serious attempts to evaluate the role of industrial parks in industrial deconcentration so far. The former concludes that the program, at best, has contributed to induce some deconcentration toward the most immediate area of influence of Mexico City, whereas the latter shows a weak relationship between a state's number of industrial parks and industrial growth, as well as a quite slow rate of occupancy (only 26 percent of the parks were considered successful according to the occupancy rate). However, these conclusions fall short of a precise assessment of the program's contribution to deconcentration, just as in the case of the regionally differentiated tax and credit regime.

4. The empirical evidence

What do we know regarding the determinants of the observed interregional shifts of manufacturing growth? How relevant has been public policy *vis-à-vis* factors not controlled by the government in this process? These are the questions that will be approached through comparing systematically the existing formal studies on the subject. First, I will discuss the methodological characteristics of these studies, in order to make it clear what exactly is going to be compared in terms of the empirical findings. Then I proceed with an analysis that reviews and contrasts the principal results. This analysis will serve to establish some preliminary propositions, in a final section, regarding the effect and importance of individual regional attributes on regional industry growth, as well as some changes in the importance of some attributes over time. This review is also intended to serve as the basis to build *a priori* expectations that eventually could be subjected to further statistical testing.

4.1. *Characteristics of the studies*

The recent empirical research and evidence on interregional industrial growth and business location decisions in Mexico is limited to a few survey-based and econometric studies. These few recent studies have been carried out within the 1990s. There are also a few early studies using basically descriptive and quite simple qualitative techniques, which are unable to produce any measurement or quantification of the impact of individual regional attributes. These studies are not the subject of this analytical review as they refer to a period in which the regional pattern of manufacturing growth was essentially different.⁸

Some of the recent studies use direct information from survey-questionnaires (addressed to plant managers/owners) to produce rankings of the most influential regional attributes or locational factors for the location choice. Perhaps due to the expansion of Mexico's manufacturing space since the early 1970s, these studies tend to focus on the factors driving location decisions outside of Mexico City. Two of the survey-studies (Vleugels, 1990; and Garza, 1992) rely on samples of plants located in industrial parks invariably adjacent to mid-sized cities. The former deals with the location decision in Central-region cities/sites, and assesses the importance, for local manufacturing growth, of relocations from Mexico City *vis-à-vis* local start-ups. 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 created between 1970 and 1987.

⁸ 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 MAMC or the whole Central region, that accompanied the process of rapid industrialization of the Mexican economy between 1940 and 1970. The period analyzed by Lamartine and López Malo ends around the mid-1950s, and Bassols (1979) updates the analysis including data of the 1975 industrial census. In some of these quite extensive works, the evolution of the regional pattern of manufacturing growth is analyzed as part of the evolution of Mexico's regional development since the beginning of the century. These early studies apply a combination of descriptions of regional statistics, unstructured interviews with local entrepreneurs and government officials, and field observations; these techniques allowed researchers to reach plausible conjectures regarding both the advantages of Mexico City *vis-à-vis* other major regions, and the association of these advantages with the concentration of industry in the former. However, no measurement or quantification of the relative impact or importance of such advantages could be produced from that type of study.

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-Tecate area (bordering California), the seat of the largest concentration of maquiladoras. This study includes only plants operating in the electronics industry and distinguishes between regional (Tijuana-Tecate area) and site-specific searches. 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 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). 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 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 analyzed period. An equilibrium model assumes that differences in industry growth across regions occur when the equilibrium is disturbed by changes in the factors affecting demand or costs (*i.e.*, changes in relative profitability across regions). The restoration of equilibrium usually is specified with a lag, due to the short-run immobility 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).

Apparently, for the case of Mexico, there are only three studies related to this research field applying multiple regression analysis (Ramírez, 1995; Tamayo, 1996; and Mendoza and Martínez, 1999). 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.⁹ This study

⁹ Flexible systems have come to affect the location decision insofar as traditional capital-labor relations and subcontracting relationships are redefined. They entail the

applies different binary-choice models in which the dependent variable, location, takes the value one if the “north” option is chosen and zero if the “not north” option is selected. It uses eight composite or block explanatory variables.¹⁰ These variables are first constructed based on data from a sample of 49 plants located in North (27) and Central (22) Mexico, and then only using 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 auto-plants located in that region, and accounts for 85 percent of Mexico’s export volume—engines, vehicles and auto-parts. The plants located in Central Mexico, in contrast, are largely oriented to satisfy domestic demand.

The macro-study by Tamayo (1996), explores the determinants of interregional growth differentials for 19 four-digit level manufacturing industries. It focuses on how the impact of public policy variables fares *vis-à-vis* the effect of factors over which the government has no control. Real manufacturing value added is the chosen measure of manufacturing growth (dependent variable), and among the explanatory variables are included measures of market potential, labor costs and productivity, agglomeration economies, and tax and public investment. The units of analysis are the 31 Mexican states plus the Federal District. A disequilibrium-adjustment model is the basic framework of analysis. The estimation technique applied is seemingly unrelated regressions (SUR). The analysis is carried out for two time periods, 1970-1980 and 1980-1988, thus permitting a systematic comparison of parameter estimates over periods and across industries.

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. Suppliers receive advice on how to use technologies, quality control, and organization of just-in-time deliveries, but they also share responsibility in designing components and delivering defect-free products just-in-time.

¹⁰ The eight block variables which resulted from factor-analyzing the survey information 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.

Mendoza and Martínez (1999) is a macro-study which focuses on the influence of agglomeration economies and external (U.S) markets on regional manufacturing employment growth. Besides these two central explanatory variables, it also controls for the effect of labor costs and productivity, and average plant size. As in Tamayo (1996), the units of analysis are the 32 states (including the Federal District), and the framework of analysis is a disequilibrium model. The technique applied is ordinary least-squares for three periods (1980-1985, 1985-1988 and 1988-1993). This study pools together all 54 four-digit level manufacturing industries. It should be noted that the estimates of this study must suffer from considerable bias and other quite obvious flaws due to design deficiencies.¹¹

The dissimilarity of methodologies in terms of techniques applied, units of analysis, periods, regions and industries covered, all of which reflect differences in the questions that each study is seeking to answer, certainly poses difficulties for achieving a straightforward comparative effort. Thus, the comparison of each particular locational attribute across studies requires to state clearly and explicitly its different definitions, as well as the different definitions of industrial growth or the type of location decision that is analyzed.

4.2. A note on the influence of industrial and trade policy

Before entering into the subject matter, it is important to discuss briefly the role that national industrial policy, trade policy, and global sourcing corporate strategies have played in the pattern of regional manufacturing growth and industrial location in Mexico. These types of public and corporate actions certainly have had an important influence on the interregional shifts of manufacturing production to the extent that they modify the relative importance of the regional attributes for the location decision. In Mexico, for instance, the protectionistic import-substitution de-

¹¹ The study is pooling the 54 four-digit industries in each of the three periods without applying the corresponding homogeneity tests. That implies the strong assumption that the parameter estimates are the same across the 54 industries, which definitely is quite unlikely. The correct approach is to pool only industries which according to the appropriate F-test can be assumed to have similar parameters. Therefore, the resulting estimations are biased as industries that are considerably different are pooled together. Other problems are that the periods of analysis are not long enough so as to represent long-term trends insensitive to cyclical fluctuations; testing the impact of wages without controlling for the effect of productivity is not appropriate either (both variables are tested simultaneously only in one of five regressions).

velopment strategy, in place roughly from 1940 to 1980, contributed to exacerbate the spatial concentration of production as trade protection stimulated industries that were already highly concentrated in Mexico City (consumer and to a less extent intermediate goods), the only sizable consumer and industrial market and the hub of a poorly interconnected national transportation network. In short, a highly concentrated pattern of production existed already at the onset of the inward-looking industrialization stage, but it certainly was magnified by the import-substitution policies as the primate city no doubt was the safest and most profitable location for most of the nascent industry. Thus, in a cumulative and circular causation process, as the pace of national industrialization accelerated, the pulling forces of the primate city (market and agglomeration economies) became stronger. For most industries there was no location alternatives better than Mexico City.

Since the mid-1980s, Mexico's long-standing inward-looking strategy began to be dramatically reversed. A far-reaching trade and investment liberalization program was implemented in order to eliminate the economy's anti-export bias rooted in the protection of the domestic market. Simultaneously, large U.S.-based transnational corporations had started relocating part of their production into Mexico in order to improve the efficiency of their global and/or North American sourcing network and their competitiveness in the U.S. market. Mexican subsidiaries in the automotive and electronic industries are the most prominent examples of this strategy. That tendency was further promoter by the North American Free Trade Agreement (NAFTA) activated in January 1994. The stable guaranteed access to the U.S. market and the potential trade diversion affecting non-member countries certainly enhanced Mexico's attractiveness countries for foreign investment *vis-à-vis* other newly industrialized countries. Consequently, the growth of foreign direct investment inflows and exports during the post-NAFTA period has been impressive. In short, the handsome combination of these corporate global sourcing strategies with the far-reaching outward-oriented industrial policies resulted in a quite dynamic industrial growth and a large scale re-orientation of production toward export-markets, mainly the U.S. market.

In terms of locational patterns the point to emphasize is that once Mexico is chosen to invest arguably because of its competitive labor costs, subsequently enhanced by the advantages of

the trade regime, a northern location is preferred *vis-à-vis* southern or central sites because it provides a better access to the U.S. market—transportation costs of inputs and output are minimized. In addition, the coordination with parent firms in the U.S. and the supply of technical and executive U.S. personnel are improved. In short, on the aggregate, the regional pattern of manufacturing growth was reconfigured as the decisive location factors for the most dynamic export-oriented industries were different from those of the leading import-substituting industries. Thus the increasing export-orientation is responsible for the notorious northward shift of production, but the reason is that access to the U.S. market became a decisive locational factor for export-oriented industries. Further comments will be made throughout the following discussion regarding the impact of national industrial policy on the relative importance of particular location factors.

4.3. The principal findings

The location factors or regional attributes are grouped in five categories: access to output markets, input sources, labor-related factors, public infrastructure, and fiscal incentives. Notwithstanding the methodological qualifications stated above, the analysis will make readily apparent whether or not the importance assigned to individual factors is consistent across studies and changes over time if there are different periods. A summary of the results for the main variables used in these studies is presented in Table 2.

4.3.1. On the importance of domestic and foreign markets

As Vleugels (1990) reports, “access to markets” has been the single most important locational factor in the Central region, as ranked by business managers. The definition of “access to markets” in that study implies a location that allows serving efficiently important national markets or the most important one (this includes a good connection to the national highway system). Consistently, the same study reveals that Mexico City is by far the main output market for plants located in Central-region cities. It is followed by the regional market—the market in other states within the same region. Local output markets—markets within the state where the plant is located—are of much less magnitude.

Table 2
Summary of results of studies on inter-area manufacturing growth and business location decisions

Study	Output Markets	Input Sources	Labor-related factors	Infrastructure	Fiscal incentives	Agglomeration economies
Vleugels, 1990 (Survey)	Access to national markets is the single most important factor in the Central Region.				Federal fiscal incentives, together with state-local incentives (tax breaks, free land) are the second most important factor in the Central Region.	
	State-local output demand is a factor of moderate-to-low importance. State-local competition is in general the lowest rated factor. Both factors taken together (<i>i.e.</i> , market access) is inversely related to plant-size and crucial for very small plants.	State-local input sources have a moderate-to-low importance. However, it varies inversely with plant size. It is important only for very small firms.	Local availability of labor and the “labor climate” (<i>i.e.</i> , union rates, union activity, turnover rates) are important location criteria, second only to local infrastructure. Small plants play down the importance of the labor climate. Wages and qualifications-skills are of moderate and moderate-to-low importance, respectively. Large plants play up the role of labor costs.	Supply of local infrastructure (power, fuels, water, and other public utilities), is the highest-rated factor for all plant sizes. Transportation facilities are also important. Banking services are of moderate importance, whereas those offered by business organizations are rated very low.	Overall, government support programs (broadly defined) are, at best, of moderate importance	
Garza, 1992 (Survey)						

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<i>Study</i>	<i>Output Markets</i>	<i>Input Sources</i>	<i>Labor-related factors</i>	<i>Infrastructure</i>	<i>Fiscal incentives</i>	<i>Agglomeration economies</i>
Tamayo, 1996 (Econometric)	<p>In 13 of 19 industries, output tends to grow the most in states with a high market potential, notably in intermediate and durable goods (1970-1980).</p> <p>The importance of market potential (domestic) declines in 1980-1988. Most of the minority of growth-industries either is insensitive to inter-state market potential differentials or shows a tendency to expand the most in low-market potential states. Only two of the 9 growth-industries continued showing a tendency to increase production the most in states with high market potential.</p>		<p>There is a tendency of output (13 of 19 industries) to expand the most in high-wage states. This tendency was particularly strong for capital-intensive industries (1970-1980).</p> <p>The same tendency is shown for most of the few growth-industries, in 1980-1988.</p> <p>Output growth in all 19 industries is insensitive to inter-state differences in labor productivity in both periods.</p>	In 14 of 19 industries, output growth is insensitive to inter-state differences in public investment in communications and transport infrastructure (1970-1980).	Most of the 19 industries do not tend to avoid states with a relatively high business-tax effort.	<p>For some industries (8 out of 19) in capital and consumer goods, there is a tendency of output to expand the most in states with a large urban size (1970-1980).</p> <p>Growth in the rest of industries (11) is insensitive to such factor.</p> <p>For the period 1980-1988, inter- area growth in all 19 industries is insensitive to cross-state differences in urban size.</p>

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<i>Study</i>	<i>Output Markets</i>	<i>Input Sources</i>	<i>Labor-related factors</i>	<i>Infrastructure</i>	<i>Fiscal incentives</i>	<i>Agglomeration economies</i>
Ramírez 1995 (Econometric)	Corporate strategies to enhance competitiveness in the U.S.-Mexico market, “producing for export”, has a strong positive influence on the decision to locate auto-plants in North Mexico		Labor conditions favorable to the application of just-in-time systems (<i>i.e.</i> , supply of non-union labor, polyvalent workers, and flexible contracts) has the strongest effect on the decision to locate an auto-plant in North Mexico. Availability of labor force with traditional qualifications, engineers, and technicians, is negatively correlated with the above location decision.	Traditional factors (<i>e.g.</i> , stock of public infrastructure and fuel distribution systems) are not determining for the decision to locate an auto-plant in North Mexico. Their impact is subordinated to the existence of favorable labor-related characteristics.	Federal government incentives (preferential loans, tax exemptions, free land) are not determining for the decision to locate an auto-plant in North Mexico. Their impact is subordinated to the existence of favorable labor-related attributes. Indirect evidence suggests, however, that federal government incentives are important for the decision at the site-specific level.	

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Study	Output Markets	Input Sources	Labor-related factors	Infrastructure	Fiscal incentives	Agglomeration economies
Mendoza and Martínez, 1999 (Econometric)	<p>Advantages from proximity to the U.S. market (a higher market potential) do not result in a higher growth of border states (1980-1985). Border states have higher growth rates in 1985-1988, but lower in 1988-1993, than the rest of the nation (the presumed higher impact of the U.S. market potential on border states is ambiguous). Inter-state growth is insensitive to distance from the U.S. border in 1980-1985 and 1985-1988; but growth tends to be higher as distance from the border increases in 1988-1993. (a)</p>		<p>Manufacturing growth is insensitive to wage rate differentials across states (1980-1985). Growth tends to be higher in states with high wage rates for the periods 1985-1988 and 1988-1993.</p>			<p>Manufacturing growth tends to be higher in states with high shares of related activities (shares in the 2-digit industry each of the pooled 4-digit activities belong to) in the three periods analyzed. The positive impact of related activities is higher in the northern border states.</p>

Study	Output Markets	Input Sources	Labor-related factors	Infrastructure	Fiscal incentives	Agglomeration economies
Quintanilla, 1991 (Survey)	"Border location factor" (i.e., advantages derived from proximity to markets and parent firms in the U.S.) is the most important factor for the maquiladoras in the State of Tamaulipas' three border cities.		The local labor-climate and supply of professionals and skilled workers are very important for the location of maquiladoras in Tamaulipas' border cities.	Very similar to the findings of Galbraith <i>et al.</i> (below)		
Galbraith <i>et al.</i> , 1990 (Survey)			An adequate supply of management-staff, technicians and skilled workers, in that order are the highest-rated criteria for the location of maquiladoras in electronics in Baja California.	Provision of infrastructure at the state/local level (transportation, energy, water for industrial use) and at the site-specific level (urban public transportation, proximity of highways, housing, industrial park) are important factors for the maquiladoras, but not as important as personnel-related factors.		

Source: Author. (a) Distance which reflects transport costs is the weighting factor in the definition of market potential

Garza (1992) reports similar results. Overall, state-local output demand has a moderate-to-low importance in the location decision. The 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 the level of local competition (*i.e.*, local market access) are crucial 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 host-city, and only 12.5 percent sell more than 15 percent of their output in their respective host-locations.

In agreement with the high importance of access to national markets found by survey studies, Tamayo (1996) which applies a multiple regression technique, found that for 13 of the 19 manufacturing industries analyzed there is a tendency for output to grow the most in states with a high market potential.¹² In addition, that study reveals that such tendency, in general, is much stronger for durable and intermediate goods industries than for consumer goods industries. It also reveals, as expected, that among industries whose location is strongly tied to the location of natural resources the tendency is rather weak. These results are for the period 1970-1980.

During the 1980-1988 period, market potential was no longer a factor though, according to Tamayo. Most of the minority of industries that experienced growth in that period of economic recession either were insensitive to inter-state market potential differentials or showed a tendency to expand the most in states with low market potential. The previous strong tendency to expand production mostly in states with high market potential was offset, if not reversed, by the severe contraction of the domestic market, which was largely concentrated in the Capital and Central regions.

¹² That study defines the market variable 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).

Simultaneously, there was a far-reaching reorientation of important industries toward export-markets, mainly the U.S. market, which prompted a northward shift of production. This reorientation toward export-markets was in response to an increasing foreign competition, forced by balance of payments requirements, or prompted by changes in corporate strategies aimed at increasing competitiveness in the U.S. market. Ramírez (1995) provides econometric evidence that the decision to locate an auto-plant in Northern Mexico is positively and strongly influenced by a factor he called “*producing for export*” (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 reflect corporate strategies to enhance competitiveness in the North American market.)¹³ Consistently, the results of qualitative studies (UNCTC 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.¹⁴ It is clear that the northward shift implied an advantage in terms of distance and thus access to the U.S. market and parent firms, relative to alternative locations further south in Mexico. Apparently, the impact of auto-plants on the local industry has been significant.¹⁵ Likewise, a survey-study (Quintani-

¹³ 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, 1995, Table 1.)

¹⁴ 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 engine and vehicle assembly capacity, for intra-firm exports to the U.S. The bulk of that additional export-capacity took 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 were increased commensurately. That program was aimed at making the industry “balance-of-payments” neutral.

¹⁵ 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, Sonora—the production of these plants is exclusively sold to Ford. Ford’s export-plant accounted for 62 and 55 percent of the State of Sonora’s exports in 1988 and 1989,

lla 1991) reports that what the author simply calls “border location factor” (which rather reflects advantages derived from proximity to parent firms and markets in the U.S.) dominates the location factors ranking of the maquiladoras in each of the three border cities/sites covered in that study.

A different story can be told when the impact of the “border factor” is analyzed for the manufacturing sector as a whole rather than for the maquiladoras or the industries in which these operations concentrate. Mendoza and Martínez (1999) report that there is no clear tendency in the performance of manufacturing employment growth in the Northern border states over time. It was not different from the rest of the nation in 1980-1985; it was higher in 1985-1988, but lower in 1988-1993. Using distance to the nearest Mexico-U.S border crossing to measure the effect of the U.S. market, the same study found that aggregated employment growth was insensitive to the distance factor in 1980-1985 and 1985-1988. Moreover, in 1988-1993, employment growth in manufactures tended to be higher as distance from the U.S border increases. Consistently, studies that analyze simply the changes in the inter-state distribution of manufacturing output during the 1980’s and early 1990’s (Katz, 1998), show that for the sector as a whole the share of the border states altogether has remained stable around 20 percent, with slight increases in 1980-1985 and 1985-1988, and minor declines in 1988-1993.

4.3.2. *Agglomeration economies*

The cost savings derived from agglomeration economies (*i.e.*, achievement of efficient scales through specialization, and the availability of positive cluster-based externalities) have been found to have a positive impact on manufacturing output/employment growth. Tamayo (1996) reports that for the period 1970-1980, eight of the 19 industries included in the study (seven of which produce durable or consumer goods) show a tendency to expand output (value added) the most in states characterized by high agglomeration economies, as measured by urban population size.¹⁶ The

respectively. Moreover, expansions and establishment of new export-plants in other industries such as computers, food and beverages, and cement are also taking place in nearby sites, the same source reports.

¹⁶ Moomaw (1983) provides explicit evidence that for many industries population size is a good surrogate for the underlying components of agglomeration economies (urbanization and localization economies, congestion diseconomies, public infrastructure, and qualified labor force). Several studies of very different methodological approaches have used measures of population size as a proxy for agglomeration economies.

rest, which is the majority, seemed to be insensitive to inter-state differentials in that factor. Surprisingly, for the period 1980-1988 agglomeration economies are no longer a factor in the inter-state output growth differentials in any of the 19 industries, according to the same study. Mendoza and Martínez (1999) found that employment growth across industries tend to be higher in states with strong *localization economies*—i.e., high shares in the 2-digit sub-sector each of the pooled 4-digit industries belongs to. (Localization economies are a component of agglomeration economies resulting from large concentrations of activity in a particular industry in proximity, which entail cost-savings arising from a greater availability of supplier firms and a large pool of skilled labor with industry-specific skills.) The result is the same across the three periods between 1980 and 1993. The impact of this variable on employment growth turned out to be higher for Northern border states, suggesting that for the maquiladoras the advantages implied by clustering plants belonging to the same industry has had a larger positive impact on growth. In short, it seems that since the mid-1980s manufacturing activity, in general, has not been particularly attracted toward regions/locations with sizable business agglomeration economies, usually the country's few large urban-industrial concentrations. Rather, growth has gravitated toward regions with a particular manufacturing specialization that guarantees strong industry-specific cluster-based business interrelations, localization economies.

4.3.3. *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. State-local supply of inputs is quite important only for very small firms. Consistently, Garza also 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 exceptions to this pattern are the plants located in Mexico's second largest industrial city (Monterrey), which present relatively strong local linkages. Similarly, Vleugels (1990) reports that for plants located in the Central region, the main source of industrial inputs is Mexico

City, followed by regional sources. Local sources of industrial inputs are also the least important.

The study by Garza also reveals 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. This sort of “footlooseness” generalized in manufacturing, to some extent, can be explained by the relative unimportance of transport costs—in 80 percent of the plants surveyed by Garza, transport costs represented less than 5 percent of total costs.

4.3.4. *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 most, a moderate proportion of total costs; labor costs are less than 20 percent of total costs in 74 percent of the plants surveyed by Garza. Among the maquiladoras, both the local “labor climate” and the availability of professionals and skilled workers are also very important for the location decision (Quintanilla, 1991). The study by Galbraith *et al.*, consistently reports that for the maquiladoras’ *regional search* (Tijuana-Tecate area), an adequate supply of management staff, technicians, and skilled workers, in that order, are the highest-rated location criteria.

The econometric evidence is consistent, to certain degree, with the at best moderate importance of labor costs (for the whole sector) supported by survey studies. For instance, Tamayo (1996) shows that during 1970-1980, contrary to conventional expectations, there was a tendency for manufacturing value added (13 of 19 industries) to expand the most in high-wage states. The explanation of such result 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 very attractive for production. For the period 1980-1988, value added growth tended to be higher in high-wage states, just as in the previous period, only in the few industries that underwent a drastic restructuring toward export-markets during the 1980s (*e.g.*, automobiles, electronic equipment, and machinery & equipment). Actually, these were also the only industries that kept growing amidst the crisis. A similar tendency is found in Mendoza and Martínez (1999) for aggregated manufacturing employment growth during the periods 1985-1988 and 1988-1993; *i.e.*, growth tended to be higher in high-wage states. For the period 1980-1985, that study reports that manufacturing employment growth was insensitive to inter-state wage rate differentials.

In agreement with the low importance of labor skill-qualifications evidenced through survey studies, Tamayo (1996) reports that manufacturing output growth in all 19 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). This result may reflect the traditional routinization and low-skill requirements of most industrial tasks in the typical Mexican manufacturing system, which enable firms to find an adequate supply of labor in virtually every major urban area. Hence, the decision as to where to increase production becomes indifferent to inter-state differentials in the level of education of the work force. 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).¹⁷

Shaiken's study also reveals 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 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" (Shaiken, 1994:

¹⁷ That study, based on interviews, 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 elementary school education, and about 50 percent of the workers in a Japanese electronics plant have only elementary school completed.

4). That emphasis on relatively inexperienced workers and weak, more compliant 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 8). Thus, the *city-site-specific search* (once the decision to locate in the north had been made) to a large extent was determined by the need to secure greater work place flexibility.

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 Northern Mexico. In contrast, such a decision is negatively correlated with the composite variable *supply of traditional labor force* which incorporates factors such as 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. In short, appropriate conditions for the *application of just-in-time systems* is the decisive locational factor for the *city-site-specific search*, 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.

4.3.5. *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.¹⁸

¹⁸ In that study, infrastructure includes the provision of power, fuels, water and other public utilities not clearly defined 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.

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.*, transportation, energy, and water for industrial use), as well as at the site-specific level (*e.g.*, urban transportation, highways, housing, and an industrial park) is an important factor, second only to personnel-related factors.

As regards fiscal incentives, Vleugels (1990) reports that federal incentives offered as part of industrial deconcentration programs (see section 3), 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 Mexican territory (Garza 1992) found that, overall, government support programs (broadly defined) have had, at best, a moderate importance. An ineffectual role of fiscal and credit incentives aimed at promoting deconcentration has also been documented for other important Latin American economies.¹⁹

The econometric evidence, in general, seems to be consistent with the preceding results. Ramírez (1995) 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, and free land) are not determining for the decision to locate an auto-plant in Northern Mexico. As noted by the author, such a result does not mean that government support programs have no importance whatsoever for the location choice, but rather that their importance is conditioned by the existence of other factors. Furthermore, Ramírez argues (based on qualitative information) that 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).²⁰ The effect of tax varia-

¹⁹ With the reservation of having relied 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.

²⁰ Federal and state incentives, Ramírez argues, were determining for the firms to choose a specific site within the North. The federal government built a 350km-gas

bles on the location choice certainly should be expected to increase as the size of the area over which the search takes place decreases. This is so because inter-site costs and market differentials usually narrow as the size of the area wherein the potential sites are located shrinks.

Tamayo (1996) reports that, during the 1970-1980 period only five of the 19 industries studied showed a tendency to expand output the most in states with a relatively high level of public investment in communications and transport infrastructure. It should be noted that such measure merely reflects a short-term policy. Most industries appeared to be insensitive to inter-state differentials in that type of investment. Theoretically, it is the stock of public capital (which reflects the long-run investment policy) rather than current investment what enhances the attractiveness of a particular region for manufacturing production. The same study indicates 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).²¹ Arguably, forward shifting to consumers is a plausible explanation given the high levels of trade protection and the oligopolistic structure of the Mexican industry 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. Certainly, higher taxes on business should not discourage industry growth,

pipeline, streamlined the seaport of Guaymas, Son., 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, Coah., and to build 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 telecommunications infrastructure. However, given the high magnitude of the federally-funded provision of infrastructure it seems 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 private businesses to turn down additional state incentives even if such incentives are not decisive for the location choice.

²¹ 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 tax concessions (given against business income taxes) which are not homogeneous across states, including those derived from the regionally differentiated system of tax credits described in section III.

provided that businesses are compensated somehow for the tax differential they pay.

4.3.6. *On the push factors inducing deconcentration*

The number of branch plants established by Mexico City-based firms in Central-region industrial parks, as well as the number of relocations of single-plant firms from Mexico City to these sites have been considerable, relative to local start-ups, as reported by Vleugels (1990). However, the proportion of plants moving away from Mexico City declines with increased distance, relative to the total sample at each site. In contrast, local start-ups become more important (the sample also includes intra-region relocations, and interregional relocations other than from Mexico City). Likewise, Aguilar (1993) provides evidence that a high proportion of the plants moving out of Mexico City is relocated within the Central region; 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 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 (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. This suggests that proximity and good highway connection and thus good access to Mexico City's market have become an attractive attribute of Central-region locations, once manufacturing activities in Mexico City started to experience diseconomies. 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. The local linkages of these relocations reportedly are minimal. A similar deconcentration pattern has been found in Sao Paulo, Brazil (Townroe, 1983), and Seoul, Korea (Kwon, 1981).²²

²² 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 metropolitan 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.

As regards the northern concentrations, there is 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).²³ 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. The study by Galbraith *et al.* 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 the 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) and public transportation. Nevertheless, the increasing number of maquiladoras in interior locations shown in the statistical reports should not be mistaken as new investments with a high foreign participation, nor as a change in the traditional locational pattern of 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, which became a relevant alternative to face both the increasing competition from abroad brought about by the far-reaching trade liberalization, and the contraction of the domestic market.

5. Preliminary inferences and policy implications

5.1. *Main direct conclusions*

Throughout the last 15 to 20 years a process of concentration reversal appears to have gained a foothold in Mexico, yet the share of the MAMC in national manufacturing is still more than one third. The attraction of industry toward the market potential offered by the few major metropolitan areas, mainly the MAMC,

²³ 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).

no doubt remains strong and hence will continue imposing severe constraints on the range of potential location alternatives that new industry or expansions would consider.²⁴

Notwithstanding the limited number of studies and their quite dissimilar methodologies and designs, which makes it difficult to reach definite conclusions, some preliminary propositions could be derived from the available evidence. Any assessment of public policy variables proved to be particularly difficult. Undoubtedly, there is a great deal of work to be done before we can evaluate the extent to which policy intervention can and should influence changes in the regional pattern of manufacturing growth.

A safe proposition is that the stock of local infrastructure needed by manufacturing operations has exerted a decisive influence on the locational choice, regardless of plant size. Thus, that factor constitutes a very important stimulus for state/local industry growth. In contrast, short-term investment policy (*i.e.*, annualized investment in economic infrastructure) apparently has no relationship with state industry growth. Nevertheless, infrastructure investment would produce a significant pay-off and be more efficient if it targets firms or activities that, together with the improved capital stock, are likely to generate important externalities and growth potential.

This review also reinforces the belief that federal-state fiscal incentives have been important yet secondary only within Central-region states/locations. The importance of that factor 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 good access to the main national market is the decisive factor for the decision to locate or relocate in Central-region sites, suggests that not even within that region the effectiveness of fiscal incentives is beyond doubt. In any case, its importance seems to be subordinated to the existence of other regional attributes. Moreover, there is some evidence that many industries have not avoided states characterized by high business tax-efforts.

²⁴ Compared to developed economies, the attraction of agglomeration economies and market potential 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. Moreover, 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.

As regards 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. That is, a great deal of the observed inter-area differentials in manufacturing growth is directly related to 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 explains, to a large extent, the still dominant yet declining share of the MAMC in manufacturing. Some industrially 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.

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. Simultaneously, since the mid-1980s access to export-markets, mainly in the U.S., has become a very important factor for the growth of dynamic industries with important participation of foreign capital. A northward shift of manufacturing growth was produced by the swift structural reorientation of these important industries toward export-markets. The impressive growth of the number and output of maquiladoras across northern border cities since the mid-1980s also accounts for an important part of the northward shift. 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. Hence, inter-area differentials in access to export-markets seem to account for a great deal of inter-area growth differentials of important industries. In the 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 labor climate propitious for the introduction of flexible technology.

There is also empirical 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. With respect to the so called agglomeration economies, while important for growth in some capital and consumer goods industries still in the 1970s, they are no longer a factor in the 1980s and early 1990s, according to the available evidence. That implies a loss of attractiveness for the few traditional large urban-industrial concentrations. In contrast, localization economies –a particular type of agglomeration economies more closely related to size in a given industry than to urban size– seem to be an important factor in the promotion of state/local manufacturing growth. A point to emphasize here is that the number of industries for which the large urban-industrial concentrations have a dominant share is declining, which in turn implies the existence of important localization economies in different non-core regions that are driving a pattern of deconcentration in manufactures.

As regards labor factors, according to the available evidence, relatively high wages do not deter industry growth, the conventionally expected negative impact of labor costs is moderate at best. 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 levels of education of the working-age population (as a proxy for labor productivity). Likewise, the qualifications of the local work force appear to have only a moderate-to-low positive impact on industry growth.

5.2. Implications for regional growth policy

Some policy implications dealing with the effectiveness of and constraints on state intervention to enhance industrial growth potential in particular areas can be drawn from this review. This is particularly important as regional policy in Mexico after having disappeared for more than a decade, is apparently making a come back with the Plan Puebla Panama, a demand-driven approach to promote the development of Southern México, possibly in coordination with Central America, mainly through investments in large scale economic infrastructure projects. So far the Plan still remains as an idea without the details about specific

programs and the consistency among them, and with no clear definition regarding financing, private sector participation and state governments' commitments.

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; the states in which the largest urban-industrial areas are located. The visible locational shift of the auto-industry toward the north (and away from the large national markets) was driven primarily 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. With a few other important exceptions, most manufacturing industries, however, are likely to remain oriented toward the domestic market insofar as they have a low export-propensity and much less involvement of foreign subsidiaries. This implies that the effect of any reallocation of public resources toward deconcentration will be constrained by the still powerful inertia toward concentration in the few large urban-industrial areas that possess a high market potential, as well as in some intermediate cities which have built up important localization 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. On the other hand, it is not an easy task 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, in developing countries it is very difficult to reconcile this trade-off between aggregated efficiency and interregional equity as 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 concentrated 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. In Mexico, manufacturing activity is shifting away from the MAMC and largely toward the Northern and some Central-west and Central-north states. The shift toward the north has been particularly pronounced and, to some extent, 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 correspondent regional policy and, to some extent, because of macro and sectoral policies introduced since the mid-1980s as key components of the export-led development strategy consolidated with the activation of the North American Free Trade Agreement (NAFTA).

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 some leading industries are 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 enhance the potential positive externalities and scale economies that firms could realize there. This can be achieved mainly through reducing these areas' economic infrastructure deficits,

which may facilitate their accelerated growth and raise national growth as well. Some authors even suggest that such policy would be more beneficial even for industrially backward areas as it would enable the economy to take full advantage of the potential benefits derived from NAFTA (Richardson and Rowland, 1994).²⁵

In short, the point to emphasize is that there is an opportunity to integrate active industrial deconcentration policies into the current 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 trade-off between aggregated growth and interregional equity can be best approached by concentrating the allocation of investment in economic infrastructure among regions/areas of intermediate development, as proposed here, and the allocation of investment in social infrastructure among lagging regions. There is already some econometric evidence showing that in Mexico economic infrastructure explains a great deal of the economic growth in regions of intermediate development, whereas its effect is insignificant among lagging regions (Looney and Frederiksen 1981; Arteaga 1996). The opposite occurred with social infrastructure investments. 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 interregional equity.

²⁵ That study identifies 12 northern border cities and 12 non-border cities (four of which are located in northern border states) as the most likely to benefit from NAFTA and hence the primary targets of federal investment in infrastructure. The selected non-border group includes four other cities in the Central region, and two more in the central-west. None is located south of Mexico City. The selection is largely based on the specialization of the cities in sectors that are expected to gain from NAFTA either directly or through backward linkages as reported in several studies on NAFTA's sectoral impact.

References

- Aguilar, I. (1993), *Descentralización Industrial y Desarrollo Regional en México: Una Evaluación del Programa de Parques y Ciudades Industriales 1976-1986*, Mexico, El Colegio de México.
- Arteaga, J. C. (1996), *Infraestructura y Desarrollo Regional: Una Aplicación de la Tesis de Hansen para el Caso de México en los Años 1980 y 1990*, Monterrey, N.L., Centro de Investigaciones Económicas/ Facultad de Economía/ UANL.
- Bassols, A. (1979), *México: Formación de Regiones Económicas*, Mexico, Instituto de Investigaciones Económicas/ Universidad Nacional Autónoma de México.
- Boneo, H. (1985), *Desarrollo Regional, Incentivos Fiscales y Localización Industrial*, Buenos Aires, Centro de Estudios de Estado y Sociedad (CEDES).
- Brown, A. J. and Burrows E. M. (1977), *Regional Economic Problems*, Great Britain, Allen & Unwin.
- Bustamante, C. (1983), *Urban Concentration and Policies for Decentralization in Mexico 1976-1982*, Mexico, Instituto de Investigaciones Económicas, Universidad Nacional Autónoma de México.
- Galbraith, C. S., De Noble, A. F. and Estavillo, P. (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, G. (1992), *Desconcentración, Tecnología y Localización Industrial en México: Los Parques Industriales 1953-1988*, Mexico, El Colegio de México.
- Gerking, S. and Morgan, W. (1991), "Measuring the Effects of Industrial Location and State Economic Development Policy: A Survey", in H. W. Herzog Jr. and A. M. Schlottmann (eds.), *Industry Location and Public Policy*, Knoxville, The University of Tennessee Press.

- González, B. and J. Ramírez (1989), "Perspectivas Estructurales de la Industria Maquiladora", *Comercio Exterior* 39, México.
- Instituto Nacional de Estadística Geografía e Informática, INEGI (1995), *XIV Censo Industrial, Industrias Manufactureras, Extractivas y Electricidad*, Aguascalientes.
- Kwon, W. (1981), "A Study of the Economic Impact of Industrial Relocation: The Case of Seoul", *Urban Studies*, 18:1.
- Katz, I (1998), *La Apertura Comercial y su Impacto Regional Sobre la Economía Mexicana*, Mexico, ITAM/ Porrúa Editores.
- Lamartine-Yates, P. (1960), *El Desarrollo Regional de México*, Mexico, Banco de México.
- Looney, Robert, and Peter Frederiksen (1981), "The Regional Impact of Infrastructure Investment in Mexico", *Regional Studies*, 15:4.
- López-Malo, E. (1960), *Ensayo Sobre la Localización de la Industria en México*, Mexico DF, Universidad Nacional Autónoma de México.
- Mendoza, E. and G. Martínez (1999), "Globalización y Dinámica Industrial en la Frontera Norte de México", *Comercio Exterior* 49:9, Mexico.
- Newman, R. J. and D. 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. (1989), *La Política Regional en México, 1970-1982*, Guadalajara, México, Universidad de Guadalajara.
- Pradilla, E. (1991), "Las Fronteras de la Maquila", in *La Reconversión Industrial en Colombia y Otras Experiencias*, Bogotá, Universidad Nacional de Colombia/ Fundación Friedrich Ebert.

- Quintanilla, E. (1991), "Tendencias Recientes de la Localización de la Industria Maquiladora", *Comercio Exterior*, 41:9, México, DF.
- Ramírez, J. C. (1995), *La Organización Justo A Tiempo en la Industria Automotriz del Norte de México. Nuevos Patrones de Localización y Eficiencia*, México, Centro de Investigación y Docencia Económica (Documento de Trabajo).
- Richardson, H. W. (1981), "National Urban Development Strategies in Developing Countries", *Urban Studies*, 18:3.
- Richardson, H. W. and Townroe, P. M. (1986), "Regional Policies in Developing Countries", in P. Nijkamp (ed.), *Handbook of Regional and Urban Economics*, vol. I, The Netherlands, North Holland.
- Richardson, H. W. and A. M. Rowland (1994), "Las Implicaciones del TLC para el Sistema Urbano Mexicano", *Revista Interamericana de Planificación*, July-December.
- Sabel, Charles F. (1989), "Flexible Specialisation and the Reemergence of Regional Economies", in P. Hirst and J. Zeitlin Berg (eds.), *Reversing Industrial Decline? Industrial Structure and Policy in Britain and Her Competitors*, Oxford.
- Schoenberger, E. (1987), "Technological and Organizational Change in Automobile Production: Spatial Implications", *Regional Studies*, 21:3.
- Shaiken, H. (1994), "Advanced Manufacturing and Mexico: A New International Division of Labor?", *Latin American Research Review*, 29:2.
- Tamayo, R. (1996), *The Determinants of the Regional Patterns of Manufacturing Growth in Mexico 1970-1988*, Pittsburgh, Unpublished Doctoral Dissertation, University of Pittsburgh.

- Tenkate, A. (1980), "Protection, Regional Concentration and Interregional Distribution of Domestic Product", in A. Tenkate and R. B. Wallace, *Protection and Economic Development in Mexico*, New York, St. Martin's Press.
- Townroe, P. M. (1983), *Location Factors in the Decentralization of Industry: A Survey of Metropolitan São Paulo Brazil*, Washington DC, World Bank Staff Working Papers No. 517.
- Towse, R. J. (1990), *High Technology Industry, Industrialization and Location: A Bibliography and Geographical Review*, VANCE bibliographies, public administration series.
- United Nations Centre on Transnational Corporations (UNCTC) (1992), *Foreign Direct Investment and Industrial Restructuring in Mexico: Government Policy, Corporate Strategies, and Regional Integration*, New York, UNCTC Current Studies
- Vázquez, M. A. and García, G. (1992), *La Modernización Industrial en Sonora*, Hermosillo, Gobierno del Estado de Sonora.
- Vleugels, R. M. P. (1990), *Industrialization and Secondary Cities in Mexico*, Nijmegen Studies in Development and Cultural Change, Fort Laurendale, Verlag breitenbach Publishers.
- Wasylenko, M. (1991) Empirical Evidence on Interregional Business Location Decisions and the Role of Fiscal Incentives in Economic Development, in H. W. Herzog Jr. and A. M. Schlottmann (eds.), *Industry Location and Public Policy*, Knoxville, The University of Tennessee Press.
- Wilson, P. A. (1991), *Exports and Local Development: Mexico's New Maquiladoras*, Austin, University of Texas Press.

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