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Regional Growth and Development in Mexico and South Korea: A comparative analysis of Kaldor's laws

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Abstract

The growth and economic development of Mexico and South Korea have followed different paths in recent decades. Since the 1980s, Mexico's economy has grown slowly, not allowing it to move onto a fast growth path like Korea's. The empirical evidence shows that in Korea growth is determined endogenously: manufacturing has been the pivot for development by heading sectoral growth and that of the productivity of labor. In Mexico, the opposite case, the empirical evidence shows that there is no endogenous growth and no sectoral leadership to broaden and maintain a robust labor market. This has an impact on the country's long term growth path. In addition, Korean manufacturing growth leads to spill-over effects in a series of regions, which sparks positive spatial externalities; in Mexico on the other hand, the sector's slow growth has not translated into a source of regional growth in the years 1998-2008.
JEL **Classification**: C01, C31, O11, O14, O25, O41, O47.
Key words: Kaldor's laws, growth and economic development, regional growth and spatial econometrics.

Introduction

In recent years, the growth and development of the Mexican and Korean economies have followed opposite paths. Today, Mexico is immersed in what Myrdal (1975) called the "vicious circle of growth," while Korea has entered into what Thirlwall (2003) would call a "virtuous circle of growth." The fact that

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in the Mexican economy, the role of the state has been substantially reduced, putting a priority on the free market, contributes greatly to explaining these different paths. Meanwhile, in Korea, the state has played a more active role in consolidating the manufacturing sector as the driving force of its growth. Korea's consolidation of the manufacturing sector as the linchpin of its growth has not only contributed to strengthening the domestic market, but has also decreased and cushioned the country's external dependence. In addition to this, the space in which Korean manufacturing operates actively contributes to generating spillovers in the country's regions; this is not the case of the Mexican economy.

Other authors have already pointed out that basing job creation, production, and growth on exports can have grave consequences. Clavijo and Casar (1994) state that small disturbances in exports due to changes in tastes and consumer preferences abroad will tend to affect employment, and therefore, national growth. The country's high level of vulnerability in the face of external shocks is associated with the high degree of its trade opening (Blecker, 2010); therefore, the domestic market can operate as a cushion in the face of unfortunate events abroad. This by no means implies that the international market is not important for growth and development, but it can be supplemented by endogenous policies with an appropriate development of the domestic market, just as the evidence shows in the Korean case.

The main aim of this article is to use the three laws of Kaldor (1966; 1984) to analyze the growth path of the Mexican economy and compare it with the Korean case for the period between 1998 and 2008. Study of the Korean case is relevant for Mexico given that it exemplifies how the manufacturing sector can be the basis for growth, with exports as a complementary factor in its development. Mexico has followed an opposite strategy: the external sector determines the growth path and manufacturing complements it. This difference has made our country highly dependent on international trade and unable to consolidate a solid domestic market that would allow it to reduce its vulnerability in the face of external shocks.

The article is divided into three sections. The first briefly discusses the evolution of both economies during the period in question. The economic policies undertaken since the 1980s are underlined, as well as the way these policies evolved to consolidate the manufacturing sector and exports as the driving force for the growth of both economies. The second section develops the Kaldor-Thirlwall model, which emphasizes the importance of the manufacturing sector and total exports. The third part makes an empirical inference about the main stylized facts. Last comes the main conclusions and policy recommendations derived from this research, underlining the important need to foster the domestic market as the axis of long-term growth and development for Mexico's economy.

The economic growth of Mexico and South Korea

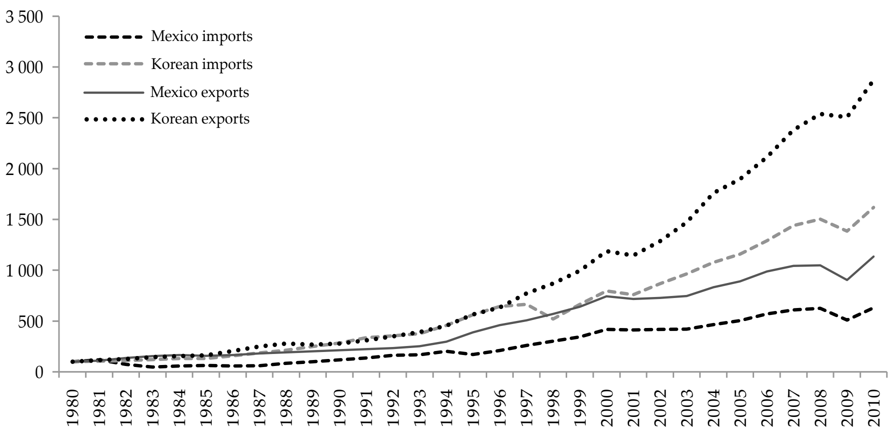
Since the mid-1980s, Mexico has prioritized a strategy of opening to international trade, which has reaped benefits and favorable results for the growth of exports. Despite the emphasis placed on promoting exports, their average growth in Mexico was 8% between 1980 and 2010, while in Korea, it was 12%. For the two economies, imports grew in the same period 6 and 10 percent, respectively.

The data in Figure 1 show that Korean exports became more dynamic in the early 1990s. The gap between Korea's exports and imports has tended to widen favorably as its economy's capability to generate foreign currency strengthened. To the contrary, in the case of Mexico, the data indicate that despite the growth in exports, it has been weaker than in the Korean case; this means that the gap between Mexican exports and imports is not as wide as that of the Korean economy.

Despite rapid growth in exports, international trade has not been a strong driving force for expansion of the Mexican economy (Ros, 2009). The fact that Mexican exports have little influence in the country's growth is due to many factors, very important among them, the real appreciation of the peso and the large share that maquiladora plants represent among exports (Moreno-Brid and Ros, 2009; Ibarra, 2011). As maquiladora-sector exports rise, their imports also tend to; this can be seen in Figure 1, which shows that exports and imports have very similar dynamics, a reflection of a weak domestic market (Ibarra, 2008). It has been confirmed that the maquiladora sector's sustained exports did not foster national chains or stimulate domestic production and that, to the contrary, they contributed to eliminating chains of local suppliers by upping the import of inputs (Stallings and Peres, 2000) and subjecting them to external competition (Moreno-Brid and Ros, 2004). Thus, the Mexican export pattern has been incapable of generating a structural change toward dynamic efficiency in which both productivity and employment can grow at the same time without generating unsustainable pressures in the external sector (ECLAC, 2012). In short, trade liberalization and macroeconomic reforms have failed to push Mexico onto a path of solid growth led by the external market (Moreno-Brid and Ros, 2009). To the weaknesses of the Mexican export model must be added internal structural problems that have blocked the country's capability to grow. Among these problems are the bad credit system, the economy's growing informal sector, the monopolistic control of key markets, low educational performance (Hanson, 2010), and a low investment rate (Ros, 2010).

Contrary to the Mexican case, the Korean government promoted exports using a centralist, managed capitalism model. One axis of this strategy was an industrialization policy oriented to the exterior. The low volume in the domestic market and the lack of natural resources led the country to seek a path toward sustained growth in the expanding foreign market. During this process, the government took out and controlled loans, investment in national companies, and even the location of the plants themselves (Lee and Yoo, 1998). In the beginning, Korea's industrial strategy was very selective in order to foster heavy industry and the chemical industry with an orientation toward exports (Cho, 1991). In the 1980s, it sought to consolidate that growth with a stable base, which it managed in the 1990s by developing industries that used new national technologies developed with state support to public and private research institutions. The success of the Korean strategy consisted of focusing on economic growth, and with that goal, fostering exports with a priority on investments that would contribute to increased productivity (Koh, 2012).

Figure **1**
Index of export and import growth for Mexico and Korea, 1980-2010



Source: Developed by the authors with World Bank data (2011).

If we compare the average growth rate of both economies' gross domestic product (GDP) from 1980 to 2010, World Bank (2013) data allow us to underline the fact that Mexico grew an average of 2% a year, while Korea grew 6% a year in the same period. In manufacturing, these differences are even greater, since Korea's grew 8.7% annually and Mexico only 2.4%. The Korean experience shows that to achieve a long-term growth path, exports must be knowledge- and technology-intensive (Hounie and Pittaluga, 1999), and must promote the creation of productive and service networks around them to be able to develop competitive local suppliers (ECLAC, 1990; 2012). This means that the products exported must be those that have the greatest technological content and value added and not just products assembled inside the country in maquiladora plants.

To reverse this situation, a strong domestic market must be consolidated with an export sector linked to it. This is why we can still learn from the discussion of the Korean case, given that that economy has managed to establish an endogenous, high-tech industrial sector on which its long-term development strategy is based. From our point of view, the Korean success falls in line with Kaldor's proposal (1966) that it is the manufacturing sector that drives economic growth from the demand side.

Kaldor's laws from the spatial perspective

Kaldor (1966) argued that it is difficult to understand the process of economic growth without taking into account the importance of the sectors, making the distinction between activities with growing and shrinking yields. The former are in the industrial sector while the latter are in the primary sector (McCombie and Thirwall, 1994; Thirwall, 1986). Greater dynamism and growth in manufacturing translates into growth in the other sectors, in productivity, and in competitiveness. For this reason, this sector's performance defines the trajectory of growth of a country or region. This proposition has been formalized in what have come to be called Kaldor's laws, which formulate three propositions establishing the way in which the manufacturing sector becomes the driving force of economic growth.

Although Kaldor's original proposition was aggregated and not regional or spatial, increasing numbers of studies have been carried out in which the three laws are evaluated on a sub-national level. McCombie and de Ridder (1983; 1984) and Bernat (1996) apply it to regions of the United States; Casetti and Tanaka (1992) look at Japan; Dasgupta and Singh (2006) analyze developing countries; Pons-Novell and Villadecans-Marsall (1999) and Fingleton and López-Bazo (2006) develop evidence about regions of Europe; and Wells and Thirlwall (2003) examine African countries. However, their work, despite having a regional dimension, does not explicitly take into account the role of space and the spatial dependence involved in growth processes. Only recently have studies of Kaldor's laws incorporated the effects of spatial dependence: Bernat (1996), Pons-Novell and Villadecans-Marsall (1999), Fingleton and López-Bazo (2006), Don (2007), Yonbock (2007), Angeriz, McCombie, and Roberts (2008).

This article applies Kaldor's laws with a sub-national perspective both for Mexico and for South Korea. This makes it possible to consider the existence of processes of spatial concentration of growth (Fujita, Krugman, and Venables, 1999) and its regional spread through spatial externalities (Fingleton and López-Bazon, 2006). To consider these effects, spatial econometrics is used (Anselin, 1988). A detailed review of this technique can be found in Cliff and Ord (1972), Paelinck and Klaassen (1979), Anselin (1987), Anselin and Florax (1995), and Arbia (2008).

In accordance with spatial econometrics, the presence of the self-correlation or spatial dependence has negative consequences in the standard estimator of ordinary least squares, which are non-biased but inefficient (Anselin, 1988).

To detect the presence of spatial dependence, we use the Moran index (Moran's I), which uses a matrix of spatial weights (W), whose elements have a value of 1 when the territorial unit is adjoining and 0 in other cases. Using Moran's I, the rejection of the null hypothesis of a random distribution of the variables in the space makes it possible to justify the use of spatial econometrics models that can be specified as follows:

$$y = \rho W_1 y + \beta z + \varepsilon \quad [1]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \quad [1a]$$

$$\mu \sim N(0,\Omega);\ \Omega_{ii} = h_i(z\alpha) \text{ con } h_i > 0 \quad [1b]$$

where $\boldsymbol{y}$ is the vector of n observations of the dependent variable, and the term of random disturbance (ε) incorporates an auto-regressive spatial dependence structure. At the same time, ε is considered to be distributed normally, with a diagonal but heteroscedastic matrix of variances and co-variances Ω_{ii}, in which the elements on its main diagonal are a function of the exogenous variables z, with α as a vector associated to the non-constant terms of z. In equations [1] and [1a], W_1 and W_2 are two matrices of spatial weights.[1]

Based on equations [1] and [1a], we can have two particular cases, the first, when $\lambda = 0$ and $\rho \neq 0$, is the model for spatial lag. The second, when $\lambda \neq 0$ and $\rho = 0$, is the model for spatial error. The selection of these models is done using LM tests and their robust versions proposed by Anselin (1988).[2]

Bernat (1996) uses this spatial equation and adapts it to the case of Kaldor's laws. We take Bernat's specifications and apply them to the cases of Mexico and Korea. In their application to Kaldor's laws, the two specific models of spatial lag and error have a different interpretation. In the case of the spatial lag model, a region's growth is directly affected by the growth of its neighbors, while in the spatial error model the growth of one region will affect that of its neighbors if it is above what can be considered "normal" (Bernat, 1996).

Kaldor's laws

The first law establishes a positive ratio between the rate of growth of total production (y_T) and the production of manufactured goods (y_M), represented by the following equation:

$$y_T = \rho W_1 y_T + \beta y_M + \varepsilon \qquad [2]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \qquad [2a]$$

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1 The two matrices of spatial weights W_1 and W_2 are associated, respectively, with a auto-regressive spatial process in the dependent variable and in the error term. We are simply following the notation put forward by Anselin (1988: 34).

2 The tests of spatial effects used were the Lagrange Multiplier (lag) and the Lagrange Multiplier (error). The methodology utilized in selecting models was proposed by Anselin (1988) and Anselin and Griffith (1988), in which the non-rejection of the null hypothesis of the insignificance of the spatial effects leads to maintaining the model without those effects; the rejection of one of the two mentioned tests leads to the utilization of the corresponding spatial model (spatial lag or spatial error); and the rejection of the two tests leads to the utilization of the corresponding robust tests to identify which of the two models is the most significant.

where β is the marginal tendency of manufacturing income; W_1 is the matrix of spatial weights; ρ is the spatial autocorrelation coefficient; and ε is a term of random disturbance. However, this is not a corollary of a simple spurious correlation as a result of the fact that manufacturing output is a fraction of total output. For this reason, Kaldor also showed that there is a profound correlation between the growth rate of manufacturing output and the growth rate of non-manufacturing output (Kaldor, 1966; Ocegueda, 2003; McCombie and Thirwall, 1994). These results were confirmed by researchers like Cripps and Tarling (1973) and Thirwall (1983); this is why the spatial specification of expression [2] is changed as follows:

$$y_{NM} = \rho W_1 y_T + \beta y_M + \varepsilon \qquad [2.1]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \qquad [2.1a]$$

where y_{NM} is the growth rate of non-manufacturing activity. Using this formulation of the model, but without considering the spatial effects, Kaldor applies it to a sample of 12 developed countries and concludes that manufacturing drives growth (Kaldor, 1966). Thirwall (1983) proposes another specification, which is used by Pons-Novell and Villadecans-Marsall, 1999), reformulating the first law as follows:

$$y_T = \rho W_1 y_T + \beta(y_M - y_{NM}) + \varepsilon \qquad [2.2]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \qquad [2.2a]$$

The implication of this third formulation is that there is a positive relationship between growth in manufacturing output and non-manufacturing output. This means that if the manufacturing sector maintains high growth rates, the growth differential must be such that it has an impact on the country's total production. That is, Kaldor argues that once the economy develops its competitive advantage, which implies endogenizing its growth, it will tend to maintain it through rising yields that development itself induces and increases due to the progress of the others.

The first law is valid if β is positive and statistically significant. That is, for the manufacturing industry to be considered the axis of growth, it is necessary to show that national output growth y_T is not closely linked to the growth of the other sectors like agriculture, mining or the services, because:

> […] there is no correlation between GDP growth and the growth of either agricultural output or mining. There is a correlation between GDP growth and the growth of services, and the relation is virtually one to one, but Kaldor believes that the direction of causation is almost certainly from the growth of GDP to service activity rather to than the other way round, since the demand for most services is derived from the demand for manufacturing output itself (McCombie and Thirlwall, 1994: 166).

The fact that the growth of manufacturing involves national GDP growth is justified in the following way: when industrial production expands, it generates productive and employment factors that are under-utilized in other sectors. Thus, the transfer does not produce a drop in production in the other sectors, but rather helps to increase it. The longer and more rapid this growth is, the longer and faster will be the rate of transfer of labor from the sectors with decreasing yields like agriculture and mining to the sector with rising yields (Carton, 2009). Nevertheless, the sector's growth rate must be higher than that of the others; this way, it will be considered the leader of national growth (Kaldor, 1966; Ocegueda, 2003).

The second law establishes that there is a positive relationship between the growth rate of manufacturing output y_M and that of the productivity of labor (g_M) in the same sector (Kaldor, 1966; Ocegueda, 2003; Thirlwall, 2003; McCombie and Thirlwall, 1994). This proposition is known as Verdoorn's law, which shows that the increase in the manufacturing output growth rate raises the labor productivity growth rate within the same sector as a result of learning processes and the greater specialization that leads to broadening out the market (Ocegueda, 2003). Kaldor said about this that:

> A greater division of labor is more productive, partly because it generates greater skills and knowledge and more experience, which results in more innovations and design improvements. He said that it is not possible to isolate the influence of large-scale production economies due to the indivisibility of several types, which are reversible in and of themselves, from these changes in technology associated with a process of expansion that is irreversible. Learning is the product of experience, which means that productivity tends to grow more rapidly the more rapidly output expands. This also implies that the level of productivity is more a function of the accumulative output than of the time-unit production rate (Kaldor, 1984: 13-14).

Formally, we have an expression for the spatial specification of the second law, as follows:

$$g_M = \rho W_1 g_M + \alpha_1 y_M + \varepsilon \quad [3]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \quad [3a]$$

$$g_N = \rho W_1 g_N + \alpha_2 y_M + \nu \quad [4]$$

$$\nu = \lambda W_2 \nu + \mu \quad [4a]$$

in which g_M and g_n are the growth rates of the productivity of labor[3] and of employment in the manufacturing sector;[4] and ε and ν are random disturbances. The coefficient α is called the Verdoorn coefficient. The interpretation of equations [3] and [4] centers on the value of α_1 and α_2; if they are positive, they imply economies of scale.

The third law refers to the general increase in the productivity of labor in any of the sectors. It supposes that the growth of manufacturing produces an excess demand for jobs, which reduces the supply of labor in the other sectors, but does not decrease output. This stimulates the productivity of labor to increase across all sectors (Kaldor, 1966; Ocegueda, 2003).

This can be formalized spatially as follows:

$$g_T = \rho W_1 g_T + \beta_1 y_M + \varepsilon \quad [5]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \quad [5a]$$

Equation [5] shows that the productivity growth rate in all sectors (g_T) is a function of the manufacturing output growth rate y_M, where the autonomous component has been eliminated. This implies that if the manufacturing industry shows higher growth rates, it will augment the productivity of labor there,

[3] Manufacturing productivity was calculated as the domestic manufacturing output divided by employment in the same sector.

[4] Here, line workers and clerical workers are differentiated; the line workers are those who really produce the goods, while clerical workers aid in realizing them.

and, once developing and consolidating, productivity will rise in the rest of the sectors due to the drag that the secondary sector generates.

Cripps and Tarling (1973) propose an alternative formulation for Kaldor's third law; they incorporate the non-manufacturing employment growth (E_{NM}) into the equation, and the spatial model can be represented in the following way:

$$g_T = \rho W_1 g_T + \beta_1 y_M + \beta_2 E_{NM} + \varepsilon \quad [5.1]$$

$$\varepsilon = \lambda W_2 \varepsilon + \mu \quad [5.1a]$$

"These three laws indicate that the industrial sector individual parameters and its productivity are the decisive factors in economic growth" (Pons-Novell and Villadecans-Marsall, 1999: 445). The variables incorporated to modify Kaldor's original equations are to emphasize the importance of manufacturing.

Exploratory analysis of spatial dependence in the growth process

To evaluate whether our variables present a random spatial distribution or show patterns of spatial dependence, which make it possible to identify processes of spillover growth, we use the Moran index, which is formally defined as:

$$Moran's\ I = \frac{N}{S_0} \frac{\sum_{ij}^{N} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{N} (x_i - \bar{x})^2} \quad [6]$$

where x_i is the quantitative x variable in the region i; $\bar{x}$ is its sample mean; w_{ij} are the weights of the matrix W; N is the size of the sample; and $S_0 = \sum_i \sum_j w_{ij}$.[5]

Figure 2 shows the administrative division used for the regional analysis of Mexico and South Korea.

5 Moran's index continues a normal standardized distribution in large samples so that a positive (negative) significant value of the $Z(I)$ will lead to the rejection of the null hypothesis of no spatial autocorrelation and the acceptance of positive (negative) spatial autocorrelation.

Figure 2
Maps of South Korea and Mexico

Source: INEGI and Korea Eximbank (available at: <http://www.koreaexim.go.kr>).

Table 1 shows the results of the index and its statistical significance.[6] The data in the table shows that for South Korea, non-manufacturing GDP y_{NM}, overall national productivity of labor g_T, and the productivity of labor in manufacturing g_M present significant spatial dependence. For the Mexican case, the tests for spatial autocorrelation were statistically significant for the GDP variables y_T, manufacturing GDP y_M, the differential of manufacturing and non-manufacturing growth $(y_M - y_{NM})$, non-manufacturing employment E_{NM}, overall productivity of labor g_T, and the productivity of labor in manufacturing g_M.

Table 1
Spatial auto-correlation (Moran's I), 1998-2008

Variables	*South Korea*	*Mexico*
Y_T	–0.097 (0.481)	0.164 (0.056)***
y_M	–0.177 (0.311)	0.318 (0.005)*
y_{NM}	0.168 (0.092)***	0.078 (0.152)
$y_M - y_{NM}$	–0.102 (0.468)	0.185 (0.032)**
E_{NM}	–0.044 (0.563)	0.231 (0.023)**
g_T	–0.310 (0.068)***	0.095 (0.130)
g_M	–0.313 (0.085)***	0.186 (0.039)**

Notes: The p-values for significance of the index is in parentheses; (*) statistically significant to 1%; (**) statistically significant to 5%; (***) statistically significant to 10%.
Source: Developed by the authors using data of the *Censos Económicos* 2004, and 2009 (Economic Censuses 2004, and 2009) from Instituto Nacional de Estadística y Geografía (INEGI), Statistics Korea (available at: <http://kostat.go.kr>), and the Bank of Korea.

Given that Moran's I is an indicator of overall spatial dependence, it is necessary to verify the existence of local spatial dependence due to the heterogeneity of both countries' regions. For that reason, Figure 2 shows that the results of the local indicator of spatial association (LISA), which makes it possible to evaluate

[6] The period analyzed is from 1998 to 2008 and was selected because of the availability and homogeneity of the data. For the Korean economy, regional information was available from 1989 to 2010, while homogeneous information for Mexico was available from 1998 to 2008. The sources of the data are the *Censos Económicos 1999*, *2004*, and *2009* (Economic Censuses, 1999, 2004, and 2009) developed by Mexico's Instituto Nacional de Estadística y Geografía (INEGI), Korea Eximbank (available at: <http://www.koreaexim.go.kr>), and Statistics Korea (available at: <http://kostat.go.kr>).

the existence of spatial autocorrelation in specific regions and the formation of conglomerates or clusters with positive spillover effects.[7]

In Figure 3, we observe that the average growth of Mexican manufacturing shows evidence of the formation of growth clusters (states identified as high-high) in Veracruz, Tabasco, and Chiapas. The clusters can be observed in Tabasco for overall production; in Tabasco and San Luis Potosí for non-manufacturing output; and in Sonora in the differential of manufacturing growth. At the same time, low growth spatial extreme values can be observed (states identified as low-low) in manufacturing output in the State of Mexico, Morelos, and Mexico City's Federal District. The same is true for GDP in the states of Guerrero, Morelos, and the Federal District; for non-manufacturing output in Guerrero; and in the differential of manufacturing and non-manufacturing growth in San Luis Potosí and Hidalgo.

In South Korea, the formation of clusters in the manufacturing sector's average growth and in the GDP for Chungcheongbuk-do. This same spatial pattern can be observed with regard to average non-manufacturing sector growth in Gyeonggi-do and to the differential of manufacturing sector/non-manufacturing sector average growth in Jeollabuk-do.

The results of the LISA analysis for the average growth in manufacturing productivity of labor, total output, and non-manufacturing employment confirms the elements mentioned above regarding Mexican production performance. According to Figure 4, manufacturing clusters can be observed in Veracruz, Tabasco, and Chiapas, and clusters of non-manufacturing activity in Yucatán. The regions of low overall productivity are Guerrero and Michoacán, and of average non-manufacturing employment growth are Sonora, Chihuahua, Coahuila, Nuevo León, Durango, and Zacatecas.

The results of the LISA analysis allow us to determine that both in Mexico and in Korea, there are specific regional concentrations where growth tends to reinforce itself, which presupposes the existence of polarization processes.

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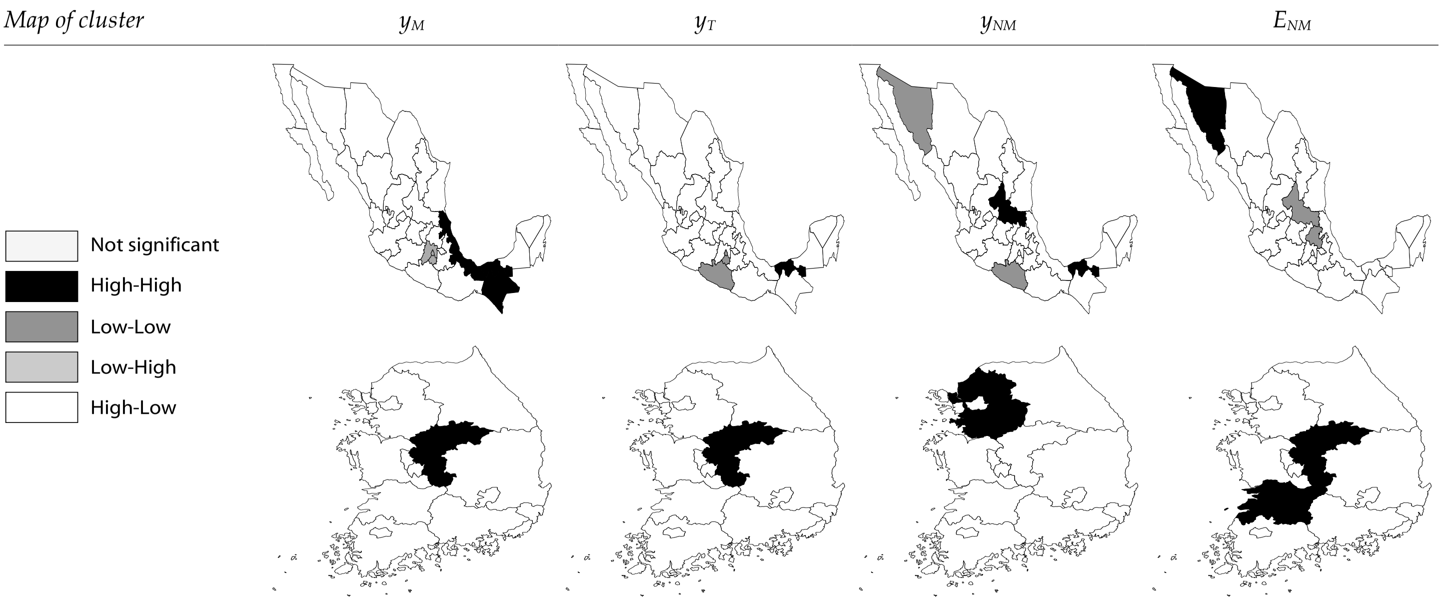
[7] The technique used here is exploratory and based on Exploratory Spatial Data Analysis (ESDA). The use of ESDA makes it possible to identify the existence of spatial regimes in the data; specifically, LISA maps are a local indicator of significant spatial association and are constructed using Moran's I. They show the regions that contribute significantly to the global Moran index and that form significant clusters of spatial association. The specificities can be seen in Anselin (2005).

FIGURE 3

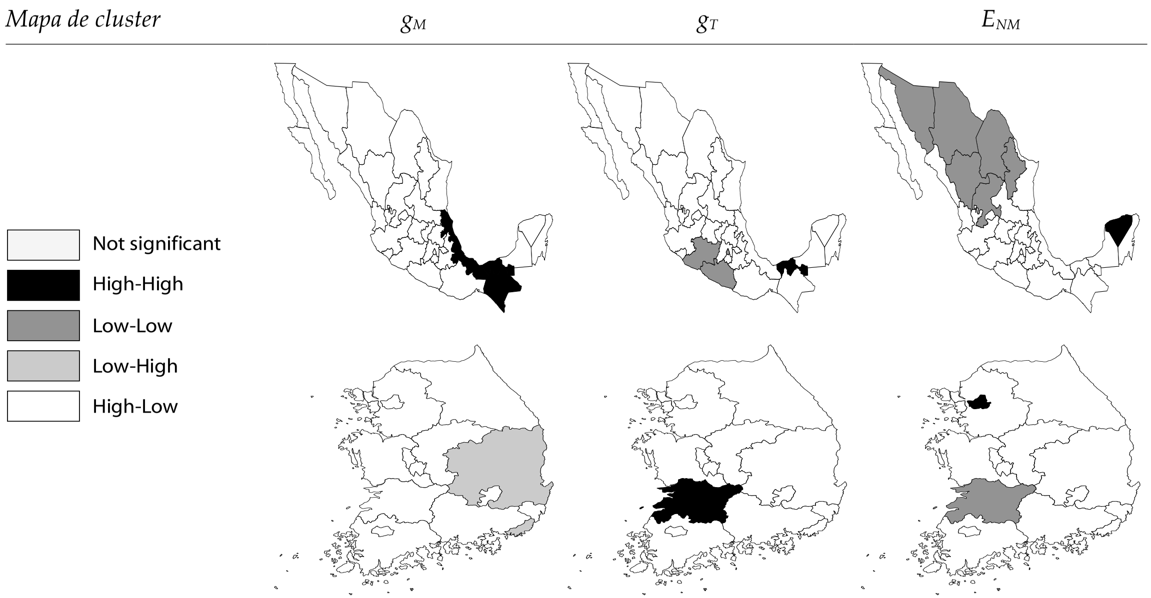
LISA growth cluster maps for Mexico and South Korea, 2003-2008



Source: Developed by the authors with information from the Bank of Korea and INEGI.

FIGURE 4

***LISA* productivity cluster maps for Mexico and South Korea, 2003-2008**



Source: Developed by the authors with information from the Bank of Korea and INEGI.

Empirical evidence for Kaldor's laws

To corroborate the hypothesis about the endogeneity of economic growth in Mexico and South Korea, Tables 2 and 3 present the results of the estimates for Kaldor's first law. The first three columns of the tables show the results of the models without spatial effects; the next columns present the estimates of the models for spatial lag and spatial error.

The most important aspects of the results presented in Tables 2 and 3 are as follows:

a) Mexico's manufacturing sector has a positive effect on GDP (0.593) only if the simplest model for Kaldor's law is used (equation [2]) or if that sector is related to the non-manufacturing sector (equation [2.2]), but not when Thirwall's modified proposal (equation [2.1]) is used. By virtue of this, the econometric evidence supporting the first law is not completely robust. In addition, the LM tests to detect spatial effects show that there is no evidence of spatial autocorrelation. These results are consistent with the evidence found by Ocegueda (2003) for Mexico's states and Federal District. Using panel data estimates for the period from 1980 to 2000, Ocegueda also concludes that there is no solid econometric basis for the first law. Not regional, but national and time-series estimates have also not produced evidence of the first law being corroborated. For example, Loría (2009) estimated a coefficient of 0.69 for the period between 1970 and 2008, but this cannot be accepted statistically due to specification problems in the model.

b) Table 3 shows the same results for Kaldor's first law, but for the Korean case. In contrast with the results for Mexico, in Korea, the manufacturing sector is significant in GDP growth. Both in Kaldor's simplified model and in the modified equations, manufacturing has a positive, significant impact on the Korean economy's growth rate with coefficients ranging between 0.389 and 0.148. Although we do not have other similar studies for the regions of Korea, the evidence presented by Felipe *et al.* (2007) for a group of Asian countries that included South Korea confirms that the first law is fulfilled in the period from 1980-2004. Mamgain's estimates (1999) for the entire country also confirm the first law for South Korea for the period from 1960 to 1988.

c) The tests for spatial dependence presented in Table 3 for Korea indicate the existence of spatial effects given that the Moran's I-Error statistic is significant. At the same time, the LM-Lag and LM-Error spatial tests show the estimation of a spatial error model. The results obtained from this spatial model make it possible to verify the existence of spillover effects in growth, which positively reinforce the effects of the manufacturing sector in the entire Korean economy. The spatial effects measured by the Lambda coefficient are in the order of 0.459 to 0.691.

Table 2
Mexico: Kaldor's first law

	Ordinary Least Squares			**Spatial Lag**			**Spatial Error**		
1998-2008	y_T	y_T	y_{NM}	y_T	y_T	y_{NM}	y_T	y_T	y_{NM}
Constant	2.613 (3.622)*	4.547 (7.066)*	3.926 (3.805)*	2.960 (2.670)*	3.513 (2.992)*	4.139 (2.695)*	1.993 (4.259)*	4.453 (5.773)*	3.700 (4.125)*
y_M	0.593 (3.998)*	—	0.466 (2.196)*	0.632 (4.301)*	—	0.484 (2.329)*	0.104 (7.202)*	—	
$y_M - y_{NM}$	—	–0.242 (–0.816)	—	—	–0.274 (–0.980)	—	—	–0.335 (–1.159)	0.522 (2.721)*
Lag	—	—	—	–0.102 (–0.501)	0.210 (0.979)	–0.050 (–0.222)	—	—	—
Lambda	—	—	—	—	—	—	–0.576 (–2.599)*	0.238 (1.115)	–0.172 (0.711)
R^2	0.387	0.021	0.138	—	—	—	—	—	—
J-B	61.390 (0.00)	113.8 (0.000)	25.11 (0.000)	—	—	—	—	—	—
Breusch-Pagan	8.038 (0.004)	0.537 (0.463)	1.077 (0.299)	7.704 (0.005)	0.594 (0.440)	1.017 (0.303)	9.236 (0.075)	0.746 (0.387)	0.908 (0.340)
Koenker-Bassett	2.068 (0.150)	0.110 (0.739)	0.414 (0.519)	—	—	—	—	—	—
White	3.687 (0.158)	0.548 (0.760)	2.908 (0.233)	—	—	—	—	—	—
Moran's I-ERR	–1.366 (0.171)	1.925 (0.054)	–0.265 (0.790)	—	—	—	—	—	—
LM-Lag	0.390 (0.532)	1.863 (0.172)	0.053 (0.816)	—	—	—	—	—	—
Robust LM (Lag)	2.193 (0.139)	1.978 (0.159)	1.080 (0.298)	—	—	—	—	—	—
LM-ERR	2.489 (0.115)	2.260 (0.132)	0.328 (0.566)	—	—	—	—	—	—
Robust LM-ERR	4.291 (0.038)	2.375 (0.123)	1.355 (0.244)	—	—	—	—	—	—
LM-(Sarma)	4.682 (0.096)	4.239 (0.120)	1.408 (0.494)	—	—	—	—	—	—

Notes: (*) statistically significant to 1%; (**) statistically significant to 5%; (***) statistically significant to 10%.
Source: Developed by the authors using INEGI, *Censo Económico* 2004 and 2009.

Table 3
Korea: Kaldor's first law

	Ordinary Least Squares			Spatial Lag			Spatial Error		
1998-2008	y_T	y_T	y_{NM}	y_T	y_T	y_{NM}	y_T	y_T	y_{NM}
Constant	2.538 (7.335)*	4.202 (13.753)*	3.391 (7.812)*	0.811 (0.903)	2.763 (2.388)*	1.474 (1.319)	2.418 (5.587)*	4.053 (7.764)*	3.315 (7.769)*
y_M	0.389 (7.437)*	–	0.148 (2.249)**	0.044 (9.554)*	–	0.173 (3.172)*	0.408 (13.34)*	–	0.162 (3.345)*
$y_M - y_{NM}$	–	0.372 (2.218)*	–	–	0.409 (5.240)*		–	0.439 (7.242)*	–
Lag	–	–	–	0.307 (1.903)**	0.274 (1.209)	0.409 (1.710)***	–	–	–
Lambda	–	–	–	–	–	–	0.691 (3.958)*	0.591 (2.792)*	0.459 (1.827)**
R^2	0.809	0.578	0.280	–	–	–	–	–	–
J-B	0.455 (0.796)	0.957 (0.619)	2.421 (0.298)	–	–	–	–	–	–
Breusch-Pagan	0.032 (0.856)	0.461 (0.497)	0.002 (0.963)	0.427 (0.775)	0.082 (0.775)	0.081 (0.776)	0.244 (0.621)	0.008 (0.927)	0.056 (0.812)
Koenker-Bassett	0.041 (0.839)	0.561 (0.454)	0.001 (0.969)	–	–	–	–	–	–
White	0.091 (0.955)	0.657 (0.719)	0.050 (0.975)	–	–	–	–	–	–
Moran's I-ERR	3.170 (0.001)	2.743 (0.006)	2.543 (0.011)	–	–	–	–	–	–
LM- Lag	3.391 (0.065)	1.160 (0.281)	3.295 (0.069)	–	–	–	–	–	–
Robust LM (Lag)	0.165 (0.683)	0.876 (0.349)	0.019 (0.891)	–	–	–	–	–	–
LM-ERR	5.901 (0.015)	4.036 (0.044)	3.562 (0.059)	–	–	–	–	–	–
Robust LM-ERR	2.676 (0.102)	3.752 (0.053)	0.286 (0.593)	–	–	–	–	–	–
LM-(Sarma)	6.068 (0.048)	4.913 (0.086)	3.580 (0.167)	–	–	–	–	–	–

Notes: (*) statistically significant to 1%; (**) statistically significant to 5%; (***) statistically significant to 10%.
Source: Developed by the authors using INEGI, *Censo Económico* 2004 and 2009.

Kaldor's second law offers elements for considering that the dynamism of the industrial sector, particularly manufacturing, is substantial for endogenizing growth due to its positive impact on the productivity of labor. Tables 4 and 5 present the empirical evidence for this second law, for which we would underline the following results:

a) In the Mexican economy, there are dynamic economies of scale in the manufacturing sector; this is confirmed when we see that when the sector grows, so does its productivity. One percentage point of manufacturing growth gives rise to a 0.73% hike (see the results in the first column of Table 4). Even though increasing yields were found in the sector, the LM spatial effect tests do not confirm the existence of spatial dependency in this growth process for the Mexican case. In estimating Kaldor's second law, Ocegueda (2003) found 0.26 and 0.36 coefficients, thus validating the hypothesis of growing yields to scale in manufacturing. For their part, Calderón and Martínez (2005) make estimations for the different states in the country and find significant and growing coefficients of 0.45 for 1965-1970 and of 0.68 for 1993-1998.

b) For Korea, the results presented in Table 5 indicate that the growth of the manufacturing sector has a positive impact on the rise in the productivity of labor, with a coefficient of 0.653. It is important to point out that, in the work that examined the evidence for this law for the first years of Korean industrialization, the estimated coefficient was 0.10, a figure considered very low compared to other countries (Woo-Sik, 1993). For the period from 1980 to 1997, Mamgain's estimates (1999) show an approximate coefficient of between 0.32 and 0.52; this can be explained by the fact that in the first phase of industrialization, the use of cheap labor was promoted, while, later, growth was attained based on technological development. In our estimates, the LM spatial effects tests justify the use of a spatial error model; its results are displayed in the third column of Table 4. One outstanding aspect is that the impact of spatial lag is negative, measured by the lambda coefficient (–0.848). This implies that when there is a random shock to manufacturing productivity in a region, one of the neighboring regions tends to shrink; this situation is compatible with relations of the center-periphery type that have been discussed in the New Economic Geography (NEG) models proposed by Krugman (1991).

Kaldor's third law is the way to show that the manufacturing sector contributes to increasing productivity in the rest of the sectors, leading to a more productive and competitive economy. The last six columns of Tables 4 and 5 present the results of the estimations of this law. Their most important factors are as follows:

a) The growth of the Mexican manufacturing sector has an influence on the growth of the productivity of labor in the economy as a whole; its effects range from 0.467% to 0.483% for each percentage point of manufacturing growth. Hikes in non-manufacturing employment, for their part, do not influence the rise in productivity; the coefficient obtained in the results of equation [5.1] indicates that it is not statistically

Table 4
Mexico: Kaldor's second and third laws

	Second law			**Third law**					
	Ordinary Least Squares	*Spatial Lag*	*Spatial Error*	*Ordinary Least Squares*		*Spatial Lag*		*Spatial Error*	
1998-2008	g_M	g_M	g_M	g_T	g_T	g_T	g_T	g_T	g_T
Constant	–1.008 (–2.223)**	–1.020 (–2.215)**	–1.072 (–2.090)**	–1.045 (–1.628)	0.541 (0.263)	–1.121 (–1.826)***	0.475 (0.247)	–2.449 (–3.662)*	0.153 (0.111)
y_M	0.739 (7.930)*	0.737 (7.560)*	0.758 (8.036)*	0.467 (3.540)*	0.483 (3.599)*	0.524 (4.076)*	0.539 (4.211)*	0.590 (6.419)*	0.621 (6.983)*
E_{NM}	—	—	—	—	–0.335 (–0.815)		–0.337 (–0.877)	—	–0.362 (–1.269)
Lag	—	0.012 (0.076)	—	—	—	–0.184 (–0.875)	–0.187 (–0.866)	—	—
Lambda	—	—	0.262 (1.247)	—	—	—	—	–0.596 (–2.715)*	–0.649 (–3.071)*
R^2	0.677	—	—	0.293	0.310	—	—	—	—
J-B	1.572 (0.455)	—	—	33.791 (0.000)	38.873 (0.000)	—	—	—	—
Breusch-Pagan	0.214 (0.643)	0.206 (0.649)	0.146 (0.702)	14.333 (0.000)	34.623 (0.000)	12.559 (0.000)	27.389 (0.000)	11.526 (0.006)	22.263 (0.000)
Koenker-Bassett	0.200 (0.654)	—	—	4.091 (0.431)	9.672 (0.007)	—	—	—	—
White	0.488 (0.783)	—	—	7.229 (0.027)	18.240 (0.002)	—	—	—	—
Moran's I-ERR	1.533 (0.125)	—	—	–1.427 (0.153)	–1.516 (0.129)	—	—	—	—
LM- Lag	0.002 (0.958)	—	—	0.860 (0.353)	0.916 (0.338)	—	—	—	—
Robust LM (Lag)	0.743 (0.388)	—	—	1.337 (0.247)	1.799 (0.179)	—	—	—	—
LM-ERR	1.140 (0.285)	—	—	2.670 (0.102)	3.052 (0.081)	—	—	—	—
Robust LM-ERR	1.881 (0.170)	—	—	3.147 (0.076)	3.935 (0.047)	—	—	—	—
LM-(Sarma)	1.883 (0.389)	—	—	4.008 (0.134)	4.852 (0.088)	—	—	—	—

Notes: (*) statistically significant to 1%; (**) statistically significant to 5%; (***) statistically significant to 10%.
Source: Developed by the authors using INEGI, *Censo Económico* 2004 and 2009.

Table 5
Korea: Kaldor's second and third laws

	Second law			Third law					
	Ordinary Least Squares	*Spatial Lag*	*Spatial Error*	*Ordinary Least Squares*		*Spatial Lag*		*Spatial Error*	
1998-2008	g_M	g_M	g_M	g_T	g_T	g_T	g_T	g_T	g_T
Constant	1.696 (2.698)*	5.526 (4.136)*	2.119 (4.875)*	1.818 (3.817)*	2.511 (6.957)*	4.327 (3.925)*	4.262 (5.766)*	1.900 (6.848)*	2.697 (5.013)*
y_M	0.653 (6.861)*	0.575 (7.862)*	0.575 (8.215)*	0.294 (4.081)*	0.314 (6.471)*	0.262 (4.508)*	0.287 (7.739)*	0.293 (5.565)*	0.350 (12.617)*
E_{NM}	—	—	—	—	–0.545 (–4.115)*	—	–0.461 (–4.698)*	—	–0.785 (–10.295)*
Lag	—	–0.586 (–3.220)*	—	—	—	–0.603 (–2.471)*	–0.446 (–2.625)*	—	—
Lambda	—	—	–0.848 (–3.355)*	—	—	—	—	–0.903 (–3.784)*	0.771 (5.546)*
R^2	0.784	—	—	0.561	0.818	—	—	—	—
J-B	0.379 (0.827)	—	—	1.558 (0.459)	0.466 (0.792)	—	—	—	—
Breusch-Pagan	0.506 (0.477)	0.807 (0.369)	0.164 (0.685)	1.529 (0.216)	0.170 (0.918)	3.106 (0.078)	0.628 (0.730)	1.443 (0.229)	0.360 (0.835)
Koenker-Bassett	0.644 (0.422)	—	—	3.186 (0.074)	0.220 (0.896)	—	—	—	—
White	1.701 (0.427)	—	—	3.922 (0.141)	3.987 (0.551)	—	—	—	—
Moran's I-ERR	–1.778 (0.075)	—	—	–2.297 (0.022)	1.227 (0.219)	—	—	—	—
LM- Lag	5.190 (0.023)	—	—	3.636 (0.056)	3.179 (0.074)	—	—	—	—
Robust LM (Lag)	1.997 (0.157)	—	—	0.006 (0.983)	6.802 (0.009)	—	—	—	—
LM-ERR	3.403 (0.065)	—	—	5.256 (0.022)	0.451 (0.501)	—	—	—	—
Robust LM-ERR	0.211 (0.646)	—	—	1.619 (0.203)	4.073 (0.043)	—	—	—	—
LM-(Sarma)	5.401 (0.069)	—	—	5.256 (0.072)	7.253 (0.026)	—	—	—	—

Notes: (*) statistically significant to 1%; (**) statistically significant to 5%; (***) statistically significant to 10%.
Source: Developed by the authors using INEGI, *Censo Económico* 2004 and 2009.

significant. Ocegueda (2003) reports similar results in testing the third law for the different Mexican states for the period 1980 to 2000. In no case were the spatial models significant for the Mexican economy.

b) In the Korean case, growth in manufacturing had a positive influence on the rise in overall national productivity of labor, with an effect of 0.294% to 0.314% for each percentage point of manufacturing growth. However, the modified equation shows that growth in non-manufacturing employment had a negative influence on overall productivity of labor (–0.545). Mamgain (1999) also confirms Kaldor's third law for South Korea, although she uses a different specification from those used here. The spatial autocorrelation LM statistical tests indicate that the most appropriate model is the spatial error model. Again, center-periphery spatial effects are obtained: a random shock to productivity in a Korean region has a negative impact on that of its neighbors.

In short, the results of the estimation of Kaldor's three laws indicate that the manufacturing sector in Korea plays a leading role, while in Mexico, it is not the driving force for the economy's growth. However, in the Mexican case, we can observe that manufacturing has growing yields to scale and has a positive effect on the economy's productivity. For the Mexican economy, it was not possible to detect spatial spillover growth effects; in the Korean case, these effects exist for increases in output, which reflects very strong input-output links among the regions. At the same time we observed center-periphery spatial effects in productivity increases in Korean regions.

Conclusions

A country's endogenous growth is of vital importance for dealing with and compensating for the effects of international economic shocks, reducing inequality, and promoting more balanced economic growth. Industry, particularly manufacturing, plays a central role in this process by making the endogenization of growth possible. In the Mexican case, industry has not managed to operate as the driving force for growth, nor does it lead to spatial externalities that would contribute to stimulating processes of positive accumulation in the most dynamic regions of the country. Korea is a contrasting case: industry is fundamental for explaining growth and spatial effects of this process do exist from the most dynamic regions to the rest of the country.

From the Kaldoran perspective, the endogenization of growth is possible if manufacturing plays a leading role as a sector. While the growth of Mexican manufacturing contributes to productivity in the other sectors, it has not been capable of operating as a force to drag the others or to generate spillover growth effects. The Korean case shows that manufacturing there did foster general growth of the economy and impacts overall productivity. However, Korea's industrial clusters operate in a framework of center-periphery relations when shocks to the economy occur; the richest clusters accumulate while productivity in their neighboring regions tends to drop.

Despite these weaknesses in Mexico's industrialization process, industry does have effects on sectoral productivity, which could translate into higher economic growth rates if industrial policy were oriented to promote the most dynamic clusters of industrial growth in the country's regions. That is, in the medium term, the implementation of a national, sectoral, and regional industrial policy could have an impact on creating a more solid industrial sector, with greater regional and inter-sectoral links; and this could sustain higher economic growth. In particular, industry's weakness as a driving force for growth in Mexico is explained by the fact that industrial policies have been abandoned for a long period of time, while in Korea, they were maintained, adapted and reformulated given the experiences and challenges in each period (ECLAC, 2012). In addition, in Korea, industrial policy has had the benefit of a strong territorial base through the construction of regional industrial parks, support for decentralization, and the development of infrastructure (Joh, Young-Pyo, and Koh, 2012). In Mexico, as Isaac and Quintana (2012) and Pradilla (2012) have shown, the main metropolitan areas have concentrated the country's industrial base. This is why a clear policy of sustainable re-industrialization of these areas could contribute to giving industry the leading role as the driving force of the country's growth.

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