

NÚMERO 157

JACOB A. JORDAAN
AND JAVIER SÁNCHEZ-REAZA

Industrial Diversity and Specialisation in Mexican Regions under Free Trade

OCTUBRE 2004



www.cide.edu

• Las colecciones de **Documentos de Trabajo** del **CIDE** representan un medio para difundir los avances de la labor de investigación, y para permitir que los autores reciban comentarios antes de su publicación definitiva. Se agradecerá que los comentarios se hagan llegar directamente al (los) autor(es).

• D.R. © 2004. Centro de Investigación y Docencia Económicas, carretera México-Toluca 3655 (km. 16.5), Lomas de Santa Fe, 01210, México, D.F.
Tel. 5727•9800 exts. 2202, 2203, 2417
Fax: 5727•9885 y 5292•1304.
Correo electrónico: publicaciones@cide.edu
www.cide.edu

• Producción a cargo del (los) autor(es), por lo que tanto el contenido así como el estilo y la redacción son su responsabilidad.

.....

We wish to thank Gilles Duranton, Andrés Rodríguez-Pose, Günther Schulze and the participants at the Deutsches Institut für Wirtschaftsforschung's Workshop on Agglomeration and Regional Labour Markets in April 2002, as well as to Anthony Venables and the participants of the European Trade Study Group Conference at the University of Nottingham in September 2004 for suggestions at different stages of the research. We thank Julio César Luna and Eduardo Rodríguez-Oreggia for their critical help concerning econometrics. Any errors remain however, ours alone.

Abstract

Traditional trade theories explain international exchanges by relative resource endowments, focusing on issues such as country-product specialisation, as well as developments in factor prices and its welfare implications. An important issue –often overlooked- is the spatial impact of international trade. However, recent contributions from the new economic geography offer important explanations as to how trade and location of economic activity are linked. One important result is that both concentration and dispersion may be stable outcomes of firm-location behaviour. Such location processes are subject to two sets of countervailing forces stimulating either concentration or dispersion, subject to transportation costs.

Mexico offers an interesting case for the analysis of the relative importance of the alternative explanations of production structures in the form of resource endowments, externalities and transport costs. Mexico's industrialisation strategy was until 1985, based on import substitution, when accession to GATT gave rise to an export promotion strategy further transformed by NAFTA in 1994. Using panel-data analysis, the paper examines to what extent the alternative theories (neo-classical and new economic geography) offer explanations for the development of regional production structures in Mexico at the state level.

Resumen

Las teorías tradicionales del comercio explican los intercambios internacionales con dotación relativa de recursos, centrándose en temas tales como especialización país-producto, así como desarrollo en los precios de los factores y sus implicaciones en bienestar. Un asunto importante –que frecuentemente se pasa por alto- es el impacto espacial del comercio internacional. Sin embargo, las contribuciones hechas recientemente por la nueva geografía económica ofrecen importantes explicaciones sobre la relación que guardan el comercio y la localización de la actividad económica. Una de las deducciones importantes es que tanto la concentración como la dispersión pueden ser resultados estables del comportamiento de localización de empresas. Tales procesos de localización están sujetos a dos conjuntos de fuerzas opuestas que estimulan ya sea la concentración o la dispersión, sujetas a costos de transporte.

México ofrece un caso interesante para el análisis de la importancia relativa de las explicaciones alternativas de las estructuras de producción en la forma de dotación de recursos, externalidades y costos de transporte. La estrategia de industrialización de México estuvo basada, hasta 1985, en la sustitución de importaciones, cuando el acceso de México al GATT indujo una

estrategia de promoción de exportaciones que se transformaría con el TLCAN en 1994. Empleando el análisis de datos de panel, el artículo examina hasta que grado las teorías alternativas (neoclásica y nueva geografía económica) ofrecen explicaciones para el desarrollo de las estructuras de producción regional en México a nivel estatal.

*Introduction**

The paper discusses the relationship between trade and industrial location. As it will be argued below, initial trade theory acknowledged the link between the two; however, traditional trade theories have not addressed those issues in detail. More recently, the new economic geography has attempted to establish such relationship. The paper then, evaluates whether changes in industrial concentration are a result of trade. In addition, the paper tests comparative-advantage-based theories vis-à-vis determinants considered by the new economic geography.

The present research focuses in Mexico due to its recent trade-policy shifts. Mexico followed a development strategy based on an import-substitution industrialisation (ISI) until 1985, when it accessed the General Agreement on Tariffs and Trade (GATT) and started the process of trade liberalisation. The policy was then transformed by gaining membership of the North American Free Trade Agreement (NAFTA) in 1994. Thus, Mexico is an ideal case to test whether different trade policies have had an effect on industrial concentration. The country has experienced three different approaches to trade: closed economy (ISI), trade liberalisation (GATT), and economic integration (NAFTA); having three types of policies allows for enriching comparisons.

On the one hand, economic integration with two much larger economies (Canada and the USA) could potentially alter industrial concentration in Mexico by furthering the previous production processes taking place across the border, namely after GATT (Sánchez-Reaza and Rodríguez-Pose, 2002). On the other hand, as trade theories based on comparative advantage explain, resource endowment shape trade patterns. As it will be argued below, industrial concentration could be determined as trade patterns, by the same initial resource endowments.

The next section will briefly outline the theoretical aspects so far mentioned, in order to provide the basis for the subsequent analysis. The third section, discusses changes in Mexico's industrial concentration using the 32 states that integrate the country, as well as the 54 manufacturing industries, in light of the relevant trade policy. The fourth section presents the model, the data used and the limitations. Finally, the fifth section will present the results of the panel data analysis performed in this paper, as well as offering an interpretation of such outcomes.

* Jacob Jordaan, The University of Birmingham, School of Geography, Earth and Environmental Sciences, Edgbaston Birmingham B15 2TT, UK; j.a.jordaan@bham.ac.uk. Javier Sánchez-Reaza, Centro de Investigación y Docencia Económicas (CIDE), javier.sanchez@cide.edu.

Trade and Industrial Location

Neoclassical Trade Theory and the New Economic Geography

Traditional theory considers that industry location decisions are influenced by local inputs and demand, as well as transferred inputs and outside demand (Hoover and Giarratani, 1999). International economics has hardly included geography in its models although governments and borders shape the location of production and hence, the patterns of trade between countries (Krugman, 1991a). Despite Ohlin (1933) recognised the link between trade and industrial location and even warned that addressing trade patterns was equivalent to asking ourselves the reasons behind the location of production, international theorists have paid little attention to such relationship. Instead, traditional trade models based on comparative advantage have focused on resource endowments as determinants of trade.

Among the four theorems that neo-classical trade theory has formulated, the Heckscher-Ohlin (H-O) theorem becomes relevant for this paper as it considers that comparative advantages among countries and exchanges are shaped by factor-endowment differentials (Markusen *et al.*, 1995). According to the H-O theorem, a country will export the commodity that uses intensively the relatively abundant factor in exchange for goods produced employing intensively the non-abundant factor (Leamer, 1984; Suranovic, 2000). Therefore, one of the milestones of neo-classical trade theory is resource endowments as a source of comparative advantage and thus, trade patterns.

However, the new economic geography has recently tried to tie the knot between trade and location by introducing trade in its core-periphery model. The technical basis to deal with increasing returns to scale is a Dixit-Stiglitz monopolistic-competition approach adapted to spatial models (Krugman, 1991b and 1992; Krugman and Venables, 1995; Fujita, Krugman and Venables, 1999). The theory is also based on iceberg transport costs as in Samuelson (1954) to include transportation costs and proximity to the market. In addition, both internal economies of scale as in Krugman (1993) and externalities in the form of backward and forward linkages as used in Krugman (1991b; 1991c and 1992) are included. The theory has gone beyond previous economic geography consideration by introducing trade as a factor that has the potential to alter industrial location (Krugman, 1998). The new economic geography has regarded such factors as backward and forward linkages that seize local externalities and transportation costs that reflect the transfer of inputs from outside the region as well as proximity to the market (Venables, 1998; Fujita, Krugman and Venables, 1999). Although mathematical formalisation has been greatly advanced by the new economic geography's perspective, one of the most intriguing questions that remain empirically unanswered is whether trade has anything to do with industrial location.

If Ohlin (1933) was right, comparative advantage based on initial resource endowments would be responsible for changes in industrial location. If the new economic geography has contributed to the understanding of economic concentration and dispersion, externalities (accounting for local linkages) and distance to the main market (reflecting transportation costs for inputs and output) will explain the dynamics of industrial concentration.

Diversity and Specialisation

It is important that any attempt to investigate the location of industries should be able to discern between different types of externalities and different external economies of scale. The debate on external economies has been focusing on the effects of diversity and specialisation (Glaeser *et al.*, 1992; Henderson, Kuncoro and Turner, 1995). Another dimension of such debate that is of outmost importance is the discussion between static and dynamic externalities. As can be observed in Table 1, externality types and external economies are intimately related.

T A B L E 1
EXTERNALITIES AND EXTERNAL ECONOMIES

EXTERNALITY TYPE	EXTERNAL ECONOMIES	
	LOCALISATION	URBANISATION
STATIC	INTRA-INDUSTRY BENEFITS VS. CONGESTION COSTS AND COMMUTING	INTER-INDUSTRY BENEFITS (OVERALL LOCAL URBAN SCALE)
DYNAMIC	MARSHALL-ARROW-ROMER (MAR), BUILD UP OF KNOWLEDGE ASSOCIATED TO COMMUNICATIONS	JACOBS, BUILD UP OF KNOWLEDGE/IDEAS ASSOCIATED TO HISTORICAL DIVERSITY

Source: Authors based on Henderson, Kuncoro and Tuner, 1995.

If we take into account static externalities, localisation economies are based on the benefits that firms in the same industry obtain from localising close to each other, a sort of trade secrets available to only those firms in the local area. In contrast, urbanisation economies refer to those economies of scale that are external to the firm benefiting from being close to firms in other industries at a larger urban scale.

Dynamic externalities incorporate prior information accrued in the local/urban area. In that sense, the dynamic version of localisation economies are known as Marshall-Arrow-Romer (MAR) externalities; they refer to a

historical accumulation of knowledge that is associated to communications among firms in the same industry spurring specialisation. On the other hand, the dynamic representation of urbanisation economies that stress the role played by interactions among firms in different industries and the accumulation of historical and diverse knowledge has been dubbed Jacobs externalities.

This distinction is of paramount importance since it could contribute towards understanding whether regional industrial diversity or specialisation play a part in the changes in the patterns of industrial location. Hence, agglomeration economies can extend in at least three dimensions, namely geographically, industrially and temporally (Rosenthal and Strange, 2003).

We have decided to include dynamic externalities and not static ones since they are regarded as the driving force -through knowledge spillovers or learning by doing- of technological innovation and thus, of economic growth in most endogenous growth models (Romer, 1986 and 1990; Lucas, 1988; Grossman and Helpman, 1994). Therefore, in what follows, the paper clearly distinguishes between Jacobs and MAR externalities and takes into account these three dimensions to incorporate external economies.

Industrial Concentration in Mexico

The closed economy approach coupled with Mexico's regional policies (Romero Kolbeck and Uruidi, 1952; Aguilar, 1999), the urbanisation process and migratory flows from rural to urban areas (Alba, 1982) brought about an important industrial concentration in Mexico City and neighbouring Estado de México -which actually surrounds it almost entirely. As can be observed in Table 2, nearly 45% of all manufacturing employment was based in those two regions. Industrial concentration could also be observed in those regions, namely Nuevo León and Jalisco, hosting the other two largest metropolitan areas (Monterrey and Guadalajara). The rest of the country experienced during ISI mild to poor industrial agglomerations.

T A B L E 2
INDUSTRIAL CONCENTRATION AT STATE LEVEL
(% OF TOTAL MANUF. EEMPL.)

	1980	1985	1993	1998	CHANGE 80-98
MEXICO CITY	27.95	20.77	15.43	11.77	-16.18
ESTADO DE MÉXICO	16.66	15.3	13.3	11.57	-5.09
NUEVO LEÓN	9.23	7.64	7.67	7.65	-1.58
JALISCO	7.05	10.19	6.86	7.69	0.64
PUEBLA	4.08	4.17	4.93	5.32	1.24
VERACRUZ	3.89	4.67	3.36	3.14	-0.75
GUANAJUATO	3.18	4.16	4.95	5.47	2.29
CHIHUAHUA	2.97	4.77	6.98	8.35	5.38
COAHUILA	2.84	3.48	3.98	4.51	1.67
TAMAULIPAS	2.22	2.63	4.14	4.50	2.28
BAJA CALIFORNIA	2.04	2.20	4.40	5.87	3.83
HIDALGO	1.93	1.77	1.71	1.74	-0.19
SONORA	1.87	2.00	2.67	3.25	1.38
QUERÉTARO	1.49	1.87	1.86	2.16	0.67
MICHOACÁN	1.43	1.80	2.09	1.95	0.52
SAN LUIS POTOSÍ	1.36	1.78	2.05	1.76	0.40
YUCATÁN	1.34	1.11	1.71	1.65	0.31
DURANGO	1.13	1.44	1.53	1.64	0.51
MORELOS	1.01	1.11	1.18	0.97	-0.04
SINALOA	0.97	1.25	1.25	0.95	-0.02
TLAXCALA	0.93	1.05	1.03	1.33	0.40
AGUASCALIENTES	0.80	1.15	1.46	1.64	0.84
OAXACA	0.74	0.87	1.23	1.23	0.49
GUERRERO	0.58	0.45	0.82	0.87	0.29
CHIAPAS	0.54	0.55	0.84	0.72	0.18
NAYARIT	0.45	0.33	0.41	0.29	-0.16
TABASCO	0.37	0.45	0.57	0.49	0.12
ZACATECAS	0.29	0.25	0.50	0.59	0.30
CAMPECHE	0.23	0.25	0.33	0.20	-0.03
COLIMA	0.19	0.18	0.24	0.22	0.03
BAJA CALIFORNIA SUR	0.15	0.18	0.27	0.28	0.13
QUINTANA ROO	0.09	0.18	0.26	0.22	0.13

Source: INEGI (1981, 1986, 1994 and 2001)

The export promotion strategy and GATT gave rise to the importance of border-states (those bordering the USA). It is notorious that all border-states (with the exception of Nuevo Leon) increase the level of concentration from 1985. The pattern is reinforced after 1993 when Mexico gained membership of

NAFTA. It is important to note that the greatest de-concentration processes are experienced in the old industrial core, while agglomerations get larger in border-states. These figures are in line with the arguments presented in Krugman and Livas Elizondo (1996) and Hanson (1998), where the process of industrialisation in border-states is a result of a dismantling of the old manufacturing hub in Mexico City when the larger market of the USA opens. In that sense, proximity to the main market could have become a key factor in determining industrial concentration both under autarky and free trade. Although there is evidence to suggest that the main market has shifted from Mexico City to the USA favouring chiefly border-states, when considering regional economic growth overall, the trend seems to be shifting but not yet to make coefficients statistically significant (Rodríguez-Pose and Sánchez-Reaza, 2003). Nevertheless, regional convergence analysis for Mexico ex-ante and ex-post trade (GATT and NAFTA) do yield evidence to suggest that border-states have been benefiting the most from liberalisation than the rest of the country entailing a process of regional divergence (Sánchez-Reaza and Rodríguez-Pose, 2002).

Besides the evidence from Hanson (1998) most manufacturing analysis for Mexico has been focusing on particular metropolitan areas such as Leon in the State of Guanajuato located in Central Mexico and Saltillo in Coahuila, a border-state in the north-east (Brown and Dominguez, 1997; Mendoza Cota, 1999) using an industrial-district approach. In contrast, our paper attempts to contribute to the understanding of the role of trade in the location of activity using dynamic agglomeration economies, as well as trade determinants and elements from the new economic geography, all of which makes it a novel piece.

Although it is desirable to obtain disaggregated data for our type of analysis, our study is intended to provide evidence on agglomeration economies from a regional and not an urban perspective. The rationale for using state-level data instead of metropolitan or urban information lies in the fact that external economies may be regional and not necessarily constrained to a particular urban space (Storper, 1997).

Taking the above arguments into consideration, it is plausible that trade has induced a change in industrial location as a result of access to a greater market -an argument that has been put forward by the new economic geography. The model that will be developed in the next section aims at testing whether distance to the main market (one of the elements of the new economic geography) or initial factor endowments (neo-classical considerations) are responsible for industrial agglomeration. As mentioned above, the model will also take into account two different types of externalities that may be playing a role in the pattern of concentration in Mexico.

The Model

The model considers two variables that stem from neo-classical theories, namely initial labour and initial capital and two related to the new economic geography, distance to Mexico City and distance to the USA as proxies for proximity to the main market. It also considers two types of externalities: Jacobs and MAR.

$$\log \left(\begin{array}{c} \frac{Q_{ikt}}{Q_{jt}} \\ \frac{Q_{jt}}{Q_{ik0}} \\ \frac{Q_{j0}}{Q_{j0}} \end{array} \right) = f(\log L_{ij0}, \log K_{ij0}, \log \text{dismex}, \log \text{disusa}, \text{Jac}, \text{MAR})$$

where:

i = state

j = 2-digit industry

k = 4-digit industry

l = 4-digit industry \neq k

t = period of time

Q = gross industrial production

L = labour

K= capital

dismex = distance in kilometres from the capital of the state to Mexico City

disusa = distance in kilometres from the capital of the state to the nearest border city with the USA

Jac = Jacobs externalities

MAR = MAR externalities

MAR externalities will reflect specialisation patterns in Mexico's manufacturing industries in a dynamic way since they refer to specialisation with respect to 1980.

$$MAR = \frac{\left(\frac{Likt}{Li0}\right)}{\left(\frac{Lkt}{L0}\right)}$$

Industrial diversity in Mexico will be incorporated in the model using the inverse of a Hirshman-Herfindahl index of concentration as used in Combes (2000) that allows for diversity to be calculated with respect to all other industries (l) when one particular branch is considered (k):

$$Jac = \frac{\frac{1}{\sum \left(\frac{Lil}{Li - Lik}\right)^2}}{\frac{1}{\sum \left(\frac{Ll}{L - Lk}\right)^2}}$$

With this model in mind, four regressions will be run. The first one will be a panel using 54 industries in 32 Mexican states for three periods of time (ISI, GATT and NAFTA). The rest of the regressions will be a panel that will be restricted to each period of time, which will produce results for each of the periods. This procedure, will allow us to identify differences in our results as trade policy in Mexico changes. As it is usual in any panel-data regression the fixed and random effects of particular industries and time will be captured by the model, while 32 dummy variables will control for specific state effects. The regression for all three periods will be run with 5184 observations and each of the regressions for the three periods will count with 1728.

The data used for the analysis stems from the Economic Census carried out every five years by Mexico's National Institute of Statistics, Geography and Information Systems (Instituto Nacional de Estadística, Geografía e Informática/INEGI). In that sense, the information coincides with the periods established in this paper, namely 1980, 1985, 1993 and 1998 (INEGI, 1981, 1986, 1994 and 2001).

Results and Analysis

Using the full sample -which implies 5184 observations- the panel-data analysis reports the results that are shown in Table 3, with fixed effects and 32 dummy variables to control for individual effects of Mexican states. Changes in industrial concentration in Mexico according to Table 3, have not been based on resource endowments as neo-classical trade theory would expect. Although the period is not entirely of free trade -and even in the NAFTA period, one could argue that is not a totally free trade situation as the process is still going on- of the two variables included to reflect resource-endowment differentials only initial capital is significant, but is negatively related, which can be interpreted as economically unrelated.

Similarly, contrary to what was expected distances to the market are not a determinant for industrial concentration changes. Distance to Mexico City is actually significant, but once again, appears with the wrong sign; one cannot argue that being away from Mexico City is positive to increase concentration. Again, the plausible interpretation is that distances to both markets are unrelated to industrial concentration changes.

Finally, both types of external economies, namely MAR and Jacobs are significant and positively related to industrial concentration. That is, both specialisation and diversity favour industrial concentration. In a practically mono-centric production structure in Mexico before trade, that could be explained by the overwhelming industrial concentration in and around Mexico City. If few places showed concentration, manufacturing activities were almost entirely agglomerated bringing specialisation and diversity together. If we remember the results of Table 2, the old industrial hub of Mexico City concentrated most of the country's manufacturing activity, which made it a diverse and specialised region at the same time. However, that cannot be an explanation for changes argued above in Mexican production structures affected by free trade. Therefore, it is important to look at the results for each of the periods in an attempt to identify differences among periods.

T A B L E 3
RESULTS FOR ALL PERIODS

	B	T
L	-0.009	-0.530
K	-0.019	-2.510*
dismex	0.041	2.310*
disusa	0.006	0.400
Jac	34.840	2.470*
MAR	0.135	6.000*
R square	0.0149	
Observations	5184	

*/ Significant at 95%

ISI was a period in which agglomeration was based not on diversity (Jacobs externalities), but on specialisation (MAR externalities). Only MAR appears to be significant and as can be observed in Table 4, a positive influence on agglomeration. Resource endowments are not statistically relevant (and bearing the wrong sign), nor are distances to the market. ISI's agglomeration is explained only by specialisation in few places, particularly in Mexico City.

Although these results seem to be consistent with the regional production structure of that time, it is surprising to find that neither the elements considered by neo-classical theory, nor those of the new economic geography appear to have an influence over concentration.

T A B L E 4
RESULTS FOR ISI

	B	T
L	-0.110	-1.100
K	-0.067	-0.770
DISMEX	0.048	0.023
DISUSA	-0.033	-0.740
JAC	41.574	0.320
MAR	0.462	7.520*
R SQUARE	0.038	
OBSERVATIONS	1728	

*/ Significant at 95%

After trade liberalisation, it is remarkable to find that neither of the two resource-endowment variables, namely initial labour and capital were significant. In contrast, distance to the USA becomes significant and negative (Table 5), which reflects the importance of being close to the main market, while being close to the largest internal market lacks relevance.

T A B L E 5
RESULTS FOR GATT

	B	t
L	-0.007	-0.810
K	-0.006	-1.870
DISMEX	0.015	1.890
DISUSA	-0.014	-1.960*
JAC	223.520	1.520
MAR	0.016	1.810
R SQUARE	0.0361	
OBSERVATIONS	1728	

* / Significant

Overall, it is important to note that concentration appears to be based more on proximity to the market and the elements of the new economic geography and less on initial factor endowments as the neo-classical theory would predict. There is also a lack of importance of specialisation or diversity in shaping agglomerations. It is possible that the results for GATT are in someway reflecting the fact that there is still few and restricted trade despite the accession to a multilateral trade framework that will only bear results in the years to come. These results can also be affected by the crises of the eighties common in Latin America, which entailed low regional growth rates in Mexico.¹

The results in Table 6 for NAFTA, are confusing and at the same time revealing. One the one hand, the possible dismantling of the old manufacturing hub in favour of northern and particularly of border-states has an effect on the type of externality that fosters concentration. As many cities in the North became industrialised, diversity is not the drive of such agglomerations as was suggested by Table 3 and the results for all periods. In contrast, specialisation of such new industrial centres determines concentrations. In fact, many of those states have followed an industrial promotion strategy based on specialisation of clusters (such is the case of Chihuahua, by far the state that

¹ In fact, only eight of the 32 states in Mexico attained a positive despite low growth rate in Mexico during the period. In addition, there is also a transformation of the whole economy from one based on import substitution and oil, to one based on freer trade and manufacturing production fuelled by the maquiladora industry (Rodríguez-Poise and Sánchez-Reaza, 2003).

experienced the greatest increase in concentration during the 18-year period contemplated by this paper). In that sense, MAR externalities, during NAFTA, shaped concentration.

T A B L E 6
RESULTS FOR NAFTA

	B	T
L	-0.426	-13.300*
K	0.060	3.030*
DISMEX	-0.028	-2.930*
DISUSA	-0.013	-1.430
JAC	-13.130	-0.090
MAR	0.139	8.570*
R SQUARE	0.0767	
OBSERVATIONS	1728	

*/ Significant

On the other hand, is striking to see that resource endowments are statistically related to agglomeration. Both, initial labour and capital are statistically significant, but whereas labour is negatively associated to concentration, capital fosters agglomeration. One explanation is that the new industrial agglomerations -particularly in border-states- are basing their industrial processes on the intensive use of capital and technology relative to the rest of the country and that southern states are economically oriented towards labour-intensive activities that do not favour agglomerations.

Finally, as opposed to our expectations, distance to the USA is not playing a statistically significant role in promoting concentration, perhaps because it is only the border which could be taking advantage of economic integration and not a gradient relationship between concentration and geographical proximity to the border. What is more -and contrary to our expectations- the results shown in Table 6 evince that the drive of concentration has been distance to Mexico City, and not to the USA once free trade is in place. These results are as striking as revealing. However, further research is needed, since the inclusion of other statistical methods and other ways to take into account proximity rather than simple distances may reveal different trends. In addition, the results could be also at present being affected by the fact that the process of liberalisation and integration is still underway and that data for 1998 probably does not reflect recent developments.

Conclusions

The paper attempts to test whether neo-classical or new economic geography's propositions best explain changes on industrial concentration in Mexico. It also acknowledges the debate on agglomeration economies and distinguishes between the two main types of externalities, namely those based on diversity (Jacobs) and those reliant on specialisation (MAR). The three different trade policies implemented by Mexico over the last 50 years or so, make of this country an ideal case to test these ideas.

Using panel-data analysis and regressions for all and each of the periods established in the paper, the results show that, as could be expected from a centralised production system, the closed-economy approach was related to industrial concentrations based both on specialisation and diversity (particularly rooted in the same industrial centre, namely Mexico City agglomerating manufacturing to such an extent that the core was both specialised and diverse). At the same time neither of the two theories tested in this paper seem to provide a good explanation for industrial changes during ISI. However, after trade was liberalised, the many industrial centres previously in the periphery, became concentrations based on specialisation and proximity to the main market that since 1986 has increasingly been the USA. Thus, as the new economic geography would predict, transport costs (proximity) becomes crucial once trade is liberalised. It was surprising that in neither of the two periods were the elements of neo-classical trade theory (resource endowments) able to explain regional production changes in the country. More striking was the fact that the relevance of the market was reversed during NAFTA, making Mexico City during a period of economic integration the most important market. The results evince the need for further research and new variables that could best reflect proximity to the market than mere distance.

Finally, the paper shows that resource endowments are important once trade is allowed (NAFTA) and that such resources could also be related to the relative intense use of production factors across Mexican regions; again, further research is needed to clarify the relationship between resource endowments and recent industrial location in Mexico. The paper also demonstrates that specialisation -possibly related to new industrial clusters- and not diversity drive agglomerations in Mexico particularly under free trade.

References

- Aguilar, A. (1999) "Mexico City Growth and Regional Dispersal: the Expansion of Largest Cities and New Spatial Forms" in *Habitat International* 23(3): 391-412.
- Alba, F. (1982) *The Population of Mexico: Trends, Issues, and Policies*, New Brunswick, N. J.: Transaction Books.
- Brown, F. and Domínguez, L. (1997) "¿Es posible conformer distritos industriales? La experiencia del calzado en León, Guanajuato", in E. Dussel, Piore, M. and Ruiz Durán, C. (eds.), *Pensar Globalmente y Actuar Regionalmente*, México, DF: UNAM-Jus.
- Combes, P. (2000) "Economic Structure and Local Growth: France, 1984-1993", *Journal of Urban Economics* 47: 329-55.
- Fujita, M., Krugman, P. and Venables, A., (1999) *The Spatial Economy*, Cambridge, MA: The MIT Press.
- Glaeser, E. L., Kallal, H. D., Sheinkman, J. A. and Schleifer, A. (1992) "Growth in Cities", *Journal of Political Economy* 100: 1126-1152.
- Grossman, G. and Helpman, E. (1994) "Endogenous Innovation in the Theory of Growth", *Journal of Economic Perspectives* 8 (1): 23-44.
- Hanson, G. (1998) "Regional Adjustment to Trade Liberalization", *Regional Science and Urban Economics*, 28: 419-44.
- Henderson, J. V., Kuncoro, A. and Turner, M. (1995) "Industrial Development in Cities", *Journal of Political Economy* 103: 1067-85.
- Hoover, E. M. and Giarratani, F. (2001) *An Introduction to Regional Economics*, <http://www.rri.wvu.edu/WebBook/Giarratani/main.htm>, May 11th 2001.
- INEGI (1981) *Censo Industrial 1980, Censos Económicos 1980*, México, DF: Secretaría de Programación y Presupuesto.
- INEGI (1986) *Censo Industrial 1985, Censos Económicos 1986*, México, DF: Secretaría de Programación y Presupuesto.
- INEGI (1994) *Censo Industrial 1993, Censos Económicos 1993*, Aguascalientes, México: Instituto Nacional de Estadística, Geografía e Informática.
- INEGI (2001) *Sistema Automatizado de Información Censal 1999*, Aguascalientes, México: Instituto Nacional de Estadística, Geografía e Informática.
- Krugman, P. (1991a) *Geography and Trade*, Cambridge, MA: The MIT Press.
- Krugman, P. (1991b) "Increasing Returns and Economic Geography" in *Journal of Political Economy* 99 (3): 483-99.
- Krugman, P. (1991c) "First Nature, Second Nature, and Metropolitan Location", *National Bureau of Economic Research, Working Paper No. 3740*.
- Krugman, P. (1992) "A Dynamic Spatial Model" *National Bureau of Economic Research, Working Paper No. 4219*.
- Krugman, P. (1993) "The Narrow and Broad Arguments for Free Trade" in *American Economic Review* 83 (2): 362-366.
- Krugman, P. (1998) "What's New About the New Economic Geography?" in *Oxford Review of Economic Policy* 14 (2): 7-17.
- Krugman, P. and Livas Elizondo, R. (1996) "Trade Policy and the Third World Metropolis" in *Journal of Development Economics* 49: 137-150.

- Krugman, P. and Venables, A. (1995) "Globalization and the Inequality of Nations" in *Quarterly Journal of Economics* 110 (4): 857-80.
- Leamer, E. (1984) *Sources of International Comparative Advantage*, Cambridge, MA: The MIT Press.
- Lucas, R. E. J. (1988) "On the mechanics of economic development" in *Journal of Monetary Economics* 22: 3-42.
- Markusen, J. R. et al. (1995) *International Trade: Theory and Evidence*, Singapore: McGraw-Hill Inc.
- Mendoza, Cota, J. E. (1999), "Reubicación Transnacional como Impulso a la Formación de Distritos Industriales. El Caso de la Región Saltillo-Ramos Arizpe", in C. Ruiz Durán y Dussel Peters, E. (eds.), *Dinámica regional y competitividad industrial*, Mexico, DF: UNAM-Jus-Fundación Friederich Ebert.
- Ohlin, B. (1933) *Interregional and International Trade*, Cambridge, MA: Harvard University Press.
- Rodríguez-Pose, A. and Sánchez Reaza, J. (2003) "Economic Polarisation through Trade" in *United Nations University/World Institute for Development Economics Research*, Discussion Paper No. 2003/60.
- Romer, P. (1990) "Endogenous Technological Change" in *Journal of Political Economy* 98 (5, part II): S71-S102.
- Romero Kolbeck, G. and Urquidi, V. (1952) *La Exención Fiscal en el Distrito Federal como Instrumento de Atracción de Industrias*, Mexico, DF: Departamento del Distrito Federal.
- Romer, P. (1986) "Increasing Returns and Long-Run Growth", *Journal of Political Economy* 94 (5): 1002-1037.
- Rosenthal, S. and Strange, W. (2003) "Evidence on the Nature and Sources of Agglomeration Economies", forthcoming in the *Handbook of Urban and Regional Economics*, Volume 4.
- Sánchez Reaza, J. and Rodríguez-Pose, A. (2002) "The Impact of Trade Liberalization on Regional Disparities in Mexico" in *Growth and Change* 33: 72-90.
- Storper, M. (1997) *The Regional World: Territorial Development in a Global Economy*, New York: The Guilford Press.
- Suranovic, S. M. (2000) *International Trade Theory and Policy Analysis*, January 5th 2000, <http://www.internationalecon.com>
- Venables, A. J. (1998) "The Assessment: Trade and Location" in *Oxford Review of Economic Policy* 14 (2): 1-6.