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State Characteristics and the Locational Choice of Foreign Direct Investment: Evidence from Regional FDI in Mexico 1989–2006

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ABSTRACT Despite the growing importance of foreign direct investment (FDI) in the Mexican economy, statistical evidence on the determinants of the regional distribution of foreign-owned firms is seriously limited. In this paper, empirical findings are presented from a variety of econometric models that identify several regional characteristics influencing the locational choice of FDI. The main findings are threefold. First, several locational factors appear to be potentially important; these include regional demand, wages, schooling, infrastructure, and agglomeration economies. Second, the effect of agglomeration economies stems from several sources. In particular, the regional presence of agglomerations of manufacturing activity and of foreign-owned manufacturing firms both have an independent positive effect on the locational decision of new FDI. Third, the locational process of maquiladora firms differs from the locational process of overall FDI. The actual findings suggest that regional demand and infrastructure, as suggested above, are *not* important locational factors for export-oriented firms. Furthermore, whereas agglomeration economies from manufacturing and the presence of existing FDI attract new maquiladora investment, the presence of a regional agglomeration of services *deters* the location of new maquiladora firms. Finally, agglomeration economies appear to be more important in the locational process of maquiladora firms.

Introduction

Following several economic crises in the 1970s and early 1980s, Mexico drastically changed its development strategy in the mid-1980s, implementing far-reaching policies that were designed to liberalize the economy and promote international trade. A central element in this new strategy was the facilitation and promotion of foreign direct investment (FDI) in Mexico, which proved highly successful (Ramirez 2002, 2003).

The importance of this marked acceleration in investment is not confined to direct economic effects associated with the large increase in invested capital in the economy. In

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addition to this, there is substantial evidence that the presence of foreign-owned manufacturing firms generates positive externalities among Mexican firms (Aitken, Hanson, and Harrison 1997; Blomström, Kokko, and Zejan 2000; Jordaan 2004, 2005, forthcoming-a,b; Ramirez 2000, 2006). Also, there are indications that these externality effects are facilitated particularly at the regional level (Aitken, Hanson, and Harrison 1997; Jordaan 2005, forthcoming-a,b). Both Aitken, Hanson, and Harrison (1997) and Jordaan (2005, forthcoming-a) find that positive FDI externalities are promoted in industries with a high level of geographical concentration within Mexico. Related to this, Jordaan (forthcoming-b) presents findings that indicate that geographical distance has a negative effect on spatial FDI spillovers. In light of these direct and indirect effects that the presence of FDI can entail and their regional dimensions, regional Mexican governments perceive the attraction of new FDI as an integral part of their regional development strategies.

Despite this importance, little statistical evidence is available on the important question of which factors influence the regional distribution of FDI in Mexico. Empirical evidence on why foreign-owned firms locate in Mexico indicates the importance of factors including geographical proximity to the U.S., the size of the Mexican market for certain industries, relatively low wages, and of course the creation of the North American Free Trade Agreement (NAFTA) (Blomström and Kokko 1997; Cole and Ensign 2005; Love and Lage-Hidalgo 2000; MacDermott 2007; Thomas and Grosse 2001). Compared to this, evidence on factors influencing the regional distribution of FDI within Mexico is sparse. One recent paper on regional FDI flows during the period 1994–2001 provides statistical evidence that suggests that the regional variation of infrastructure influences the location process of FDI (Mollick, Duran, and Silva-Ochoa 2006).

The purpose of the present paper is to address this important gap in the literature by conducting an econometrical study to identify regional characteristics that have influenced the regional distribution of FDI in Mexico during the period 1989–2006. For this, we estimate a variety of econometric models with several alternative dependent variables that capture important elements of this regional distribution. The main contribution of our analysis is threefold.

First, we provide new statistical evidence on which location factors play a role in the location process of FDI in Mexico. Our analysis is different from Mollick, Duran, and Silva-Ochoa (2006) in several respects. For instance, whereas Mollick, Duran, and Silva-Ochoa look at the period 1994–2001 using data for 22 states, we consider a wider period (1989–2006) and use data for all 32 states. Also, we estimate the effect of a wider variety of control variables. Importantly, we use several carefully measured indicators of regional agglomeration economies that are more closely related to the underlying concept of agglomeration.

Second, we are able to partly disentangle the role of agglomeration economies in the location process of FDI. In line with recent studies on several other host economies (e.g., Crozet, Mayer, and Muchielli 2004; Guimarâes, Figueiredo, and Woodward 2000; Head, Ries, and Swenson 1995, 1999; Hilber and Voicu 2005), we assess empirically whether the location decision of FDI is affected by the regional presence of agglomeration

economies, originating in the manufacturing sector and service sector. Furthermore, we also allow for an independent effect of the regional presence of foreign-owned manufacturing firms on new regional FDI flows.

Third, our econometric analysis distinguishes between the location pattern of overall FDI and of the maquiladora industry. By estimating separately econometric models for both types of FDI, we are able to assess whether and how the location process of foreign-owned firms that are predominantly export oriented differs from the general location process of FDI in Mexico.

The paper is constructed as follows. In the second section, we discuss recent locational changes of Mexican manufacturing industries during the period of trade liberalization and present indicators of the regional distribution of FDI during this period. The main finding of this section is that FDI has gravitated to those states that incorporate substantial shares in overall manufacturing employment, suggesting that the factor of agglomeration is important in the location process of FDI.

The third section discusses the data and econometric model. Our panel data set contains observations for the periods 1989–1993, 1994–1998, 1999–2002, and 2003–2006, for the 32 states of Mexico. In line with empirical research on FDI location processes in other host economies, we include right-hand side variables capturing the level of regional demand, wages, human capital, infrastructure, and the presence and size of agglomeration economies. In calculating the regional presence of agglomeration economies, we distinguish between agglomerations of manufacturing activity, services, and existing manufacturing FDI.

The fourth section presents the main findings, of which the following are particularly noteworthy. First, we find that several state characteristics are associated with the regional distribution of FDI flows. The level of regional wages deters the presence of FDI; regional demand, schooling, communication networks, and agglomeration economies all have a positive effect on the regional location of new FDI. Findings for restricted samples and with lagged right-hand side variables (as control for endogeneity) support these findings, be it that the estimated effect of regional demand appears to contain an endogenous component, reflecting the relationship that states with high levels of inward FDI achieve higher levels of regional gross domestic product (GDP).

Second, the effect of agglomeration economies appears to consist of two important elements: both the regional presence of an agglomeration of manufacturing activity and the regional presence of existing FDI firms have independent positive effects on the regional presence of new FDI. This finding is in line with recent empirical evidence on FDI location processes in other host economies.

Third, the location process of maquiladora firms appears to be different from the location process of overall FDI. An important difference is that export-oriented firms do not appear to be influenced in their location choice by the level of regional demand. Additional regressions that control for endogeneity and the regional composition of the research sample indicate that infrastructure also appears to be unimportant for these firms. Another difference concerns the effect of agglomeration economies. Whereas the presence of

agglomerations of manufacturing activity and of existing regional FDI are positively associated with the level of regional maquiladora employment, the regional presence of an agglomeration of services is negatively associated with maquiladora employment. In combination, these findings suggest that maquiladora firms gravitate to regional production centers that consist mainly of manufacturing activity. In addition, relatively speaking the regional presence of agglomerations of manufacturing activity appears to play a more important role in the location decision of maquiladora firms.

Finally, the fifth section provides a summary of the findings and discusses policy implications and suggestions for future research.

Trade Liberalization, Agglomeration, and FDI

In response to several economic crises in the 1970s and early 1980s, the Mexican government changed its development strategy drastically in the mid-1980s, substituting a strategy of economic liberalization and trade promotion for the development strategy of import substitution. Import restrictions were either abolished or severely relaxed, structural programs were initiated to promote exporting activities, state-owned companies were sold off at a rapid rate, and the main laws on FDI were changed several times to facilitate and promote the level of foreign investment into the Mexican economy (Loser and Kalter 1992; Pacheco-Lopez 2005; Ramirez 2002, 2003). Also, the maquiladora program received new impulses in an effort to increase the number of assembly-style foreign-owned manufacturing firms in this program (Sklair 1993). The measures to promote FDI were highly successful. For instance, in the 1990s, the level of FDI more than doubled (Ramirez 2002, 2003). Also, the maquiladora program grew quickly. As an indication of this, whereas in 1980 only 8 percent of the Mexican manufacturing labor force was working for maquiladora firms, in 2003 this had increased to 25 percent.[1] Finally, the variety of efforts to liberalize and promote the internationalization of the Mexican economy became locked in in 1994 when Mexico, the U.S., and Canada created the NAFTA, which also fostered further liberalizing policies in recent years.

Regional distribution of manufacturing activity and FDI. Two important elements of the structural changes in the Mexican economy following the introduction of trade liberalization in the 1980s have been the marked increase in the level of FDI into the country and the substantial changes in the relative importance of regions within Mexico. To obtain a good impression of these locational changes in the Mexican economy, we have constructed Table 1, which presents indicators of both the regional distribution of manufacturing employment shares and of FDI for selected years of the period 1988–2006. We distinguish between Mexico City (the Federal District and Estado de Mexico), the border states (Baja California, Coahuila, Chihuahua, Nuevo Leon, Sonora, and Tamaulipas), and the remaining group of other states.

The first set of columns indicates how the regional employment shares of the three groups of states have changed during the period of trade liberalization. One feature is that Mexico City has seen its dominance as main agglomeration deteriorate, experiencing a decrease to 21 percent in 2003. At the same time, the border states experienced an increase

TABLE 1. REGIONAL DISTRIBUTION OF THE MANUFACTURING SECTOR AND FDI: 1988–2005.

States	Manufacturing employment (% share)			FDI flows (% share)			Employment in maquiladora industry (% share)		
	1988	1998	2003	1989–1993	1994–1999	2001–2005	1990	1997	2002
Distrito Federal	19	11	10	59.9	51.6	62	0.14	0.21	0.19
Estado de Mexico	14	12	11	7.4	6.9	3.5	0.38	1.02	0.73
Mexico City	*33*	*23*	*21*	*67.3*	*58.5*	*65.5*	*0.51*	*1.23*	*0.93*
Baja California	4	6	6	3	7	2	19.5	22	20.4
Coahuila	4	5	5	0.7	1	1.3	6.9	8.5	10.3
Chihuahua	7	8	8	1.4	5.1	5.4	37	26.7	24.3
Nuevo Leon	8	8	8	3.9	12.6	12.1	3.2	4.4	5
Sonora	2	3	3	0.8	1.6	1.1	8.6	8.6	7.1
Tamaulipas	4	4	5	2.4	3.3	2.3	18.4	15.1	15.3
Border states	*29*	*34*	*35*	*12.2*	*30.6*	*24.2*	*93.6*	*85.3*	*82.4*
Other states	*38*	*43*	*44*	*20.5*	*10.9*	*10.3*	*5.9*	*13.5*	*16.7*

Note: Value regional FDI flows: data provided by Secretaria de Economia; Regional share in employment in maquiladora industry: calculated with data from Sistemas de Cuentas Nacionales de Mexico. La Produccion, salarios, empleo y productividad de la industria maquiladora de exportación (INEGI 2000, 2006).
Sources: Regional manufacturing employment shares calculated with data from Economic Census (1989, 1999, 2004).
FDI, foreign direct investment.

in their participation in manufacturing activities to 35 percent. In addition to these two important changes, the group of other states also experienced an increase in its participation share.[2]

The new economic geography-inspired explanation for these marked locational changes in regional employment shares is that the introduction of trade liberalization made the border states more attractive for manufacturing industries, in light of their proximity to the U.S. In other words, trade liberalization caused the U.S. to replace Mexico City as main destination market for many industries (Hanson 1996, 1998a,b; Krugman and Livas-Elizondo 1996). Having said so, Mexico City has continued to exercise its attractive force on those industries that produce mainly for the domestic market. As new empirical findings in an important recent paper by Faber (2007) show, export-oriented industries gained in importance in those states with good market access to the U.S. (the border states), whereas import-competing industries fared well in states with relatively poor international market access (such as Mexico City), enjoying a higher level of "natural protection." Additional statistical evidence indicating the importance of both the U.S. and Mexico City as destination market is offered by Hanson and Jordaan and Sanchez-Reaza (2006).[3]

The next set of columns shows the regional distribution of total FDI flows into the states during trade liberalization. This distribution is characterized by several features. It is clear that Mexico City has received the majority of new FDI. Between 1988 and 2005, the average share of Mexico's capital city is about 66 percent. One reason for the dominance of Mexico City is that it constitutes Mexico's main financial center, receiving the vast majority of international investment in finance and financial services. Having said so, it is important to consider that the FDI flows assigned to this region are likely to be inflated. Many foreign-owned firms have their headquarters in Mexico City and assign FDI flows to them while the actual production sites and back offices created with the investments are often located elsewhere in the country.

The border states have seen their participation in new FDI more than double under trade liberalization, from about 12 percent in the late 1980s to more than 24 percent in recent years. Furthermore, there are indications that suggest that the participation of the border states in Table 1 is understated. The border states receive many foreign investments that are characterized by relatively low levels of capital intensity. A good example of this is the sector of textiles and leather. Between 1994 and 2001, the share of this sector in the total value of FDI flows into Mexico amounted to less than 4 percent. However, this sector contained 15 percent of the total number of new FDI firms during this period (Pacheco-Lopez 2005). Therefore, it is likely that the participation of the border states in FDI is higher than Table 1 indicates.

The group of remaining states has experienced a substantial decrease in its participation in FDI. In the early years of trade liberalization, these states received almost 21 percent of FDI. In recent years, this share has been more than halved to 10 percent. Also, the number of states with little FDI in this group has grown considerably. Whereas in the beginning of the period only four states received small shares of FDI, the most recent statistics indicate that this number has risen to 13.

Finally, the last set of columns presents the regional distribution of the maquiladora industry. It is clear that the border states represent the most important location area for firms participating in this program. During the early years of the program in the late 1960s and 1970s, maquiladora firms were required by law to locate in the border states. However, starting with the government of de la Madrid in the mid-1980s, locational restrictions were loosened on several occasions (CEPAL 1996; South 1990). As a result, from the mid-1980s onwards, maquiladora firms have been allowed to locate in any region in Mexico without restrictions (MacLachlan and Aguilar 1998; South 1990; Weiler and Zerlentes 2003). Also, they are allowed to sell a substantial portion of their production directly on the Mexican market. Having said so, the lifting of the restrictions on location and destination markets has not altered the situation that the border states constitute the main location area for the maquiladora industry. Of course, proximity to the U.S., being the main source of inputs and the main destination market for finished products, is an important explanation for this clear locational preference.

Having said so, it is noteworthy that in recent years, the group of other states has experienced a substantial increase in their participation in the maquiladora industry, from less than 6 percent at the beginning of the period to more than 16 percent in recent years. Additional data published by INEGI (2006) indicate that firms in the sector of textiles and leather (sector 32) in particular are choosing non-border locations in Mexico, while some firms in the sector of metal products (sector 38) are locating in states further away from the border with the U.S.–Mexican states that have benefited from this recent trend are Jalisco (sector 32 and 38) and Yucatan, Durango, and Puebla (sector 32).

Summary. The introduction of trade liberalization has led to structural changes in the Mexican economy. One transformation concerns the marked changes in participation shares of Mexican states in the manufacturing sector. In particular, Mexico City has seen its share in manufacturing employment be reduced sharply, in contrast to the central role that this agglomeration played during the period of import substitution. In contrast, the border states have benefited greatly from the opening up of the international market, experiencing a marked increase in their participation in the manufacturing sector. As a result of these changes, the spatial distribution of economic activity in Mexico has changed from being agglomerated in Mexico City to a situation where manufacturing production is concentrated in several regional production centers in the capital city and the border states.

The second change is that the level of FDI has increased dramatically. Furthermore, partly in line with the locational changes of the manufacturing sector, the location pattern of new FDI during trade liberalization is characterized by a considerable level of geographical concentration. In particular, Mexico City and the border states represent the main destination regions for new FDI, depending on whether we consider total FDI inflows or the location pattern of maquiladora firms. This trend that new FDI appears to have gravitated to those states that incorporate substantial shares of manufacturing employment suggests that FDI is attracted to agglomerations of economic activity, as found recently for other countries by e.g., Crozet, Mayer, and Muchielli (2004), Head, Ries, and Swenson (1995, 1999) and Hilber and Voicu (2005). Of course, agglomeration economies represent only

one of a variety of regional characteristics that may influence the location process of FDI. In order to assess whether and to what extent the location choice of FDI is indeed affected by agglomeration economies, a more inclusive empirical analysis is required. Such an analysis is introduced and presented in the next sections.

Data and Econometric Model

Introduction. In recent years, a considerable number of empirical studies have been published on the statistical identification of location factors of FDI in a variety of host economies. These studies can be classified into two types. The first type consists of empirical studies that use the number of new foreign-owned manufacturing firms in regions of a host economy as the dependent variable in the estimation of conditional logit models following McFadden (1974). Often-cited examples of this approach include Head, Ries, and Swenson (1995, 1999) and Coughlin and Segev (2000); Coughlin, Terza, and Arromdee (1991) for the U.S.; Crozet, Mayer, and Muchielli (2004) for France; Guimarâes, Figueiredo, and Woodward (2000) for Portugal; and Hilber and Voicu (2005) for Romania.

In the absence of such data, the second type of empirical studies consists of the estimation of a mixture of econometric models, where the dependent variable takes on a variety of forms. Examples of this type include Boudier-Bensabaa (2005) and Cassidy and O'Callaghan (2006) who use FDI stock at the regional level in Hungary and China, respectively; net capital expenditure by FDI among regions in the UK (Driffield and Munday 2000); the value of realized FDI in regions in China (He 2002); and the value of FDI flows in Vietnamese provinces (Pham Hoang Mai 2002).

It is important to consider that although these approaches differ in their econometric models, they all share the same identification strategy. The observed regional distribution of either the number of new FDI firms or values of regional FDI can be interpreted as the revealed preference for locational attributes by new FDI. In other words, the observed regional distribution of new FDI can be interpreted as being the outcome of a location decision by new FDI firms. Under this assumption, we can infer that those regional characteristics that are significantly associated with the regional distribution of FDI must play a role in the location process of new FDI.

The body of existing empirical research of FDI location processes shows that there are several types of location factors that are usually considered: regional demand, regional production costs related to labor, infrastructure, the presence of agglomeration economies, and the presence or magnitude of regional public policies designed to attract and facilitate new FDI. Of these location factors, the effect of regional policies is the most problematic to incorporate, as data on this location factor are often not available. Likewise, our analysis does not include an estimation of the possible effect of such policies in Mexico, as data restrictions prevent us from calculating a suitable variable.

Econometric model and data. Given the nature of the data that are available to us, we conduct an empirical study of FDI location among Mexican states that falls under the

second type of approach. In particular, we estimate a variety of econometric models that relate the regional level of FDI to regional demand, regional production costs, regional infrastructure, and regional agglomeration economies.

Dependent variables. Table 2 presents the definitions and data sources of the dependent and independent variables. The first dependent variable that we use is the value of FDI inflows among the 32 Mexican states during the periods 1989–1993, 1994–1998, 1999–2002, and 2003–2006. As mentioned earlier, a disadvantage of this variable is that it may overstate the importance of Mexico City as host region, whereas the importance of the border states may be higher than suggested by the regional distribution of FDI flows.

Therefore, we also use an alternative dependent variable that captures the regional distribution of the maquiladora industry. We measure this variable as the regional distribution of the number of maquiladora employees for the same four time periods. Of course, a potential disadvantage of this variable is that it only captures the location process of maquiladora firms, which may not be similar to the location process of foreign-owned firms that do not participate in the maquiladora program. Therefore, we take the findings for this dependent variable to be particularly relevant for those foreign-owned firms that are predominantly export oriented.

Explanatory variables. The first type of control variable is regional demand. *Ceteris paribus*, we expect foreign-owned firms to gravitate toward those states that have a relatively high level of (potential) demand for their products. To capture this effect, we use state-level GDP.[4]

The second type of location factor concerns the regional variation of labor-related production costs. The central element of this is the wage level. Our expectation is that the regional presence of FDI is negatively affected by the regional wage level. We measure this location factor as the total wage bill of the regional manufacturing labor force divided by the number of manufacturing employees.

When using wages as explanatory variable, we need to control for the feature that wages incorporate both production costs and productivity. To capture the productivity element, we include two additional human capital variables. One variable captures the regional level of schooling, measured as the average level of schooling of the regional economic active population. Second, we include a variable capturing the regional variation of labor quality of the manufacturing labor force. This variable is measured as the ratio of white-collar employees over blue-collar employees (see Blomström, Kokko, and Zejan 2000; Jordaan 2005).

Next, we include three measures of regional infrastructure. In the selection of infrastructure variables, we are guided by data availability for all the four time periods. Following Chiquiar (2005), we use the following variables: railroads per 100 km^2, the number of telephones per 100 persons, and the percentage of households with electrical supply.

TABLE 2. DEFINITION OF VARIABLES AND DATA SOURCES.

Variable name	Description	Source
FDI	Value of regional FDI inflows; 1989–1993, 1994–1998, 1999–2002, 2003–2006	Secretaria de Economia
FDI-Maquila	Number of employees in maquiladora firms; 1990, 1994, 1997, 2002	INEGI. Sistema de Cuentas Nacionales; (2000, 2006)
GDP	State level GDP; 1985, 1990, 1995, 2000	http://www.inegi.gob.mx
Wages	$\frac{(wagesmanufacturingsector)}{manufacturingemployees}$; 1988, 1993, 1998, 2003	Economic Census 1989, 1994, 1999, 2004
Schooling	Level of schooling economic active population; 1985, 1990, 1995, 2000	Provided by INEGI
LabourQual	Labor quality of manufacturing labor force: $\frac{(whitecollarmanufacturingemployees)}{(bluecollarmanufacturingemployees)}$; 1988, 1993, 1998, 2003	Economic Census 1989, 1994, 1999, 2004
Infra-rail	Railroads per 100 km^2 1985, 1990, 1995, 2000	Chiquiar (2005) for 1985; Annuario Estadistico (INEGI) for other years
Infra-tel	Telephones per 100 persons; 1985, 1990, 1995, 2000	Chiquiar (2005) for 1985; Annuario Estadistico (INEGI) for other years
Infra-elec	Percentage of households with electrical supply; 1985, 1990, 1995, 2000	Chiquiar (2005) for 1985; Annuario Estadistico (INEGI) for other years

Mandens	Indicator of density manufacturing sector; $\sum u \frac{(employeesmansector) - county}{(squarekilometers) - county}$; $u = \frac{(employeesmansector) - county}{(employeesmansector) - state}$ 1988, 1993, 1998, 2003	Economic Census 1989, 1994, 1999, 2004
Servdens	Indicator of density service sector; $v = \frac{(employeesservsector) - county}{(squarekilometers) - county}$; $u = \frac{(employeesservsector) - county}{(employeesservsector) - state}$; 1988, 1993, 1998, 2003	Economic Census 1989, 1994, 1999, 2004
FOR_1	Number of foreign-owned manufacturing firms; 1988, 1993, 1998, 2003	Secretaria de Economia, 1989, 1994, 1999, 2004
FOR_2	(employees working for FDI)/(regional manufacturing force)	Provided by INEGI, 1989, 1993, 1998

Note: All variables are in logs.
FDI, foreign direct investment; GDP, gross domestic product.

The last type of location factor that we include concerns the regional variation of agglomeration economies. Previous research indicates that there are several ways to capture the regional presence of agglomeration economies. Productivity studies have often resorted to variables measuring the size of regional economic activity, such as population size or the number of employees in the regional manufacturing sector (see Eberts and McMillen 1999; Rosenthal and Strange 2004 for surveys of this type of study). An alternative to this is to use the share of the manufacturing sector or the services sector in total regional employment (e.g., Guimarâes, Figueiredo, and Woodward 2000; Mollick, Duran, and Silva-Ochoa 2006).

A drawback of the use of such variables is that they may contain endogenous elements and be related to other explanatory variables, creating the problem of multicollinearity. Also, variables such as the share of manufacturing in total regional activity capture the concept of agglomeration only partially, as such variables do not contain any information on the type of location of the manufacturing sector within the states. Therefore, in our estimations we adopt an alternative strategy to control for the presence of agglomeration economies, by including right-hand side variables that capture the level of density of economic activity in the states (see Ciccone and Hall 1996). Examples of other empirical studies that have adopted a similar strategy include Coughlin, Terza, and Arromdee (1991) who use density of manufacturing at the state level in the U.S. (manufacturing employment divided by square kilometers) and Hilber and Voicu (2005), who use a similarly defined variable to capture the presence of agglomeration economies in regional service sectors in Romania.

We calculate two density variables to capture the effects from agglomeration: manufacturing sector density and service sector density. It is important to consider that calculating these variables at the state level may produce ill-based measures of density, as population and economic activity are not uniformly distributed within the Mexican states (Jordaan forthcoming-a,b). To obtain more accurate indicators of density, we use information at the county level to calculate the number of manufacturing employees and the number of service sector employees per square kilometer at the county level. We then aggregate these county-level density scores, using the counties' shares in total regional manufacturing employment and service sector employment as weights. This gives us density scores for the states that are corrected for differences in density across counties within the states.

Finally, several recent studies have used an additional agglomeration variable in the form of the regional presence of existing foreign-owned manufacturing firms and have identified a positive effect of this variable on the probability that a region is selected by new FDI (e.g., Crozet, Mayer, and Muchielli 2004; Head, Ries, and Swenson 1995, 1999; Hilber and Voicu 2005). To assess whether this factor is also important in the location process of FDI in Mexican states, we use two alternative variables that capture the regional presence of existing manufacturing FDI. The first variable is measured as the number of existing foreign-owned manufacturing firms in the states. The second variable is measured as the percentage of the regional manufacturing force working for FDI. The latter variable is only available for the years 1988, 1993, and 1998.

Empirical Results

Location factors of FDI in Mexico. Our baseline empirical model is:

$$FDI_{rt} = \beta 1_{rt} + \beta 2 Wages_{rt} + \beta 3 Schooling_{rt} + \beta 4 LabQual_{rt} + \beta 5 Infra\_rail_{rt} + \beta 6 Infra\_tel_{rt} + \beta 7 Infra\_elec_{rt} + \beta 8 Mandens_{rt} + \beta 9 Servdens_{rt} + \beta 10 For_{rt} + \delta t + \varepsilon_{rt}$$

where r and t are the regional and time dimension of the data and δt is the location-specific effect. A summary of the main findings of estimating a variety of versions of this econometric model is presented in Table 3.

One issue that we need to address first concerns the question whether to use fixed, between, or random effects, as this influences the interpretation of the estimated correlations (Wooldridge 2003). Fixed-effects estimation uses changes of the variables over time to estimate the association between the control and dependent variable. In this case, a positive association between e.g., infrastructure and regional FDI indicates that states that increase infrastructure more than other states attract more FDI. In contrast, between-effects estimation uses the variation between cases to identify associations. In this case, an estimated positive association between infrastructure and regional FDI indicates that a region with a relatively high level of infrastructure receives more FDI inflows. Finally, the random effects generalized least squares (GLS) estimator produces a weighted average of both fixed and between effects.

Columns 1 to 3 present the three specifications. We only report the effects of those variables that are significant in at least one of the three specifications. The first column presents the fixed-effect model. Schooling and telephone line density carry significant positive coefficients, whereas the regional level of density of the service sector deters new regional FDI. The second column presents the between-effects estimation. In this estimation, states with relatively high regional demand attract new FDI. The density of telephones is again positively associated with new regional FDI. Also, states with a relatively large number of existing foreign-owned manufacturing firms attract relatively large levels of new FDI. The Hausman test statistic indicates that the between-effects model is preferred over the fixed-effects model. Column 3 presents the GLS random effects model. The Hausman test statistic indicates that the random effects model suits our data better than the between-effects model.[5]

All but one of the explanatory variables in column 3 carry significant coefficients with the expected sign. For instance, the level of regional demand and the level of regional schooling have a positive effect on new FDI. In contrast, the regional wage level has a negative effect. Infrastructure also has a positive effect, as indicated by the positive coefficient of the telephone density variable. Finally, agglomeration economies also attract new FDI, indicated by the positive association between regional FDI and the level of density of the manufacturing sector, as well as the presence of existing foreign-owned manufacturing firms.[6]

One possible problem with the findings of column 3 is that the estimated standard errors may contain an error caused by clustering at the regional level. To assess whether this has

TABLE 3. LOCATION FACTORS OF FDI IN MEXICAN STATES: 1989–2006.

	1	2	3	4	5	6	7	8	9	10	11
	Fixed effect	Between effects	Random effects	Cluster region	Standardized beta coefficients	No Mexico City	No border states	No Mexico City and border states	New FDI firms as dependent variable	FDI employment as dep var	Lagged X variables
GDP	0.49	0.73	0.46	0.46	0.34	0.56	0.46	0.42	0.62	–0.16	0.29
	(0.42)	(0.31)**	(0.18)*	(0.17)*		(0.23)*	(0.21)**	(0.17)***	(0.69)	(0.16)	(0.21)
Wages	0.89	–0.16	–0.94	–1.05	–0.34	–1.32	–1.10	–1.10	–0.03	0.29	–1.24
	(1.01)	(0.78)	(0.44)**	(0.05)**		(0.73)***	(0.65)***	(0.64)***	(1.46)	(0.44)	(0.46)*
Schooling	15.56	1.18	5.65	5.42	0.31	4.75	4.15	5.02	–2.28	4.23	5.76
	(6.91)**	(3.09)	(2.11)*	(2.02)*		(2.36)**	(2.55)***	(2.66)***	(5.17)	(1.79)*	(1.88)*
LabQual	—	—	—	—	—	—	—	—			
Infra-rail	—	—	—	—	—	—	—	—			
Infra-tel	3.71	1.87	1.27	1.15	0.22	1.41	1.22	1.40	3.48	–0.49	0.48
	(1.48)*	(0.87)**	(0.59)**	(0.46)*		(0.41)*	(0.47)*	(0.59)**	(1.60)**	(0.46)	(0.26)***
Infra-elec	—	—	—	—	—	—	—	—	—		—
Mandens	–0.05	–0.18	0.34	0.22	0.16	0.30	0.29	0.27	0.74	0.63	0.22
	(0.75)	(0.19)	(0.14)*	(0.06)*		(0.03)*	(0.06)*	(0.11)*	(0.30)*	(0.10)*	(0.03)*
Servdens	–4.91	0.22	–0.23	—	—	—	—	—	–1.53	—	
	(1.02)*	(0.21)	(0.19)						(0.68)**		
For	0.07	0.37	0.16	0.20	0.21	0.21	0.19	0.17	5.45	0.26	5.26
	(0.08)	(0.17)**	(0.07)**	(0.10)**		(0.09)**	(0.09)**	(0.12)	(2.44)**	(0.05)*	(1.44)*
Walch chi^2	7.07	21.99	139.95	167		239	85.86	99.21	44.74	151	84.25
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hausman test	—	8.65	2.64	2.44	—	7.56	5.42	5.74	7.30	10.48	3.97
		(0.28)	(0.91)	(0.87)		(0.27)	(0.49)	(0.45)	(0.20)	(0.16)	(0.68)
Breusch-Pagan test	—	—	0.22	0.22	—	0.37	0.20	0.32	0.04	13.47	1.38
			(0.63)	(0.63)		(0.54)	(0.63)	(0.57)	(0.83)	(0.00)*	(0.24)
Adj. R^2	0.35	0.43	0.55	0.54	—	0.46	0.47	0.32	0.26	0.71	0.59
n	128	128	128	128	—	120	104	96	96	96	96

* $p < .01$; ** $p < .05$; *** $p < .10$.

Note: Heteroscedasticity robust standard errors in parentheses. Starting from column 4, estimated standard errors robust to regional clustering. Regressions 1–8 and 10 are based on using FOR_1 (using FOR_2 in these regressions produces similarly signed positive coefficient but with only 96 observations). Regressions 9 and 11 use FOR_2. Estimating regression 9 as a Tobit regression produces similar results.

GDP, gross domestic product.

affected the results, we classify the Mexican states into five regions: Border, North, Central, South, and Southeast.[7] The findings from estimating the econometric model that controls for clustered standard errors in these five regions are presented in column 4. The estimated coefficients remain rather stable in magnitude and significance level, which suggests that the results are not affected by the clustering problem.[8]

Column 5 presents the standardized Beta coefficients of regression four, which corrects for differences in measurement of the control variables, allowing us to compare the relative importance of the estimated effect of the control variables. Based on these coefficients, it appears that regional demand, wages, and schooling are all equally important in their effect on the location decision of new FDI. Next, the regional presence of existing FDI and infrastructure both have an equally sized effect that is somewhat smaller than the first three variables. Finally, the effect of agglomeration economies from manufacturing on the regional distribution of FDI flows is relatively the smallest.

Next, we estimate the econometric model for subsamples of states. Estimating the econometric model on the entire set of states implicitly assumes that new investors consider all states in their location choice. However, it may be that new investors consider certain states to be closer substitutes than others. For instance, a foreign investor may have decided to consider only non-Mexico City states as possible location, in which case the investor only compares 30 states in the country. If this is the case, the estimated coefficients can be biased, as they depend on the actual composition of the sample of states that the investor considers.[9] To assess whether this is a problem in our analysis, we estimate the econometric model on all states excluding Mexico City, all states excluding the border states, and all states excluding both Mexico City and the border states.

The results of these estimations are presented in columns 6–8. The magnitude of the coefficients and the estimated significance levels differ somewhat in these additional regressions on selected groups of states, but the nature of the estimated effect of the right-hand side variables remains remarkably stable.[10] This suggests that the results from the regressions are not sensitive to the regional composition of the sample and that the findings for the 32 states can be taken as identifying those location factors that are important in explaining the regional distribution of FDI flows among Mexican states.

Another issue concerns the measurement of the dependent variable. The flow variable of regional FDI is likely to contain measurement errors, as discussed earlier. To assess whether this affects the empirical results, we use an alternative variable based on the information that we have on the number of foreign-owned firms at the beginning year of each period. Using this information, we can calculate the number of new foreign-owned manufacturing firms per period.[11] The results of using this FDI stock variable are presented in column 9. Regional GDP, wages, and schooling carry insignificant coefficients. Infrastructure, agglomeration economies from manufacturing, and the regional presence of existing FDI maintain to have their significant effect. An alternative regression with the regional number of employees working for FDI firms for the years 1988, 1993, and 1998 as dependent variable produces similar findings, with the addition that also schooling carries a significant positive coefficient in this regression.

Finally, we take a closer look at the problem of endogeneity, which arises if in addition or instead of a line of causation running from the control variables to regional FDI, the line of causation also runs in the opposite direction. We do partially control for this problem by measuring the control variables either before or at the begin year of the time periods. As a further check, we estimate the econometric model using control variables that are lagged by one period. Column 11 presents the results. Wages, schooling, infrastructure, the regional level of density of the manufacturing sector, and regional foreign participation all carry significant coefficients with expected signs. The exception is the estimated effect of regional demand, which becomes insignificant. We interpret this finding as an indication that we need to interpret the estimated coefficient of regional demand with some caution, as its estimated effect may contain an endogenous element.[12] This means that part of the relation between regional FDI and regional demand may reflect a positive effect of regional FDI on the level of regional GDP.

Location factors of the maquiladora industry. To see whether the location process of maquiladora firms differs from the location process of overall FDI as identified in the previous section, we estimate several econometric models with the alternative dependent variable capturing the regional distribution of the maquiladora industry. The main findings of these regressions are presented in Table 4.

Again, we start with estimating the full econometric model and report the estimated effects that carry acceptable significance levels or that are different from the findings in Table 3. Compared to the findings for overall FDI, there are some similarities and also important differences. The similarities are that both schooling and infrastructure have positive effects on the regional choice of maquiladora firms. One important difference is that the level of regional demand is not significantly associated with the regional level of maquiladora employment, suggesting that the location process of export-oriented foreign-owned firms is not affected by regional demand.

Second, the wages variable does not carry a significant coefficient. Instead, the variable measuring labor quality carries a significant negative coefficient. This seems to suggest that maquiladora firms prefer to locate in states that have a relative abundance of blue-collar labor, in line with the feature that maquiladora production technologies are often characterized by the intense use of low-skilled labor.

Third, the effect of agglomeration economies is different. Similar to the findings in the previous section, states with a relatively high level of density of the manufacturing sector appear to attract more maquiladora investment. Also, the regional presence of existing FDI has a positive effect on the regional presence of maquiladora activity. However, at the same time, the estimated negative effect of the services density variable indicates that the regional presence of an agglomeration of service activities deters the presence of maquiladora firms. In combination, these findings indicate that maquiladora firms are attracted to regional production centers of mainly manufacturing activity.[13]

An important issue with the findings presented in column 1 of Table 4 concerns the dependent variable, which is measured as the number of maquiladora employees per region. Although locational restrictions of the maquiladora industry had been lifted prior to 1989,

TABLE 4. LOCATION FACTORS OF THE MAQUILADORA INDUSTRY: 1988–2006.

	1	2	3	4	5	6	7
	Baseline model	Omitting period 1989–1993	Dep var = employment growth	Standardized beta coefficients	No Mexico City and employment growth	No border states and employment growth	No city, no border, empl growth
GDP	0.27 (0.25)	0.69 (0.64)	0.06 (0.49)	—	0.40 (0.55)	0.51 (0.64)	0.76 (0.82)
Wages	–0.44 (0.80)	0.10 (0.55)	–1.03 (1.00)	–0.14	–3.14 (1.22)*	–1.75 (1.51)	–3.88 (2.00)**
Schooling	9.61 (1.85)*	9.90 (5.08)**	21.66 (6.79)*	0.39	23.25 (6.27)*	18.26 (7.06)*	21.51 (8.04)*
LabQual	–1.98 (0.50)*	–4.01 (2.14)***	–4.30 (3.38)	–0.17	–5.48 (3.77)**	–6.48 (5.63)	–6.41 (5.69)
Infra-rail	—	—	—	—	—	—	—
Infra-tel	1.86 (0.48)*	–0.17 (2.46)	–2.12 (3.14)	—	–1.23 (2.91)	–1.12 (3.39)	–0.24 (3.02)
Infra-elec	—	—	—	—	—	—	—
Mandens	1.08 (0.41)*	0.73 (0.42)***	2.20 (0.51)*	0.58	2.32 (0.47)*	1.66 (0.41)*	2.05 (0.39)*
Servdens	–1.55 (0.37)*	–0.75 (0.78)	–2.08 (0.73)*	–0.36	–0.80 (1.33)	–2.00 (0.53)*	–4.18 (2.06)**
For	0.20 (0.10)*	7.37 (3.24)*	8.03 (5.83)*	0.10	7.69 (4.25)***	33.30 (3.67)*	28.58 (9.42)*
Walch chi-square	175.12 (0.00)	59.05 (0.00)	32.14 (0.00)	—	78.50 (0.00)	252 (0.00)	38.73 (0.00)
Hausman test	2.43 (0.96)	10.50 (0.21)	10.06 (0.26)	—	9.01 (0.34)	10.20 (0.22)	6.11 (0.63)
Breusch-Pagan test	2.86 (0.09)***	0.15 (0.70)	0.15 (0.73)	—	2.51 (0.11)	1.69 (0.19)	0.62 (0.43)
Adj. R^2	0.64	0.59	0.34	—	0.39	0.31	0.37
n	128	96	96	—	90	78	72

* $p < .01$; ** $p < .05$; *** $p < .10$.

Notes: All estimations are random effects models. Similar to the models in section 4.1, the between-effects component is considerably larger than the within-effects component. Heteroscedasticity robust standard errors in parentheses. Estimated standard errors robust to clustering at the regional level. Regression 1 uses FOR_1, all other regressions use FOR_2. Regressions 1 and 2 use the regional number of workers in maquiladora firms as dependent variables, regressions 3–7 use growth in the number of regional maquiladora employees as dependent variable.

GDP, gross domestic product.

it is very likely that a considerable part of the regional distribution of the maquiladora industry in the early 1990s reflects the locational restrictions of the maquiladora industry from earlier years, which required maquiladora firms to locate in the border states.[14] To asses to what extent this may have biased the estimated coefficients, we estimate two additional regressions. One regression omits the time period 1989–1993 in an attempt to lower the effect of the locational restrictions. The second regression uses the growth rate of the number of maquiladora employees for the periods 1989–1993, 1994–1998, and 1999–2002. The findings of these regressions are shown in columns 2 and 3. The nature of the estimated effect of most of the right-hand side variables remains stable. The main exception to this is the estimated effect of the infrastructure variable, which ceases to be significant, suggesting that new maquiladora investment has not been influenced in its location choice by the regional variation in infrastructure.

Column 4 presents standardized Beta coefficients for regression 3. The relative importance of the control variables is different from the regression for regional FDI flows. In particular, the standardized Beta coefficients show that the agglomeration economies variables of manufacturing and services belong to the most important factors in the location process of maquiladora firms. Schooling also has a relatively strong effect. Wages, labor quality, and regional foreign participation are also important, but have relatively smaller effects on the maquiladora dependent variable.

An additional advantage of using employment growth as dependent variable is that it lowers problems with endogeneity. Therefore, in estimating the econometric model on selected groups of states, we continue to use employment growth as dependent variable. Again, the nature of the estimated effect of the control variables appears to be independent of the regional composition of the sample.[15] Having said so, the significance of the coefficient of the labor quality variable is sensitive to which states are included in the research sample. The feature that the negative effect of labor quality only materializes in the sample without Mexico City suggests that the relative abundance of blue-collar labor affects the location choice of those new foreign-owned firms that only consider border and non-border (excluding Mexico City) states. As for the other variables, it appears that overall, their estimated effect on the location decision of maquiladora investment is not affected by the regional composition of the research sample, supporting the empirical findings for the full regional sample as presented in column 3.[16]

Summary and Conclusions

The introduction of trade liberalization has caused structural and far-reaching changes in the Mexican economy. Two important elements of the transformation of the Mexican economy have been marked locational changes in favor of the border states and the dramatic increase in the level of FDI. Despite this growing importance of FDI, there is only very limited empirical evidence on factors that play a role in the regional location decision of new FDI. The purpose of this paper has been to address this gap in the literature, by estimating a variety of empirical models designed to identify statistically those regional characteristics that have influenced the regional distribution of FDI in Mexico in recent

decades. In line with recent research on other host economies, we pay special attention to include carefully measured variables that capture elements of the regional variation in agglomeration economies.

The main findings of the empirical analysis are threefold. First, looking at the regional distribution of FDI flows, the estimations indicate that there are several regional characteristics that appear to be important in the location process of FDI. Regional demand, wages, the level of schooling of the regional labor force, the presence of a good communications network, and the regional presence of agglomeration economies are all significantly associated with the regional distribution of new FDI. Of this set of control variables, the effect of regional demand in particular must be interpreted with some caution, as estimations with alternative dependent variables or with lagged control variables produce an insignificant effect of this variable, indicating that the estimated positive effect of regional demand may be biased because of endogeneity problems.

Second, the findings reveal that the effect of agglomeration economies consists of two elements. One element is that FDI is attracted to states with a relatively high level of density of the manufacturing sector, indicating the importance of the regional presence of manufacturing agglomeration economies. The other element is that the regional presence of existing foreign-owned manufacturing firms has an additional independent positive effect on the regional presence of new FDI, which is in line with recent empirical findings on FDI location processes in other host economies.

Third, the findings provide indications that the location process of maquiladora FDI is different from the location process of overall FDI. One difference is that the location decision of new maquiladora firms does not appear to be influenced by regional demand. Furthermore, some of the estimations show a negative effect of the labor quality variable, which suggests that maquiladora firms may prefer to locate in states with a relative abundance of blue-collar labor, in line with the feature that production technologies of these firms are often characterized by intensive use of low-skilled labor. Interestingly, infrastructure does not appear to be an important location factor for these firms.

As for the effect of agglomeration economies, there are two important differences. One difference is that although maquiladora firms seem to be attracted to states with a relatively high level of manufacturing sector density and presence of existing FDI, at the same time, a high level of density of the regional service sector deters the regional presence of new maquiladora firms. In combination, these findings seem to suggest that maquiladora firms are attracted to those regional production centers that contain mainly agglomerations of manufacturing activity. The second difference is that, based on a comparison of the standardized Beta coefficients of the two main alternative econometric models, the relative importance of agglomeration economies seems to be much higher in the location process of maquiladora firms.

This set of empirical findings has several policy implications. First, given the variety of regional characteristics that appear to play a role in the location process of FDI, regional governments have several options to attract new FDI. For instance, the findings suggest that

improving the educational level of the regional labor force or investing in infrastructure can enhance the probability that a region is selected by new foreign-owned firms. Another interesting feature is the positive effect of existing FDI in a region on the attraction of new FDI. This effect suggests the presence of a process of cumulative causation, where active government involvement in enhancing the level of regional FDI can have additional positive effects on new FDI in future time periods. Of course, an important element of such regional policies that will need to be addressed is the extent to which these policies should be instigated and carried out at the regional or federal level.

Second, the differences in the location process between overall FDI and the maquiladora industry indicate that it is important for regional governments to appreciate which regional factors are important for different types of FDI. An important indication that FDI in Mexico is susceptible to changes in location patterns is that recently, several export-oriented foreign-owned firms have decided not to locate in the border states but have selected alternative locations situated at a greater distance form the border with the U.S. By understanding the relative strengths and weaknesses of the states, in combination with an appreciation of the fact that different types of FDI will value regional characteristics differently, regional governments will be able to design more effective and efficient regional development policies to attract new international investment.

Finally, in our opinion, the empirical findings suggest two important topics for future research. One is related to the notion that geographical proximity is likely to enhance the occurrence of FDI spillovers (Barba Navaretti and Venables 2005). For instance, recent empirical findings on FDI externalities in Mexico indicate that geographical proximity between economic agents stimulates the occurrence of positive FDI spillovers (Aitken, Hanson, and Harrison 1997; Jordaan 2005, forthcoming-a) or alternatively that distance has a negative effect on spatial externalities (Jordaan forthcoming-b). The findings in the present paper indicate that FDI is attracted to states with a high level of density of manufacturing activity. This finding of a positive effect of agglomeration on the presence of new FDI clearly gives further credence to the notion that the relation between agglomeration and FDI spillovers may be an important one, deserving more attention in future research.

The second issue concerns the possible role that FDI has played in the structural locational changes in Mexico following the introduction of trade liberalization. The analysis of the present paper provides statistical evidence that FDI is attracted to those states containing agglomerations of activity. At the same time, these are the states that have been subjected to changes in relative regional prosperity quite severely. This suggests that FDI may have reinforced the marked locational changes that have occurred in recent decades, which is partially supported by empirical findings that FDI generates positive externalities in Mexican manufacturing industries (Aitken, Hanson, and Harrison 1997; Jordaan 2005, forthcoming-a,b). Future research should, therefore, address the question of how and to what extent the regional location pattern of FDI, through the generation of spillovers, may have contributed to changing regional dynamics in the Mexican economy in recent decades.

NOTES

1. Own calculations, based on Sistema de Cuentas Nacionales de México. La Producción, Salarios, Empleo y Productividad de la Industria de Maquiladora de Exportación (INEGI 2000, 2006).
2. There is substantial variation in the locational changes of manufacturing industries. A prime example of the growing importance of the border states is sector 38 (metal products), containing activities such as the production of cars and car parts, televisions, and computers. During the period of import substitution, Mexico City incorporated 52 percent of total employment in this sector, compared to less than 27 percent in the border states. In 2003, the situation had been reversed, with Mexico City containing only 15 percent of employment in this sector, whereas the border states had seen their employment share rise spectacularly to almost 60 percent (see Jordaan and Sanchez-Reaza 2006).
3. Related evidence of the sustained importance of Mexico City is provided by studies on regional growth under trade liberalization. These studies present evidence of a growing level of diverging growth rates between Mexico City and the border states on the one hand and the southern states on the other hand (Aroca, Bosch, and Maloney 2005; Chiquiar 2005; Rodriguez-Oreggia 2005; Rodriguez-Pose and Sanchez-Reaza 2002).
4. It is important to indicate that we measure all explanatory variables either before or at the beginning year of the time periods, depending on data availability. By creating a time lag between the dependent and independent variables, we attempt to minimize problems of endogeneity.
5. The GLS random effects model is a matrix-weighed average of within- and between-effects components. Additional statistics from the random effects estimations indicate that in all regressions, the between-effects component explains a larger share of the variation in the dependent variable compared to the within-effects component. In other words, the regional variation of FDI flows is more explained by differences between states rather than differences within states over time. This means, for example, that FDI gravitates to states with relatively high levels of agglomeration, rather than to states that experience relatively large increases in agglomeration over time.
6. The estimated positive effect of the manufacturing agglomeration economies variable and the infrastructure variable are in line with the findings of Mollick, Duran, and Silva-Ochoa (2006). The coefficients in our estimations are smaller, which may be caused by differences in sample size, measurement, and composition of the vector of control variables. It is important to mention that in additional regressions, we only find a significant positive effect of their measure of agglomeration economies (manufacturing share in regional production) when we restrict our regression model to only include regional demand, infrastructure, and agglomeration economies. Using their variable of agglomeration economies in our extended empirical model produces an insignificant coefficient for this variable. Not only does this indicate that their estimated effect of agglomeration economies is likely to be affected by omitted variable bias, it also suggests that our measure of agglomeration economies is more accurate.
7. We would like to thank one of the anonymous referees for suggesting this. Border = Baja California, Coahuila, Chihuahua, Nuevo León, Tamaulipas, and Sonora; North = Baja California Sur, Durango, Nayarit, San Luis Potosí, Sinaloa, and Zacatecas; Central = Distrito Federal, Guanajuato, Hidalgo, Jalisco, Michoacán, Morelos, Puebla, Querétaro, and Tlaxcala; South = Chiapas, Guerrero, Oaxaca, and Veracruz; Southeast = Campeche, Quintana Roo, Tabasco, and Yucatán.

8. However, to ensure that the problem of clustering does not affect the results, we control for clustering at the regional level in the remainder of the paper.
9. Empirical estimations of conditional logit models of FDI location choices face the same problem (see, e.g., Head, Ries, and Swenson 1995).
10. The only exception is the variable measuring the number of existing foreign-owned firms that does not carry a significant coefficient in regression 8.
11. This variable is only an approximation of the new number of FDI firms, as we do not have information on the actual number of FDI firms that are created and closed during the periods.
12. Similar to Mollick, Duran, and Silva-Ochoa (2006), we have also run additional regressions with regional demand, infrastructure, or the number of existing foreign-owned manufacturing firms as dependent variable, using the other variables as control variables. We then added the residuals of these regressions to the original econometric model with regional FDI as dependent variable. If the residuals carry significant coefficients in these regressions, there is likely to be a problem of endogeneity (see Hausman 1978). The residuals from the three alternative regressions with regional demand, telephone density, or the number of existing foreign-owned firms do not carry significant coefficients in the second stage regressions, suggesting that the problem of endogeneity may be limited.
13. An explanation for this may be that foreign-owned export-oriented firms prefer to use services provided by mother companies located outside of Mexico.
14. Choosing and planning a location for new FDI is a time-consuming process. This means that the location of several of the new maquiladora firms in the period 1989–1993 will have been selected in the previous period, when the locational restrictions were still in place.
15. An important feature of the findings for the research sample omitting Mexico City is that the negative effect of the regional presence of an agglomeration of services is maintained. The estimated negative effect of this variable in the full regional sample could have been caused by the large presence of services in Mexico City. Maquiladora firms may avoid this region, causing the negative coefficient of the services density variable. The fact that this variable also has a significant negative coefficient in research samples without Mexico City indicates that this is not the case.
16. We also estimated regression models for the different groups of states omitting the period 1989–1993. The findings from these regressions are similar to those presented in columns 5–7 in Table 4. Furthermore, we ran estimations for all states and groups of states, regressing the regional number of maquiladora employees on one-period lagged control variables Again, this produced findings in line with columns 3 and 5–7 in Table 4.

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