AN ANALYSIS OF DISABLED PEOPLE AND THE LABOR MARKET IN MEXICO

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ABSTRACT: The aim of this work is to analyze the situation of disabled people in the labor market in Mexico, taking into account socioeconomic variables and the spatial dimension. The results of our analysis provide guidelines for actions geared at improving the inclusion of disabled people in the labor market, and, as a consequence, in society. We apply cluster analysis to thirty-two Mexican federal states using data of the XII Censo de Población y Vivienda 2000; this allows us to identify spatial correlation processes and therefore spatial clusters. A dual structure emerges in the distribution of disabled people in the Mexican labor market, showing that effective economic policies to encourage the inclusion of disabled people into the labor market must take into account the socioeconomic diversity of different geographical areas.

The issue of disability has grown strongly during the first years of the twenty-first century; it has gained importance among professionals, intellectuals, and society in general. The problems of people with disabilities have been exposed unreservedly in the Mexican Congress, as well as in educational, health, and economic forums. The first article of the Mexican Constitution says that it is the responsibility of the state to maintain equality among Mexicans such that discrimination of any kind, in particular against citizens with disabilities, should not exist. The Ley General de las Personas con Discapacidad (General Law for Persons with Disability) guarantees full inclusion of these citizens in a framework of equality in all situations of life, and in particular in the right to work, as established in article 9 of chapter 2, under the responsibility of the federal, state, and municipal levels of government.

The aim of our work is to analyze the situation of disabled people in the labor market in Mexico with a view to providing guidelines for improving their inclusion in the labor market and in society. Analyzing the data of the Censo General de Población y Vivienda 2000 for the thirty-two Mexican federal states, the latest available at the time of writing, we investigate territorial aspects of the labor market for disabled people. We provide first a general, aggregate description and second a statistical analysis of the labor market situation of disabled people. Starting from the analysis of the correlation coefficient, we move on to cluster analysis

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and verify the presence of spatial correlation processes that enable us to identify spatial clusters. We refer to these techniques of spatial statistics: Moran's Index and Local Indicators of Spatial Association (LISA) cluster map (Anselin 1988). The results of our investigation show a dual structure in the distribution of disabled people in the Mexican labor market, suggesting that effective policies for the inclusion of disabled people into the labor market must be differentiated in order to take into account the socioeconomic characteristics of different federal states.

DISABLED PEOPLE AND THE LABOR MARKET IN MEXICO

In this section we summarize information on the general working situation of people with disabilities in Mexico contained in the General Census of Population and Household 2000 (Censo General de Población y Vivienda 2000), the latest available at the time of writing.[1] The census questionnaire has some very specific questions on disability in its section on the characteristics of people. Section 6, "Do you have limitations?" allows us to identify people with disabilities, in the sense of people characterized by some physical or mental limitations; it contains a set of subquestions on what limitation the interviewed person suffers from, for example, walking, impediments on the upper limbs, deafness, speech impairment, blindness, mental deficiency, or other physical or mental deficiencies; the final subquestion asks for confirmation that there are no physical or mental limitations. Section 7, "How have you been affected by this limitation?" investigates the causes of the limitations, with a set of subquestions asking whether the limitation derives from birth, from an illness, from an accident, from old age, or from other causes. We concentrate on subquestion 6, and we identify as people with disabilities those who suffer from some form of physical or mental limitation.[2] From the replies to subsequent questions it is possible to identify the situation of disabled people with respect to work. In this respect it is necessary to recall that in Mexico persons with aptitude for work are those aged at least twelve.

The data from the 2000 census provide a detailed description of the situation of disabled people, with respect to participation, employment, wage, hours worked, and level of education as summarized in table 1. Unfortunately, the available data do not allow an analysis in terms of the gender or the age of people with disabilities.

Table 1 shows that out of 1,605,890 disabled persons aged at least twelve, 402,237 were "economically active"; 397,183 of them were occupied and 5,054 did not have any job; 1,188,615 disabled people were registered as "economically inactive" and the remaining 15,038 as "not specified." Disabled people have a much lower rate of participation in the labor market (25 percent) compared with the rest

1. Instituto Nacional de Estadística y Geografía, Censo General de Población y Vivienda 2000, http://www.inegi.org.mx/sistemas/olap/proyectos/bd/consulta.asp?c=10252&p=14048&s=est.

2. With this procedure, we use the concept of self-reported disability. This choice is made widely in the literature, as, for instance, in all the articles on disability that use European Union Statistics on Income and Living Conditions data.

Table 1 Employment of disabled people over twelve years of age

Economically active population		Economically inactive population	Not specified	Total
402,237		1,188,615	15,038	1,605,890
Employed	Not employed			
397,183	5,054			
Participation rate of disabled people (PRDP): 402,237/1,605,890 = 25.05				

Source: Our calculation on the published data from the XII Censo de Población y Vivienda 2000.

Table 2 Distribution of employed disabled people by sector of activity (%)

Service and trade	Industry	Agriculture (including animal breeding, silviculture, fishing, and hunting)	Unspecified
48.5	24.4	23.4	3.7

Source: Our calculation on the published data from the XII Censo de Población y Vivienda 2000.

of the population (49.3 percent).[3] In Mexico 33 percent of citizens with incapacities obtain income by running their own small firm.

The distribution of employed disabled people among sectors of activity is shown in table 2. This national level structure is also replicated in most of the federal states; however, in several states, especially in those with agricultural and cattle-raising vocation, the importance of the sectors changes. Disabled people were mostly occupied in the agricultural sector in Chiapas and Hidalgo; in other federal entities the service sector was identified as the source of employment well above the national average, as in Campeche, Guerrero, Michoacán, Nayarit, San Luis Potosí, and Sinaloa.

In table 3 we analyze the wage distribution of the salary received daily by the 397,183 employed disabled people, comparing it with the wage distribution of nondisabled people. Table 3 shows that the percentage of people receiving no wage at all is higher among disabled people than among nondisabled people, as is the percentage of people receiving a salary equal to or less than the minimum wage (i.e., 21.9 percent for disabled people versus 12.2 percent for nondisabled people). Above the minimum wage the relationship swaps direction, as the percentage of disabled people receiving a wage higher than the minimum is lower than that of nondisabled people, for wages both above and much above the minimum wage.

In table 4 we analyze the distribution of hours worked by not disabled and

3. As usual, the participation rate in the labor market of disabled people (PRDP) is defined as the ratio between the number of economically active disabled people and the total number of disabled people of working age, that is, older than twelve years of age. "Active people" indicates the sum of employed people and people looking for jobs.

Table 3 Distribution of wage received by disabled and nondisabled people (%)

	$W = 0$[a]	$W \leq Wm$	$Wm < W \leq 3Wm$	$W > 3Wm$	W not specified
Disabled people	12.9	21.9	37.4	14.9	6.7
Nondisabled people	8.3	12.2	48.1	26.1	5.4

Source: Our calculation based on the published data from the XII Censo de Población y Vivienda 2000.

Note: W = wage, Wm = minimum wage.

[a]We interpret the situation of working for no wage as that in which workers, perhaps in agriculture, receive board and lodging in exchange for work.

Table 4 Distribution of hours worked by not disabled and disabled people (%)

	Hours				Total number of employed people
	< 32	33–40	41–48	> 48	
Nondisabled people	18.93	19.44	28.21	30.23	33,221,464
Disabled people	27.83	16.02	22.36	28.98	397,183
Unspecified					111,563

Source: Our calculation based on published data from the XII Censo de Población y Vivienda 2000.

disabled people. The distribution of hours worked shows that relatively more disabled people work less than thirty-two hours a week when compared with not disabled people, and the reverse is true for people working more than thirty-three hours a week. However, only 16.0 percent of employed disabled people declared that they worked between thirty-three and forty hours weekly (i.e., the prescribed weekly official time set by labor legislation in Mexico); 51.4 percent of disabled people worked more than forty hours a week. (An astonishing 12 percent of disabled people claimed to work more than sixty-four hours a week, but this can probably be interpreted in terms of people who receive board and lodging as part of their salary.) This raises the following reflection: why does the law allow them to work more than forty hours weekly? Is this not an attempt against their health? Would it not be better they spent this time in educational and training activities?

INTRODUCTION, STEPS, METHODS OF INVESTIGATION, AND DATA USED

In this section we develop spatial analysis for the purpose of identifying Mexican areas that show similar characteristics in terms of the labor market for disabled persons and socioeconomic variables. The purpose of this exercise is to identify similarities among areas that go well beyond administrative boundaries, areas that are likely to require similar instruments of economic policy geared at improving the employment situation of disabled people. In addition, identifying spatial correlations shows the possibility that contiguous areas influence each other, so that instruments of economic policy applied to one area within a cluster may produce results not only in the given area but also in contiguous areas, because of invisible spatial links between contiguous areas. The analysis is developed in terms of variables strictly related to the labor market, that is, to the participation rate of disabled people (PRDP) and the employment rate of disabled people (ERDP) with various levels of education and wages; and also in terms of three general socioeconomic or environmental variables: the rate of growth of gross national product (GNP), the Human Development Index (HDI), and population density (PD). The analysis is organized in three subsections, according to the following steps and methods of investigation: first we analyze the PRDP by calculating the coefficient of correlation between PRDP and the other variables; next we apply cluster analysis to identify groups of homogeneous federal states; finally, we develop the analysis of spatial correlation, using a tool of spatial statistics to test for local spatial autocorrelations and to identify local clusters where contiguous areas show similar values. Among the various possible tools to be used for this purpose, we use here the Moran Index and the Local Indicators of Spatial Autocorrelation (LISA) cluster map. We use aggregate data at the level of federal states published by the Instituto Nacional de Estadística y Geografía (INEGI), Censo General de Población y Vivienda 2000.

ANALYSIS OF THE PRDP AND FIRST RESULTS

In this part of the investigation, we discuss factors that may explain the distribution of PRDP across Mexican federal states. The intuition behind our analysis is that disabled people decide to participate in the labor market taking into account both the general characteristics of their environment and the personal characteristics of disabled people who are already employed. The first group of variables indicates how favorable the environment appears to be with respect to the employment of disabled people; the second group of variables records the success of the employment of disabled people. As indicators of the environment we propose measurements connected with the rate of growth of GNP, the HDI,[4] and PD. As indicators of the labor histories of already employed disabled people the macro data illustrated in the first part of this work suggest use of the following variables: the ERDP, the salary that employed disabled people receive, and the level of education of employed disabled people, to capture the effect of professional competence that education indicates. We express these variables in terms of the PRDP (the ratio between active disabled people older than twelve and the total disabled people older than twelve); the percentage of employed disabled people without any education and with primary, secondary, or higher education; and the percentages of employed disabled people who receive no salary, who receive

4. The Human Development Index (HDI) measures the average results obtained in a country with respect to three basic aspects of human development: a long and healthy life, measured in terms of expected life at birth; knowledge, measured by a combination of adults' literacy rate (the UN Development Programme [UNDP 1990] attributes a weight of two-thirds to this variable); the general gross schooling rate, considered at the level of primary, secondary, and tertiary education (the UNDP [1990] attributes a weight of one-third to this variable); and dignified lifestyle, measured by per capita GNP expressed in purchasing power parity dollars.

a salary at least as large as the minimum wage,[5] and who receive a salary larger than the minimum wage. We use as method of investigation the analysis of the correlation coefficient between the PRDP and the other variables.

First we examine the correlation coefficients of PRDP and variables related to the labor histories of already employed disabled people. Table 5 shows the value of the correlation coefficient between PRDP and ERDP with various levels of education. The table shows that this correlation coefficient is never significant. A supply-side interpretation is required to explain these results: disabled people do not have high expectations in terms of jobs, and therefore to decide whether to participate in the labor market, do not use as a benchmark the educational level of already-employed disabled people.

Table 6 shows a positive and statistically significant value of the correlation coefficient between the PRDP and the percentage of employed disabled people who receive a salary at most equal to the minimum wage; however, the value of the correlation coefficient between the PRDP and the percentage of employed disabled people who receive a wage larger than the minimum wage appears to be negative and significant. As before, these results can be explained from the supply side: disabled people have very low expectations in terms of jobs, and therefore to decide whether to participate in the labor market they use as a benchmark the employment situation of disabled people with very low salaries, though not the employment situation of disabled people who receive no salary at all. Finally, table 6 also examines the correlation coefficient between PRDP and variables related to the environment: the sign of the correlation coefficient between the PRDP and PD, the rate of growth of GNP, and the HDI is negative for the three variables but not significant. Variables related to the socioeconomic situation appear to be irrelevant in attracting disabled people to participate to the labor market.

The results of this first analysis provide suggestions for economic policy: the participation of disabled persons in the labor market does not improve with the general well-being of the areas, expressed in terms of environmental factors like HDI and the rate of GNP growth. Active and specific labor market policies targeted directly at disabled people appear to be required in order to improve their participation in the labor market.

CLUSTER ANALYSIS

We carry out our analysis by applying cluster analysis (CA) to federal states in order to identify groups of similar states that show characteristics heterogeneous between one another but similar within each group (compare Nosvelli 2006 and Cerioli and Zani 2007).

Before applying cluster analysis, the usual analysis of principal components is applied to the original variables (see, e.g., Friedman and Meulman 2004) to identify the variables to be used in the cluster analysis. In other words, we apply CA

5. All employment rates are calculated considering the number of employed disabled people with different levels of education and with different level of wages with respect to the total population of disabled people older than age twelve.

Table 5 Relationship between the PRDP and ERDP with different levels of education

	PRDP	ERDP without any education	ERDP with just primary education	ERDP with just secondary education	ERDP with just higher education	ERDP with education above higher
PRDP	1.0000					
ERDP without any education	0.2387	1.0000				
ERDP with just primary education	−0.3447	−0.8596*	1.0000			
ERDP with just secondary education	−0.1992	−0.9384*	0.7828*	1.0000		
ERDP with just higher education	−0.0878	−0.9251*	0.6523*	0.8360*	1.0000	
ERDP with education above higher	−0.1697	−0.8425*	0.5305*	0.7017*	0.8858*	1.0000

*$p < .05$.

Table 6 Relationship among the PRDP and ERDP with various levels of wages and socioeconomic variables

	PRDP	ERDP without salary	ERDP with wage up to minimum wage	ERDP with wage above minimum wage	Density of population	Rate of growth of GNP	HDI
PRDP	1.0000						
ERDP without salary	0.2926	1.0000					
ERDP with wage up to minimum wage	0.4835*	0.7164*	1.0000				
ERDP with wage above minimum wage	−0.4035*	−0.9312*	−0.9157*	1.0000			
Population density	0.0214	−0.2524	−0.0625	0.1644	1.0000		
Rate of GNP growth	−0.1051	−0.2387	−0.3222	0.2986	−0.0813	1.0000	
HDI	−0.0960	−0.8111*	−0.6308*	0.7862*	0.4246*	0.1348	1.0000

*$p < .05$.

to a subset of the original variables, that is, to those variables that have the highest correlation with the first k principal components, given that the remaining ones turn out to be scarcely connected with the basic aspects of our investigation. The choice of the proper number of principal components takes place on the basis of three criteria that take into account their explanatory power.[6]

On the basis of the results of the analysis, we choose only two principal components, which we define as follows: a synthetic indicator of the level of education of employed disabled people, and a synthetic indicator of the socioenvironmental variables. The matrix of correlation of the initial variables with the two selected principal components, not shown here for brevity, shows that the only variable left out of the analysis is the rate of GNP growth.[7]

We now proceed to CA. We present the results for the hierarchical method of classification with complete linkage. This method assumes as distance between two groups G_1 and G_2 the maximum distance between pairs of elements each belonging to group G_1 and to group G_2. In this case we have the following:

$$d(G_1, G_2) = \max d(x_i, x_j) \; \forall \; x_i \in G_1 \text{ e } \forall \; x_j \in G_2$$

This method tends to produce compact clusters without any chain effect and it is invariant with respect to monotonic transformations of distance (Cerioli and Zani 2007).[8] This algorithm of aggregation clearly shows the differences among elements: it highlights homogeneity among the elements of a group, rather than the differences between groups.

Figure 1 shows some results of the cluster analysis: two clusters clearly emerge, if one cuts the dendogram at the height 15 of the indicator of dissimilarity (vertical axis) where the only anomalous values refer to the federal states of Oaxaca and Chiapas. The clustergram (Schonlau 2002) as well identifies two clusters (figure 2), and so does the Calinski-Harabasz index that allows us to choose the suitable number of groups in terms of which the analysis should be developed (table 7); in particular, we choose the number of clusters at which the Calinski-Harabasz pseudo-F assumes the highest value; in our case the highest value of the test (27.34) is obtained in correspondence to a number of clusters equal to 2.

The values in table 8 are standardized; therefore, when positive or negative they indicate values respectively above or below the average. The values in table 8,

6. First we consider a number of principal components which take into account at least 95 percent of the variance of each of the k initial variables, which imposes a minimum threshold; second, we keep all the principal components whose eigenvalue is greater than 1; third, we observe the screen plot of the eigenvalues as a function of the number of principal components; as eigenvalues are obtained in decreasing order, the graph will show a decreasing curve, with a kink in correspondence to the proper number of principal components.

7. Standardized deviations are taken into account, given that HDI and population density are expressed in a unit of measure different from the other variables.

8. We developed several other methods of cluster analysis, i.e. the one with the hierarchical method of classification (in particular, the method of single linkage, and the method of complete linkage); and the one with the not-hierarchical method of classification (method of the k averages). The method of single linkage confirms the robustness of our results; the method of k averages does not provide additional findings to the investigation, but mainly confirms the results already obtained. For brevity those results are not reported here.

Table 7 Calinski-Harabasz pseudo-F: Method of complete linkage

Number of clusters	Calinski-Harabasz pseudo-*F*
2	27.34
3	24.48
4	21
5	20.78
6	19.93

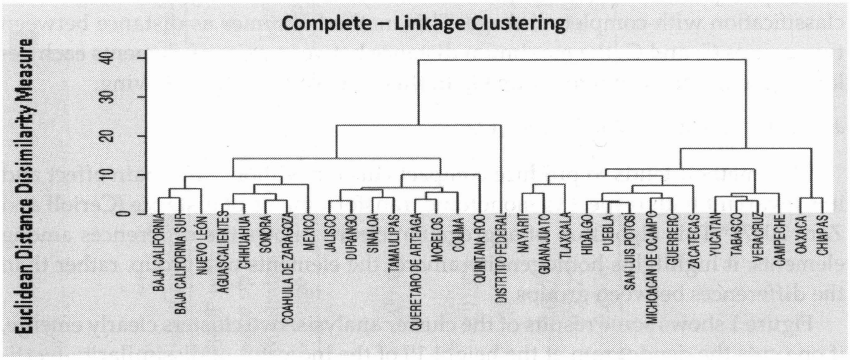

Figure 1 Dendogram: Method of complete linkage

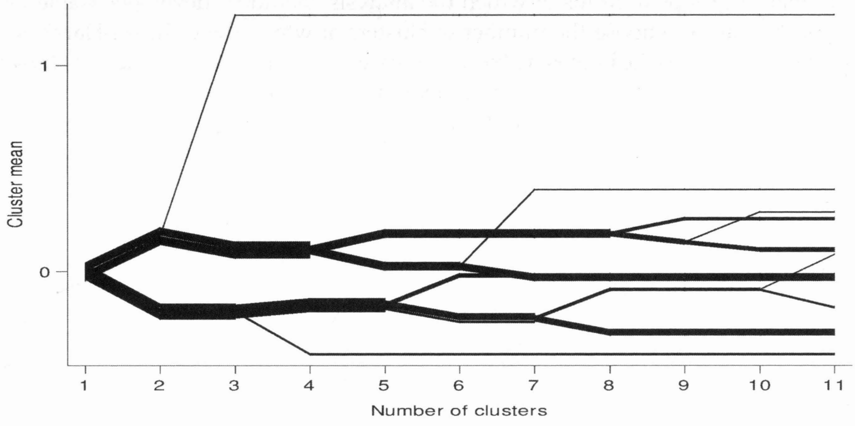

Figure 2 Clustergram: Method of complete linkage

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Table 8 Average values of the indicator in each cluster: Method of complete linkage

Cluster	1	2
PRDP	−1.69E−01	0.190971
ERDP without any education	−7.31E−01	0.828852
ERDP with just primary education	0.6305689	−0.7146447
ERDP with just secondary education	0.689632	−0.78158
ERDP with just higher education	0.695997	−0.7888
ERDP with education above higher	0.582779	−0.66048
ERDP without salary	−0.75246	0.852791
ERDP with wage up to minimum wage	−0.71426	0.809491
ERDP with wage above minimum wage	0.794897	−0.90088
Population density	0.165428	−0.18748
HDI	0.697799	−0.79084

which are the numerical result of cluster analysis, suggest that federal states in which environmental conditions are above average (i.e., HDI and PD) show also above-average employment conditions of disabled people, in terms of both level of salary received and professional qualifications. In the first cluster, characterized by high HDI and high PD, the level of education of employed disabled people is above average, as is their level of wage, whereas the percentage of disabled people with no salary, or with a salary at most equal to the minimum wage, is below average. Instead, the second cluster identifies federal states with below-average environmental variables and employed disabled people with very low qualifications: high levels of employed disabled people without any education, which is below the average percentage of disabled people with any other educational level but above the average work for no salary, or for a salary below the minimum wage, and below the average for other levels of wage. These findings suggest that general well-being goes together with general above-average conditions of employment of disabled people. General policies geared at improving the general well-being of a geographical area therefore appear suitable for improving the employment situation of disabled people.

A second finding of the analysis concerns the PRDP. With respect to the participation rate of disabled people, the first cluster characterized by high general well-being shows a below-average PRDP, whereas the second cluster shows an above-average PRDP. The cluster analysis seems to confirm the previous findings of the correlation analysis, showing that PRDP does not appear to respond to the variables considered, so that participation is affected only by active and specific policies toward disabled people.

ANALYSIS OF SPATIAL CORRELATION FOR THE MEXICAN LABOR MARKET OF DISABLED PEOPLE

Our previous results have shown two rather remarkable clusters in terms of variables connected with the local labor markets of disabled people. We now investigate whether there are processes of spatial correlation; spatial interdependence appears in terms of spatial concentration of similar or different values (positive or negative interdependence, respectively). A proper indicator of spatial interdependence is necessary for measuring its intensity and allowing for comparisons across countries or over time. Among the many indicators developed by the literature, we choose the Moran Index, the most traditional of the indicators of spatial correlation, which has the following definition:[9]

$$I = \frac{\sum_i \sum_j W_{ij}(X_i - \mu)(X_j - \mu)}{\sum_j (X_i - \mu)^2}$$

X_i and X_j indicate the variable describing the phenomenon under investigation respectively observed in region *i* and in region *j*, μ is the average value in the sample, and W_{ij} is the standardized matrix of spatial contiguity, which specifies the criteria for defining contiguity (for a discussion of this matrix, see appendix A). This index allows us to establish the relationship existing between a phenomenon observed in a given federal state *j* and the same phenomenon observed in contiguous federal states. In our analysis we included all the variables used so far, except for the rate of GNP growth, consistent with the results of the analysis of principal components.

Table 9 shows the results of the analysis: the I Moran Index is constantly significant, and a process of positive spatial correlation emerges for all the variables considered (see Anselin 1988; for a discussion of the matrix of contiguity, see appendix A). Table 9 shows that the signs of the Moran Index are the same whether calculated with the queen or the rook matrix of contiguity (see appendix A), as are, almost always, the values of the I index; these results for both matrixes confirm the robustness of our estimates. The signs of the I Moran Index are all positive, which indicates positive spatial correlation for all the variables considered in the analysis. As an example, we illustrate the implications of these results for PRDP: a high level of PRDP observed in a particular federal state is associated with high levels of PRDP in contiguous federal states. This interpretation is valid for all the variables considered, as they all show positive spatial correlation. However, the intensity of the spatial correlation varies among variables: PRDP shows the strongest spatial correlation, with a value of the I Moran Index greater than 0.60, whereas PD shows the weakest correlation (almost none), with a value of 0.08.

These results have implications for economic policy, as positive spatial correlation suggests that policy applied in one federal state has effects on contiguous federal states as well.

We now apply the Local Indicators of Spatial Autocorrelation (LISA), a tool of spatial statistics allowing us to test for local spatial autocorrelation and to identify

9. The I Moran Index is similar to the correlation coefficient: it varies between 0 and 1, −1 and +1. When I equals 0, there is no spatial auto correlation; when I is close to −1 or to +1, there is high spatial correlation, negative or positive, respectively. The Moran Index has the following main characteristics when compared to the coefficient of correlation: (1) it takes one variable, not two, into account; (2) it incorporates the weights (w_{ij}) that refer to the relative areas; (3) we can think of it as expressing the correlation between a variable referring to neighboring regions (O'Sullivan and Unwin 2003).

Table 9 Moran I Index with matrix of contiguity of rook and queen types

Variable	I_Moran (queen matrix)	I_Moran (rook matrix)
PRDP	0.63***	0.6156***
ERDP without any education	0.3731***	0.4029***
ERDP with just primary education	0.3872***	0.4108***
ERDP with just secondary education	0.2834**	0.3151**
ERDP with just higher education	0.3981***	0.4222***
ERDP with education above higher	0.2086**	0.2316**
ERDP without salary	0.4159***	0.4499***
ERDP with wage up to minimum wage	0.5763***	0.5896***
ERDP with wage above minimum wage	0.5507***	0.5804***
Population density	0.0765**	0.0765**
HDI	0.3415***	0.3668**

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

local clusters where contiguous areas show similar values. LISA provides information about the position of the spatial clusters and about the types of spatial correlation. The LISA statistic is described by the following expression, where the symbols have the same meaning as in the I Moran Index:

$$LISA = \frac{(X_i - \mu)}{\sum_j (X_i - \mu)} \sum_j W_{ij}(X_j - \mu)$$

As before, we identify clusters with respect to the variables used throughout the analysis (i.e., a first group of variables related to the labor market situation of disabled people, such as PRDP, ERDP receiving various levels of wage, and with various educational levels), and with respect to environmental variables (e.g., HDI, PD). We find two clusters for the PRDP (see figure 3): a cluster in southern Mexico (Tabasco, Chiapas, Campeche, Yucatán, Quintana Roo) with high participations rate of disabled people, and one in northern Mexico (Chihuahua, Coahuila, Nuevo León, Durango, Zacatecas, Aguascalientes, San Luis Potosí) with a low PRDP. Similar clusters appear with respect to wages: there is a cluster of federal states in northern Mexico (Baja California, Baja California Sur, Sonora, and Chihuahua) characterized by a large number of employed disabled people obtaining high salaries, and a cluster in southern Mexico (Puebla, Veracruz, Oaxaca, Tabasco, and Chiapas) characterized by a large number of employed disabled people who at most receive the minimum wage. Variables connected with education show only one cluster of disabled people who are employed but have no education, mainly concentrated in southern Mexico (Veracruz, Oaxaca, Tabasco, and Chiapas). The HDI shows a cluster of poorer federal states in southern Mexico (Guerrero, Veracruz, Oaxaca, and Chiapas), and the variable linked to population density shows a cluster of less populated federal states in northern Mexico (Chihuahua, Coahuila, Sinaloa, Durango, and Nuevo León) .

The results of our spatial analysis of the labor market of disabled people confirms the results of our cluster analysis and identifies two well-defined areas: a

Figure 3 LISA cluster map. In the LISA cluster maps, black shows a high-high spatial correlation; dark gray, a low-low spatial correlation; gray, a low-high correlation; and light gray, a high-low correlation. Areas with a high-high and low-low correlation suggest spatial clusters, whereas areas of high-low and low-high indicate spatial outliers (see appendix B).

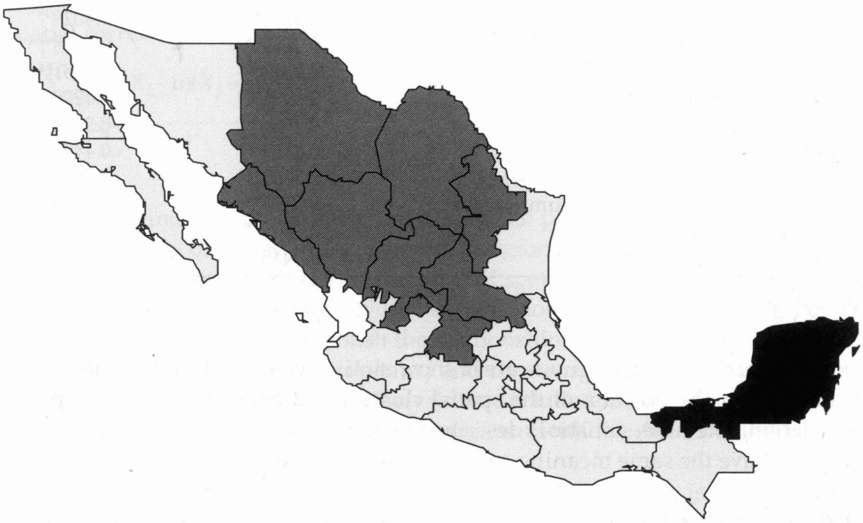

Figure 3.1 Participation rate of disabled people

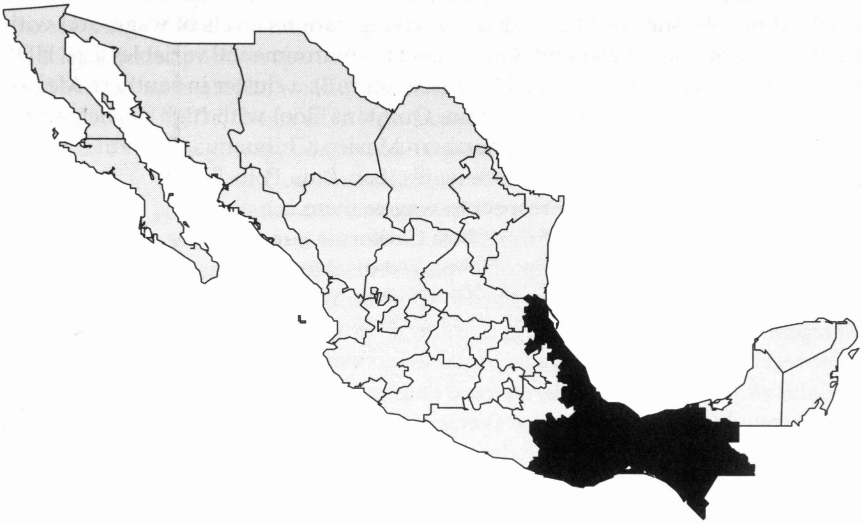

Figure 3.2 ERDP without any education

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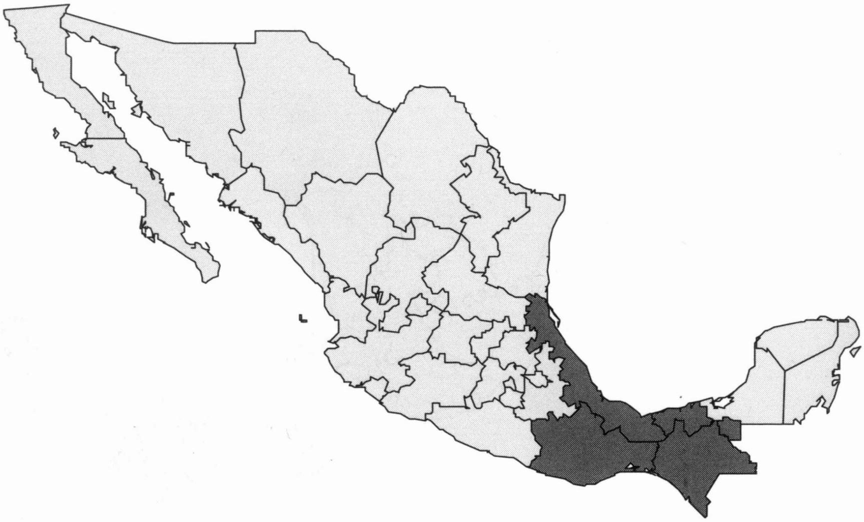

Figure 3.3 ERDP with just primary education

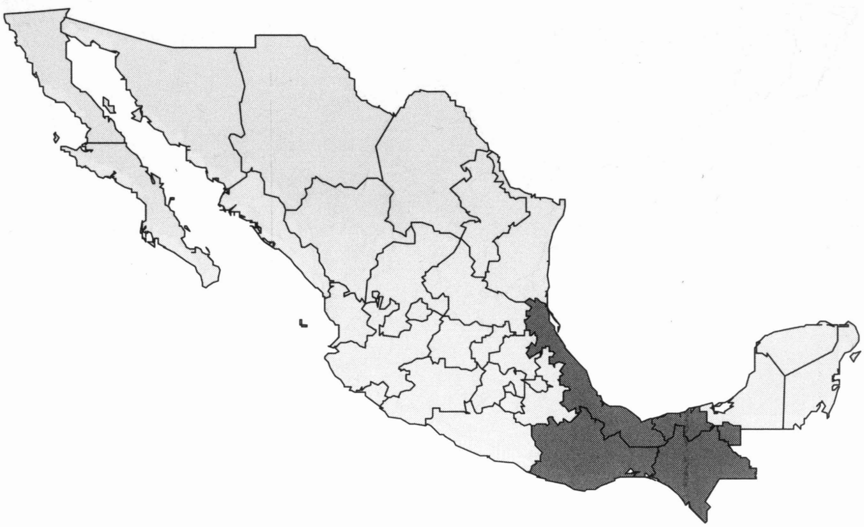

Figure 3.4 ERDP with just secondary education

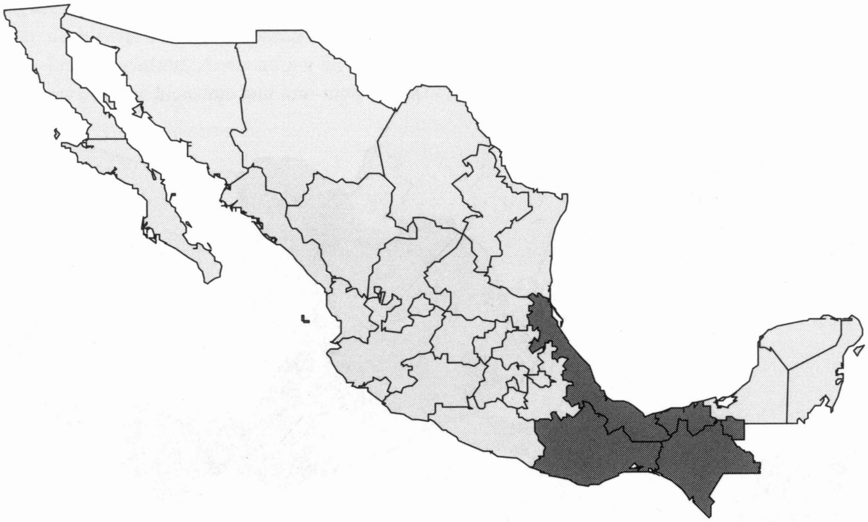

Figure 3.5 ERDP with just higher education

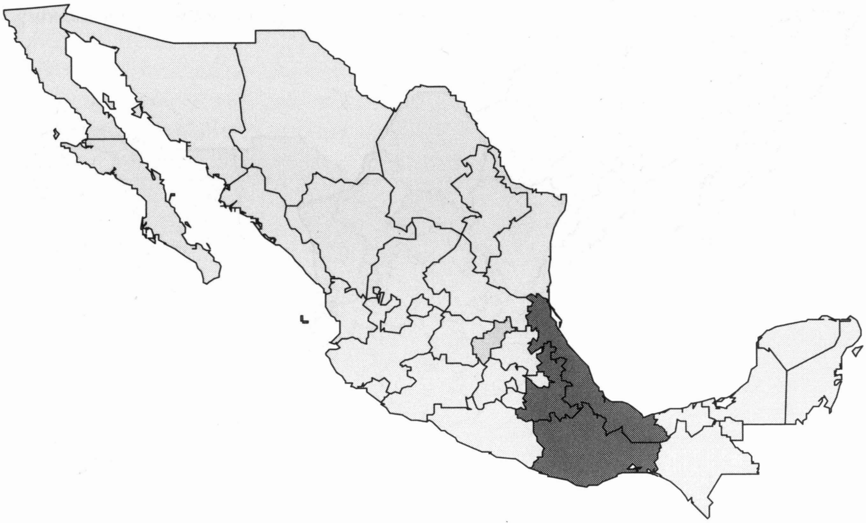

Figure 3.6 ERDP with education above higher

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Figure 3.7 ERDP without salary

Figure 3.8 ERDP with wage up to minimum wage

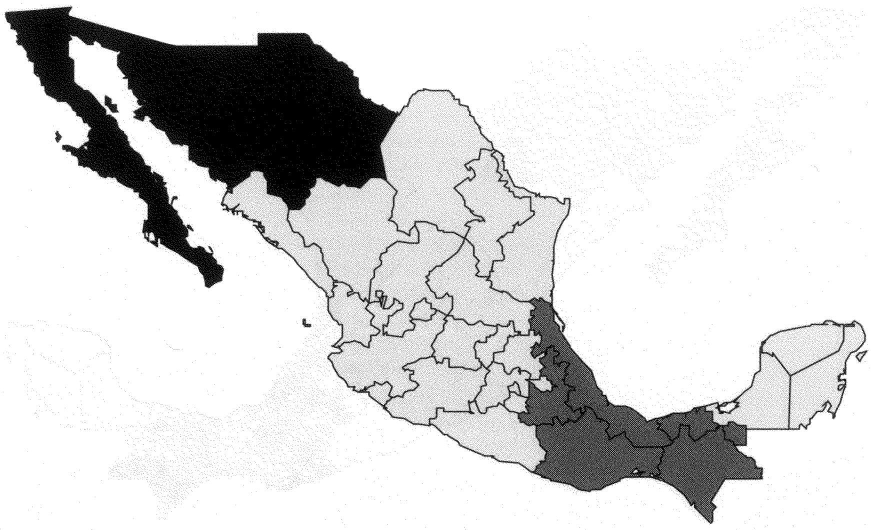

Figure 3.9 ERDP with wage above minimum wage

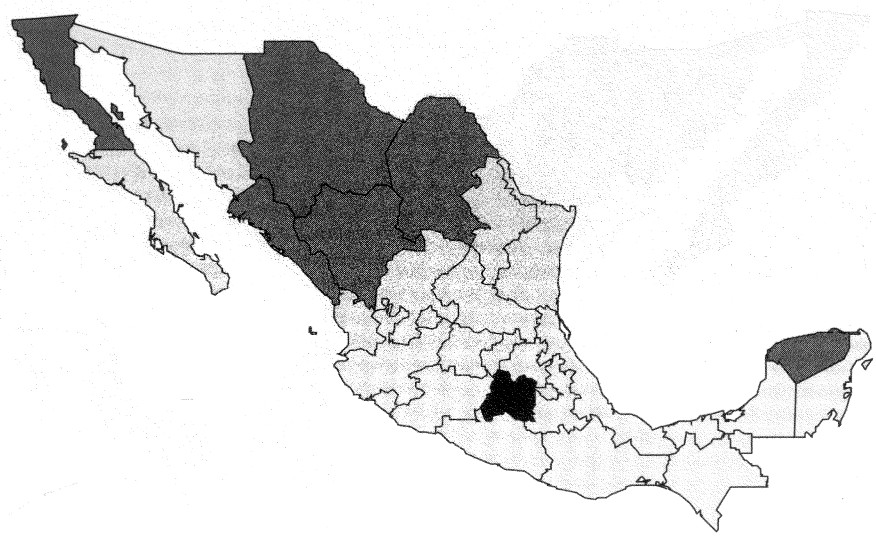

Figure 3.10 Density of the population

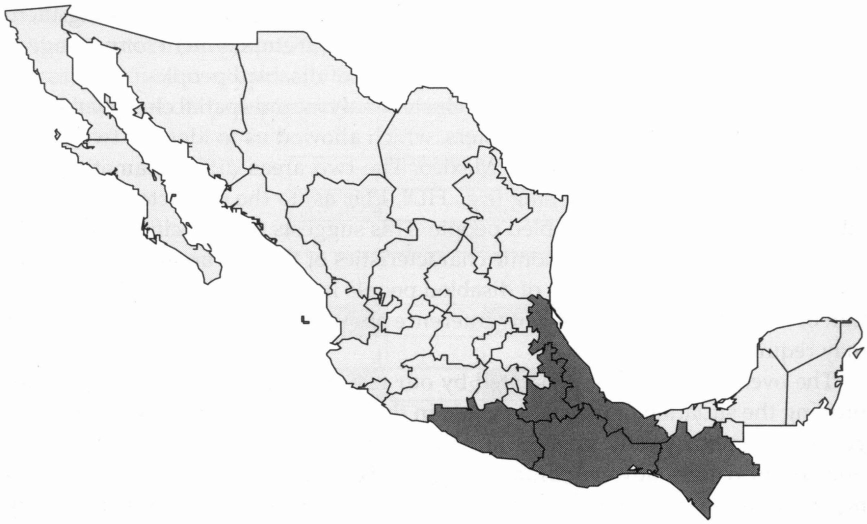

Figure 3.11 HDI

center (northern Mexico) and a periphery of the country (southern Mexico) (Krugman 1991, 1999).

CONCLUSIONS

The correlation analysis shows two important things. First, environmental variables play no role in the decision of disabled people to actively take part in the labor market, as variables like the growth rate of GNP and the HDI are not significantly correlated to PRDP. We have the first implication of economic policy: the participation of disabled persons in the labor market does not improve even if the general well-being of the areas is comparatively high in terms of environmental factors like HDI and GNP growth. Active labor market policies, directly geared at disabled people, are required to improve their situation in the labor market. Second, we have shown that there is no statistically significant correlation between the PRDP and the rate of employment of already-employed disabled people with various levels of education; also, we note that the PRDP is significantly and positively correlated to the rate of employment of disabled people who receive a very low salary, but not to that of employed disabled people who work for no salary. This suggests that the expectations of Mexican disabled people in terms of work and payment, are, probably realistically, extremely low, but that employment without payment does not persuade them to take part in the labor market. These findings provide suggestions in terms of policies: it appears that raising the level of education of disabled people would not trigger an indirect effect of making them to want to take part in the labor market, and therefore would not contribute to the improvement of their general well-being in terms of financial autonomy.

However, protecting the employment of disabled people by guaranteeing them at least some wage—in other words, doing away with employment for no wage—would encourage the labor market participation of disabled people.

With the tools of analysis of classic cluster analysis and spatial cluster analysis, we have found evidence of two clusters, which allowed us to identify two different areas: northern and southern Mexico. The two areas differ dramatically in terms of their general well-being (e.g., HDI, PD), as do the characteristics of the labor market situation of disabled people. This suggests that specific policies taking into account the socioeconomic characteristics of the two areas are needed in order to improve the situation of disabled people in the labor market. The limitation of the data does not allow any inference about the speed that the adjustment may require.

The overall impression generated by our results is that there is scope for improving the situation of disabled people in the labor market in Mexico, both with general and with specific policies, and that research has much to say in this direction, as our results, however limited, suggest. The wealth of data on the socioeconomic situation of disabled people available in the 2000 Mexican census clearly show great interest in these problems, and further research is possible. Two directions for further research emerge from our investigation: our results and policy recommendations are based on the census data for the year 2000, the most recent data available at the time of our writing, and data that are aggregated at the state level; a follow-up investigation is therefore essential, to compare our results with the recently published census data for the year 2010. Also, this analysis should be developed at a more local level, should suitable data become available.

APPENDIX A: THE CONTIGUITY MATRIX

Central to spatial statistics and econometrics is the problem of formally expressing the structure of geographic dependence. This problem has been solved by introducing a matrix W, of spatial weights or spatial lags. This is the most general shape of the matrix:

$$W = \begin{bmatrix} 0 & w_{12} & \dots & w_{1N} \\ w_{21} & 0 & \dots & w_{2N} \\ \dots & \dots & \dots & \dots \\ w_{N1} & w_{N2} & \dots & 0 \end{bmatrix}$$

The matrix is square and not stochastic; the elements w_{ij} express the intensity of the connection between each pair of regions *i,j*. There can be various measures of this intensity, which must be not negative and finite. Various indicators are used to construct the matrix of weights, as various types of distances, such as cultural, linguistic, and administrative, can be considered in addition to the classic matrix of contiguity.

Each of these indicators has pros and cons; therefore, there is not a single, universally accepted rule. The choice depends on the objective of the investigation, so that the weights are always exogenous with respect to the subject of investigation.

We show some examples (figure A1) of contiguity matrixes well established in the literature (Anselin 1988). The names rook, bishop, and queen refer to chess pieces, and the three types of matrix are built according to the rules governing the possible moves of these pieces on the chess board:

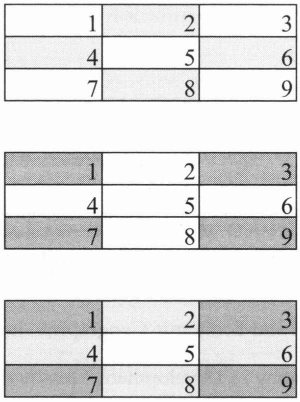

Figure A1 Rook contiguity, bishop contiguity, queen contiguity

If we consider the central element, here identified with number 5, it is possible to identify three different matrixes of spatial contiguity. In the rook contiguity matrix we only consider elements which border with the central element, i.e., elements 2, 4, 6, and 8; the bishop contiguity matrix is characterized by elements which share corners with the central element, i.e., elements 1, 3, 7, and 9; in the queen contiguity matrix the central element shares with the other elements both borders and corners, and therefore in our example all the elements are considered.

In the analysis in the text we have used a rook and a queen contiguity matrix.

APPENDIX B: SPATIAL AUTOCORRELATION, FURTHER CONSIDERATIONS

The Moran scatterplot is drawn in a Cartesian graph where the normalized variable x is on the horizontal axis, and the normalized spatial lag of this variable (W_x) is on the vertical axis.

If the dots are scattered across the quadrants, there is no correlation. If there is a clear relationship, the Moran scatterplot can be used to identify various types of spatial correlation.

If most of the dots are in the northeast and southwest quadrants, the correlation is positive, with the following specification: dots in the northeast quadrant identify a high-high relationship, as they mark high values both of x (region i) and of W_x (regions contiguous to i); dots in the southwest quadrant identify a low-low relationship, as the values of both variables are low.

If the concentration of the dots is high in the other two quadrants, the correlation is negative. In particular, dots in the northwest quadrant are associated with low values of x and high values of W_x (low-high relationship), and vice versa in the southeast quadrant (high-low relationship).

The results of the Moran scatterplot can be shown in the LISA cluster map so that geographic areas with different types of correlation can be identified (high-high, low-low, high-low, low-high). In this way it is possible to verify whether regions sharing a specific type of correlation are contiguous and form a cluster.

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