Measuring the Spatial Clustering and Diffusion of Multiparty Competition in Urban Mexico (1994-2000)

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ABSTRACT

The objectives are (1) to measure the level of spatial clustering and (2) the test of the contagious diffusion hypothesis of political behavior in a sample of Mexican cities. The problem of spatially autocorrelated data in OLS methods is discussed. It is found that the PRI vote has become concentrated, whereas the vote for the PAN and PRD has spread under the period of study. Nevertheless, this spread of support for the latter two parties did not follow a contagious diffusion process; rather, statistical results demonstrate an increase in their support independent of promixity to strongholds.

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Introduction

The spatial variation of voting behavior in Mexico has repeatedly revealed two spatial patterns: urban/rural differences and regional electoral cleavages (Ames, 1970; Buendia, 2000; Butler, Pick and Jones, 1991; Klesner 1987, 1993, 1998; Molinar & Weldon, 1990; Reyna, 1971; Ramos, 1985; Story, 1987; Walton & Sween, 1971) Traditionally, the PRI (*Partido Revolucionario Institucional*) old regime has received support from rural voters, whereas the non-PRI parties (*Partido Accion Nacional* , PAN, and *Partido de la Revolucion Democratica*, PRD) have received support from urban voters and remained spatially clustered in some regions.

Dietz and Shidlo (1998) are correct when they state that Latin-Americanists have made few analyses of urban voters. The Mexican literature on the urban electorate has focused mostly in specific cities, usually Mexico City. However, the urban electorate has rarely been studied across a sample of cities; only one nationwide analysis of urban electoral behavior in Mexico is available (Pacheco, 1997). Nevertheless, the urban electorate is fundamental to explain the rise of multiparty competition in Mexico.

The urban electorate is not an homogeneous bloc. Electoral results show considerable variation within the Mexican system of cities. Some parties win in some cities, whereas other parties perform better in others. For example, in the 1997 elections, the *Partido Accion Nacional* (PAN) received 60% of the vote in Tepatitlan, Jalisco, but only 2% in Cardenas, Tabasco. The *Partido de la Revolucion Democratica*

(PRD) received 62% of the vote in Cardenas, Tabasco, but only 4% in Puerto Vallarta, Jalisco. In contrast, the PRI had its highest level of support with 58% of the vote in Saltillo, Coahuila and its lowest level with 23% in Cajeme, Sonora -- a more uniform level of support across urban areas.

Also, between the 1994 and the 2000 federal representative elections, non-PRI parties such as the *Partido Accion Nacional* (PAN) and *Partido de la Revolucion Democratica* (PRD) received an enormous increase in support from urban voters. In 1994, the PRI won the majority in 81 of the 89 largest cities. In 2000, it won the majority in only 19 cities. The rest of the cities were distributed between the PAN and the PRD (see Table 1). In this period, voting behavior in Mexican major cities displayed the typical pattern of spatial clustering but also a geographic process of party replacement.

Table 1. Cities Where a Political Party Obtained the Majority of the Vote in the 1994, 1997 and 2000 Federal Representative Elections.*

Party	1994	1997	2000a
PAN	5	28	59
PRI	81	41	19
PRD	3	20	11
Total	89	89	89

a. PAN became Alianza por el Cambio; Coalition of Partido Accion Nacional (PAN) and Partido Verde Ecologista de Mexico (PVEM). PRD became Alianza por Mexico: Coalition of Partido de la Revolucion Democratica (PRD), Partido del Trabajo (PT), Convergencia, Partido de la Sociedad Nacionalista (PSN), and Partido Accion Social (PAS). The three latter parties were created just befote the 2000 elections.
* Cities with 100,000 inhabitants or more in 1995 (n = 89).
Source: IFE 2001; author's calculations

These patterns suggest two things. One, the urban context where elections took place was a significant factor in determining electoral preferences. Two, the diffusion or spread of political parties into new cities/places was not an arbitrary spatial process.

Several scholars have debated about the reasons for these patterns. Some argue that the local context of the voter does not matter (McAllister, 1987; McAllister & Studlar, 1992). Rather, they propose that the spatial variation in voting behavior is caused by the aggregate effect of socioeconomic characteristics that happen to covary with location. This proposition is often called the *components-effect* explanation. This proposition suggests that the electorate can be analyzed as one national group whose behavior is not place specific.

Other scholars argue the opposite, that local context matters (Agnew, 1987; Burbank, 1995; Cox, 1969, 1987; Flint, 1995; Johnston, Shelley & Taylor, 1990; Johnston, 1991; O'Louhglin & Anselin, 1991). Specifically, they say that voting behavior varies across places independently of the compositional characteristics of the population in the location where the voters live. This proposition has two implications. One, social phenomena occurring in the local context such as the local economic conditions and the local political issues, have an effect on the voter (Cox, 1987). Two, the electorate should not be studied as a homogeneous group across the nation (Flint, 1995). Its analysis requires a place-specific approach.

In addition to the local-contextual-effect debate, evidence of party replacement processes also suggests that information on electoral choices undergoes a diffusion

process (Flint, 1995). Previous studies have found that political parties spread contagiously; in other words, they depend on physical proximity (Flint, 1995; Lutz, 1995). The considerable increase in support for non-PRI parties in urban areas between 1994 and 2000, suggests the operation of a spatial diffusion process of political information.

Even though new parties seemed to have successfully sent their messages to many cities, it is not known if their support spread in a contagious pattern. Our knowledge of the causes for the spatial clustering in voting behavior and the geographical replacement of old political parties by new ones is limited and invites several questions: Does the local urban context matter? Or does the aggregate socioeconomic composition of cities explain this spatial clustering? How do new political parties diffuse across space? Certainly, the PAN and PRD spread to new cities and supplant the PRI. But did this spread follow a contagious diffusion process? Or was it rather a national trend where place and distance was irrelevant? This "spatial" approach, through the testing of geographical theories, can help to explain why the PRI has lost power in favor to the PAN and the PRD.

This paper focuses on urban electoral behavior also since rural areas have remained generally unchanged in favor for the PRI; it has been in urban areas where electoral changes and party replacement have mostly happened.

The Mexican electoral context of the late nineties

It is important to interpret election results in the cultural and historical context of the country and region where they take place (Agnew, 1990; Basañez, 1995). For that reason, some feasible explanations for these geographical processes can be found by attending to (1) the national context of the elections, (2) the regional electoral loyalties, and (3) the role of the mass media in spreading information on rising political parties.

In this sense, the 1997 and especially the 2000 Federal elections made history in Mexico for the magnitude of the PRI electoral breakdown. Never had the PRI suffered such electoral losses, ones that, by the way, are said to have brought evidence of Mexico's transition to democracy (Rodriguez, 1998). Academics have offered two contextual explanations for the results of this election:

1. The product of a new civic culture and credible elections in Mexico (Bailey & Valenzuela, 1997; Rodriguez, 1998).
2. The effect of economic crisis and structural government corruption (Blum, 1997).

Rodriguez (1998) claims that the rise of non-PRI parties in urban local elections is due to the development of a new civic culture. Specifically, she says that electoral reforms have created a new civic culture that demands government accountability and electoral processes transparency. In this regard, Schedler (2000) mentions that until the early 1990s the PRI political regime was notorious for electoral

fraud, but that things are different today as a consequence of electoral reforms. Pastor (2000) presents the results of a survey of voters conducted before the 1988 elections, where 87% of the respondents did not believe that the PRI regime would respect the final results. But Bailey and Valenzuela (1997) believe that having credible results allow voters to consider other political alternatives than the PRI, so that party realignments can occur.

Blum (1997) interprets the PRI's electoral losses in 1997 as the combined effect of the 1995 economic crisis and structural corruption. He argues that the 1997 electoral realignment was just the starting stage of a larger political process: "… we may be witnessing the birth of a competitive multiparty political system" (p. 28). His main argument is that in Mexico key political changes have occurred only when "…(1) a period of economic growth and rising social expectations has been interrupted by a severe economic crisis affecting the population's personal welfare; (2) an impression of the weakness, corruption, and incompetence of what appears to be a hopelessly doomed government grips the general public and the intelligentsia; and (3) the ruling elite becomes irreparably divided over its perceptions of basic interests or issues" (Blum, 1997, pp. 28-29). Lawson (1997) agrees with the previous explanations. He says "political reform, civic mobilization, and public disgust over corruption and economic mismanagement all contributed to the PRI's defeat" (p. 13).

These political and economic conditions reflect the context of the 1997 and 2000 elections. In 1995 Mexico experienced its worst economic crisis of the 20th

century. The GDP decreased by 7% and manufacturing industry by 8%; and the negative economic effects were felt mostly by the poor (Fuchs, 2001). The PRI regime was perceived as incapable of maintaining order in the political process and promoting economic growth (Blum, 1997).

Regarding regional loyalties, it is important to consider that both the North and *Bajio* regions have historically been a strongholds for the PAN. There are records of intense electoral opposition to the PRI in the *Bajio* since the 1940s and victories for the PAN in some cities since the 1960s (Rionda, 2000). Actually, since 1989 and 1991 respectively, the PAN has been the governing party in the state of Baja California and Guanajuato. The current Mexican President Vicente Fox was governor of *Guanajuato* state before winning the presidential election in 2000.

These historical patterns confirm the existence of regional loyalties to the PAN. Brustein (1988) comments that "where a party best reflects the local interests there is where it will receive the strongest support" (p. 71). In this sense, the context of the North and *Bajio* regions can be defined as traditional by Mexican standards. The *Bajio* is particularly an area historically identified with strong Catholic values and political conservatism. For example, the *Cristeros* (soldiers of Christ) rebellion of 1927 in the *Bajio* was a consequence of regional opposition to the Mexican federal government's anti-Catholic church position at that time. Religious conservatism is still strong and influences the local political agenda. One example is offered by Shirk (2000) who comments that in Guanajuato (in the heart of the *Bajio* region), laws have

been proposed by the PAN majority in the local congress to ban abortion even in cases of rape. This political position would be difficult to sell in Mexico City, which contains a more left-wing (PRD profile) electorate.

In terms of access to electoral information, Schedler (2000) states that the electoral reforms of 1996 "did much to level the electoral playing field, equalizing parties' access to financial resources by combining generous public funding with strict limits on private financing, realistic campaign-spending ceilings, rigorous accounting requirements and close *Instituto Federal Electoral* (IFE) oversight of party finance" (p. 11).

According to the theory of the rational voter, voting decisions require the possession of political information (Iversen, 1994). The theory predicts that voters decide which political party they are going to vote for only after they know what each party is offering. In Mexico, one consequence of federal electoral reforms has been access to greater financial resources by new parties for their campaigns. According to Olson and Freeman (2000), in 1994 political parties spent about 25% of their campaign funds on radio and TV advertisements; in 1997, that figure rose to 56%.

In Mexico, television is a key source of political information for the voter (Olson & Freeman, 2000). Before the 1990s, mass media was considered to favor the PRI over other political parties (Lawson, 1997). According to Lawson, every election before 1997 the PRD had been systematically excluded from broadcast-media channels. For the 1997 elections however, this author considers that the Mexican mass

media had grown more pluralistic. For example, "while the PRI commanded 88% of television time devoted to the 1988 presidential campaign and 51% in 1994, preliminary counts suggest that its 1997 share fell to 23%" (p. 15). Apparently, electoral reforms allowed non-PRI parties to spread their message and "to compete on a roughly equal footing with the PRI" (p. 13). Overall, fairness in access to mass media has been encouraged by increases in public funding for campaign and the privatization of media networks (Lawson, 1997).

But, from our spatial approach, did television make space and distance irrelevant? There is theoretical debate in this regard: Stephens (1995) has argued that the spread of political information is constrained by distance. On the other hand, Harvey (1989) comments that the current proliferation of new technologies of mass communication surpasses space, and Urry (1997) comments that instantaneity in the transmission of information today puts places in a global context.

Theoretical perspectives on the spatial clustering and diffusion of electoral behavior

The spatial variation of voting behavior has been explained from two different theoretical perspectives: Component effects vs. local contextual effects.

In support for the component effects perspective, McAllister and Studlar (1992) have argued for the British case that regional voting is a "functional rather than a territorial division" (p. 175), that is, regional variation in voting behavior is a

consequence of aggregate socioeconomic differences. The local context does not influence voter attitudes in Britain (McAllister, 1987). This is often called the compositional effects perspective (Agnew, 1987). In consequence, this perspective suggests that similar people vote similarly, independently of their location (McAllister, 1987; McAllister & Studlar, 1992). This implies that the electorate can be studied as a national unit, not necessarily regionally (Stokes, 1967).

Its theoretical framework is the nationalization theory, which is based on modernization theory premises (Agnew, 1987). The main proposition is that place or local context, as an explanatory variable is only important in traditional societies, not in modern ones.

One effect of modernization is urbanization, which in Mexico is a major factor for explaining spatial variations in voting behavior (Klesner, 1993, 1998; Molinar & Weldon, 1990). Deutsch and Huntington (cited in Dietz & Shidlo, 1998) have also suggested the importance of urbanization in Latin America for explaining social mobilization processes. They have argued that cities are by their nature more political than rural areas because urban residents are exposed to higher levels of political stimuli such as political parties, social movements, media etc. (Deutsch, 1961; Huntington, 1991).

On the other hand, the local contextual effects argument is that social and political interests in specific places can be different from national trends (Agnew, 1987). These interests may shape patterns of voting behavior independently of the

aggregate socioeconomic characteristics of the population. Specifically, the local context is understood as the interaction between an individual and his or her environment "with the nature of the environment being constructed over time in part by the actors" (Flint, 1998; p. 1293).

The local context perspective rests upon Gidden's structuration theory. This theory mainly states that human *agency* and *structure* affect each other. On one side, *agency* is influenced by "traditions, institutions, moral codes and established ways of doing things" (Giddens & Pierson, 1998, p. 77). On the other, individuals transform *structures* either by ignoring, replacing, or reproducing them differently across time and space.

The local environment has long believed to have an effect on political behavior (Agnew, 1987; Burbank, 1995; Cox, 1969; Flint, 1995; Johnston, Shelley & Taylor, 1990; Johnston, 1991; O'Loughlin & Anselin, 1991). Briefly, it is argued that people in similar socioeconomic circumstances may vote differently depending on where they live. Individuals are constantly exposed to social stimuli, and they make use of the information derived from the local social environment when making political decisions (Burbank, 1995).

Cities as places also exercise a contextual effect on voters. Saurzopf and Swanstrom (1999) analyzed electoral behavior in a sample of U.S. metropolitan areas and concluded that it is critical to study the metropolis as a place that has "political transformative effects" on voters, since different places create different political

attitudes and electoral behaviors (p. 88). Specifically, local contextual effects may occur as of "social networks, sources of information and reference to groups rooted in places" (Sauerzopf & Swanstrom, 1999, p. 87).

The effects of local campaigning in urban Mexico have started to be geographically analyzed. For example, Tejera (2000) studied the 1997 vote in *Iztapalapa*, a working class area of Mexico City, and found that the PRI campaign was directed to those areas and individuals with an established relationship with the party. In terms of the effects of local contextual issues, he found that changes in the vote were related to changes in legislation related to public housing.

With regards to the spatial diffusion perspective, Tobler (1970) stated that "everything is related to everything else, but near things are more related than distant things" (p. 236). Based on this perspective, scholars have argued that collective behavior is capable of spreading across places independently of socioeconomic change (Agnew, 1987). According to Hagerstrand (1966), the spread process of new ideas and behaviours is likely to be contagious, thus producing a kind of spatial effect where social phenomena spread out based on physical contiguity and proximity. Some examples are voting behavior (Flint, 1995; Lutz, 1990), fertility (Tolnay, 1995), and church membership (Land, Deane & Blau, 1991).

Spatial diffusion is neither uniform nor instantaneous (Lowe and Moryadas, 1975). For example, a diffusion process of support for new political parties may not be spatially random, but present higher levels of support near the source (where the party

was supported in the previous election). Lutz (1990) studied nationalist parties in Wales and Scotland in the 1980s and 1990s and found that their support diffused in a contagious fashion: New voting support was statistically related to neighboring areas of previous support. This finding agrees with Stephens' (1981) study of the Swedish electorate, which concluded that the spread of political ideas and realignment is dependent on distance.

Places, not space, possess different aggregate population characteristics that may operate as either barriers or facilitators in the diffusion process. Flint (1995) found that social and economic characteristics of places would facilitate the diffusion of the Nazi party.

These findings support the relevance of the local contextual perspective since they give us evidence of spatial variation in the diffusion of electoral behavior that is independent of the spatial clustering of aggregate socioeconomic characteristics. They also contradict the nationalization thesis in that voters in similar places behaved differently.

Voting Covariates in Mexico

The majority of the ecological studies in Mexico have been mainly grounded in modernization theory although only some make specific mention of it (e.g., Butler, Pick & Jones 1991; Klesner, 1993, 1998; Peschard, 1988; Reyna, 1971). The use of

variables related to urbanization and industrialization makes reference to the view that the modernization process --the transition from a traditional non-democratic society into a multiparty and competitive political system-- is a consequence of the transformation of economic organization. In other words, the modernization of the economy, in a Western direction, brings a change in political practices, including electoral preferences.

In terms of the units of analysis, cross-sectional studies of Mexican states are the most numerous in the literature (Ames, 1970; Reyna, 1971; Ramos, 1985; Klesner, 1987; Story, 1987; Butler, Pick and Jones, 1991), followed by case studies of Mexico City (Davis and Coleman, 1982; Molinar & Valdes, 1987; Peschard, 1997; Tarres, 1988), electoral districts (Molinar & Weldon, 1990; Klesner, 1993), the national electorate as one unit (Buendia, 2000; Dominguez & McCann, 1995) and *municipios* (Klesner, 1998; Walton & Sween, 1971). In most cases, federal elections are analyzed and only a few studies (Miron, 1998; Molinar & Valdes, 1985) have paid attention to local elections.

Only one study has analyzed electoral outcomes across urban areas. Pacheco (1997) compared the results of the 1988, 1991, and 1994 congressional elections in the 200 most populated *municipios* (all of them urban areas*)* in the country and found that the territorial distribution of the vote for the three major national parties (PAN, PRI, and PRD) was not homogeneous.

In terms of the findings, there is general agreement that urbanization and industrialization are useful predictors of voting behavior especially for non-PRI parties. Urbanization has been operationalized mostly based on population size and industrialization as population employed in the manufacturing industry.

Also region makes a significant difference (Dominguez and McCann, 1995; Klesner 1993, 1998; Molinar & Weldon, 1990; Story, 1987). The PAN has been supported in the north and the center of the country, whereas the PRI has been evenly supported throughout the nation but especially in the south. The PRD and other left-wing parties have been favored in the center and southwest in some elections and very often and strongly in the metropolitan area of Mexico City.

Income is the most common variable used as an indicator of social class. It has been detected to be a significant aggregate data predictor of the vote for all the parties in Mexico. Specifically, it has been found that poorer people favor the PRI and richer people favor the PAN (Klesner, 1987, 1998; Ramos, 1985; Reyna, 1971; Tarres, 1996).

Occupation has been used as a proxy for social class (Dominguez & McCann, 1995; Reyna, 1971). There are some contradictions in the literature in this respect. For example, Dominguez and McCann (1995) found no evidence of statistical significance for the professional class as a predictor in the 1988 and 1991 federal elections. In their study, a wide set of occupations represent the professional class --any job that requires a college degree. On the other hand, Butler, Pick, and Jones (1991) found that in the

1988 elections, occupation (agricultural, construction, managerial, service, unemployment included) had a significant effect in shaping electoral outcomes. Similar conclusions were reached previously by Reyna (1971). He found that for the 1952-1967 period jobs that require a college degree (managerial and professional), or other jobs not related to agriculture, significantly related to a preference for non-PRI parties. Bureaucrats seemed to support the PRI, while the unemployed supported the PRD (Klesner, 1998).

One exception to the class-voting hypothesis is Peschard's (1997) claim that votes for PRD cannot be determined by social class. According to her, the PRD is a party that crosses social classes. It should be noted that her study was specific to Mexico City, which is a place with a local history of support for non-PRI political parties.

Measurements of education also show that higher levels increase the propensity to vote for the PAN and decreases the preference for the PRI. This variable is said to have a positive effect on the PRD (Dominguez & McCann, 1995; Klesner, 1998). However, according to Peschard (1997) this variable is not significant either.

In terms or religion, even though it is commonly thought that the PAN attracts the Catholic vote, this conclusion should be taken with caution. Depending upon the operationalization of the variable, diverging conclusions can be reached. While Klesner (1993, 1998), using aggregate data from the Census, consistently finds a statistically significant correlation of Catholicism with voting for the PAN,

Dominguez and McCann (1995), using survey data and asking questions more about religiosity, found church-goers did not favor the PAN, whereas they did tend to vote for the PRI and not for the PRD.

Religious self-definition on the census is a nominal category. Many people who were baptized Catholic might just check off "Catholic" on the form, but they may not be active church-goers. Therefore, the use of census data does not permit a measure of the true relationship between religious faith and party preference. Other problems arise with this variable. For example, non-Catholics are most numerous in southern Mexico, making the region itself an intervening or confounding variable to a certain degree. This methodological problem with the use of spatial data is related to the previous theoretical discussion on local contextual effects and voting behavior.

To sum up, these studies document the spatial variation of the vote, the existence of regional and social cleavages, and the urban nature of votes for non-PRI parties. The contradictory conclusions in terms of the direction of the effects are related to the operationalization of variables and to the source of the information; surveys or census data. Nevertheless, the literature shows broad agreement that different aggregate population characteristics in different places can predict aggregate voting results.

Methodology: testing theories of spatial variation and diffusion in Mexico

The statistical analysis of ecological data has two methodological implications (O'Loughlin & Anselin, 1992): spatial dependence and spatial heterogeneity. Spatial dependence exists when "the value of the dependent variable in one spatial unit of analysis is partially a function of the value of the same variable in neighboring units" (Flint, Harrower & Edsall, 2000, p. 4). This interaction relates to the issue of spatial autocorrelation: a clustering of similar values on the map. Spatial heterogeneity refers to the variation in relationships across space (Lesage, 1999). The methodological implication in ordinary least squares (OLS) methods is that statistical inferences will be misleading due to heteroskedasticity (Anselin, 1988). Failure to detect it can result in inefficient parameter estimates and inflated estimates of standard errors (Anselin, 1988). The most widely used technique for the detection of spatial autocorrelation is Moran's *I* (1950). A test for spatial dependence can be included in regression analysis.

The study uses three dependent variables -- the vote for each party (PAN, PRD, PRI) in the 2000 elections. Three equations are used --one for each party. These models include causal variables to test for the existence of local contextual effects and contagious diffusion, after controlling for demographic and socioeconomic variables (component effects).

As previously mentioned, variables associated with urbanization and industrialization have seemed capable to predict spatial variation in voting behavior in Mexico since the first studies in the 1970s (See Table 2). These variables have been

classified in the Mexican literature as "classic" for detecting aggregate voting behavior (Molinar & Weldon, 1990).

A control variable is the regional dummy, since Mexican parties have been shown to possess strong regional bases (Klesner, 1998). The purpose for including this control variable in the model is to detect regional variation and the existence of contextual effects. The definition of region is the same as in Klesner's (1998) study of Mexican electoral behavior. This approach also permits us to detect the presence of spatial heterogeneity in the data.

This study incorporates a test on the contagious diffusion hypothesis by adding a temporal-spatial lag. This temporal-spatial lag is the average value of the vote for a party in neighboring cities in 1994. The logic behind this approach is that, hypothetically, information flows are a function of distance (Stephens, 1981).

The geographical location of each city is given by the coordinates of the centroid for each city. For the computation of the spatial autocorrelation coefficient, neighbors are predefined based on distance from the centroid. The minimum distance considered for the computation of the autocorrelation coefficient is 330 kilometers (263 miles) which is the minimum distance in which all cities in the sample have at least one neighbor. The distance considered for the regression models is 330 kilometers (263 miles) as well.

Table 2. Dependent and independent variables in the analysis.

Dependent variable	Description
Voting support	Vote for each party (PAN, PRD, PRI) in the 2000 elections (percentage of the total vote)
Independent variable	**Description**
Population	Population size by 100,000 (2000)
Ethnicity	% speak Indian language (2000)
Migration	% lived in other state in 1995 (2000)
Occupation	% manufacturing workers (2000)
Education	% > 15 yrs. old read and write (2000)
Income	% > 10 daily minimum wages (2000)
Religion	% Catholic (2000)
Temporal-spatial lag	Average value of the vote for each party in neighboring cities in the 1994 election
Region	5 regions (Central, North, Bajio Center West, Mexico City Metropolitan Area, and South)

This study utilizes a group of the 89 cities that in 1997 had 100,000 or more inhabitants. Cities may be conformed by one or more *municipios.* In this sense, m*unicipio* (227) data was aggregated to the urban scale for this purpose. The reason for the population threshold is to study cities comparable in size. Mexico does not have an official definition of city, however the Mexican National Population Council (CONAPO) has defined the cities and metropolitan areas used in this study.

The source for socioeconomic information is the National Institute of Statistics, Geography and Informatics in Mexico (INEGI). The socioeconomic data at the *municipio* level for 2000 is available on the Web. Electoral Outcomes for 1994 and

1997 federal elections are available also on the Web from the Federal Electoral Institute in Mexico (IFE).

The procedure in this study has two steps. The first is to test the hypothesis of spatial dependence; that electoral results in one city depended on results in nearby cities. The second is to test if this spatial autocorrelation can be explained by either "composition effects" or "place effects", and if the spread of the vote for the various political parties followed a contagious diffusion process.

Results of the Analysis

This section is divided into two parts. The first part presents the results of the spatial clustering analysis. The second presents the results of the tests for local contextual effects and contagious diffusion hypotheses.

a) Spatial clustering

The results in Table 3 show evidence of positive significant autocorrelation, confirming that voting behavior in urban areas is spatially clustered. This political phenomenon exemplifies the first law of geography that "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236). This finding also expands previous results in Mexican literature showing that there are urban clusters of voting preferences.

Table 3. Values of Moran *I* correlation coefficient for each political party by year and by buffer zone.

Party	330 kilometers	600 kilometers	1200 kilometers
PAN			
1994	0.167**	0.086**	0.030**
1997	0.199**	0.044**	0.022**
2000a	0.072*	-0.034	-0.024
PRI			
1994	0.020	-0.006	-0.020
1997	0.225**	0.076**	-0.023
2000	0.251**	0.082**	0.003
PRD			
1994	0.193**	0.095**	0.052**
1997	0.155**	0.039**	0.008*
2000b	0.069*	0.016	0.007*

** Significant at the 0.01 level (2 tailed test)
* Significant at the 0.05 level (2-tailed test)
a. Alianza por el Cambio; Coalition of Partido Accion Nacional (PAN) and Partido Verde Ecologista de Mexico (PVEM)
b. Alianza por Mexico: Coalition of Partido de la Revolucion Democratica (PRD), Partido del Trabajo (PT), Convergencia, Partido de la Sociedad Nacionalista (PSN), and Partido Accion Social (PAS). The three latter parties were created just befote the 2000 elections.

A coefficient value of 1 indicates perfect positive spatial autocorrelation, meaning that similar voting results, either high or low are spatially clustered. A value of -1 indicates perfect negative spatially autocorrelation, meaning that voting results are perfectly dispersed across space (like black and white colors in a chessboard). A value of zero indicates an absence of spatial arrangement: a geographically random display.

The coefficient was calculated for 3 different buffer zones so that the effect of different area definitions of nearby cities could be observed. An increase in the buffer

zone size implies an increase in the number of neighboring places. The results shown in Table 3 indicate that the strength of the association decreased for all parties as the radius of the buffer zone increased. Again, this finding validates Tobler's first law of geography. As applied to this research, the law states that as we expand the geographical area within which the levels of spatial dependence are calculated, the level of clustering in our variable of interest will tend to decrease, since its spatial variation will tend to increase (distant things are less related).

Results for the PAN in the 1994 and 1997 elections are positively autocorrelated, meaning that the vote for this party was spatially clustered; results in one city were associated with similar results in neighboring cities. There was an increase in the strength of the association between 1994 and 1997, indicating a process of geographical concentration. However, this pattern changed for the 2000 election. The main reason was its coalition with the PVEM which is also clustered but in other cities (Mexico City, Salamanca, and Orizaba) causing a change in its geography of the vote. Also, this process suggests a trend of rising national predominance.

Spatial patterns for the PRI are distinctive. Voting behavior in 1994 showed no patter of clustering, but it did for 1997 and 2000. The reason is that spatial distribution of the vote for the PRI in the first election was uniform across the country. It received very similar levels of voting support everywhere: 40 to 60% of the total vote in 72 cities (81% of the sample). For the 2000 election the situation was completely

different. The PRI lost support notably and in a geographic pattern; its urban support became more concentrated around certain cities.

The urban vote for the PRD also exhibited a pattern of spatial clustering. Between 1994 and 2000 the strength of the spatial association decreased suggesting a process of geographical decentralization.

Spatial pattern findings in this part offer preliminary evidence of spatial effects or spillovers of political behavior between cities. However, they are only tentative because the causes are not known. It might be that a spatial match between voting behavior and the socioeconomic composition of the population could explain the spatial autocorrelation in our dependent variable.

Also, as mentioned previously, a contagious diffusion test requires an autoregressive approach, which considers the spatial lag of the dependent variable as a regressor. With the aim of detecting the nature and causes of these findings, a spatial regression analysis was performed. This test is described in the following section.

b) The Local Context and the Contagious Diffusion

As was previously explained, spatial models allow the researcher to identify causal variables of spatial variation and simultaneously test the contagious diffusion hypothesis.

Table 4 shows the spatial regression results for the PAN, the PRI, and the PRD. None of the models show spatial autocorrelation in the residuals. In other words,

the spatial autocorrelation problem in linear regression modeling has been resolved, and the model does not require further independent variables. In this sense, the inclusion of the temporal-spatial-temporal lag as an autoregressive solution is actually not necessary for the correction of the model. However, since we are also interested in the contagious diffusion hypothesis, we incorporate it as a regressor.

Table 4. Spatial lag regression results for PAN-PVEM coalition, PRI and PRD-6 coalition voting behavior (2000).

Variable	PAN-PVEM	PRI	PRD-6
Constant	-0.484**	1.105**	0.817**
Socioeconomic			
Population size[a]	0.000	0.000	0.000*
Catholicism	-0.013	-0.510**	0.441**
Literacy	1.204**	-0.284	-1.472**
Manufacturing	0.595**	0.003	-0.468**
Income	5.918**	2.609	-5.344**
Ethnicity	0.698**	0.039	-0.764**
Migration	-0.289	-1.008**	0.592
Context effect[c]			
North	0.089*	0.067*	0.088**
Bajio	0.118**	0.025	-0.087**
Metro	-0.007	0.015	-0.037
South	-0.015	-0.011	0.108**
Diffusion effect			
Temporal-Spatial Lag	0.034	-0.421	0.109
Regression diagnostics [b]			
Moran *I* test for Spatial dependence	-0.017 (.844)	-0.008 (.920)	-0.029 (.598)
Kolmogorov-Smirnov test for Normality	0.588 (.880)	0.617 (.842)	0.868 (.439)

** Significant at the 0.01 level (2 tailed test)
* Significant at the 0.05 level (2-tailed test)
[a]There is a value after 4 ceros.
[b] Probability in parentheses
[c] The region of reference is Center: Mexico City and the state of Mexico
Note: Unstandardized coefficients (n = 89)

For the PAN, several voting covariates show statistical significance. Particularly, higher levels of literacy, manufacturing, income, and ethnicity are

positively correlated with PAN voting in our sample of cities. Unexpectedly, catholicism did not serve as predictor, whereas ethnicity did have a positive effect.

Two regional contextual variables, Bajio and North, are positive and statistically significant for the PAN, indicating that these variables have independent explanatory importance. In other words, these regions continue to explain some of the variance in the vote after controlling for the other voting covariates. It follows that there must be a regional preference for the PAN since it overperformed in the Bajio and North regions after the spatial autocorrelation in the residuals was accounted for, meaning that the effect cannot be a consequence of mispecification of the model. Historically these two regions have been strongholds for the PAN. There is no evidence of either multicollinearity or heteroskedasticity problems. The Kolmogorov-Smirnov statistical test on the spatial residuals suggests a normal distribution (KS = .588 n.s).

For the PRI, The model reveals catholicism and migration as the only significant variables correlated with PRI 2000 voting after controlling for the other covariates. Both are negatively correlated.

It was considered useful to compute the Variance Inflation Factor (VIF) in order to prevent potential multicollinearity problems.[1] Results do not show any independent variable exceeding the general VIF rule of 10 (Belsley, Kuh, & Welsch, 1980). We also checked for violations on the homoskedasticity (constant variance

[1] VIF values were calculated using the SPSS software. R^2 and F values were also obtained using the SPSS software. The S-Plus extension for ArcView unstandardized ordinary least square estimates were comparable to SPSS.

across predicted values) assumption. Additionally, the Kolmogorov-Smirnov statistic test on the spatial residuals shows them to be normally distributed (KS = .617, n.s.).[2]

For the PRI, only the North contextual effect variable (regional dummy) showed statistical significance, which is another differing finding from previous studies. Historically, the PRI has not been associated to any particular region; it was the only truly national party. This finding is in accordance to the increasing levels of spatial clustering for this party and the loss of its national dominance (see tables 3 and 1 respectively). The model tested ideal for linear fit as our spatial diagnostics show; the spatial error terms were independent and normally distributed.

In regard to the contagious diffusion hypothesis, the non-significance of the temporal spatial lag suggests its rejection. No relationship between electoral results in 2000 and previous results in neighboring cities was found. After statistical controls were set, earlier support in nearby cities was inconsequential for explaining variation in electoral behavior.

As with the other two parties, the PRD model accounts for the spatial autocorrelation of the residuals, suggesting that the model has the necessary independent variables for explaining the spatial clustering. Once again, neither heteroskedasticity nor multicollinearity seem to be present. Spatial residuals show a normal distribution (KS = ..868 n.s.).

[2] The null hypothesis in this test is no difference between the actual distribution of the residuals and a normal distribution.

Several socioeconomic factors are important for the PRD. For instance, it performs better in cities with lower levels of catholicism and fewer manufacturing activities. The North and South regions were favorable for this party. Interestingly, the PRD showed a considerable increase in its support in some northern cities such as *La Paz* (39%), *Fresnillo* (35%) and *Zacatecas* (34%) mostly as a consequence of its alliance with the PT for which there is local history of previous support in those cities. In the south, it counts on inconditional support in cities such as *Cardenas (Michoacan), Apatzingan (Michocan), Iguala (Guerrero)* and *Cardenas (Tabasco).* Nevertheless, the Bajio region was unsupportive. The PRD underperformed there after voting covariates have been controlled for. This finding confirms the existence of a contextual effect and a geography of exclusion between the PAN and the PRD in the Bajio region.

The contagious diffusion hypothesis should be rejected for this party as well. The temporal spatial lag did not show statistical significance, indicating that electoral results in 2000 were not related to the results in 1994 in nearby cities.

Discussion and conclusion

In terms of methodology, the results add but do not contradict previous findings in the literature on voting behavior in Mexico. The classical variables associated with modernization theory (industrialization, education, etc.) help explain electoral results for the study of Mexico's largest cities.

These results do add two more findings to the existing literature. First, in the local contextual effect debate, they demonstrate that the Bajio region had both a significant positive correlation with voting for the PAN and negative one with the PRD. The North region had a positive effect for the PRI. This latter geographic finding is unique for the 2000 election.

For all the parties, the model accounted for the spatial autocorrelation in the residuals, meaning that the model was complete for this purpose. This fact added to the detection of a spatial effects in some regions, strongly suggests the existence of contextual effects operating for the PAN, the PRI and the PRD.

A second finding is that voting behavior was not contagious for any political party. Even though support for the PAN and the PRD indeed diffused through the territory due to their rising status of majority party in various cities, the diffusion in this period was not restricted by proximity to previous areas of electoral support. Support in 2000 was unrelated to performance in 1994 in nearby cities. This finding suggests a process of increasing national support independent of the location of the voter. Equally, the vote for the PRI in 2000 was not geographically dependent (temporal-spatial lag) either, meaning that its preference was independent of proximity to previous areas of support.

Overall, the models provided a good linear fit. The regression models did not show autocorrelated residuals or multicollinearity problems. In particular, the absence of spatial autocorrelation in the regression residuals pointed out that the regression

model was complete for explaining the spatial autocorrelation of the residuals. The model accounted for it for all parties, so the inclusion of more explanatory variables was not required for this purpose.

In terms of theory testing, the connections among the mandated changes in the availability of mass media, funding for electoral campaigning, and the non-significance of the temporal-spatial lag variable, suggest that the mass media played a role in spreading the electoral message of the PAN and the PRD nationwide. In fact, in the 1997 and 2000 elections the vote was independent of spatial proximity to the strongholds of all parties. Lawson (1997) commented that the 1997 electoral results verified that all parties are competing in virtually all regions of Mexico; elections reflected the persistence of regional strengths, but the 2000 elections show these are becoming increasingly contested across the country.

In this regard, our finding of increasing levels of multiparty competition across cities, independent of physical proximity to previous areas of support (non-contagious spread), might be related to Blum's (1997) hypothesis of economic crisis and nationwide dissatisfaction with the PRI regime. Nevertheless, the link between our findings and Blum's statement is not empirically confirmed, and further research is required on the relationship between national economic conditions, public opinion on government performance, and voting behavior.

Of course, one limitation in this study is that even though diffusion variables and spatial regression models permit the detection of relationships among places, they

do not uncover the mediation processes of politics and the social processes within places (Flint, Harrower & Edsall, 2000). Such processes are beyond the scope of this study. An analysis of specific processes such as the impact of the mass media and electoral campaigning on voting results would require enormous amounts of city-specific data, which were impossible to obtain for this study. In this sense, our findings reveal one underdeveloped area in Mexican electoral studies that is central for understanding the rise of multiparty competition: the impact of mass media and political campaigning on voting behavior.

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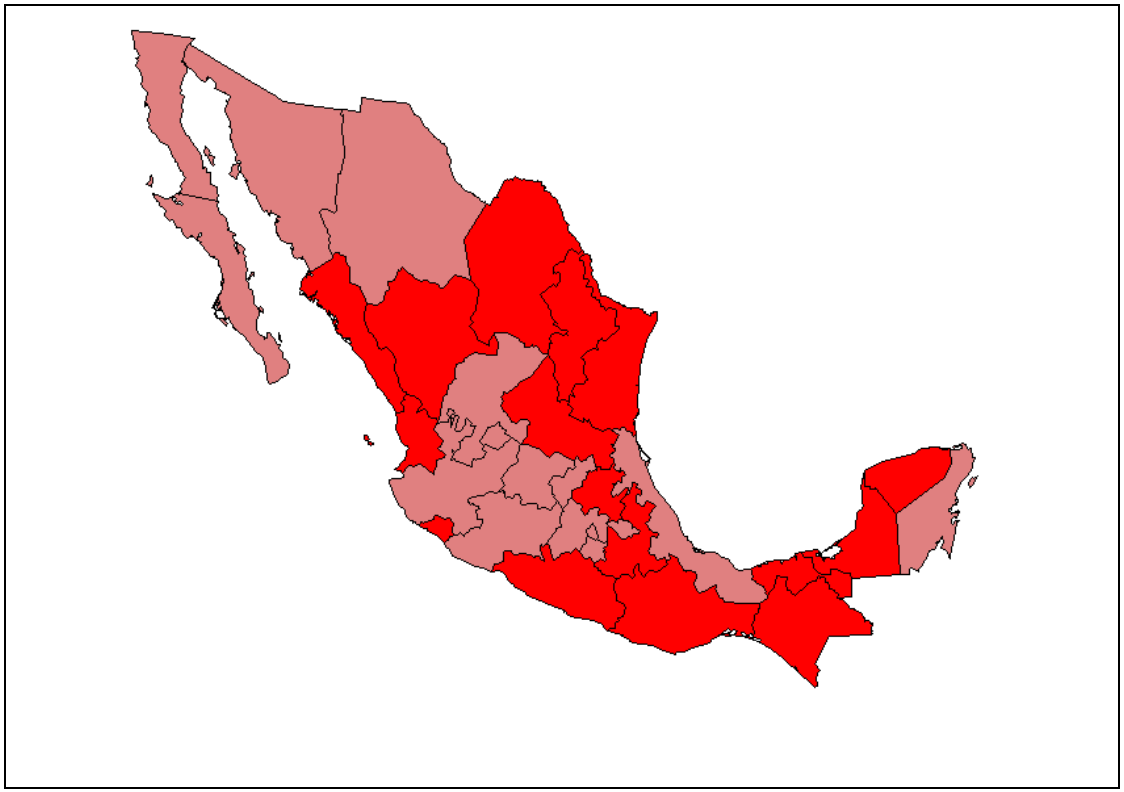
Appendix 1. State maps results for the 1994 and 2000 Federal Representative Elections (includes urban and rural areas)

Figure 1. Voting behaviour for the PRI in 1994 shows a uniform pattern across the country, except for the Federal District-Mexico City

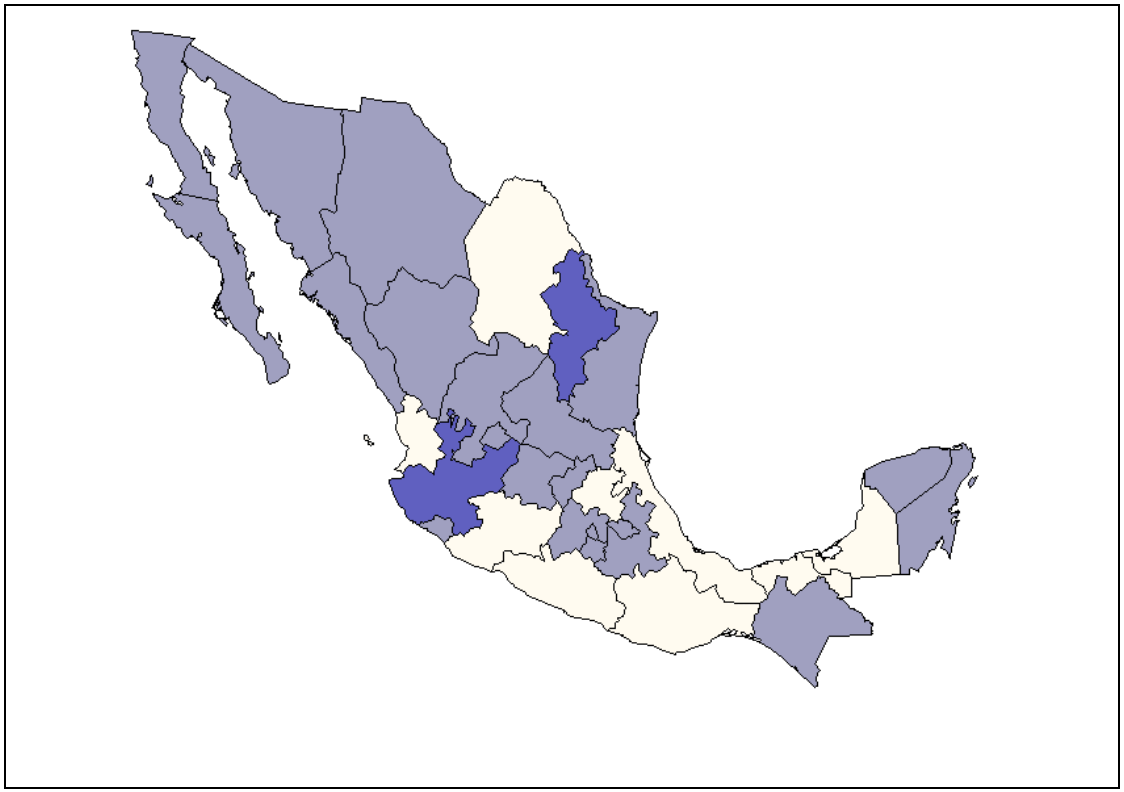
*Darkest color represents a range between 40 and 60% of the vote

Figure 2. Voting behaviour for the PRI in 2000 shows a pattern of clustering in the northeast, south and peninsula de Yucatan*



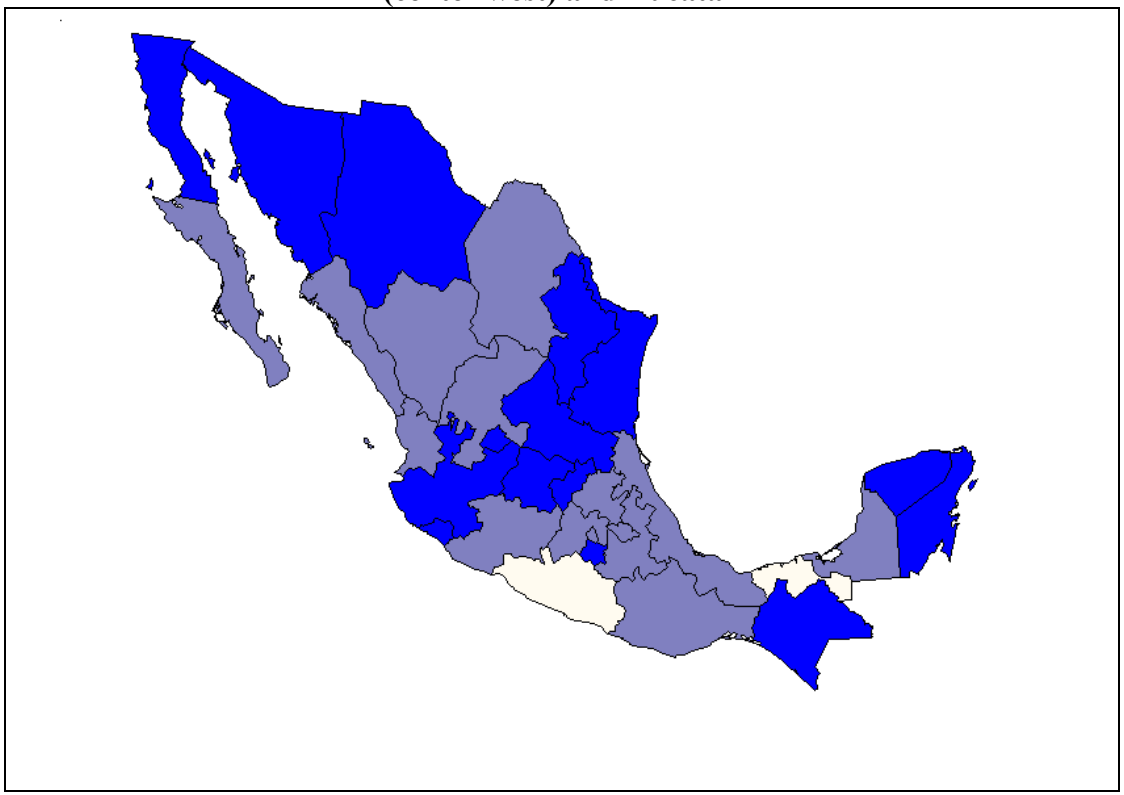
*Darkest color represents a range between 40 and 60% of the vote

Figure 3. Voting behaviour for the PAN in 1994 shows a pattern of clustering in the north, northwest regions and Yucatan*



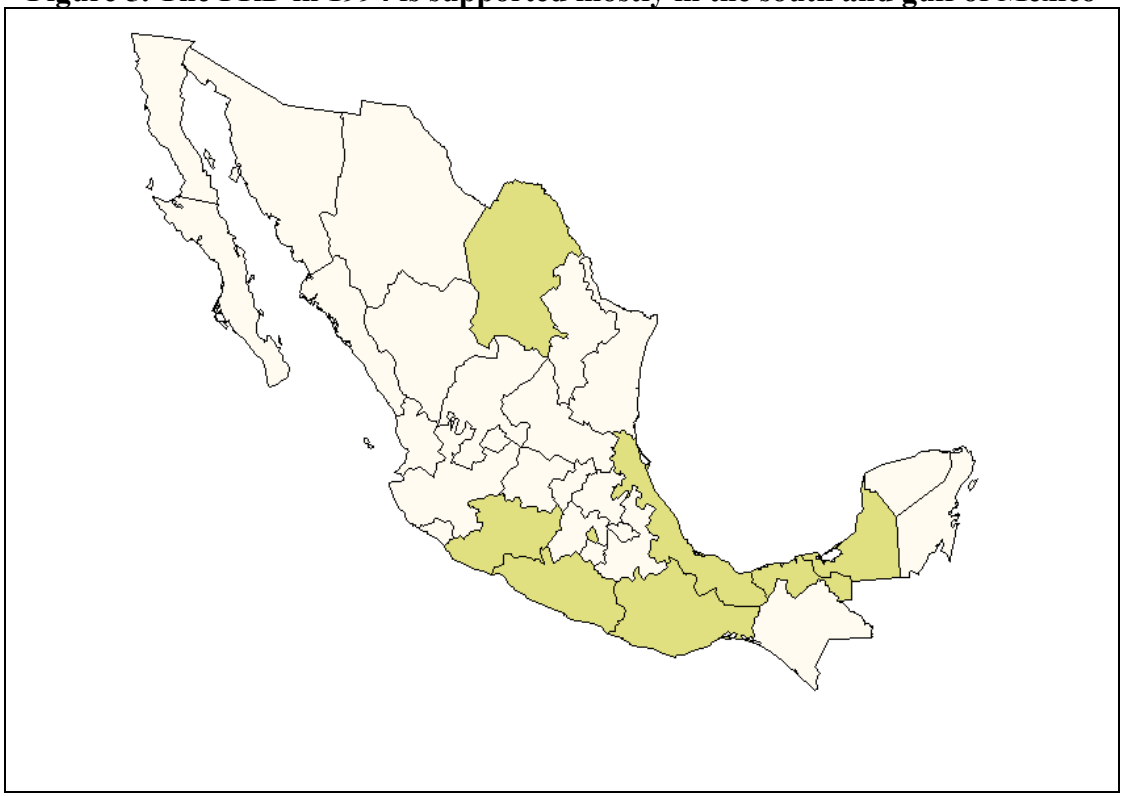
*Darkest color represents a range between 40 and 60% of the vote

Figure 4. The PAN-PVEM in 2000 increases its support nationwide, but it is still concentrated in the north, bajio (center west) and Yucatan



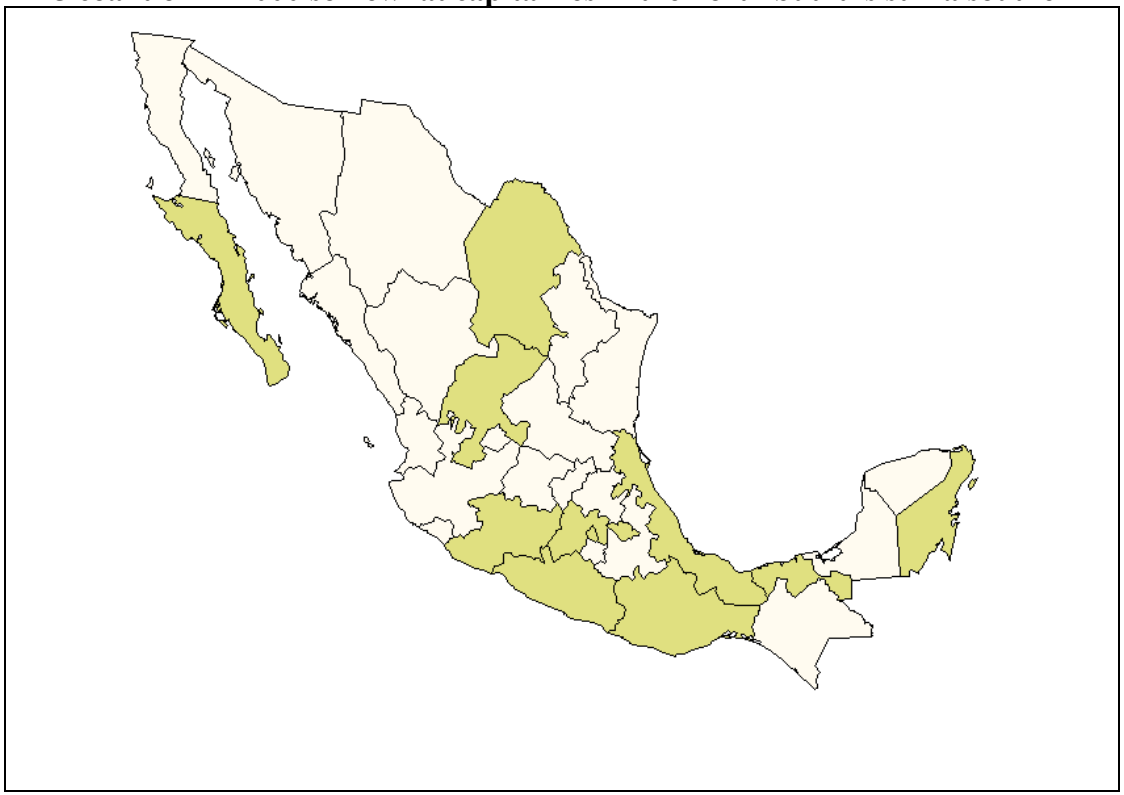
*Darkest color represents a range between 40 and 60% of the vote

Figure 5. The PRD in 1994 is supported mostly in the south and gulf of Mexico



*Darkest color represents a range between 20 and 40% of the vote

Figure 6. The PRD-5 coalition in 2000 somewhat capitalizes in the north but it is still a southern-Mexico city party



*Darkest color represents a range between 20 and 40% of the vote