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DEDICATION

To my mother and the memory of my father, the victim of violence of a different era.

ABSTRACT

This dissertation seeks to explain differences in crime rates across Mexico as well as their relative change during the 1990s. I draw on ecological theories according to which the incidence of crime is related to the social characteristics of communities. However, I find it necessary to revise and extend these theories that have been developed largely based on the experience in U.S. urban areas. Not only do social variables commonly used in community-level studies of crime – such as poverty and ethnic composition – have a different meaning or require a different operationalization in the context of a developing country, but the Mexican case presents us with new ecological settings and new dimensions of social structure that have an effect on social control and crime. In the first part of the dissertation I analyze homicide rates in over 1,800 municipalities. I extend theories of human ecology to rural areas in order to explain the impact of different patterns of land ownership and structures of agricultural production on violence in the Mexican countryside. I contribute to theories that relate family structure and crime by considering the effect of extended family households. I estimate the influence of international factors such as the traffic of illegal drugs and migration to the United States. I develop a theory relating political change and violent crime that takes into account the hierarchical nature of social and political control in Mexico and test it using results from municipal elections. In the second part of the dissertation I look more closely at crime in Mexico City. Using crime rates from a sample of over 800 neighborhoods and housing units I analyze how community characteristics such as the level of income, the housing structure and household

composition affect the incidence of crime. I suggest a neighborhood transition process whereby the increase in commercial establishments in affluent neighborhoods leads to a loss of social control and the flight of high-income residents who can afford to do so. In the concluding chapter I place the recent changes in crime in Mexico in a broader historical perspective and compare existing patterns of crime to those of the advanced capitalist countries of the West.

CHAPTER 1

INTRODUCTION

Crime became a serious problem in Mexico during the 1990s. Some Mexican cities such as the nation's capital witnessed an explosion of crimes, especially those involving the seizure of property. Between 1990 and 1998 muggings in Mexico City rose by over 300%, robbery of vehicles by more than 400%, bodily harm by 100% and homicides by nearly 50%. Alarming reports of kidnappings, bank robberies and holdups appeared every day in the city's newspapers and the evening news. By the end of the decade residents of all social classes came to feel that they lived in a city that was considerably less safe than it was ten years before but were left wondering why. To many observers it seemed that the entire country was engulfed in a dangerous crime wave. However, although crime did increase dramatically in many places, the available evidence suggests a simultaneous decline in certain forms of violence in many cities and towns. Homicide rates, the best and most comparable indicators of criminal violence nationwide, decreased by over 38% and even more in rural areas.

Mexico's general pattern of interpersonal violence still resembles that of a developing country in which homicide rates are highest in rural areas where law enforcement authorities are absent or ineffective, and where the influence of modern forms of social control are weak. As these marginalized areas have become more

incorporated into the development process homicidal violence has begun to decline. At the same time, urban centers such as Mexico City have experienced a rise in predatory crimes that is symptomatic of a different stage in urban development, but aggravated by the absence of state and social institutions capable of meeting the challenge. These opposite trends are in a sense two sides of the same modernization process that Mexico is undergoing and which it shares with many developing countries elsewhere in the world. This dissertation attempts to explain both aspects of this complex process. I first examine the differences in homicide rates in municipalities across Mexico and explain their overall decline. I then look more closely at crime within Mexico City and determine how its process of urban development helps explain the current pattern of criminal activity.

My analysis of crime in Mexico has led me to revise and extend a sociological theory whose origins may be traced back to the Chicago School of Sociology of the early twentieth century. According to this theoretical perspective differences in crime rates are related to the social and organizational characteristics of entire communities as opposed to individual pathologies or cultural traits. While maintaining the focus on the structural origins of crime, I find it necessary to substantially amend and recast social disorganization theory in order to make it more compatible with the experience in developing countries today. Not only do social variables commonly used to test these theories have a different meaning or require a different operationalization in a country such as Mexico, but the Mexican case presents us with new dimensions of

social structure and new processes of social change that have an effect on a community's ability to prevent crime.

Among other things, the high levels of homicidal violence in Mexican rural areas requires me to extend theories of urban ecology in order to understand how the social organization of the Mexican countryside affects rural homicide rates. Second, one of the limitations of community-level approaches to the study of crime is their general neglect of how broader social processes whose scope transcends the community may influence local social dynamics. The importance of transnational phenomena such as international migration and the traffic of illegal drugs to the United States makes this a particularly serious limitation in the Mexican case. I therefore propose a strategy to account for the effect of both these elements. Third, classic criminological theories have generally ignored the influence of political factors. I argue that in societies undergoing rapid political change such as Mexico we need to take into account the effects of greater political competition on crime. I develop a theory of social control that explicitly considers the hierarchical nature of social and political ties in Mexico. Finally, criminologists have often posited a relation between family disruption and crime. I measure the effect of a new dimension of family structure that is especially relevant in the Mexican case, namely family extension.

The dissertation is organized into four substantive chapters and a conclusion. The first three chapters are devoted to the analysis of homicide rates at the municipal level nationwide, while the last one deals with other forms of crime in Mexico City. In chapter 2 I describe the data and the methods I use throughout most of the study. I examine differences in homicide rates across all Mexican municipalities and their changes over time. I consider the effects of standard correlates such as poverty, inequality, ethnic composition and family structure, but suggest ways in which they must be reconceptualized when studying crime in developing countries. I also estimate the impact of international migration and drug traffic. In order to identify whether patterns of homicidal violence towards women differ from men, and whether youth violence is driven by different factors, I analyze female and youth victimization rates separately. Finally, using recently developed techniques for spatial analysis I measure the dependence of homicide rates across neighboring municipalities.

In chapter 3 I look more closely at criminal violence in rural areas. I extend theories of human ecology proposed by Robert Park and Ernest Burgess over 80 years ago to rural settings in order to explain differences in rural homicide rates. I derive and test hypotheses regarding the impact of land scarcity, collective ownership and the organization of agricultural production on violence. I find a direct parallel between the competition for space that human ecologists describe as characteristic of urban centers and the competition for arable land in rural areas. I suggest why agricultural systems that are more individualized or that involve more commodified

relations of production may be expected to have higher rates of interpersonal conflict and violence.

Chapter 4 examines the relation between political competition and crime. A large number of countries that have recently undergone transitions from authoritarian to democratic regimes have also experienced increases in violence. Yet sociological theories of crime have generally failed to consider the effect of political factors, and those that do are not sufficiently specific. While homicides declined in most Mexican municipalities in the 1990s, I find that greater electoral opposition to the ruling party was conducive to higher homicide rates in rural areas net of other factors. I draw on the extensive literature on patronage networks to develop a theory of hierarchical social control that explains this relation.

In chapter 5 I focus specifically on Mexico City, one of the places where crime increased the most during the period under consideration. After describing the overall trend in criminal activity, I examine the ecological correlates of different types of crimes in a large sample of neighborhoods and housing projects in the Federal District. I find the spatial distribution of criminal offenses to be quite different from that in cities in industrialized countries. Among other things, I analyze the impact of neighborhoods' income level, housing arrangements and degree of commercialization. I suggest that a proper understanding of crime in the growing urban centers of the developing world requires us to appreciate the different processes

of expansion and spatial differentiation they have undergone. Finally, in the concluding chapter I place recent changes in crime in Mexico in a broader historical context. Drawing on scant evidence about the evolution of crime since the 1940s I argue that recent trends may be seen as part of a transition that shares some similarities with that experienced by the industrialized countries of the West earlier in their histories.

CHAPTER 2

STRUCTURAL CORRELATES OF HOMICIDE IN MEXICAN MUNICIPALITIES: EXTENDING SOCIAL CONTROL THEORY

Homicides are social events whose distribution across time and space reveals much about the organization of societies and the transformations they are undergoing. This is one of the primary reasons why homicide rates have been a subject of interest for social scientists for more than a century. What exactly the patterns in the distribution of homicides reveal about the structure of social organization is, however, a matter of contention. A long-standing tradition of research dating back to the Chicago School of Sociology in the early twentieth century argues that homicides, and crimes more generally, are due to a failure in the social and organizational structure of a community (Shaw and McKay 1942; Shaw, Zorbaugh, McKay and Cottrell 1929; Thomas and Znaniecki 1918). According to one current of thought within this tradition, disorganization at the community level leads to a breakdown of the mechanisms of social control that preserve social order by ensuring individuals' conformity to social norms (Bursik and Grasmick 1993; Sampson and Groves 1989; Kornhauser 1978; Janowitz 1975). An impressive body of work by criminologists over the last several decades has supported this school of thought known as social control theory. However, as I have discussed in the previous chapter, social control theorists have tested their hypotheses by focusing primarily on crime in settings in the United States and Western Europe, while at the same time claiming their universal

applicability. In the following three chapters of this dissertation I test social control theory by examining patterns of homicide in Mexico, a developing country with considerably different forms of social organization and undergoing rapid social and political changes.

I argue that the Mexican case requires us to revise and extend community-level theories of crime in order to explain variations in homicide rates across Mexican municipalities and over time. Not only do the social variables commonly used to test such theories—such as poverty and ethnic composition—have a different meaning or require a different operationalization in a country such as Mexico, but the Mexican case presents us with new dimensions of social structure and new processes of social change that have an effect on social control and crime. For instance, Mexican family practices force us to consider the effect of a new dimension of family structure, namely family extension. The Mexican case also requires us to take into account the local effects of broader global processes such as international migration and the traffic of illegal drugs to the United States. Perhaps more fundamentally, the high rates of rural violence in Mexico challenge an important assumption of social disorganization theories regarding the effect of urbanization.

Since this is the first chapter in which I examine homicides in Mexico I begin by describing their distribution throughout the country as well as their changes during the past decade. I then introduce the data sources and methods I use. In the remainder

of the chapter I test some key propositions using the national sample of municipalities. I examine the effects of urbanization, poverty and inequality, ethnic composition and family structure on the incidence of homicide. I consider the impact of international migration and the traffic of illegal drugs to the United States. I replicate my results using an alternative data source and analyze the effect of these same factors on the homicide rates involving female and juvenile victims. I explore the spatial dependence of homicides across municipalities. And finally, I use different statistical methods to distinguish the effect that municipal characteristics have on homicide rates across municipalities and over time. The statistical models presented in this chapter will serve as a baseline for analyses in subsequent chapters where I will consider new hypotheses regarding the effects of agrarian structures of production, and political competition.

2.1 Homicide in Mexico

Homicides have been the subject of numerous empirical studies in part because they are the most accurately and consistently recorded form of criminal activity. There are relatively less variations in the definition of what constitutes a homicide across countries and historical periods than for other types of crimes. Through painstaking archival work historians have been able to reconstruct time series of the number of deaths from homicide in the United States and Britain for the last several hundred years. Similarly, criminologists have been able to carry out large

cross-country comparisons of homicide rates based on official data, which would be nearly impossible for other crimes.

Homicides are also the best-documented type of crime in Mexico. They are more uniformly defined and vary less in the extent to which they are reported and prosecuted across the 31 states and the Federal District that make up the country. As I will describe in the section on Data Sources below, homicide rates may be computed from mortality statistics which define homicide as a cause of death, as well as from the number of individuals charged with a homicide offense. These two relatively independent sources allow me to verify the results of my statistical analysis, and give me greater confidence in the conclusions I reach.

Mexico is unusual both because of its high overall homicide rate and because of the wide variation in the incidence of homicide across its regions. As shown in table 2.1 the national homicide rate is among the highest of all countries reporting to the World Health Organization in 1995. Mexico is behind only a handful of East European and Latin American countries, and has an incidence of homicide almost twice as high as the United States. Homicide is the ninth leading cause of death in

Mexico, and the second cause of death for males 15 to 24 and 25 to 34 (after accidents).[1]

This high level of violence is unevenly distributed across the country. Figure 2.1 shows the homicide rate in Mexico's 2428 municipalities that constitute the units of analysis I use throughout this chapter. The homicide rates in 1990 range from more than 30 per 100,000 residents in the southern states of Oaxaca, Guerrero, Morelos and Michoacán, to a low of close to 3 per 100,000 in the state of Nuevo León in the north. A clear regional pattern is evident. Those municipalities in the southern part of the country, the Mexico Valley, and the northwest have higher aggregate rates. Interestingly, the highest homicide rates correspond to predominantly rural areas. The Federal District, which is the central part of Mexico City, has a homicide rate that is slightly below the national average. This distribution is reminiscent of that in the United States and Western Europe prior to the nineteenth century, and supports the notion that Mexico is undergoing a transition to a more modern regime of social control.

[1] The other eight leading causes of death according to the World Health Organization's classification system in descending order are: diseases of the circulatory system, malignant neoplasms, accidents, diabetes, conditions originating in the perinatal period, chronic liver disease and cirrhosis, infectious and parasitic diseases, and pneumonia. Obviously, the rankings are sensitive to how causes are aggregated. Nevertheless, this simple ranking gives an idea of the importance of homicide as a cause of death in Mexico (WHO 1998).

In contrast to the apparent trend in property crimes, the homicide rate decreased dramatically in most parts of the country during the course of the 1990s. Figure 2.2 shows the national homicide rate according to mortality statistics and the number of alleged homicide offenders from 1990 to 2000. The two series are plotted on different scales shown on each side of the graph in order to better compare their overall shape. They reveal a remarkably similar trend: a slight rise in the incidence of homicide during the first two or three years of the decade followed by a steady decline. According to mortality statistics, the national homicide rate decreased 38.3% between 1990 and 2000.[2] This overall decline in homicide in the face of a rise in property crimes in urban areas such as Mexico City is also consistent with the transition to a modern pattern of criminal activity as described in the previous chapter.

Table 2.2 shows the homicide rates and their respective changes by state from 1990 to 2000. The state-level homicide rates provide further evidence of the scope of the decline during the later half of the decade. Whereas the number of states was evenly divided between those that experienced an increase and those that experienced

[2] A third data source may be used to further corroborate the decline in homicides during the 1990s. In 1995 the National Statistics Institute began compiling the number of crimes reported to state Attorney General's offices for selected states. Homicide rates computed from this source have the disadvantage of not being based on a uniform definition of homicide since there are important differences between state laws and the National Statistics Institute make no attempt to standardize reported offenses as it does with prosecuted offenders. Nevertheless, homicide rates based on reported offenses indicate a general decline for the years covered in all but four states for which data are available.

a decrease in homicide between 1990 and 1995, by 2000 all but 6 of them had posted a decline. Interestingly, most of these 6 states are located in the relatively wealthier and more industrialized northern part of the country, and three of them are on the U.S.-Mexican border. By contrast, the more rural states in the southern regions, which had the highest homicide rates in 1990 witnessed the largest declines.[3] Oaxaca, Morelos and Michoacán all experienced declines of over 50%.

Mexico constitutes an interesting setting to study homicide not only because of the wide variation in the homicide rates across geographical regions, but as I have already implied, also because of the diverse social settings it encompasses. The country contains bustling urban centers, including one of the world's largest cities, as well as traditional rural towns. Communities in each of these settings have experienced social changes and changes in their internal organization that set them apart from the communities in the United States that have been the subject of numerous criminological studies. They therefore constitute important test cases for theories that posit a relation between community characteristics and crime. In the sections below I attempt to explain the large differences in the levels of homicide in Mexican municipalities based on their structural and organizational characteristics.

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[3] Of course, the larger decline in the states with highest original values may be the effect of a "regression to the mean", but the declines in some of these states were so dramatic that they changed their relative standing.

2.2 Data Sources

Municipalities are the smallest political and administrative units in the Mexican system of government. They are also the smallest units for which homicides are reported nationally and are therefore the most appropriate units to examine the ecological determinants of homicide. The number of homicides in each municipality is available from two different sources. First, the National Statistics Institute (INEGI) compiles basic information on all fatalities occurring in the country based on death certificates in accordance with the World Health Organization's guidelines (INEGI 1992, WHO 1998). This information includes the cause of death, as well as the place and date of occurrence, and the age, sex, education level, occupation, place of residence and marriage status of the deceased. The external cause of death E55 in the WHO's classification system (ICD-9 and ICD-10) groups all deaths due to "homicide and injury purposely inflicted by other persons" (WHO 1977, 1992). I use the total number of deaths in this category to compute municipal homicide rates. Second, the National Statistics Institute also reports the number of alleged offenders in state and federal courts for different types of crimes, including homicide, for each

municipality.[4] Alleged offenders are those who have been officially charged with a crime by the corresponding Attorney General's office.

Homicide rates estimated using the number of prosecuted offenders underestimate true offending rates since only a fraction of the crimes committed will result in criminal charges against a suspect. More importantly, crime rates based on the number of alleged offenders will be biased according to the efficacy of law enforcement in the different municipalities. Those municipalities with more resources devoted to investigating crimes and prosecuting suspected criminals will tend to have higher rates of alleged offenders regardless of whether they actually have higher offending rates. In addition, because most homicides fall under state and not federal jurisdiction, there is less uniformity in their categorization nationwide compared to deaths due to homicide in mortality statistics. For these reasons, I test most of the models using homicide rates based on mortality statistics. I use alleged offender data only to verify the results in a separate section below.

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[4] Beginning in 1996 the National Statistics Institute also provides the number of offenses reported to the state Attorney General's offices (*Agencias del Ministerio Público*) regardless of whether they resulted in charges brought against any individual. Though reported incidents constitute a better measure of the number of offenses actually committed than the number of individuals charged with a crime, they are grouped by the municipality where the alleged offense was reported, not where it was allegedly committed. Since the number of state attorney offices varies considerably between municipalities (many municipalities do not have an office), the number of reports filed in a particular municipality will not be an accurate measure of the offenses committed there. Moreover, because the number of reported offenses are not based on a standard form sent by the National Statistics Institute to the Attorney Generals' offices but are reprinted using each state's categorization of crimes, data on reported offenses lack uniformity in the definitions of what constitutes an offense.

Homicide rates are computed for 1990, 1995 and 2000 to coincide with the years for which the variables used as predictors in the regression analysis are available. The independent variables are drawn from the 1990 and 2000 population censuses as well as the Population Count of 1995 (*Conteo de Población y Vivienda 1995*), a shorter survey applied to every Mexican household at midpoint between the two censuses. As in the United States, the Mexican censuses are carried out every ten years at the beginning of the decade. The questionnaire includes a longer set of questions than the standard one applied in the U.S. In addition to the basic demographic characteristics of household members and their relation to the head of the household, the Mexican census includes questions on the physical state of the dwelling, the total income received, and the length of residence in the municipality, among others. The Population Count of 1995 consisted of a shorter questionnaire in which only basic demographic characteristics were asked. Because not all variables in the models are available in the Population Count—for instance, there is no information regarding income or employment—I use linear interpolation to estimate some variables for 1995.

The regression models below are tested using the entire set of Mexican municipalities including the 16 *delegaciones* (boroughs) that compose the Federal District (2,428 cases in all). However, because the state of Oaxaca has a disproportionate amount of municipalities for its size and total population, its 570

municipalities (over one fifth of the national total) were grouped into 30 districts commonly used for statistical purposes (INEGI 1998a).

2.3 Hypotheses and Measures

In this section I describe some of the central hypotheses regarding the relation between aggregate municipal characteristics and homicide that derive from social control theory. I explain the ways in which these hypotheses must be reconsidered in light of the conditions in developing countries such as Mexico, and how the variables used to test them require a different operationalization. Using maps with graded scales I describe broad patterns in the distribution of the social indicators across areas of the country and make preliminary assessments regarding their association with homicide rates based on visual inspection. These relations are more formally tested using regression models described in the following section. The variables introduced here will also be used as control variables throughout the first three chapters of the dissertation.

Urbanization – A fundamental assumption of social disorganization theory since its original formulation by Chicago School researchers is that urbanization leads to higher crime rates because it increases anonymity and weakens social ties. In their classic study *Juvenile Delinquency and Urban Areas* (1942) Clifford Shaw and Henry McKay attribute higher crime rates to specifically urban processes such as the concentration of poverty, residential mobility and ethnic heterogeneity. A large

number of studies since then have tested the effect of these and other urban characteristics on crime. For instance, Sampson (1983, 1985) finds that crowded urban areas have higher crime rates. He argues that residents of densely settled ghettoes are less likely to recognize their neighbors and engage in guardianship.

Although the relation between the degree of urbanization and crime is often implied in ecological studies it is rarely tested. Statistical analyses of homicide in the U.S. usually include the population density as a predictor. Since a higher density is associated with increased public social interaction it may be considered a rough index of urbanization. However, virtually all these studies limit their analysis to metropolitan areas (Sampson 1987; Williams 1984; Bailey 1984; Messner 1982, 1983; Blau and Blau 1982) or neighborhoods within cities (Morenoff, Sampson and Raudenbusch 2001; Messner and Tardiff 1986), thus significantly reducing the variation in the level of urbanization in their samples. Because my national sample includes both urban and rural municipalities I am better able to test the effects of urbanization.

In the regression models below I use the number of residents per square kilometer, the percentage of municipal residents living in towns of less than 2,500, and a dummy variable for municipalities containing cities with populations of 100,000 or more in 1990 as alternative measures of the degree of urbanization. Although the exact cut-off points for rural and urban areas are somewhat arbitrary,

the results of the regression analysis appear to be robust for a relatively large range of thresholds. Unfortunately, there are no official guidelines from the National Statistics Institute for what constitutes a rural municipality. Instead, the degree of rurality is defined in terms of the size of towns within municipalities, and a threshold of 2,500 residents is commonly used (see for instance INEGI [1999a]). Similarly, samples of cities with 100,000 residents or more are often used in statistical studies of crime in the United States (see for instance Sampson [1987]). There are a total of 98 Mexican municipalities containing cities with populations of 100,000 or more in 1990 and 531 municipalities where all residents live in towns of less than 2,500. In later sections of this chapter similar criteria are used to create interaction terms in order to test the differential effect of some municipal characteristics on homicide rates in rural and urban areas.

Figure 2.3 shows the population density in Mexican municipalities. Municipalities shaded in darker have higher concentrations, and correspond to those where large urban centers are located. A second layer superimposed on the density scale identifies municipalities with homicide rates in the top 15th percentile (37.3 per 100,000 or more) using a hatching pattern. This technique used throughout the chapter allows me to visually detect patterns in the distribution of homicide as well the association between homicide and key independent variables. The Mexico City metropolitan area in central Mexico, and the municipalities corresponding to the cities of Puebla to its south, Guadalajara in the west and Monterrey in the northwest, stand

out as those with the highest densities yet they are not among those with the most homicides per population. In fact, a clear inverse relation between population density measured in persons per square kilometer and higher homicide rates is discernible. The same pattern holds for the other measures of rurality. For example, municipalities where 100% of the population lives in towns of less than 2,500 residents have an average homicide rate of 15.5 per 100,000 over the three years considered, compared to 13.7 per 100,000 in municipalities containing cities with 100,000 residents or more. These simple bivariate relations provide initial evidence that the relation between urbanization and higher crime rates so common in industrialized countries such as the United States does not hold in Mexico. In the U.S. rural counties have a homicide rate of 3.8 per 100,000, while metropolitan areas have a rate of 5.5 per 100,000 according to the FBI's Uniform Crime Report statistics for 2000 (FBI 2000).

There is a body of historical work on crime in the United States and Western Europe that draws an opposite conclusion with regards to the effect of urbanization on crime. Looking at long-term trends in these regions Ted Gurr (1979, 1981, 1989) identifies a decline in violent crime during the nineteenth and early twentieth centuries, followed by an increase beginning in the 1960s. He argues that the decline in violence is a result of the process of modernization, that is, of the transformation from an agricultural to an urban industrial society. Cities offered greater economic opportunities and institutional forms of social control such as schools and police (Gurr 1979, 1981). Similarly, Roger Lane (1986, 1989) attributes the long-term

decline in violent crime in the nineteenth century to "the urban industrial revolution" which brought about more organized forms of work and education, and demanded personal habits that were less conducive to violence. The subsequent rise in crime is explained by the decay of industrial society beginning in the 1970s. From this perspective, it is possible that the higher homicide rates in Mexican rural areas may parallel those of the early industrialized West. In other words, the high incidence of violence in the Mexican countryside may reflect the absence of institutions of social control associated with industrialization.

Resource Deprivation: Poverty and Inequality – A long-standing debate in the literature on homicide in U.S. urban areas has to do with the effect of economic conditions. Specifically, researchers have focused on the relative effect of poverty and income inequality. Social control theorists since Shaw and McKay have argued that a lack of economic resources is conducive to higher crime rates because it inhibits organizational participation and generally weakens a community's ability to act collectively. On the other hand, Strain theorists emphasize the effects of relative, as opposed to absolute, economic deprivation. Following Merton (1938) they argue that delinquent behavior is a result of the frustration of individuals unable to achieve the material success valued by society. According to strain theorists, the experience of deprivation weakens individuals' commitment to social norms (see Patterson [1991]). In an influential study of violent crime in a sample of 125 metropolitan areas in the U.S., Blau and Blau (1982) find that inter-racial socioeconomic inequality and

inequality in general are the most important determinants of criminal violence. Once inequality is accounted for, the level of poverty appears not to have an effect. In contrast, Messner (1983) finds that poverty levels in 204 metropolitan areas are positively related to homicide while the Gini index of income inequality is not a statistically significant predictor (see also Williams and Flewelling 1988; Bailey 1984; Williams 1984).

In general, the evidence for the relative importance of the effect of poverty and inequality on homicide rates at the subnational level in the United States is mixed. Whereas some studies find inequality to be a more important predictor of higher homicide rates than poverty (Blau and Blau 1982), others arrive at the opposite conclusion (Messner 1983; Bailey 1984, Williams 1984). As Land, McCall and Cohen (1990) suggest, inconsistencies in the findings of studies of the effects of economic factors may be due to collinearity among the predictors in the regression models. However, multicollinearity is an empirically testable condition, not something to be decided *a priori*. In the regression models below I test the association between economic deprivation and homicide using measures of poverty and inequality separately and together in the same regressions without any evidence of multicollinearity (the maximum VIF in regressions using data for each year separately never exceeds 4).

The relation between economic distress and homicidal violence has rarely been tested in countries other than those in the industrialized West. Yet there are some reasons to suspect that the relation may be different in the context of a developing country such as Mexico. Social control theorists argue that poverty is associated with higher levels of crime because it inhibits civic participation and weakens social ties among community residents. However, the resilience of social bonds in the face of economic distress may depend on the societal context. For instance, authors writing on the strategies of the urban poor in Mexico have noted the use of reciprocal ties as a coping strategy for the scarcity of goods (Lomnitz 1977). Consequently, low income communities may in fact exhibit unusually strong social networks. Similarly, impoverished urban communities in Mexico are frequently organized into collective social movements demanding access to housing and social services. The solidarity formed around these common struggles may also serve to prevent crime. On the other hand, the scope of poverty and the level of inequality are far greater in Mexico than in any industrialized country. To the extent that their effects on social cohesion within communities may be generalized, we may expect poverty and inequality to have stronger impacts on the levels of criminal violence in Mexican municipalities.

An additional complication arises from the problem of measuring poverty across urban and rural contexts. Production for subsistence constitutes a considerable portion of the real income of the rural poor in Mexico and yet is excluded from wage

levels reported in the census. Similarly, wealth generated from the construction of dwellings by the urban poor will not be captured in reported income levels. For this reason I use a composite index of marginality developed by the Mexican National Population Council (CONAPO) as an alternative measure of poverty. The index of marginality is based on 9 variables from the population censuses. These variables include: 1) the illiteracy rate among individuals 15 years of age or older; 2) the percentage of individuals 15 years of age or older with incomplete primary education; 3) the percentage of residents in dwelling without sewage or toilet; 4) the percentage of residents in dwellings without electricity; 5) the percentage of residents in dwellings without running water; 6) the percentage of dwellings with more than two occupants per bedroom; 7) the percentage of residents in dwelling with dirt floors; 8) the percentage of residents living in towns of less than 5,000; and 9) the percentage of the economically active population earning less than 2 minimum wages (CONAPO 1993).

The CONAPO index is clearly biased towards rural poverty. As a measure of "marginality" it is meant to capture the degree to which residents are marginalized or excluded from the development process that Mexican society is thought to be undergoing. It is therefore not just an index of economic deprivation, and may even be interpreted as an inverse measure of modernization. (CONAPO 1993: 5-20). Nevertheless, because of the difficulties associated with measuring non-monetary

forms of income already noted, the CONAPO index is preferable to an indicator of poverty based solely on wages.

As originally formulated, the CONAPO index of marginality is standardized and therefore only provides information about a municipality's position relative to other municipalities. It cannot measure changes in the level of poverty within a particular municipality over time. For this reason I recreate the index using a factor analysis with the same variables. The index is first created using data from the 1990 Census. The same factor loadings are then used in subsequent years.[5] This procedure makes changes in the marginality index score for a given municipality over time meaningful.[6] In order to verify the results of the regressions using the marginality index separate models are tested using the illiteracy rate as a measure of poverty.

The map in figure 2.4 shows the distribution of poverty in Mexican municipalities according to the revised index of marginality in 1990. Municipalities located in the southern states of Chiapas, Oaxaca and Guerrero, as well as those in the Huasteca Region in the northeast and the Sierra Tarahumara in the northwest have the highest indeces of marginality. Once again, municipalities with homicide rates in the

[5] The factor loadings for the nine variables listed above are (in the same order): 0.88, 0.90, 0.79, 0.74, 0.74, 0.73, 0.88, 0.61, 0.79. The eigenvalue for the factor is 5.62.

[6] Only four of the nine variables used in the calculation of the revised marginality index are available in the Population Count of 1995. The marginality index for that year is estimated by fitting a regression with those four variables in 1990 and then using the 1995 variables to predict the new scores.

top 15th percentile are identified with hatching. A visual inspection reveals a very strong association between greater poverty and higher homicide rates. Note however, that because the index of marginality also includes the percentage of residents living in small towns it is biased towards rural poverty (compare to the population density map in figure 2.3). The relation between marginality and homicide will be further examined in the regression analysis below. I will also test the association between income inequality and homicide using a ratio of individuals 12 years of age or older earning more than 5 times the minimum wage to those earning 2 times the minimum wage or less.

Finally, because the effect of economic distress may be due to a lack of employment opportunities rather than income levels, I also examine the impact of unemployment on homicide in Mexican municipalities. The analysis presented here with regards to unemployment should be considered as merely suggestive since the effect of unemployment on crime rates cannot properly be tested without a sufficiently long time series and one with much shorter time intervals. As Cantor and Land (1985) and Land, Cantor and Russell (1994) indicate, unemployment may be expected to have opposite effects in the short and long terms. Following a Criminal Opportunities perspective, they argue that unemployment decreases crime in the short term because it decreases the circulation of property and persons. Unemployment increases crime in the long term because it adversely affects individuals' economic position (see Hale and Sabbagh 1991 for a critique of this model). Several cross-

sectional studies have also found a direct positive relation between unemployment and crime (see Freeman [1985, 1995] and Chiricos [1987] for reviews), while Sampson (1987) argues that unemployment indirectly increases violent crime rates due to the disruptive effect it has on families. In the regression models below I use the percentage of individuals 12 years of age or older who worked 33 or more hours per week as a measure of full employment instead of the open unemployment rate because it is a better measure of labor market conditions in a country such as Mexico where there are few unemployment benefits and most people cannot afford to go completely without work for extended periods of time.

Ethnic Composition – A vast body of work on crime in the U.S. deals with the effect of the racial or ethnic composition of communities. Shaw and McKay (1942) argued that ethnic heterogeneity prevented agreement among neighborhood residents and was therefore conducive to social disorganization and higher delinquency rates. Recent studies have shifted attention away from the effects of ethnic heterogeneity *per se* and towards explaining the higher levels of homicide in predominantly African-American communities. While some authors attribute the higher homicide rates to cultural values that promote violence (Wolfgang and Ferracuti 1967), others explain these higher rates in terms of structural factors. In their study of criminal violence mentioned above, Blau and Blau (1982) argue that inequality between racial groups explains differences in homicide rates across metropolitan areas. Once inequality is taken into account racial composition has virtually no effect. Working

within the social control perspective, Sampson (1987) finds that high rates of homicide and robbery among African-Americans are explained by the disruptive effects of black male unemployment on African-American families. Finally, some sociologists have suggested that racial segregation leads to the concentration of poverty in pockets of U.S. inner cities, and that it is this concentration that is associated with crime (Massey 1995; Peterson and Krivo 1993).

In the analysis below I control for the ethnic composition of a municipality by introducing the percentage of individuals considered to be members of an indigenous group. Membership in one of the country's many indigenous groups is established by the ability to speak a native language, though this is clearly an imperfect measure. Defined in this way, indigenous people account for approximately 7% of the population 5 years of age or older.[7] Concentrated primarily in rural areas, they constitute one of the most economically disadvantaged sectors of Mexican society and may therefore be expected to exhibit the concentration effects described by authors writing on segregation in the United States. They may also be expected to experience higher homicide rates because they are frequently under attack by various armed groups and locked in disputes over land. On the other hand, many indigenous communities maintain strong social and political institutions that enable them to enforce norms and exercise control over community members. Thus, from the

[7] Though commonly used for statistical purposes, such a measure no doubt underestimates ethnic diversity in Mexico. This categorization groups together members of over 62 different linguistic groups.

perspective of social control theory, we may expect predominantly indigenous municipalities to exhibit lower homicide rates.

Figure 2.5 shows the distribution of members of indigenous groups according to their ability to speak a native language. The native groups are heavily concentrated in a few areas of the country. Among them are the Maya in the Yucatán Peninsula, the Nahuatl speaking groups in central Mexico, the Mixteco in the southern state of Oaxaca, the Tarahumara in the northwest and the Huasteco in the east. Comparing figures 2.5 and 2.4 we notice that the regions with greater concentrations of indigenous peoples are also characterized by high indices of marginality. However, the relation between the percentage of indigenous residents shown in gray scale and the areas with high homicide rates shown in hatching is weak.

Family Structure – Social control theorists argue that certain characteristics of family structure are conducive to higher levels of criminal activity in urban areas. Specifically, they posit that a high incidence of marital dissolution and the prevalence of single-parent households decrease a community's ability to prevent crime. The argument is not that single parents or their children are committing a disproportionate number of crimes, but rather that family disruption decreases social control at the community level. As Sampson and Groves (1989) put it, "two-parent households provide increased supervision and guardianship not only of their own children and household property, but also for general activities in the community. From this

perspective, the supervision of peer-group and gang activity is not simply dependent on one child's family, but on a network of collective family control." (p. 781)

The indicator of family disruption most commonly used in aggregate-level studies of homicide is the rate of marital dissolution. A high incidence of divorce and separation is consistently found to be associated with higher rates of homicide in U.S. urban areas (Land, McCall and Cohen 1990; Williams and Flewelling 1988; Messner and Tardiff 1986; Williams 1984; Blau and Blau 1982). Sampson (1987) also examines the effect of a large percentage of female-headed households on violent crime. He finds the percentage of African-American female-headed households to be the most important determinant of black juvenile robbery and homicide. Female headship is in turn determined by employment opportunities of African-American men.

Female-headed households may be expected to have a particularly strong effect on the organization of Mexican communities since as González de la Rocha (1986, 1988) argues, women in Mexico are more actively involved in establishing and maintaining neighborhood and kin social networks. Yet, because women heads of households must often carry out domestic work in addition to their paid employment, they have less time to invest in the creation and maintenance of social ties. This leaves these households more isolated and vulnerable, and may weaken social control

in their communities. Female heads of household may also be ostracized for violating various social norms.

In the regression analysis below I examine the effect of marital dissolution and female headship on homicide rates in Mexican municipalities. Female headship is measured as the percentage of households of any type headed by women according to the 1990 and 2000 censuses.[8] Marital dissolution is measured as the percentage of individuals 12 years of age or older who are divorced or separated. Both indices of family structure registered an increase during the decade of the 1990s. Between 1990 and 200 the average percentage of municipal households headed by women increased from 15.8% to 18.6%, while the average divorce and separation rate among individuals 12 years of age and older increased from 1.5% to 2.5%.[9]

One surprising difference with the United States is that female-headed households are associated with *higher* incomes in Mexico. At the aggregate level, the percentage of female-headed households and the marginality index are negatively correlated. At the individual household level, female-headed households have been found to have higher incomes per family member than male-headed households

[8] The number of separated or divorced individuals and the number of households headed by women are not available in the Population Count of 1995. Values for that year are imputed using linear interpolation.

[9] The census classifies individuals according to whether they are currently divorced or separated, not whether they have ever been divorced or separated. Those who have remarried are not included in the total.

(Echarri Cánovas 1995, INEGI 1999c, Boltvinik 2000a). In a separate section below I consider the association between the structure of Mexican families and homicide in greater detail including the impact of extended families, and the differential effect of family disruption in urban and rural areas.

Age Composition – The relation between age and criminal activity appears to be relatively invariant across societies and historical periods (Hirschi and Gottfredson 1983; Gottfredson and Hirschi 1990; see also Greenberg 1977, 1985 for an alternative explanation of the same relation). Young males account for a disproportionate amount of both offenders and victims of violent crime in most countries, and Mexico is certainly not the exception. However, age-specific offending and victimization rates reveal a slightly different pattern than in countries like the United States. Figure 2.6 shows the age-specific homicide victimization rates for males and females derived from mortality statistics for 1990. According to this figure the risk of being a victim of homicide is greatest for males between the ages of 25 and 29 and declines slowly for each cohort after that. Figure 2.7 shows the age-specific homicide offending rates based on the number of alleged offenders in 1990 (note that the series does not include juvenile offenders which are reported separately). The age-specific arrest rate peaks for males ages 20 to 24 and declines rapidly for older cohorts. The sharper decline in offending rates with age compared to the victimization rates suggests that while younger cohorts are committing a disproportionate number of homicides they

are not being victimized at commensurate rates.[10] This pattern is somewhat different from the United States where victimization rates decline more quickly with age. In the regression models below I include the percentage of the municipal population constituted by males 15 to 29 years of age as a predictor of the homicide rate. Because the analysis is based on homicide victimization rates obtained from mortality statistics rather than offending rates, and the former vary less with age we may expect the municipal age structure to be a relatively weak predictor. However, this expectation is based solely on the consideration of an aggregation effect and not an ecological one. It is possible that a greater proportion of young residents creates an overall loss of social control and an increase in violent crime regardless of the specific age of victims.

Law Enforcement – Several accounts of criminal violence emphasize the role of formal control exercised by law enforcement agencies. Rational choice theorists among others, argue that a high probability of punishment acts as a deterrent to crime (Becker 1968). An examination of the deterrent effects of law enforcement is beyond the scope of this dissertation and requires a longer time-series analysis (Saltzman et al. 1982). Nevertheless, in the models below I introduce the ratio of individuals charged with homicide by state and federal authorities to the number of homicides

[10] An alternative explanation is that young offenders are being prosecuted at disproportionate rates than older ones.

reported in mortality statistics in order to account for possible differences across municipalities due to variations in the efficacy of law enforcement.

Regional Differences – Studies of violent crime in the United States have often concentrated on the relative importance of regional cultural differences. While some researchers attribute higher rates of violent crime in the Southern states to a subculture of violence (Wolfgang and Ferracuti 1967), others find that these higher crime rates are explained by structural factors (Blau and Blau 1982). As discussed above, there are also persistent regional patterns in the distribution of homicides across Mexican municipalities. A clustering of municipalities with high homicide rates is evident in the northwestern part of the country, the northcentral and southcentral states and the Mexico Valley where the nation's capital is located. In the regression analysis I introduce dummy variables for municipalities in each of these four regions in order to test for differences that are not accounted for by the structural predictors. In addition, because this clustering of municipalities with high levels of homicide may also indicate the presence of spatial contagion across municipalities instead of spatial heterogeneity due to common structural or cultural characteristics I also test a spatial lag model in a separate section below.

2.4 Methods

The distribution of homicide rates in Mexican municipalities is heavily skewed towards lower values. It has the shape of a rapidly decaying function where

most municipalities have low homicide rates while a few have extremely high ones. Homicides are, after all, relatively rare events. Under these conditions, Ordinary Least Squares regressions lead to unreliable estimations (King 1988). The number of homicides in each municipality more closely resembles a positive count variable of the sort commonly encountered in epidemiological studies. In such cases, a different type of regressions known as negative binomial regressions are more appropriate (Beck and Tolnay 1995). Negative binomial regressions are similar to the more commonly used Poisson regressions in that the underlying distribution of the dependent variable is assumed to be close to a Poisson distribution, and maximum likelihood estimation is used. However, whereas Poisson regressions assume that the variance of the dependent variable is equal to its mean, negative binomial regressions allow for greater dispersion. Because the variance of the number of homicides in Mexican municipalities is considerably larger than its mean, I use negative binomial regressions instead of Poisson regressions in the analysis that follows.

In order to take advantage of the repeated information available for each municipality over time, the number of homicides along with the predictors for each of the three years are pooled into a single dataset. Random effects negative binomial regression models are then used to test the effect of municipal characteristics on the incidence of homicide. These models assume that the number of homicides in a municipality i at time t follows a Poisson distribution with mean γ_{it}:

$$y_{it} \sim \text{Poisson}(\gamma_{it})$$

where γ_{it} has a Gamma distribution with parameters λ_{it} and $1/\delta_i$:

$$\gamma_{it} \sim \text{Gamma}(\lambda_{it}, 1/\delta_i)$$

λ_{it} is a function of the municipal characteristics $\boldsymbol{x}_{it}$ and an offset term that captures the size of the population exposed to the risk of homicide:

$$\lambda_{it} = \exp(\mathbf{x}'_{it}\boldsymbol{\beta} + \text{offset}_{it})$$

where $\text{offset}_{it}=\ln(pop_{it})$.[11] Allowing γ_{it} to have a Gamma distribution results in an overdispersed Poission distribution. In fact, it can be shown that the Poisson-Gamma mixture leads to a probability for y_{it} that follows a negative binomial distribution with parameters γ_{it} and $1/\delta_i$ (see Cameron and Trivedi 1998: 100-102). The municipality-specific term δ_i is the dispersion parameter and is analogous to the disturbance added to the linear combination of predictors in linear panel models. In the random-effects overdispersion models used throughout most of this chapter δ_i is allowed to vary across panels such that for each panel $1/(1+\delta_i)$ follows a Beta distribution (instead of a normal distribution usually assumed for the disturbance term in linear random effects models). In the final section of this chapter I will consider fixed effects negative binomial regression models where the dispersion parameter δ_i is not randomly distributed but "fixed" by conditioning the probability of the number of

[11] Because the size of the group exposed to the underlying rate is the municipal population, the incidence rate is the number of homicides per person-year. In other words, the regression coefficients can be interpreted in terms of the magnitude of the association between each variable and the underlying homicide rate.

homicides in each municipality on the sum of the homicides in that municipality across time.[12]

The random effects negative binomial regressions have three important advantages over the fixed effects regressions. The first advantage is that, like their linear counterparts, the estimates of the random effects models are not conditional on the sample, that is they allow out-of sample inference. To understand the second, and more important advantage of the random effects models we must first call attention to a crucial difference between the negative binomial models for panel data and their linear counterparts. In the negative binomial models what is "fixed" or "random" is the dispersion parameter *not* the effects of the predictors $\mathbf{x}'_{it}\boldsymbol{\beta}$. One of the crucial advantages of the fixed effects linear models as compared to the random effects linear models is that they eliminate the effects of any unmeasured individual characteristics that are stable over time (and therefore captured in the individual-specific disturbance term) (see Greene 2000; Judge, et al. 1988; England 1988). However, this is *not* the case in the negative binomial fixed effects models. In these models the dispersion parameter is constant and drops out of the calculations just like the disturbance term in the fixed effects linear models, but because $\mathbf{x}'_{it}\boldsymbol{\beta}$ is not fixed the effects of time-

[12] For a more complete description of random and fixed effects negative regressions see Cameron and Trivedi 1998; Hausman, Hall and Griliches 1984; and *Stata Release 7.0 Reference Manuals.*

invariant municipal characteristics are *not* eliminated.[13] Fixing the disturbance term in this way therefore imposes awkward conditions on the models without attaining one of the main advantages of fixed effects regressions in the linear case. A third problem is that because of the way the conditional fixed effects negative binomial regressions are implemented, cases in which the dependent variable takes on a value of zero in all time points (280 out of 1858 municipalities) are dropped from the analysis, or a constant must be added to all cases in order to prevent their exclusion.

To sum up, negative binomial regressions are preferable to linear regressions because of the extreme skewness of dependent variable.[14] They are also preferable to Poisson regressions because the homicide count variable is overdispersed (it has a variance that is substantially greater than its mean). Secondly, pooling the data corresponding to all three years and using panel models is preferable to testing cross-sectional models for each year independently because I am able to take advantage of repeated information for each municipality and say something about the effect of changes in the predictors on homicide rates over time. Finally, random effects negative binomial models are preferable to fixed effects negative binomial models

[13] A clear indication of this is the fact that in the negative binomial fixed effects regression models we can actually estimate the coefficients of variables that do not change over time (such as the regional dummies), which we cannot do in the linear fixed effects models.

[14] In separate analyses not presented here most of the results were replicated by taking the natural logarithm of the homicide rate and using linear regressions. However, a constant was added to the number of homicides before taking the natural logarithm in order to prevent the exclusion of municipalities with no registered homicides. The results were sometimes sensitive to the magnitude of the constant added.

because: the estimates are not conditional on the sample; they do not impose the restriction that the dispersion parameter be fixed without gaining any of the advantages associated with linear fixed effects models (in other words, the effects are not really "fixed" as explained above); and they do not require the addition of a constant to the homicide count in order not to drop cases with no registered homicides in all three time points.

One final point with regards to the interpretation of the regression results is worth mentioning. In the negative binomial regressions the municipality-specific effects are multiplicative rather than additive because λ_{it} is an exponential function of $\mathbf{x}'_{it}\boldsymbol{\beta}$. This means that the results of the regressions must be expressed as incidence rate ratios or in terms of the percentage increase in homicides per population associated with an increase in each independent variable instead of slopes. In other words, the exact magnitude of the increase associated with a change in a given predictor will depend on the values of the remaining variables. This interpretation is no different than what would be required if linear regressions were used and the dependent variable was transformed using the natural logarithm.

2.5 Results

Table 2.3. shows the results of the baseline random effects negative binomial regression model as well as those for the models using alternative measure of urbanization. Contrary to the assumptions of social disorganization theorists who

argue that urbanization and higher population density lead to greater anonymity and a loss of social control, a larger number of residents per square kilometer is consistently found to be associated with *lower* rates of homicidal violence. Similarly, municipalities with a greater percentage of residents living in towns of less than 2,500 have higher homicide rates while those containing cities of 100,000 or more have lower rates when all other factors are included in the regressions. These findings suggest that either rural communities in Mexico suffer from social disorganization or their greater organization is conducive to more organized forms of violence. As some anthropologists have suggested, the strength of communities may be reflected in violence against violators of social norms, so that social control may actually be positively associated with violence (Taylor 1979).

Second, in contrast to the findings of studies of segregation in the United States, municipalities with higher concentrations of members of indigenous groups appear to have *lower* rates of homicide though the magnitude of the corresponding coefficients is small. It may be the case that stronger social institutions and greater social cohesion in predominantly indigenous communities may help reduce the level of violence. However, we should be cautious in interpreting this result. It is possible that the negative regression coefficient may simply reflect an under-reporting of deaths due to homicide in those areas.

Third, as expected based on the age distribution of homicide victims discussed above, a higher percentage of municipal residents constituted by young males is associated with higher homicide rates. However, the association is not particularly strong, and does not reach statistical significance in some models (see tables below). The relatively small coefficient suggests that the decline in homicide rates in Mexico during the 1990s cannot be attributed to a change in the age structure of the population. Between 1990 and 2000 the number of young males 15 to 29 years of age in Mexican municipalities declined as a proportion of the population from an average of 13.0% to 12.4%. According to the results of the baseline model, a decrease in the percentage of young males of this magnitude is associated with a decline in the municipal homicide rate of only 2.4%, all else remaining equal. In order to further test the effect of changes in the age structure of the population, a fertility index given by the ratio of children under the age of 5 to the number of women 14 to 49 years of age, was entered into a separate regression not reported here (see Sampson 1987 for the use of a similar index). The results also indicate that a younger population (i.e., a higher fertility index) is weakly associated with more homicides per population.

Table 2.4 shows the results of the regression models examining the effect of resource deprivation on homicide. Among all the indicators considered in this chapter, the index of marginality stands out as one of the strongest predictors of homicide rates in Mexican municipalities. According to the regression coefficient in model 2, one standard deviation increase in the marginality index is associated with

an astonishing 27.8% increase in the homicide rate.[15] Since the marginality index may be considered a measure of extreme resource deprivation, we may conclude that poverty is strongly associated with higher homicide rates. Alternatively, if we consider the index of marginality as an inverse measure of modernization then this finding clearly supports the notion that homicide rates are inversely related with the degree of modernization.

The association between poverty and higher homicide rates is corroborated by the positive coefficient of the illiteracy rate (see also the models below). The illiteracy rate is only one of the nine component variables of the marginality index but has the advantage of being available for all three time periods. For this reason it is used as a control variable in many of the models discussed below.

The inequality index given by the ratio of high to low wage earners is also a significant predictor of homicide, albeit with a very small coefficient—one standard deviation increase in the index is associated with a mere 2.5% increase in the homicide rate. However, the direction of association is somewhat surprising. Since there are many more low wage earners than high wage earners in virtually every

[15] As with the coefficients for all other variables in the models presented throughout this dissertation, the exact magnitude should be interpreted with caution since they are dependent on the methods used. The results presented in the tables are more useful in establishing the direction of association, the statistical significance and the relative importance of different indicators than in measuring the exact magnitude of the effects. However, regardless of the type of regression models, the coefficient of the marginality index was considerably greater than that of most other variables introduced.

municipality, the ratio is almost always lower than one (mean=0.06). Therefore, a higher value of the inequality index almost invariably indicates a more equitable income distribution among residents. This result may be interpreted as contradicting strain theory, according to which a more equitable distribution should be associated with lower homicide rates instead of higher ones. However, the unexpected result may also be due to measurement problems. First, as mentioned earlier, measures of income based solely on wages are notoriously inaccurate in a country such as Mexico. Other non-monetary forms of wealth generation constitute an important part of the income of rural residents. Second, the simple ratio of high to low wage earners may not accurately capture the distribution of income even among wage-earning residents and its effect may be sensitive to the exact threshold values used.

In order to further examine the effect of resource deprivation on the incidence of homicide I also tested regression models using the percentage of individuals 12 years of age or older who earn two minimum wages or less and those earning more than 5 minimum wages as separate predictors (instead of using their ratio). Surprisingly, the higher percentage of low-income earners is associated with lower homicide rates, though this may also be a result of measurement problems. Finally, the results of the last model in table 2.4 indicate that unemployment has a significant impact on homicide. An increase of one standard deviation in the percentage of individuals employed for 33 hours or more per week (i.e., not under-employed) is associated with a 7.8% decrease in the municipal homicide rate.

Taken as a whole the results of the models in table 2.3 suggest that resource deprivation has an important positive effect on the level of homicide in Mexican municipalities (positive in terms of magnitude not the desirability of the outcome). It is therefore surprising that the economic crisis of the mid-1990s did not result in an overall rise in homicide. The mid-decade economic downturn was indeed severe. In 1995 alone (the worst year of the crisis) the Mexican economy contracted by over 6% and the open unemployment rate jumped 68%. Yet during that same year and for each subsequent year the national homicide rate continued to decline. Nevertheless, despite the downturn in the economy in the mid 1990s many of the indicators introduced in the models posted a modest gain by end of the decade. The rate of full employment (those working 33 hours per week or more) actually registered an overall increase from a municipal average of 29.0% in 1990 to 31.9%. This small increase in employment accounts for only a 3.4% decrease in the homicide rates. More significantly, the index of marginality decreased from an average of 0.0 to -0.7, which corresponds to a decline of 16.1% in the homicide rate.

The association between family structure and homicide will be considered in a separate section below. However, the results of the regression models presented in tables 2.3 and 2.4 indicate that a high prevalence of female-headed households is associated with higher homicide rates. Based on the large positive coefficient of the law enforcement efficacy index, the level of formal social control exercised by the

state may be thought to have a strong mitigating effect on homicide. However, as mentioned above, a proper analysis of the deterrent effects of law enforcement requires the kind of longitudinal data that are not currently available for Mexico. The coefficient of the law enforcement efficacy indicator should be considered as merely suggestive. In separate analyses not presented here the total municipal spending on police was found to be associated with a small decrease in homicide rates. Finally, significant differences in the homicide rates persist for municipalities in the Mexico Valley as well as the southcentral and northwestern states when all the variables described above are entered into the regression models. Municipalities in the Mexico Valley stand out for their unusually high rates of violence. Once other factors are controlled the municipalities in that region have homicide rates that are 136% higher.

2.6 New Dimensions of Family Structure: The Effect of Extended Family Households

When social control theorists examine the relation between family structure and crime they usually focus on the effects of marital dissolution and to a lesser extent, female headship. As discussed above, the underlying argument is that two-parent households increase guardianship and supervision in communities. In the previous section I found the percentage of female-headed households to be an important predictor of homicide rates in Mexican municipalities. In this section I consider the effect of marital dissolution. More importantly, I also argue that Mexican family practices force us to consider a new dimension of family structure that has not

been examined in studies of crime in the U.S., namely extended families. What happens in a societal context where extended family units are more common? Does the incorporation of extended family members into a single-parent household make up for the loss of supervision and guardianship? Does the prevalence of extended families in general help strengthen community ties and therefore lower crime, or is family extension symptomatic of greater social disorganization?

I identify two competing hypotheses regarding the effect of family extension on community social control and crime. First, insofar as they raise the number of adults present in the household, extended families may be expected to increase social ties within a community and encourage a greater degree of civic participation. For the same reason, family extension may also be expected to increase guardianship over property and persons, and lead to lower crime rates. On the other hand, family extension in Latin American countries has been linked to factors which may inhibit social control, especially female headship. As Tienda and Ortega (1982) argue, the incorporation of extended family members into the household unit is a strategy commonly employed by female heads of household. It allows this disadvantaged group to increase their household income by adding wage earners or by providing domestic work which allows women to seek employment outside the home. In this sense, family extension may be seen as a consequence of family disruption and symptomatic of greater social disorganization.

In the regression models below I use the percentage of households constituted by nuclear families according to the 1990 and 2000 censuses as a predictor of municipal homicide rates.[16] The percentage of nuclear families is used instead of that extended ones simply because they are easier to identify. Nuclear families are defined as all those composed of a parent and his or her children, a couple living alone, or a couple with their children. In 1990 74.5% of all households were made up of nuclear families. By 2000, nuclear family households constituted 68.7% of all households in the country. Because nuclear families tend to be smaller I control for family size by including the percentage of families with 4 members or less in the regression models. Finally, in order to test whether the association between family extension and homicide varies by degree of urbanization, interaction terms are created for municipalities where more than 75% of the population lives in towns of less than 2,500 in 1990, and for municipalities containing a city with population of 100,000 or more that same year.

The results of the random effects regression models are shown in table 2.5. First, a higher percentage of divorced or separated individuals 12 year of age and older is associated with higher homicide rates. An increase of one standard deviation in the divorce and separation rate corresponds to a 12.7% increase in the incidence of homicide. As in studies of violent crime in the United States, high rates of family disruption appear to be conducive to more crime. Since the divorce and separation

[16] Values for family organization and size for 1995 are estimated using linear interpolation.

rate in the average Mexican municipality increased from 1.5% to 2.5% of individuals 12 years of age or older between 1990 and 2000, this increase alone should have led to a 14.1% rise in homicide rates were it not for changes in other predictors. Second, the association between female headship and crime already mentioned holds even when controlling for the other indicators of family structure. However, contrary to Sampson's (1987) study of violent crime in the U.S., separate analyses not presented here indicate that female headship in Mexico is negatively associated with the various measures of economic hardship.

Finally, family extension is not significantly associated with the homicide rate at the national level. However, when the interaction terms for urban and rural areas are included the results are quite strong and in opposite directions. An increase of one standard deviation in the percentage of nuclear families corresponds to a decrease of 19.7% in the homicide rate in urban areas and an increase of 11.4% in rural areas. In other words, the two hypotheses outlined above appear to be operative according to the level of urbanization. In rural areas, extended families may indeed increase social control by increasing the number of adults present in the home and by increasing ties between households and the broader community. However, in urban areas family extension may be more symptomatic of family disruption.[17]

[17] An alternative explanation for lower homicide rates in rural municipalities with larger percentage of extended family households may be drawn from the work of Roger Gould (1999, 2000) on feuding in nineteenth century Corsica. Extended families may provide a disincentive for individuals to commit violent crimes against members of large and united family units for fear of reprisal by extended kin. This is an individual-level explanation rather than ecological, and can therefore not be tested with aggregate data without committing an ecological fallacy.

2.7 Replication of Findings Using Offending Rates

The results presented so far are based on regressions using the homicide rate computed from vital statistics as the dependent variable. As discussed earlier, vital statistics are by far the most accurate source for estimating homicide rates in Mexican municipalities. They use an internationally recognized system for the classification of the causes of death and are therefore not affected by differences in the definition of homicide in state laws. Unlike rates computed from the number of individuals charged with a homicide offense they do not introduce the biases in prosecution. Nevertheless, mortality statistics may still contain considerable measurement error. For this reason I replicate my findings using alleged homicide offender rates. The Mexican National Statistics Institute defines alleged offenders as all those who have been officially charged with homicide by the corresponding state or federal prosecutor's office.[18] The total number of alleged homicide offenders charged under federal and state laws is used to compute homicide offending rates. Because the number of individuals against whom charges are brought will depend on the amount of resources available to local law enforcement institutions alleged homicide offender rates are biased towards wealthier and more urban municipalities. For this reason I

[18] Under Mexican law, once charges are brought against an individual the court has 72 hours to issue a resolution as to whether he or she must stand trial. For statistical purposes an individual is considered to be a alleged offender regardless of whether he or she is indicted. In the regression analysis I use the municipality in which the alleged offense is thought to have occurred rather than that where the alleged offender resides.

expect the coefficients of the resource deprivation and urbanization variables to be smaller.

The coefficients of the regression models using the number of individuals charged with a homicide offense as the dependent variable are shown in table 2.6. These results essentially corroborate the findings presented in the previous sections. With the exception of the regional dummy variables all the coefficients are statistically significant and have the appropriate sign. As expected, the magnitudes of the coefficients for the population density, the illiteracy rate and the marginality index are considerably smaller than in the models using mortality statistics. In particular, the coefficient for the index of marginality is 45% smaller than before. Interestingly, a greater percentage of young males is associated with a larger increase in the rate of homicide offenders than homicide victims (66% larger). This larger effect is consistent with the difference in the age-specific offending and victimization distributions described earlier. Those curves showed a much steeper decline in offending rates with age. The sign of the coefficient for the index of law enforcement is of course inverted since a greater efficacy will lead to more arrests and charges brought against alleged offenders. More surprisingly, however, there appear to be few significant regional differences in the offending rates once all other factors are taken into account. Only the northwest dummy is significant in one of the models presented. Despite attempts by the National Statistics Institute to homogenize the definition of criminal offenses across state boundaries, it is possible that the lack of

statistical significance of the regional dummies may reflect differences in the state penal codes. It is also possible that the regional dummies are measuring the effect of limitations on state resources not captured by the measures of resource deprivation and law enforcement efficacy. For instance, while the southern states have higher victimization rates according to previous results, they are also among the poorest in the nation.

2.8 Female and Juvenile Victims

The results presented so far are based on estimates of all the homicides occurring in a municipality. In this section I apply the same regression models to the number of female victims obtained from mortality statistics in order to identify whether patterns of homicidal violence towards women differ from men. I also test the models using an estimate of young homicide victims computed as the proportion of alleged offenders between the ages of 16 and 29 multiplied by the homicide rate obtained from mortality statistics. This estimate of young victims is problematic because it is based partly on offender data. Specifically, this estimate assumes that the likelihood of a homicide offender being charged for that crime does not depend on the offender's age. Secondly, because there is not a uniform set of criteria by which cases are sent to the juvenile correction system in each state (and therefore not reported in official crime statistics), the number of young alleged offenders are not strictly comparable across states. Finally, and most problematic, this estimate assumes that

young victims constitute the same proportion of all victims as young offenders constitute of all alleged offenders.

Despite these measurement problems it is important to consider the differential effect that municipal characteristics may have on female and juvenile homicide rates not only because the death of women and young persons by homicide is an important social problem. These differences may also reveal further information about the underlying mechanisms at work. If higher homicide rates are indeed due to weaker social controls then we should expect a stronger or weaker association between certain key variables and the incidence of homicide of women and young persons. For instance, criminal behavior and victimization among the young should be more sensitive to guardianship and adult supervision. Therefore, if social control theory is correct, we should observe a stronger association between characteristics of family structure conducive to more adult supervision and juvenile homicide rates.

Table 2.7 shows the results of the regression models using juvenile homicide rates as the dependent variable. When we compare the regression coefficients with those for the national sample in tables 2.3, 2.4 and 2.5 we notice some important differences.[19] First, the coefficient for population density is 40% smaller than in the regression using total homicide rates. Similarly, in regression results not shown in the

[19] All the differences in the regression coefficients reported in this section were significant at the 0.05 level.

table, municipalities containing cities with populations of 100,000 or more had juvenile homicide rates that were 82% greater than the rest. These two results indicate that juvenile homicide is higher in more urban areas. This finding is consistent with social control theory in that urban communities generally exercise less supervision of local youths and grant them more anonymity than small towns. Second, though the percentage of female-headed households has a similar coefficient as in the models using the total number of homicide victims to compute the dependent variable, the coefficient for the divorce and separation rate is 78% larger (one standard deviation increase in the divorce and separation rate is associated with an astounding 23.8% increase in the homicide rate). In other words, the juvenile homicide rate is more sensitive to marital dissolution than the rate of homicide for other age groups. This finding is again consistent with social control theory. Surprisingly however, the juvenile homicide rate is slightly less sensitive to resource deprivation as measured by the marginality index. Finally, the regional differences observed in the original regression models are greatly diminished. Two of the coefficients for the regional dummies are no longer statistically significant, and the coefficient for the northcentral region is actually negative. Taken at face value, these results would indicate that the greater overall homicide rates in those regions are due to greater rates among older cohorts. However, because the juvenile homicide rates are estimated using the number of prosecuted offenders these differences in the coefficients of the regional dummies may be due to the biases inherent in these data described above.

Table 2.8 shows the results of the regression models using female homicide rates. The coefficients are strikingly different from the ones using the total rates, and reveal important characteristics of homicidal violence towards women in Mexico. First, the coefficient for the percentage of young males is 190% greater than in the original regressions. It is quite likely that young males are disproportionately perpetrating violent crimes against women. However, we cannot arrive at such a conclusion based on this aggregate-level analysis without committing an ecological fallacy. Instead, this result should be considered as strongly suggestive until a more detailed individual-level study is carried out. The second noticeable difference with the results of the original regression models is that both measures of resource deprivation appear to have considerably smaller effects on female homicide rates. The coefficient for the marginality index, which was one of the most important predictors of the overall homicide rate, is 65% smaller and no longer statistically significant. In other words, homicidal violence towards women is no more likely to occur in poorer (or less "modern") communities than in wealthier ones. From a social control perspective, it is possible that the social cohesion among community members and greater organizational participation that is supposed to be more common in less disadvantaged communities may not protect women against homicidal violence which occurs more often in the home. Finally, the coefficients for all the regional dummy variables are larger, except the one corresponding to the northwest region.

2.9 Drug Traffic

One of the limitations of community-level theories of crime is their general neglect of how broader social processes whose scope transcends the community may affect local social dynamics. In the next two sections I consider two examples of how the Mexican case encourages us to think of how transnational processes may have an impact on local social dynamics and crime. I first examine if the traffic of illegal drugs through Mexico, and their production for export to the United States, is associated with higher homicide rates. I then consider the effect of international migration on homicide. I suggest several ways in which outmigration may disrupt the social organization of Mexican communities and lead to an increase in criminal violence.

The problem of illegal drugs in Mexico is one of production and traffic more than consumption.[20] Because of their inability to legally enforce contracts criminal organizations involved in drug production and trade often resort to violence to settle disputes and maintain internal discipline. However, as in other drug-producing countries such as Colombia, the number of violent deaths directly attributable to the drug industry is probably too small to account for differences in aggregate homicide rates across municipalities (Gaviria 1998). Therefore, any effect induced by the

[20] The use of most drugs is still quite low by international standards. According to the National Survey of Addictions conducted by the Secretary of Health in 1998 only 1.23% of Mexicans between the ages of 12 and 65 had used an illegal drug during the past year, while 5.25% had done so at some point in their lifetime (*La Jornada*, July 12, 1999).

production and traffic of illegal drugs must be indirect. Drawing on existing theories of crime from the field of economics, I suggest three possible ways in which a growth in the drug trade may have spilled over to other types of crimes. The first hypothesis has to do with the effects of drug traffic on the state's capacity to exert formal control. A growth of drug-related crimes may have overwhelmed the law enforcement system and stretched out its resources (see Sah 1991). That is, if more crimes are committed while the resources spent on law enforcement remain constant, then less resources are available to investigate and prosecute each crime. This congestion of the law enforcement system in effect lowers the probability of punishment and may therefore be suspected of making criminal activity more appealing to others. If this hypothesis is correct we should expect to find lower conviction rates in areas with more drug-related activities along with higher crime rates. As in most economic models dealing with the deterrent effects of law enforcement, the implicit theoretical assumption is that variations in formal sanctions, and not so much informal social control at the community level, are responsible for differences in crime rates. Consistent with rational actor formulations, crime is assumed to decrease as the likelihood of apprehension increases thus raising the expected costs (Becker 1968).

A second way in which the production and traffic of drugs may result in an increase in other types of crimes such as homicide is through the transfer of knowledge and technology from the drug cartels to other groups. Such transfers may happen through alliances between criminal organizations, contact between convicted

offenders in prisons, or the sale of guns and other equipment (Gaviria 1998). Finally, evidence from journalistic accounts suggests that members of the most prominent cartels have diversified their activities into other types of crimes such as armed robbery and kidnappings. The experience and organization in the drug trade lowers the cost of entry into other criminal activities in a similar way as legal business operations in one area lowers the cost of participating in related fields and in nearby areas. To these three factors we may add the more intangible effect that the growth of the drug trade may have on social norms and values making criminal activity seem more acceptable.

Unfortunately, the scarcity of information on the production and traffic of drugs through Mexico makes it impossible to test the relative importance of these three mechanisms at the municipal level. The only available indicator is the number of alleged offenders charged with drug-related crimes or "delitos contra la salud". This broad category of crimes includes everything from drug possession to production and sale and therefore does not allow us to distinguish the relative importance of each of these different types of offenses. Moreover, because it is based on the number of charges brought against individuals, this indicator is biased according to the efficacy of local law enforcement institutions and the willingness to prosecute drug offenders. Figure 2.8 shows the distribution of alleged drug offenders per population across Mexican municipalities in 1990. Despite the crudeness of the indicator it appears to identify the regions of the country known for the production

and traffic of illicit drugs. The darker-shaded areas in the border regions clearly demarcate the zones of influence of the Tijuana, Juárez and Gulf cartels. Similarly, the higher rates of drug-related crimes along the northwestern states of Jalisco, Nayarit, Sinaloa and Sonora confirm this region's reputation as the nation's most important drug corridor. Although there does not appear to be a strong association between these areas characterized by a high incidence of drug-related crimes and those with higher homicide rates identified with hatching for 1990, they do coincide with those experiencing the largest *increases* in homicide during the decade.

Table 2.9 shows the results of the regressions where I introduce the rate of alleged drug offenders as a predictor of homicide. The corresponding regression coefficient is positive and statistically significant. An increase of one standard deviation in the number of alleged drug offenders per population is associated with a modest 6.5% increase in the homicide rate once all other variables in the models are taken into account. Because the number of individuals charged with drug-related crimes is likely to depend on many factors other than actual offending rates, I also test a second model using a simple dummy variable to indicate municipalities where drug charges were filed against *any* individual instead of the drug offending rate. The coefficient is again positive and statistically significant. Municipalities where at least one individual was charged with a drug offense (707 out of 1,888 municipalities in 1990) had homicide rates that were 22.1% higher than those where no such charges were filed.

These results do not allow us to distinguish between the effects of drug production and traffic. However, additional information on drug offenses is available at the state level. The Federal Attorney General's office (PGR) reports the amount of marihuana and poppy eradicated (in kilograms and hectares of surface area) by state (INEGI 2000). It also reports the amount of marihuana, opiates, cocaine and psychotropic drugs seized, as well as the number of people detained and weapons seized in drug-related charges. Figures 2.9a through 2.9e show scatterplots of the homicide rate versus five different measures of drug production and traffic for the 31 states and the Federal District along with the bivariate regression line and regression coefficient for 1999. The relation between some measures of the production and traffic of illegal drugs and homicide appear to be rather weak at the aggregate state level. However, the association between drug production—measured by the number of hectares of marihuana plants (figure 2.9a)—and homicide is considerably stronger than that between drug traffic—measured by the amount of marihuana and cocaine seized (figures 2.9b and 2.9c)—and homicide. The same pattern holds for 1995 and 1998, the two other years for which comparable data are available. Finally, the number of people detained on drug charges, and especially the number of weapons seized in drug-related operations, are strongly related with higher homicide rates. The

latter findings suggests that the association between the drug industry and homicide may be due to the greater availability of guns.[21]

2.10 International Migration

In this section I consider the impact of international migration on homicide rates in Mexican municipalities. I propose and test four different hypotheses for why migration may affect crime rates in sending communities. The hypotheses are a natural extension of social disorganization theory as described in earlier sections of this chapter, and therefore do not require the development of an entirely new theoretical framework. The propositions put forth in this section constitute one of the clearest examples of how the study of crime in the context of a developing country requires the consideration of a new set of factors.

1) *Weakening of social ties* – Researchers since the days of the Chicago School of sociology have argued that residential mobility leads to a loss of social control and higher crime rates. Communities characterized by a rapid turnover of residents are thought to have weaker social networks that are essential for enforcing norms and stemming criminal activity (see for instance Sampson [1985]).

[21] Obviously, these findings are only suggestive. Bivariate relations do not control for all the variables found to be important predictors of the homicide rate in the analysis using municipal-level data. More importantly, the state-level correlations are only for a single year. A longitudinal analysis is still needed to determine the relation between changes in production and traffic may have been responsible for changes in homicide rates. Finally, the relation between the two sets of variables may be spurious rather than directly causal: drug traffic and violence may be more common in states with certain characteristics such as a young population, a corrupt law enforcement system, etc.

International outmigration may be linked to higher homicide rates simply because it implies greater residential instability. By definition, seasonal and permanent migrants will spend less time in their communities of origin and are therefore likely to have weaker ties with other residents. These weaker ties may have broader repercussions for their entire communities. This is the reverse process that Chicago School theorists examined. Whereas they were interested in how waves of migrants *to* Chicago affected the organization of communities, I am proposing that outmigration *from* Mexican towns may also affect crime. One way to test this proposition is to compare the effects of domestic and international migration. If the hypotheses is true, that is if international migration affects crime rates simply because it promotes residential mobility and thereby weakens social networks, then we should expect interstate and international migration to have roughly the same effect. Moreover, we should also expect the effect to disappear once residential stability—the percentage of longtime municipal residents—is taken into account in the regression models.

2) *Female Headship* – International outmigration may also affect homicide rates due to the disruptive effects it has on Mexican families. Typically, the male head of household is absent for extended periods of time while working in the U.S. (though this pattern is changing, see Cornelius 1992). According to the results of regression models above, female headship is an important predictor of municipal homicide rates. It is therefore possible that international outmigration may affect the incidence of homicide indirectly by increasing the percentage of female-headed households. This

proposition can be tested by controlling for female headship in the regression models. Secondly, it can also be tested by considering the relative impact that the international migration of men, as opposed to women, has on the municipal homicide rate. If international migration affects the level of criminal violence in Mexican communities due to the disruption of families that occurs when men travel to the United States in search of better employment opportunities, then we should see a greater association between the percentage of male migrants and homicide rates.

3) *Income Inequality* – International outmigration increases income inequality between families that receive remittances from members living abroad and those that do not. Income inequality has in turn been associated with higher homicide rates. It is therefore possible that the effect of international migration on homicide may be mediated by its effect on income distribution among municipal residents. This proposition can be tested by controlling for income inequality in the regression models along with the indicator of international migration.

4) Drug Traffic – International outmigration may also affect the level of homicidal violence by promoting drug traffic between sending and receiving communities. Ethnographic work by Alejandra Casatañeda (2000) in the municipality of Aguililla, Michoacán and Redwood City, California suggests that the traffic of drugs between these two communities was facilitated by the movement of migrants back and forth. Moreover, feuds between the principal families involved in the drug

trade resulted in numerous deaths in both sides of the border. This proposition—that the effect of international migration is mediated by its effect on the traffic of drugs—can be tested controlling for the rate of alleged drug offenses in the regression models.[22]

Data to test these hypotheses are drawn from the 2000 Census which was the first one to include questions about international migration. The questionnaire asked respondents whether any member of the household lived abroad five years prior to the interview (that is, in 1995). This measure is clearly deficient in that it captures the percentage of returning migrants rather than those currently living abroad (even if it were available the latter measure would also be problematic because it would not count all those migrants whose entire households were living abroad). However, compared to previously existing estimates of outmigration based on regional samples (INEGI 1999b; Colegio de la Frontera Norte 1999), the Census estimates have the advantage of covering the entire country and measuring migration at the municipal level.[23]

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[22] A more complete analysis of the direct and indirect effects of the mediating variables in this section would require the consideration of many other factors, and is beyond the scope of this dissertation. My objective is simply to establish whether there is any measurable effect once the intervening variables are taken into account.

[23] Since we are not so concerned with the exact magnitude of the effect, the percentage of current residents who lived abroad five years prior to the interview is appropriate for our purposes so long as we assume no regional differences in the rate of returning migrants relative to those still living abroad, and no major shifts in the distribution of the municipality of origin of international migrants over the last 5 years.

Figure 2.10 shows the rate of international outmigration from Mexican municipalities according to the percentage of residents who reported having lived abroad in 1995. The clustering of municipalities with the highest migration rates corresponds to areas of the country known to be traditional sending communities. In addition to municipalities along the northern border of the country, those in the states of Durango, Jalisco and Michoacán stand out for their high rates of international migration.[24] The relation between outmigration and homicide is not immediately evident in the map. To isolate the possible effect requires the inclusion of this indicator along with the other variables in the regression models.

Table 2.10 shows the results of the negative binomial regression models testing the association between international migration and homicide. Because indicators of international migration are only available for 2000 these are cross-sectional models and do not take into account changes over time. According to the results of the first model in the table the percentage of international migrants is strongly associated with more homicides per population. An increase of one standard deviation in the percentage of residents that lived abroad five years prior to the census corresponds to a 15.5% increase in the homicide rate. The results of the second model corroborate social disorganization theorists claim that residential stability—measured as the percentage of current municipal residents who lived in the same municipality

[24] An inverse relation between international outmigration and poverty is clearly discernible when comparing figures 2.7 and 2.3.

five years before—is negatively associated with homicide. However, even when controlling for residential stability, the coefficient for the percentage of international migrants remains positive and statistically significant. Moreover, the results of the third model indicate that while the percentage of interstate migrants is also a significant predictor of homicide, its magnitude is much smaller than that for the percentage of international migrants in the same model. These two findings suggest that while important in its own right, residential instability fails to account for most of the effect of international migration on homicide.

The fourth model in table 2.10 compares the impact that the migration of men and women have on homicide rates at the municipal level. The results are indeed surprising. The magnitude and sign of the regression coefficients indicate that the migration of women has a *much larger* positive effect on the homicide rate than the migration of men. An increase of one standard deviation in the percentage of female migrants is associated with a 51.7% increase in homicide compared to 25.3% decrease associated with one standard deviation increase in the percentage of male migrants. This finding clearly contradicts the second hypothesis that suggests that the effect of international migration is due to the disruptive effects the migration of men has on Mexican families. Moreover, the larger coefficient for the migration of women is consistent with the notion put forth earlier that women play a disproportionate role in the preservation of social order in Mexican communities.

The final two models in table 2.10 test the hypothesis that the effect of international migration on homicide in Mexican municipalities is mediated by the effect of the former on income inequality and drug traffic. The coefficients for the ratio of high to low wage earners and the rate of alleged drug offenses are both statistically significant in the expected direction. However, the percentage of international migrants continues to be a significant predictor of homicide even when these variables are included in the regression models.

To summarize, the results of all the models considered in this section strongly suggest that international outmigration is conducive to higher homicide rates. The migration of women is more strongly associated with higher homicide rates than the migration of men, suggesting that women play a more important role in the preservation of social order in Mexican communities. The effect of migration on homicide cannot be explained solely by its impact on residential stability, family disruption, income inequality or drug traffic in the community. Further ethnographic research will be required to verify the causal direction proposed here as well as the precise mechanism by which increased outmigration may lead to an increase in violent crime.

2.11 Spatial Dependence of Homicide Rates

Standard regression techniques assume that the cases considered are independent of each other. The assumption of independence is problematic in this

situation because geographical borders are often arbitrary and do not always correspond to boundaries of social interaction. Spatial boundaries are also permeable in the sense that residents of one municipality may commit a crime or be victimized in nearby municipalities. A municipality's proximity to others with high crime rates may therefore be expected to be an important determinant of its own crime rate. Recent ecological studies have begun to consider the spatial interdependence of community characteristics (Morenoff, Sampson and Raudenbusch 2001; Sampson, Morenoff and Earls 1999; Morenoff and Sampson 1997). Morenoff, et al. (2001) find evidence that a neighborhood's proximity to areas with high crime rates is associated with higher rates beyond what is explained by a neighborhood's own characteristics. Conversely, Sampson, et al. (1999) find that neighborhoods benefit from proximity to others with high levels of collective efficacy.

A commonly used measure of spatial dependence is Moran's I (Anselin 1995a, 1995b). For any characteristic y_i corresponding to geographical units in a sample, Moran's I is:

$$I = (n/S_0)\sum_i\sum_j w_{ij}z_i z_j / \sum_i z_i^2$$

where n is the number of observations; w_{ij} is the corresponding element in the spatial weights matrix that measures the proximity between two geographical units i and j; z_i and z_j are de-meaned scores of the variable of interest y, in other words $z_i = y_i - \mu$ and $z_j = y_j - \mu$; and S_0 is a scaling constant given by the sum of all weights, $S_0 = \sum_i\sum_j w_{ij}$.

In order to draw inferences regarding Moran's I statistics, it is customary to assume that it follows a normal distribution. Another alternative is to create a distribution for Moran's I by permuting the values of y_i for all cases and re-computing I (see Anselin 1995a). Due to the large size of the sample of municipalities considered here, both methods lead to similar results. Using the contiguity matrix where w_{ij} is originally equal to one if two municipalities share a common border (rook criterion) and zero otherwise and then standardizing by row, the values of Moran's I for the logged municipal homicide rates for 1990, 1995 and 2000 are: 0.36, 0.40 and 0.37. They are all statistically significant at the 0.001 level, indicating the presence of positive spatial autocorrelation. Municipalities with high and low homicide rates respectively, are more clustered spatially than would be expected solely by chance.

Anselin (1995b) has suggested a way to decompose global indicators of spatial dependence such as Moran's I into the contribution of each case in the sample. These local indicators may be used to identify hot spots, and outliers that may be influencing the global statistic. Moreover, the local values of Moran's I may be displayed using graded maps. Figure 2.11 shows the distribution of the local Moran's I for homicide rates in Mexican municipalities. All municipalities where Moran's I is statistically significant are shaded darker, and four different patterns are used to identify cases with high values surrounded by others with high values, cases with

high values surrounded by low values, and so forth. Clusters of municipalities with high homicide rates surrounded by others with high rates are found in the northwestern part of the country and in municipalities along the coast in the states of Michoacán, Guerrero and Oaxaca. These municipalities may be suspected of suffering the adverse effects of being located next to others with high rates of homicidal violence. By contrast, municipalities in the northcentral state of Guanajuato appear to enjoy the effects of being next to others with low violence. There are relatively few cases in the other two categories, but a few municipalities in the Huasteca region stand out for having high homicide rates while being surrounded by municipalities with low rates. Perhaps the mountainous terrain there makes homicide rates among municipalities in that region less dependent on each other.

In order to measure the spatial dependence of homicide rates across municipalities and verify that the findings discussed in the previous sections of this chapter are not a result of unmodeled spatial effects I test a set of spatial lag regression models. Because current software for spatial analysis does not allow the estimation of panel models using spatial lags I examine spatial dependence using cross-sectional models for each year separately.[25] Also, because routines implementing negative binomial regressions with spatial autocorrelation are not yet

[25] In chapter 4 I propose an extension of Anselin's instrumental variables method for random effects models.

available, I use linear models with the logged homicide rate as the dependent variable.[26] The spatial lag models for each year are of the form:

$$y_i = \rho \sum_j w_{ij} y_i + \mathbf{x}_i \boldsymbol{\beta} + \varepsilon_i$$

where y_i is the logged homicide rate; w_{ij} are the elements of the contiguity matrix already described; ρ is the autoregressive coefficient; and the remaining terms are the same as before. Because models are tested for each year separately, spatial dependence is assumed to exist cross-sectionally only and not over time.

The models are estimated by means of an instrumental variables method where spatially lagged exogenous variables for each time period are used as instruments for the original set of variables in a two-stage least squares regression (Kelejian and Robinson 1993). Anselin (1992) notes that the instrumental variables method leads to consistent estimates and is particularly well suited for large samples such as the one used here (and for which maximum likelihood estimation is computationally prohibitive) since statistical inference is based on asymptotic considerations.[27]

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[26] A unit is added to the number of homicides before taking the natural logarithm in order prevent the exclusion of municipalities with nor registered homicides that year. After the log transformation the distribution of the dependent variable is almost normal.

[27] The contiguity matrices and spatially lagged variables were constructed using the software *SpaceStat* (see Anselin 1992, 1995).

Table 2.11 shows the results of the spatial lag models for 1990 and 2000 and compares them to those with no spatial effects. The fact that the linear models with no spatial effects presented in the first column for each year essentially replicate the results of the negative binomial regressions provides further evidence that the findings discussed earlier are not a consequence of the specific methods employed. More importantly, the results of the spatial lag models corroborate my previous findings in that the coefficients for all the variables that were statistically significant are once again significant and with the same sign even once the spatial dependence is taken into account.[28] Moreover, the spatial autoregressive coefficient (ρ) is large and statistically significant indicating a strong spatial dependence of the homicide rates in Mexican municipalities. Proximity to other municipalities with high homicide rates is associated with a higher incidence of homicide even when other factors are controlled. In both years the spatial lag model results in a dramatic reduction in the spatial dependence of the error terms as measured by the Lagrange multiplier test but no meaningful change in the regression coefficients.

[28] The only exception is the coefficient for the percentage of young males which was significant in the negative binomial random effects models. However, the fact that the coefficient for this variable is also not significant in the linear models with no spatial lags suggests that this difference is not due to the spatial dependence, but rather to the transformation of the dependent variable or the cross-sectional nature of the regressions.

2.12 Fixed Effects Models: An Examination of Changes in Homicide Rates Over Time

A limitation of the negative binomial random effects models used in the analysis above is that they do not allow us to distinguish the effects that municipal characteristics have on homicide rates across municipalities and over time. In this section I test negative binomial fixed effects and population average models and compare them to the random effects models in an attempt to disentangle the effects across space and time. However, in contrast to linear panel models where we can separate the variance explained between and within groups by comparing these two types of model, the negative binomial panel models do not allow for such a clear separation (Hausman, Hall and Griliches 1984: 928-934). Although they do not isolate the effects along both dimensions, large discrepancies between the coefficients of the same variables in the different models may indicate the relative importance of the variables in explaining differences in homicide rates across municipalities and over time.

As explained in the Methods section above, a key difference between negative binomial panel models and their linear counterparts is that in the former what is "fixed" and "random" is the dispersion parameter δ_i not the effects of the predictors $\mathbf{x}'_{it}\boldsymbol{\beta}$. "Fixing" δ_i by conditioning the probability of the number of homicides in each municipality on the sum of the homicides in that municipality across time does not result in the elimination of all time-invariant municipal characteristics and the

separation of the effect corresponding to $\mathbf{x}_{it} - \bar{\mathbf{x}}_i$ as it does in the linear fixed effects models. Similarly, it does not result in the isolation of the effect of $\bar{\mathbf{x}}_i$ in the population average model. However, each of these models will tend to explain more of the variance in one of the two dimensions.

The negative binomial fixed effects models have the disadvantage that they drop from the analysis all cases in which the dependent variable takes on a value of zero in all time points (15% of cases). In the models presented below a unit is therefore added to the homicide count for all municipalities. Because this addition may have an effect on the random effects models these are estimated once again with the new dependent variable and presented in the tables along with the fixed effects and population average models. Secondly, though the computational procedures allow the estimation of coefficients for variables that are constant over time in the fixed effects models, these coefficients do not have a clear meaning. The regional dummy variables are therefore eliminated from the fixed effects models below.

Tables 2.12 and 2.13 show the results of the random effects, fixed effects and population average negative binomial regression models using the new dependent variable. Comparing the regression coefficients across the three models we notice the following differences: First, the degree of urbanization as measured by the population density is an important predictor in all three models. However, the corresponding coefficient is much larger (almost three times as large) in the fixed effects model

compared to the population average model, suggesting that urbanization is a much more important predictor of the decline in homicide rates over time than across municipalities. Based on the increase in population density experienced by the average municipality between 1990 and 2000, the homicide rate should have declined by 7.8% due to this factor alone according to the results of the fixed effects model (the average municipality experienced a total decline of 36.2% in homicide). The differences in the coefficients of the other indicators of urbanization between the population average and fixed effects models not presented in the tables also corroborate the greater importance of urbanization over time.

Second, the coefficient for the illiteracy rate is much larger in the fixed effects models, and that for the degree or marginality is at least as large (the coefficient was larger in alternative models not presented here). These two findings suggest that the improvements in the economic conditions of those worst off in Mexico—surprising in their own right given some accounts describing an increase in poverty during the decade—may have been largely responsible for the decrease in homicide rates over time. The reduction in the degree of marginality in the average municipality over the decade is associated with a 9.6% decrease in the incidence of homicide according to the results of the fixed effects model in table 2.13. Furthermore, if the degree of marginality is considered to be an inverse measure of modernization, then this finding supports the hypothesis that homicide rates decline with modernization.

Finally, the coefficient of the percentage of female-headed households actually reverses signs in the fixed effects models compared to the random effects and population average models. Taken at face value, the results suggest that the increase in the percentage of female-headed households in Mexican municipalities over the decade actually led to a *decrease* in homicide rates. Models including the divorce and separation rate as a predictor also indicate a reversal in the sign of the corresponding coefficient in the fixed effects models. These findings contradict social control theory which posits a positive relation between family disruption and violent crime. A reversal in the coefficients of the measures of family disruption in the fixed effects models compared to the population average models may not only reflect a different effect between the average values and deviations from the average, but as in linear panel models it may be due to misspecification of the model. For instance, the reversal may suggest that the positive relation between family disruption and homicide is spurious, in other words, that it is caused by some unmeasured variable that is constant over time. In either case, these results throw into doubt the causal effect of family disruption which was found to be among the most important predictors of homicide rates in the random effects models.

2.13 Conclusions

In this chapter I have attempted to explain the differences in homicide rates across Mexican municipalities and their changes over time. The analysis has led me to revise and extend community-level theories of crime in several ways. I have shown

how some of the social variables commonly used to test these theories—such as poverty and ethnic composition—require a different operationalization or have a different meaning than in the industrialized West. More importantly, the Mexican case has forced me to extend ecological theories in order to take into account new dimensions of social structure and new processes of social change that have an effect on social control and crime. I argued that Mexican family practices require the consideration of a new dimension of family structure, namely family extension. I also demonstrated the need to analyze the local effects of broader processes such as international migration and the traffic of illegal drugs to the United States. In the final sections of this chapter I replicated my findings using an alternative data source and considered the effect that ecological factors have on the homicide of women and young persons. I also controlled for the spatial dependence of homicides across municipalities. And lastly, I compared the results of fixed effects and population average models in an attempt to disentangle the effects of municipal characteristics on homicide rates across municipalities and over time. The theoretical implications of the analysis of homicide in Mexico will be taken up in the concluding chapter of the dissertation. In this section I will simply highlight a few key findings.

One of the most important differences in the distribution of homicides in Mexico compared to the United States is the higher level of homicide in rural areas. All else remaining equal, Mexican municipalities with lower population densities and those in which a larger proportion of residents live in small towns have higher

homicide rates, whereas municipalities containing cities with 100,000 residents or more have fewer homicides per population. This pattern of higher violent crime rates in rural areas is reminiscent of the United States and Western Europe during the nineteenth century, and supports the notion that Mexico is undergoing a transition to a more modern regime of social control. This theme is further developed elsewhere in this dissertation.

Gains in the socioeconomic conditions of many Mexicans may explain differences in homicide rates across municipalities and appear to account for a large share of the decrease in homicides based on the estimates of the fixed effects regression models. Because the index of marginality is meant to capture the extent to which communities are excluded from the development process that Mexican society is thought to be undergoing, it may also be interpreted as an inverse measure of modernization. The fact that the marginality index is one of the most important predictors of homicide rates may also be seen as supporting the modernization thesis. Finally, another important set of hypotheses considered in this chapter dealt with the relation between family structure and violent crime. Marital dissolution and female headship were both found to be strongly associated with higher homicide rates across municipalities but not so much over time according to the results of the fixed effects models.

The findings presented in this chapter are based on the analysis of homicide rates in the national sample of municipalities. In the next chapter I will examine the incidence of homicide in a subsample of rural areas. I will consider how differences in the organization of agricultural production affect the level of social control and violence in the Mexican countryside. In chapter 4 I will propose a theoretical framework for understanding the effect of rapid political change on homicide in rural settings. Together, these chapters provide an overall picture of the distribution of violent crime across Mexico. In chapter 5 I will examine the rising trend in other types of crimes in Mexico City.

CHAPTER 3

AN ECOLOGICAL THEORY OF HOMICIDE IN RURAL AREAS: LAND SCARCITY, COLLECTIVE OWNERSHIP AND THE ORGANIZATION OF AGRICULTURAL PRODUCTION

One of the most remarkable findings of my analysis of the national sample of municipalities in the previous chapter is the extraordinarily high homicide rate in rural areas. I found municipalities with lower population densities and those with a larger proportion of residents living in small towns to have higher rates of homicide even when all other relevant variables were included in the regression models. In this chapter I further explore homicide in rural areas. I extend theories of Human Ecology to rural settings and draw on scarce ethnographic work available on violence in rural Mexico to propose three empirically testable hypotheses regarding the effects of land distribution, collective ownership, and the organization of agricultural production on homicide.

There is a considerable urban bias in sociological research on crime. Ecological theorists in particular focus their attention almost exclusively on urban settings in the United States and Western Europe. They examine the relation between various structural and organizational characteristics of metropolitan areas or neighborhoods within cities and rates of violent crime (see Land, McCall and Cohen [1990] and Parker, McCall and Land [1999] for comprehensive reviews). Very few studies have looked at crime in rural areas from an ecological perspective, and those

that have simply apply the same models without considering how the rural context might require the examination of new dimensions of social structure. This urban bias may be partly due to the lower rates of criminal violence in rural areas in the United States and Western Europe. According to the FBI's Uniform Crime Report statistics for 2000 rural counties in the United States had a homicide rate of 3.8 per 100,000, while metropolitan areas had a rate of 5.5 per 100,000 (FBI 2000; see also Reiss and Roth [1993]).

By contrast, homicide rates are higher in Mexican rural municipalities than in urban areas. Municipalities where more than 75% of the population lives in towns of less than 2,500 residents have an average homicide rate of 16.0 per 100,000 over the three-year period considered in chapter 2, compared to 13.7 per 100,000 in municipalities containing cities with 100,000 residents or more. Even when demographic characteristics and economic conditions are taken into account in the regression models rural municipalities continue to have higher homicide rates. As discussed earlier, this finding contradicts one of the standard assumptions of social disorganization theorists who argue that urbanization and higher population density lead to greater anonymity and a loss of social control. The higher rates of rural violence is reminiscent of the pattern of crime in the United States prior to the nineteenth century.

The fact that theories of social disorganization were developed with the urban settings in advanced industrialized countries in mind does not mean they are not useful in other environments such as rural Mexico. On the contrary, if these theories truly capture universal principles, they should be able to explain differences in criminal violence among rural areas. Just like urban areas, small rural towns differ in the degree of social cohesion among residents, and consequently, in the degree to which they are able to enforce norms and prevent crime. However, the factors that lead to varying levels of social integration among residents are quite different from those in large urban centers. In the next sections of this chapter I extend theories of human ecology to rural areas and identify three factors that may be expected to lead to lower homicide rates. I then test these hypotheses using data from the 1991 Agricultural and Livestock Census.

3.1 Human Ecology and Rural Violence: The Effect of Land Scarcity

In order to apply theories of Human Ecology to rural settings and derive hypotheses about crime we need to revert back to their original formulation. One of the basic principles of Human Ecology as first proposed by Robert Park and Ernest Burgess was that, in direct analogy with the plant and animal world, competition among individuals determines their spatial distribution within urban areas (Park 1936; Park and Burgess 1925). The competition for resources and space that human ecologists describe as characteristic of urban settings has its direct counterpart in the competition for arable land in rural areas, with the difference that in rural areas land is

seen as a resource necessary for subsistence and not simply as a place of residence. The subsistence farmer or peasant depends on the land for his or her survival, whereas the urban dweller prefers a certain part of the city based on the convenience and amenities it affords. Because the loss of land, or loss of good quality land, has a direct impact on the livelihood of the peasant and may indeed be life-threatening, conflict over land may be expected to turn more violent.

Two conditions further aggravate land conflicts in the countryside. First, there are more restrictions on the redistribution of population compared to movement between neighborhoods in urban areas. The greater dependence on kinship and friendship networks and cultural attachment to a village or a particular ethnic and linguistic group make migration to neighboring areas more difficult and costly (unless network ties there have already been established). Secondly, cities are expanding or expandable systems. They grow by incorporating new land, and often entire towns into larger metropolitan areas. Such expansion, and the possibility of increasing population density, may prevent the escalation of conflict over space. By contrast, in rural settings the expansion of arable land is severely limited once forest lands are depleted. There are also limitations to increasing population density since capital investments are usually needed to increase crop yields or develop processing industries. Conflict over land therefore more often takes the form of a zero-sum game (Foster 1965). For these two reasons, the combination of population growth and the introduction of large-scale agricultural production will lead to a scarcity of land per

population in some municipalities, and is likely to result in increased conflict and violence. Thus, a first hypothesis with regards to the impact of agrarian structures on rural violence may be stated as follows:

> *1a) When agricultural land is scarce relative to the number of individuals there will be more conflict and therefore more homicides.*

I test this hypothesis and others proposed in this chapter using data from the 1991 Agricultural and Livestock Census and homicide rates from vital statistics. The Agricultural Census is carried out every decade (separately from the Population Census described in the previous chapter) and provides information on all rural landholdings, including the type of ownership, the form of agricultural production, the amount produced and basic information on rural residents (INEGI 1993). I measure the scarcity of land for the sample of rural municipalities in three different ways: the log of the number of persons per hectare of agricultural land, the log of the average plot size, and the percentage of rural production units of 5 hectares or less. Because the extent to which small plots of land may satisfy the needs of residents will depend on the quality of the land, I introduce maize yields (expressed as tons per hectare) along with each indicator of land scarcity in the regression models.

Although the available land may be sufficient to satisfy the basic needs of rural community members, an unequal distribution of land may also lead to conflict among residents. Just as an unequal distribution of income has been posited by strain

theorists to lead to higher crime rates, so an unequal distribution of land may be thought to increase violence in rural areas. This hypothesis can be expressed as an extension of the previous one:

1b) An unequal distribution of land will also lead to more violent conflict.

I test this hypothesis by introducing into the regression models an index of land inequality given by the log of the ratio of rural production units of more than 100 hectares to units of less than 2 hectares.

Because the alternative indicators of land scarcity proposed here should measure the same phenomenon they are introduced in separate regressions below. In addition, factor analysis is used to construct a composite index of land scarcity. The large factor loadings and their respective signs corroborate the assertion that the four variables are indeed measuring the same underlying characteristic.[1] Figure 3.1 shows the distribution of the composite index of land scarcity for the sample of all municipalities where more than 75% of the population lives in towns of less than 2,500 residents. Municipalities in the more arid and less fertile regions of northern Mexico are characterized by larger plot sizes and consequently less residents per hectare of agricultural land. However, no clear relation is apparent between

[1] The factor loadings for the log of the number of persons per hectare of agricultural land, the log of the average plot size, the percentage of rural production units of 5 hectares or less and the ratio of rural units of more than 100 hectares to units of less than 2 hectares are 0.94, -0.95, 0.78, -0.95, respectively. The first eigenvalue is 3.31.

municipalities with more land scarcity and those with the highest homicide rates identified in hatching.

3.2 Collective Ownership of Land: Ejidos and Communal Lands

Conflict over land may result not only from scarcity but also when property rights over plots are not clear, not well enforced, or are contingent. Mexican law supports two different types of collective land tenure in addition to private and public ownership. Written during the Mexican Revolution, the Agrarian Law of 1915 and Article 27 of the 1917 Constitution captured the demands of a large segment of the peasantry for the restitution of lands taken from them during the course of the nineteenth century. The Agrarian Law of 1915 made explicit the rights of villages over communal lands first recognized by Colonial authorities and later rescinded by Liberal reformers in the 1860s. The Constitution of 1917 made provisions for the breakup of large landholdings and the creation of agrarian collectives known as *ejidos*. In the decades following the Revolution large tracts of land were distributed in the form of ejidos. By 1999 there were a total of 27,285 ejidos nationwide employing 3.1 million members and their dependents. There were also 2,197 communal units employing over half a million members. Approximately 51.4% of the country's rural land is either ejidal or communal, while 37.6% is private, and the remaining portion is made up of public lands and agricultural colonies (Robles Berlanga 1999; Cornelius and Mhyre 1998).

Ejidos and communal land units may exercise a large amount of discretion in the apportionment of land among their members. Communal lands are distributed according to village traditions, usually based on individual family needs. And while every *ejidatario* or *ejidataria* (ejido member) has a right to a portion of land which he or she can inherit to family members, he or she cannot sell or mortgage it.[2] Decisions concerning the distribution of land among ejido members as well as other matters are made by ejido assemblies headed by elected officials. In addition to the land that is allotted to individual ejidatarios and ejidatarias, a portion of the ejido's land may be worked by the collectivity, and all members may benefit from it.

Because apportionment of land within ejidos is often carried out by an internal political process, it frequently leads to disputes. Conflicts also arise with regards to the limits of individual plots (since there are no titles specifying the precise boundaries[3]), the inheritance of ejidal lands, and the use of lands belonging to the entire community, among other issues (Robles Berlanga 1999). Finally, ejidos and villages with communal property are often encroached upon, or otherwise engaged in disputes over land rights with neighboring communities or private landholders. These

[2] In addition to ending the government's constitutional obligation to distribute land, the reform of the Agrarian Law in 1992 also allowed ejidatarios to obtain individual titles for their lands, and privatize or disband the ejido if so agreed by the ejido assembly. See Cornelius and Myhre 1998, pp. 1-4. During the period considered in this study (1990-91) this law was not yet in effect.

[3] As part of the 1992 reform, the federal government created the Program for the Certification of Ejido Land Rights and the Titling of Urban House Plots (PROCEDE) whereby ejido members can obtain individual titles to their land parcels.

conflicts often turn violent. The violence generated by conflict due to insecure property rights leads to a second hypothesis:

> *2) When property rights are not well enforced or are contingent there will be more conflict over lands, and therefore higher rates of homicide. Ejido and communal units experience more conflict because: a) apportionment of land within these communities is carried out by an internal political process that leads to disputes; and b) they are often encroached upon by neighboring landholders.*

In order to test this hypothesis I enter the percentage of the surface area constituted by ejidos and communal units according to the 1991 Agricultural and Livestock Census. Those municipalities with a larger percentage of communal and ejido lands are expected to have higher homicide rates. Figure 3.2 shows the distribution of ejido and communal lands in the sample of rural municipalities. The highest concentrations of collectively held lands are found in the southern states of Chiapas, Oaxaca and Guerero, and in the northwestern region where the states of Chihuahua, Durango and Sinaloa join. Some of these zones also appear to be among those with the highest homicide rates shown in hatching.

3.3 The Organization of Agricultural Production in the Mexican Countryside

Social control theorists have argued that greater cohesion among community members in urban areas is conducive to lower levels of crime. A more cohesive community is thought to be better able to enforce social norms and exercise guardianship over property. Social cohesion also plays a role in rural areas. However,

because rural towns and villages are not only a place of residence, but also the place of work for many residents, the degree of social cohesion in such communities will depend to a large extent on the relations of production and exchange associated with the existing agricultural system. In particular, I hypothesize that agricultural systems that require a greater degree of dependence among residents, such as those involving small-scale production for subsistence, will be associated with greater social cohesion and therefore less crime. Conversely, agricultural systems that require less cooperation and those that involve more commodified relations of production and exchange will be associated with less cohesion and therefore more crime.

The concept of social capital has been used to refer to the collective gains associated with increased cohesion among community members, and specifically to its effect on lowering crime rates (Coleman 1990: 300-321; see also Sampson, Morenoff and Earls 1999). As James Coleman points out, the exchange of favors may not only benefit individuals involved, but also creates a web of obligations that constitutes a public good. All else being equal (for example income), communities in which peasants depend on the aid of others for their livelihood will have more social control than communities of isolated producers or agricultural workers for hire. The latter will depend more on their relation with their employer for their livelihood than on other community members. The introduction of wage labor in larger agricultural enterprises will weaken traditions of reciprocity and individuals' dependence on

others for subsistence, and therefore the power that communities exercise over individual behavior. This hypothesis may be stated as follows:

> *3a) Agricultural production systems that involve more commodified relations of production and exchange will be associated with a breakdown of community social cohesion and therefore more crime.*

Participation in agricultural markets will also lead to greater conflict over property and control over trade. This is particularly evident in agricultural areas dedicated to the production of cash crops. In his study of violence among the Chatino in the southern state of Oaxaca, James Greenberg (1989) finds that the introduction of coffee production disrupted the organization of communities and led to violent conflicts over land. Although the lands were technically still communal, the investment in coffee plants turned individual parcels into *de facto* private property. As the traditional system of land distribution based on usufruct rights and inheritance was replaced by private ownership, land became concentrated in fewer hands. Those who lost out in the process of land accumulation were resentful and fought back using violence:

> "As privatization engendered conflicts between claims to land based on 'sale' and those based on traditional rights of inheritance or usufruct, the fuel of envy and witchcraft accusations was added to the fires that produced homicides. As privatization proceeded apace, many villagers were reduced to landless rural proletarians. Witchcraft accusations soon gave way to killings and vendettas, until blood feuds tore the Indian communities apart." (Greenberg 1989, p. 194)

The relation between the commodification of agricultural production and conflict over land may be stated as an extension of the previous hypothesis:

3b) The introduction of more commodified relations of agricultural production will also lead to greater conflict over resources and control over trade.

In the regression analysis below I measure the impact of the relations of agricultural production using two different indicators. First, I enter the percentage of agricultural units producing for subsistence. Because subsistence farmers will depend to a greater extent on the aid of nearby residents for harvesting and other activities, communities characterized by subsistence farming may be expected to exert more control over individual behavior and should therefore have less criminal violence. However, subsistence farmers by definition have barely enough land to survive. Under such marginal conditions conflict over access to land is more likely to turn violent. The cohesive effect of greater dependence on neighbors associated with subsistence farming will therefore be confounded with the effect of land scarcity (described earlier as hypothesis 1). The second measure I use to test the impact of the relations of production is the percentage of agricultural units with individual (as opposed to group) organization of production. Agricultural units with individual organization are those where a single individual is responsible for all decisions regarding its use and administration (INEGI 1993). Finally, I test the effect of cash crop production on homicidal violence using the percentage of units dedicated to harvesting coffee and raising cattle.[4]

[4] On the dislocations produced by the introduction of cattle raising see Schryer 1990.

3.4 Data and Methods

The variables for land scarcity, collective ownership and the organization of agricultural production described above are all drawn from the 1991 Agricultural and Livestock Census. The variables from the baseline model in chapter 2 are also introduced as controls. They include: the population density, the percentage of the population composed of young men between 15 and 29 years of age, the percentage of the municipal population 5 years of age or more who speak an indigenous language, the illiteracy rate as a measure of poverty, the percentage of female-headed households, and the law enforcement efficacy index. The regional dummy variables defined in chapter 2 are also included in the regressions to test for remaining regional differences once all structural variables are taken into account.

The models are tested using a subsample of the national database of Mexican municipalities described in chapter 2. The subsample is created by selecting all municipalities where more than 75% of the population lives in towns of less than 2,500 residents (n=697 minus missing cases in 1990). As I mentioned in the previous chapter, the National Statistics Institute provides no clear guidelines for what constitutes a rural municipality. Instead, the degree of rurality is usually defined in terms of the size of towns within municipalities, and a threshold of 2,500 residents is commonly used. Although the 75% cut-off point is somewhat arbitrary, the results appear to be robust for a considerable range of thresholds.

As in the previous chapter, I use negative binomial regressions to test the hypotheses described above. Negative binomial regressions are more appropriate in cases where the dependent variable is heavily skewed towards lower values. However, since the agricultural variables are only available for a single year I use cross-sectional regressions instead of the panel models in the previous chapter. This means that I am unable to take into account the effect of changes in land distribution and the organization of agricultural production over time. The cross-sectional negative binomial regressions have a slightly different parameterization than the random and fixed effects models. Whereas in the panel models the underlying distribution of the dependent variable has a constant dispersion $1+\delta_i$ within a panel, in the cross-sectional models the dispersion is equal to $1+\alpha_i \exp(\mathbf{x}_i'\boldsymbol{\beta})$ where α_i is an overdispersion parameter. In other words, the dispersion now depends on the predictors $\mathbf{x}_i'$. Nevertheless, the coefficients may be interpreted in the same way as before and should be roughly comparable. Finally, because the agricultural variables are for 1991 I use the total number of homicides in 1991 instead of 1990 as the dependent variable.

3.5 Results

Table 3.1 shows the results for the regressions of homicide on the four separate measures of land scarcity in Mexican rural municipalities (hypothesis 1). The results of each of the four models contradict my original hypothesis: a smaller

average plot size, a greater number of persons per hectare of land, and a higher percentage of agricultural units with a small plot size are all associated with *lower* rates of homicide (though the significance levels of some of the coefficients are quite low). Similarly, a more unequal distribution of land (i.e., relative scarcity) is *not* significantly associated with higher homicide rates. It is difficult to interpret these findings. One possibility is that municipalities with smaller plots may be less dedicated to agricultural production and therefore less likely to exhibit conflicts over land. Secondly, it may be the case that complete landlessness and not the size of individual plots is associated with more conflict and violence. Those municipalities with larger landholdings may have a greater number of unemployed and displaced peasants struggling for land. Another possible explanation for the positive association between land scarcity and homicide is that the various indicators of land scarcity are so closely related to the overall population density that it is impossible to distinguish the effects of these two predictors in the regression models. This makes sense because a larger number of persons per hectare of agricultural land almost necessarily implies a large number of residents per total surface area of the municipality. The Variance Inflation Factors (VIF) for the measures of land scarcity in the regression models in table 3.1 are unacceptably high (often greater than 4.0), indicating the presence of multicollinearity. Similarly, the model including the composite index of land scarcity in table 3.2 also shows evidence of multicollinearity (VIF of 4.03). A second composite index of land scarcity is therefore constructed that includes the population density. The large factor loading for the population density (0.84) provides further

evidence that this variable is measuring the same underlying municipal characteristic.[5] According to the second model in table 3.2, the new composite index is strongly associated with less homicides per population though it is impossible to distinguish between the effect of less agricultural land per inhabitant and that of a greater population density more generally.

The results presented in table 3.3 confirm the second hypothesis with regards to the effects of property rights on rural homicide rates. Those municipalities with a large percentage of communal and ejido lands have much higher homicide rates when all other relevant variables are controlled, including land scarcity and quality of land. All else remaining equal, increases in the percentage of surface area constituted by ejido and communal lands of one standard deviation are associated with increases of 30.9% and 52.3% in the homicide rate respectively. These findings strongly support the notion that when property rights over land are not well enforced or are contingent there will be greater conflicts and higher rates of violence. However, other explanations cannot be entirely ruled out. For instance, many ejidos are located in areas with long-term disputes over water and land, and these may be responsible for the greater degree of violence. The federal government's recent efforts to regularize land titles for individual parcels within ejidos through the PROCEDE program

[5] The remaining factor loading for the log of the number of persons per hectare of agricultural land, the log of the average plot size, the percentage of rural production units of 5 hectares or less and the ratio of rural units of more than 100 hectares to units of less than 2 hectares are 0.96, -0.97, 0.75, -0.93, respectively. The first eigenvalue is 4.01.

(Program for the Certification of Ejido Land Rights and the Titling of Urban House Plots) may provide a natural experiment to dissociate the effects of contingent property rights. If a reduction in homicide is observed over time in those municipalities where individual land titles have been given out then there will be additional evidence to support the proposition regarding property rights.

The results of the third and fourth models in table 3.3 support the hypothesis that rural municipalities characterized by more isolated forms of agricultural production have higher homicide rates. Municipalities with a larger percentage of agricultural units with individual (as opposed to group) organization have significantly higher homicide rates. Although a greater number of units producing for subsistence is not significantly associated with the incidence of homicide, this is probably a result of land scarcity as noted above. Finally, table 3.4 presents the results for the complete models including predictors for land scarcity, collective ownership, the form of agricultural organization, and the production of cash crops. The results strongly support the notion that cash crop production is associated with higher homicide rates. Increases of one standard deviation in the percentage of units dedicated to coffee and cattle production are associated with increases of 22.1% and 20.2% in homicide rates respectively. These large effects are consistent with the proposition that the introduction of capitalist forms of agricultural production create social dislocations and weaken the web of social relations that help enforce norms and prevent violence in rural communities. However, we should note that once the

production of cash crops is introduced in the regressions the coefficient for the percentage of agricultural units with individual organization becomes insignificant, suggesting the coefficient for that predictor was capturing the effect of cash crop production.[6]

The coefficients of the control variables reveal some interesting similarities and differences between rural areas and the national sample of municipalities examined in the previous chapter. First, a higher population density continues to be associated with lower homicide rates even when the sample is limited to municipalities where more than 75% of the population lives in towns of less than 2,500 residents. In other words, to the extent that population density may be said to have a negative effect on homicide, the effect holds even for the subset of municipalities with the lowest densities. However, as discussed above this effect may be confounded with that of land distribution. Second, a large percentage of young males is not associated with higher homicide rates as it is in the national sample. This result is indeed surprising since the relation between age and violent criminal activity is often thought to be invariant across a wide range of societies and historical periods (Hirschi and Gottfredson 1983; Gottfredson and Hirschi 1990). Among other things, this result may indicate that the type of violence in the Mexican countryside (such as that generated by land disputes) may not disproportionately involve young men as other forms of violence in urban areas. Third, the percentage of female-headed

[6] There is no evidence of multicollinearity in these models.

households is only weakly associated with higher homicide rates. In some of the models the corresponding coefficient fails to reach statistical significance. It is possible that other forms of community organization prevalent in rural areas, such as extended family groups, help mitigate the influence of a high concentration of female heads of household. Finally, the regional differences that were so strong in the national sample are considerably lower in rural areas suggesting that the structural variables considered in the models are better able to explain regional variations in the level of violence in rural areas compared to urban areas. Only municipalities in the Mexico Valley continue to have disproportionately higher homicide rates once all other variables are taken into account. Given their proximity to Mexico City, it is quite likely that the higher rates may be a result of spatial contagion.

3.6 Conclusions

To summarize, in this chapter I have extended theories of Human Ecology to rural settings and derived three empirically testable hypotheses regarding the impact of land scarcity, collective ownership and the organization of agricultural production on homicide rates. I argued that the competition for space that human ecologists describe as characteristic of urban settings has its counterpart in the competition for arable land in rural areas. Because access to land has a direct impact on the livelihood of peasants, conflict over land is expected to turn more violent. Surprisingly, I did not find land scarcity and land inequality to be associated with higher homicide rates in the statistical analysis. The high collinearity with the overall population density was

suggested as one possible explanation for this finding. Second, I proposed that insecure and contingent property rights are associated with more violence. In particular, because apportionment of land within ejidos and communal units is carried out by an internal political process that often leads to disputes they tend to have more violence. In the statistical analysis municipalities with a large percentage of ejido and communal land were indeed found to have significantly higher homicide rates even when controlling for all other relevant factors. Finally, I hypothesized that systems of agricultural production that are more individualized or that involve more commodified relations of production will be characterized by less social cohesion and more violent crime. The results of the regression analysis confirm this hypothesis. Municipalities with individual forms of agricultural production and those producing cash crops such as coffee and cattle raising have a higher incidence of homicide.

CHAPTER 4

POLITICAL COMPETITION AND VIOLENCE IN MEXICO: HIERARCHICAL SOCIAL CONTROL IN LOCAL PATRONAGE STRUCTURES

During the past two decades a large number of countries have undergone transitions from authoritarian to democratic regimes. Many of these same countries have experienced an increase in violence. In some cases the violence is perpetrated by members of the dying regime against their challengers, or is a result of conflict between nationalist or ethnic groups encouraged by the decline of state power. However, many fledgling democracies have also suffered an upsurge in violence associated with ordinary street crime. Sociological theories of crime, formulated largely based on the experience of the United States and Western Europe, generally fail to consider the effect of political factors, and those that do are not sufficiently specific.[1] While political science studies are more directly concerned with the impact of political factors on violence, they focus primarily on the relation between the type of regime and large-scale conflicts such as civil wars. They typically use entire countries as the units of analysis and therefore do not consider the way political structures operate at the local level to produce the conditions for interpersonal violence (see for example Hegre, et al. 1999; Mueller and Weede 1990; Gurr 1993; Powell 1982; Hibbs 1973).

[1] By political factors I refer to those that concern citizens' relations with the state but that do not directly pertain to law enforcement. They include, but are not limited to, mechanisms for the representation of interests (such as elections), the responsiveness of state authorities to citizens' demands, and the perceived legitimacy of state institutions.

In this chapter I examine the relation between greater political competition and homicidal violence at the subnational level in Mexico, a country undergoing an uneven transition to democracy. I suggest that in order to understand the effect of political competition and factionalization we need to consider the impact of these changes on informal social and political networks. Specifically, in societies characterized by the presence of hierarchical social relations social and political changes that weaken the relative power of dominant segments of society may have a disproportionately strong effect on crime. Greater electoral competition will disrupt patron-client ties—especially in rural settings where they play a larger role—and lead to a temporary loss of social and political control and consequently a greater use of violence.[2]

4.1 Extending Social Control Theory

One of the central concerns of sociology since its beginning has been the ways in which groups of individuals preserve social order (Durkheim 1964 [1893]; Ross 1920 [1901]; Park and Burgess 1969 [1921]). The set of all practices that help to enforce social norms and thereby contribute to maintaining social order are referred to by some theorists as social controls (Black 1984; Gibbs 1981; Kornhauser 1978). They include the punishments and rewards for deviating or conforming to social

[2] This chapter is based on the work in Villarreal (forthcoming). However, in order to be consistent with the analysis in the previous two chapters I use negative binomial regressions to test my hypotheses instead of linear regressions used in the original article.

norms (external controls), as well as internal feelings of guilt and shame that are a result of a process of socialization (internal controls) (Kornhauser 1978: 24). Though this broad definition includes sanctions by state authorities, most theorists focus on informal mechanisms used to ensure conformity. Under this framework violent crime is considered a consequence of a lack of social control, which is in turn attributed to a failure in the social and organizational structure of a community (Sampson, Raudenbush and Earls 1997; Bursik and Grasmick 1993; Sampson and Groves 1989; Kornhauser 1978; Janowitz 1975; Shaw and McKay 1942). One advantage of social control theory from a sociological standpoint is that crime is seen as a truly social phenomenon and not a result of individual pathologies. It allows analysts to relate the incidence of crime in particular settings to various ecological characteristics.

In most versions of social control theory a community's ability to enforce social norms and prevent crime depends on the strength and density of social ties among its members.[3] Residents who know and trust one another are more likely to watch over each other's property and take concerted action against potential offenders. Poverty, ethnic heterogeneity and residential mobility among other factors are all thought to decrease social cohesion and trust among community residents and therefore increase crime (Kornhauser 1978; Shaw and McKay 1942). In numerous

[3] More recently, Robert Sampson and his associates have developed a new theoretical approach wherein social control does not depend on the strength of social ties but rather on a shared sense of trust and willingness to act they term "collective efficacy" (see Sampson, Raudenbush and Earls 1997; Sampson, Morenoff and Earls 1999; Morenoff, Sampson and Raudenbush 2001).

empirical studies comparing violent crime rates across neighborhoods and metropolitan areas these and other characteristics have been associated with higher crime levels (see for instance Sampson and Groves 1989; Sampson 1987; Williams 1984; Messner 1982; Blau and Blau 1982).

Until now, social control theorists have generally failed to consider the impact of political factors on crime. This gap in criminological research may in part be due to an almost exclusive focus on settings in the United States and Western Europe. In the contexts of stable democracies variations in political factors may have less impact on social control and crime. A notable exception is the work of Gary LaFree (1998), who argues that a decline in the legitimacy of political institutions in the United States during the 1960s weakened citizens' commitment to enforcing social norms and therefore contributed to an increase in crime: "When members of a society begin to doubt the fairness of their political institutions, even if they do not themselves violate laws, they become less enthusiastic agents for the social control of others. Parents, families, and neighborhoods do less to defend rules and respond less harshly to rule violations." (p. 80). Though a loss of legitimacy of national political institutions may indeed reduce commitment to laws pertaining to citizens' relations to the state such as paying taxes and military conscription (Levi 1997, Scholz 1998), the mechanism by which the loss of legitimacy may lead to a weakening of commitment to social norms against property crimes or interpersonal violence remains under-specified. Moreover,

insofar as a democratically elected government is likely to enjoy greater legitimacy this theory would predict lower crime rates in regimes with contested elections.

A second problem with social control theory is that it does not explicitly take into account the differential effect that certain groups within society may have on preventing criminal violence. A community's ability to enforce norms and achieve common goals is assumed to be a function of the social cohesion among all members. But there is no reason to believe that ties among all individuals within a community have the same effect on social control. Because of their location within the power structure of a community certain individuals may exert greater control over the behavior of others. In societies characterized by the presence of patronage networks social changes that undermine the source of unequal exchange between actors at different levels in the social hierarchy may result in a temporary loss of social control and an increase in crime.[4]

[4] In his comprehensive theory of social control Donald Black (1976, 1984) considers how differences in status and degree of intimacy affect the form of social control. However, Black defines social control in the narrower sense of "how people define and respond to deviant behavior", as opposed to the definition above that includes all practices that influence human behavior and prevent the violation of social norms (Black 1984: 4-6). He is interested in questions such as how differences in status between individuals impact their likelihood of using the law as opposed to other (perhaps more violent) means to settle disputes, and how the degree of intimacy with third persons who act as settlement agents will affect the type of settlement behavior, from friendly pacification to repression (Black and Baumgartner 1983; Cooney 1998). Black's framework does not take into account how the web of obligations in which an individual is immersed exerts a powerful influence on his or her behavior. Differences in status and degree of intimacy do not explain the power that patrons have over their clients' actions. As explained below, this power derives from the unequal relations of exchange in which clients are forced to engage.

4.2 *Caciquismo*: Local Patronage Networks in Mexico

During the past decade the Mexican political system has undergone a significant transformation from an authoritarian single-party system to a more competitive democracy. The successful transfer of presidential power to a candidate of an opposition party in December, 2000 after more than 70 years of one-party rule is a major landmark in the consolidation of a democratic system of government. However, the pace of local democratic change has been far from uniform nationwide. Many parts of the country, and particularly rural areas, are still governed by traditional political strongmen belonging to the *Partido Revolucionario Institucional* (PRI). These strongmen know as *caciques* form part of a large patronage system that has been threatened by recent social and political changes.

The practice of *caciquismo* predates the Revolution of 1910-20 from which the current regime emerged, and has been traced to Colonial and pre-Colonial times. The Spanish Colonial authorities used the term cacique to refer to indigenous leaders throughout the empire (Schwerin 1973; Alegria 1952). During the nineteenth century the term was also applied to local military bosses and landowners who controlled a certain town or region of influence (Wolf and Hansen 1967). However, a new type of cacique emerged after the Revolution whose legitimacy derived in part from his participation in the struggle for the restitution of village lands (Friedrich 1968, 1977, 1986).[5] With time the role of local caciques became institutionalized as fewer had a

[5] I use the male term consciously to highlight the gender-specific character of caciques.

direct connection with the armed struggle. Their power increasingly derived from their connection to the national party structure. Allegiance to the party allowed local caciques to operate with a certain level of impunity and permitted them to secure resources for their followers. The incorporation of local caciques into the post-revolutionary party in turn benefited the national leadership in that through them they were able to consolidate their control over rural areas.

A post-revolutionary cacique may be generally defined as a local leader who "has total or near total political, economic, and social control of a geographic area." (Ugalde 1973: 124). He rules by the threat and use of violence against his opponents, and by the disbursement of goods and favors to his supporters, the core of which is often constituted by relatives (Friedrich 1968). The rural cacique has also been described as a political broker that bridges the gap between peasant villages and the national political system (Wolf 1956), and as an economic middleman linking a capitalist national market with non-capitalist forms of agricultural production (Paré 1975; Bartra 1993). Though more common in rural areas, the term has also been used to identify local leaders in low-income urban settlements and at various levels of the party bureaucracy (Cornelius 1975, 1977).

A cacique's power derives both from patron-client relations which afford him legitimacy among local residents as well as from coercion, in other words from his control of the means of violence. The relation between a cacique and his subordinates

is one between a patron and his clients insofar as it is founded on an unequal exchange where the former provides essential resources and influence in exchange for political support or allegiance from the latter (Pitt-Rivers 1954; Blau 1964; Scott 1977; Lomnitz 1982). As James Scott (1977) indicates, the imbalance in the exchange between patron and client is based "on the fact that the patron often is in a position to supply unilaterally goods and services which the potential client and his family need for their survival and well-being." (p. 125) Among the most important services provided by a patron is protection in areas where state institutions are too weak to guarantee clients' personal safety. Similarly, a patron often controls access to arable land necessary for subsistence. A cacique's power over other members of a community depends on his ability to monopolize these essential goods and services. Because markets are less competitive and resources more scarce in remote rural areas, such settings are more conducive to the dominance of a single individual (Scott 1977; Scott and Kerkvliet 1977; Hall 1977). The practice of caciquismo is therefore more common in rural Mexico (Hansen 1971: 206, 223; González Casanova 1970: 32-36; Padgett 1967: 33).

Some of the most important resources controlled by a local cacique derive from his connections with the national political leadership. Through his ties with the ruling party a cacique was traditionally able to secure government funds from assistance programs as well as positions in public office for his subordinates. He was also able to intercede on behalf of local residents in their dealings with higher

authorities. However, as the PRI has lost power at the state and national levels, local caciques have been increasingly unable to deliver the goods on which their power largely rests. Resources obtained by patrons through political connections are the least secure on which to base their power over clients since they depend on the support of individuals in higher levels of the political system (Scott 1977: 129). A change in political leadership may impede the delivery of goods by a particular cacique and allow others with political connections to the new state and national leaders to successfully challenge his authority. Commenting on the effects of political competition on patron-client structures in Southeast Asia, Scott (1977) notes that it tends to increase factionalism:

> "In most traditional settings, patron rivalry was largely limited to the local arena so as not to invite external intervention. An electoral system, by contrast, creates rival national or regional parties which need allies at the local level. A weak faction that might previously have been forced to compose its differences with a dominant faction, can now appeal for external support. Many of these external allies are able to provide their local adherents with patronage, cash, or other favors so as to maintain a local foothold. *The net effect of electoral competition is thus to exacerbate many of the latent factional differences among patron-client clusters and occasionally to buttress weak patrons whose position would otherwise have disintegrated.*" (p. 141, my emphasis)

A cacique's power is not only based on unequal relations of exchange and on the legitimacy he enjoys as a result of his ability to represent the interests of the community at higher levels of the political system. He also relies on the threat and use of violence against opponents. In his classic study of *caciquismo* in a Tarascan village in southwestern Mexico, Friedrich (1977, 1986) documents how the competition for

political dominance among cacique groups led to periodic episodes of extreme violence. Though a cacique will resort to killing political opponents if necessary, his monopoly of critical resources and his overwhelming control of the means of violence make direct challenges to his authority relatively uncommon. As suggested about criminal organizations in various settings as well as international conflict, the strength of one organization or state may act as a deterrent to the use of violence by others (see Huth 1999). Moreover, as in other feuding societies, a cacique is likely to restrict attacks by his close supporters for fear that retribution may be directed against him or his group as a whole (Gould 1999, 2000). In other words, a cacique's power may not only discourage violent challenges to his authority, but also the use of violence by his followers. However, when his monopoly of political power is threatened a cacique will resort to killing his opponents, especially in areas where he operates without fear of prosecution. Knowing this, opponents who directly challenge his authority are also more likely to use violence.

The consolidation of a competitive electoral system with effective alternation of parties in office will weaken the power of a cacique since he will no longer be able to control the distribution of state resources and political influence on which his

power depends.[6] The weakening of a cacique will temporarily lead to increased violence in the community for several reasons. First, his relative weakness will make challenges to him and his group of close collaborators more common. The cacique may in turn respond with violence, leading to an escalation of the initial conflict. Second, he may lose control over his subordinates as he is unable to deliver the benefits on which their loyalty is based. Factionalism among subordinates is likely to turn violent. Finally, the new elected authorities may at least temporarily lack the coercive power to deter crime. One of the central functions of caciques and patrons more generally is the protection of clients in situations where legal institutions are weak and kinship networks are insufficient to guarantee their personal safety (Scott 1977; Scott and Kerkvliet 1977; Hall 1977). A weakening of a cacique's authority without a simultaneous strengthening of the state's law enforcement capacity may therefore be expected to result in an increase in predatory crimes against community members. To sum up, electoral competition may be expected to increase inter- and intra-factional struggle as well as predatory crime in the community. In the following sections I test this proposition using the national sample of Mexican municipalities. I first describe the construction of key indicators and the methods used. I then present the results and replicate them in ways that rule out competing hypotheses.

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[6] Policy changes that prevent local bosses from making the receipt of government funds conditional on clients' political support may also weaken their position and make challenges to their authority more likely. Over the last decade, several important poverty alleviation programs funded by the Mexican federal government have bypassed local authorities and delivered funds directly to beneficiaries (see for instance Fox 1994). Since the elimination of the discretionary power of local party bosses is sometimes an explicit goal of advocates of democratic change, its effect on greater factionalization and conflict may be seen as an indirect effect of the democratization process.

4.3 Data and Measures

The relation between electoral competition and homicidal violence is tested using municipal election results for the years 1987 to 1999 (de Remes 2000). Municipalities are the smallest political and administrative units in the Mexican system of government. They are therefore the most appropriate units of analysis to examine local political competition. The extent of competition is measured as the proportion of votes received by candidates from parties other than the Institutional Revolutionary Party in the most recent election. The evolution of this indicator clearly reveals an overall loss of support for the PRI in local elections during the decade as shown in figure 4.1. From 1990 to 2000 the average percentage of votes received by other parties increased from 25% to 56%. The proportion of votes for parties other than the PRI is a measure well-suited for our purposes because it captures the degree to which the power of local caciques (who are tied to the party) is weakened.[7] However, this variable does not take into account how the votes are divided among all competing parties. Laakso and Taagepera (1979) propose an index that measures the extent of factionalization along party lines rather than the degree of electoral competition. It is given by $1/\sum v_i^2$ where v_i is the proportion of votes for each party. The Laakso-Taagepera index is thought to measure the "effective number of

[7] The aggregation of votes for parties other than the PRI is consistent with the model of electoral behavior in Mexico proposed by Domínguez and McCann (1996) where voters first choose whether they are in opposition to the PRI and only afterwards for which opposition party they will cast their vote.

parties" competing in an election. I introduce it in the regression analysis below as an alternative indicator of political contestation at the municipal level.

Homicide rates are once again computed from mortality statistics for 1990, 1995 and 2000 to coincide with the years for which the control variables are available. The measures of electoral competition are calculated using the results of the most recent municipal election going back up to three years prior to the year from which homicides are drawn (in other words, 1987-89, 1992-94 and 1997-99). Municipal elections are held every three years with election years staggered according to the state to which the municipality belongs.[8] The three-year periods therefore guarantee the inclusion of one election for most municipalities while ensuring that the electoral results are recent enough to be an accurate measure of the political opposition faced by local caciques.[9] Since election years are lagged relative to the homicides we can be reasonably confident that we are not testing the inverse

[8] Though municipal elections should be held every three years, there were some exceptions during the years covered in the analysis. For instance, municipalities in the state of Mexico postponed their elections in 1999 in order to adjust their calendar to coincide with the federal elections in 2000.

[9] If elections were not held during the previous three years or no electoral results were available for those years the municipality was eliminated from the sample for that time period (350 out of 5,574 cases in the three time periods). Municipalities in the state of Oaxaca are also eliminated from the sample because many of them choose local officials according to traditional customs instead of direct electoral competition between candidates of different parties. Similarly, the 16 *delegaciones* or boroughs that compose the Federal District were not included in the samples because they did not hold elections for local officials until 2000.

causal relation between violence and greater electoral competition.[10] Finally, the variables from the baseline model in chapter 2 are introduced as controls in the regressions below. Since the hypotheses corresponding to these variables have already been described at length in earlier chapters I will omit their discussion here. The control variables are obtained from the 1990 and 2000 population censuses as well as the 1995 Population Count.

4.4 Methods

The municipal homicide rates along with the predictors for each of the three years are pooled together into a single dataset. Negative binomial random effects regressions are once again used to test the effect of political competition on the incidence of homicide net of the other structural characteristics. As described in chapter 2, these random effects models take advantage of repeated measures for each municipality, but do not fully exploit the information based on changes over time. In a separate section below I test fixed effects models that make use of this additional information. Two dummy variables are used to capture parametric shifts in the level of homicide between time periods.

[10] Some studies of violent crime use three-year average incidence rates in order to smooth out yearly fluctuations (Morenoff, et al. 2001; Sampson 1986, 1987; Messner 1983). Using a three-year average in this case would cause an overlap with the next elections for a large number of municipalities. Therefore the homicide rate for a single year is used. In separate regressions not reported here the homicide rates for two- and three-year periods were used and confirmed the results presented.

In order to test the difference in the effect of political competition in rural municipalities compared to the rest of the sample two interaction terms are introduced in the regressions. Since the degree of rurality is usually defined in terms of the size of towns within municipalities rather than the total municipal population, the interaction terms were constructed based on the percentage of municipal residents living in towns of less than 2,500 (a common cut-off point for rural localities, see INEGI 1999). The interaction terms correspond to municipalities where more than 75% of the population but less than 100% live in towns of less than 2,500 residents (7.9% of the cases), and municipalities where 100% of residents live in such small towns (36.9% of the cases). In separate regressions not presented here an interaction term for municipalities where more than 50% live in small towns was used with similar results as the 75% interaction term.

4.5 Results

Table 4.1 shows the results of the random effects models. The coefficients of the interaction terms for the most rural municipalities (those where 100% of residents live in small towns) are statistically significant in the expected direction. Moreover, when added to the coefficients for the entire sample they are positive and statistically significant indicating that rural municipalities with more electoral competition and party factionalization have higher homicide rates even when controlling for other structural characteristics. In the most rural municipalities an increase in the percentage of votes for opposition parties from 0% (20.3% of the cases) to 40%

(32.3% of cases have that percentage or more) is associated with a 22.0% increase in the homicide rate, while an increase of one effective party competing in local elections is associated with a 21.5% increase in the incidence of homicide.

The association between greater electoral competition and homicide in rural areas is consistent with the hypothesis that the effect is due to a weakening of local caciques. For reasons discussed earlier, patron-client relations on which the power of local caciques is based, are more common in rural areas. Therefore, if the effect of electoral competition is in fact mediated by the disruptive effects it has on patronage networks, we would expect a greater impact in rural municipalities. By contrast, in non-rural municipalities where patron-client relations are less pervasive and where political bosses act with less impunity, we should not observe greater homicide rates with increased opposition to the PRI.

As for the coefficients of the remaining variables, they are consistent with the findings discussed in chapter 2. The coefficients of the illiteracy rate and the percentage of female-headed households indicate that more disadvantaged areas and those with a higher percentage of family disruption have higher homicide rates. The presence of a large young male population is only weakly related with higher homicide rates. Contrary to the findings of studies of segregation in the United States, municipalities with higher concentrations of members of indigenous groups appear to have slightly lower rates of homicide. Similarly, contrary to the assumptions of social

disorganization theorists who argue that urbanization and higher population density lead to greater anonymity and a loss of social control, a larger number of residents per square kilometer is consistently found to be associated with *lower* rates of homicidal violence. Finally, significant differences in the homicide rates persist for municipalities in the Mexico Valley as well as the Southcentral and Northwestern states but not for municipalities in the Northcentral region when all the variables described above are entered into the regression models. Municipalities in the Mexico Valley—composed here of only those municipalities belonging to the state of Mexico (122) since the neighboring Federal District is eliminated from the sample—once again stand out for their unusually high rates of violence once other factors are controlled.[11]

4.6 The Ruling Party and Violence

It may be thought that lower homicide rates in municipalities where the PRI receives a high percentage of votes may be due to the suppressive effect of PRI officials being in office and not to political competition *per se*. The presence of

[11] The analyses presented here were replicated using the number of alleged homicide offenders to calculate municipal homicide rates. As explained in previous chapters, alleged offender data are the only alternative source available to verify my results, yet they provide a much less accurate estimate of the actual number of homicides committed since many cases never result in criminal charges against an individual. They are also sensitive to differences in state-level legal definitions of homicide. More importantly, because the number of persons charged with an offense will depend on the amount of resources available to local law enforcement institutions and the political will to prosecute offenders, homicide rates based on alleged offenders are biased towards wealthier, more urban municipalities, as well as those where political bosses exercise less influence. Consistent with the expected bias in prosecution, the coefficient for political competition was negative for non-rural municipalities in the regressions using alleged homicide offender rates. The results support my central hypothesis in that the effect of political competition was significantly greater for rural municipalities compared to the rest of the country.

officials from an authoritarian political party may be thought to deter criminal activity among other reasons because of the wide array of extra-legal powers at their disposal. If true, this argument would support the thesis that authoritarian governments are better able to deter violence. In order to test this hypothesis a dummy variable is used to identify municipalities governed by the PRI. In addition, two interaction terms are again created to test whether the effect of the PRI official being in office differs for rural municipalities. The results of this new set of regressions shown in table 4.2 corroborate the previous finding regarding the effect of political competition on homicide. Regardless of whether the Institutional Revolutionary Party governs a municipality, the extent of political competition and party factionalization continue to be associated with higher homicide rates in the most rural municipalities but not the rest of the country.[12] In all the models the coefficients for the dummy variables indicating whether the PRI was in office fail to reach statistical significance. In other words, municipalities governed by the PRI have homicide rates that are no different from those governed by members of other parties. There is therefore no evidence that authoritarian local governments are better able to deter violence.

[12] In the linear regressions used in Villarreal (forthcoming) the degree of party factionalization has a small negative effect on the homicide rate in non-rural municipalities once the ruling party's presence is taken into account, but continues to have a positive effect in rural municipalities as predicted. This negative association between party factionalization and homicide in non-rural municipalities may indicate that in urban areas where patronage networks are weaker more electoral competition results in a greater accountability of elected officials and an incentive for them to reduce violence.

4.7 Spatial Dependence

As discussed in chapter 2, the assumption of independence among cases in standard regression techniques is problematic when geographical units of analysis are used. Geographical borders do not always correspond to boundaries of social interaction. Spatial boundaries are also permeable in the sense that residents of one municipality may commit a homicide or be victimized in nearby municipalities. A municipality's proximity to others with high homicide rates may therefore be expected to be an important determinant of its own crime rate. In chapter 2 I used spatial lag models for each year in the study to measure the spatial dependence of homicide rates across municipalities and verify that the findings presented were not a result of unmodeled spatial effects. In this section I propose a technique for implementing spatial lag regression models for panel data and use it to rule out the possibility that the relation between political competition and homicide found in this chapter is due to unmodeled spatial effects.

The spatial lag regression models for panel data are of the form:

$$y_{it} = \rho \sum_{j} w_{ij} y_{it} + \mathbf{x}_{it}\boldsymbol{\beta} + u_i + \varepsilon_{it}$$

where w_{ij} are the elements of a contiguity matrix originally equal to one if two municipalities i,j are contiguous and zero otherwise and then row-standardized; ρ is the spatial autoregressive coefficient; and the remaining terms are the same as before. Spatial dependence is assumed to exist cross-sectionally only and not over time. As in chapter 2 the log homicide rate is used as the dependent variable instead of the

homicide count and linear regressions are employed simply because the routines necessary for implementing negative binomial regressions with spatial lags are not yet available. The models are estimated by means of the same instrumental variables method as before, except that now the spatially lagged exogenous variables for each time period are used as instruments for the original set of variables in a two-stage random effects regression instead of running separate regressions for each panel.[13]

The results of the spatial lag model shown in table 4.3 corroborate my previous findings in that the coefficients for political competition and party factionalization are statistically significant and with the same sign as before even once the spatial dependence is taken into account. Moreover, the spatial autoregressive coefficient (ρ) is large and statistically significant indicating a strong spatial dependence of the homicide rates in Mexican municipalities. Proximity to other municipalities with high homicide rates is associated with higher rates in a given municipality even when other factors are controlled.

[13] This method is an extension of one proposed by Luc Anselin (1988, 1992) for non-panel models (see also Kelejian and Robinson 1993). Anselin (1992) notes that for non-panel models the instrumental variables method leads to consistent estimates and is particularly well suited for large samples such as the one used here (and for which maximum likelihood estimation is computationally prohibitive) since statistical inference is based on asymptotic considerations. The contiguity matrices and spatially lagged variables were constructed using the software *SpaceStat* (see Anselin 1992, 1995). The variables were then imported into software allowing the estimation of instrumental variables random effects models.

4.8 A Fixed Effects Model

The results of the random effects models reveal a clear pattern of association between political competition and homicide across municipalities. As predicted by the theory, greater electoral competition is associated with higher homicide rates in rural municipalities, while in the rest of the country it appears not to have an effect. However, these models did not test the effect of changes in political competition over time. If the decline in support for the ruling party (PRI) is indeed responsible for an increase in violence due to the disruptive effects it has on patronage networks net of other factors, then we should observe a rise in the incidence of homicide in those municipalities that experienced the greatest increases in support for opposition parties during the 1990s once other factors are controlled.[14] In other words, we should observe the relation between increased opposition and homicide not only across municipalities, but also over time for each municipality. In this section I test fixed effects negative binomial models and compare them to the random effects models in an attempt to disentangle the effects across space and time. As explained in chapter 2, the negative binomial panel models do not allow for a clear separation of the effects between and within groups (Hausman, Hall and Griliches 1984: 928-934). However, although they do not isolate the effects along both dimensions, large discrepancies between the coefficients of the same variables in the different models may indicate

[14] What I am examining is the marginal effect of political competition when other factors are held constant. The positive association between political competition and homicide is indeed surprising given that while political competition increased steadily between 1990 and 2000, the average municipal homicide rate for rural and non-rural areas increased between 1990 and 1995, but declined by 2000.

the relative importance of the variables in explaining differences in homicide rates across municipalities and over time.[15]

One disadvantage of the negative binomial fixed effects models have the disadvantage that they drop from the analysis all cases in which the dependent variable takes on a value of zero in all time points (15% of cases). In the models presented below a unit is therefore added to the homicide count for all municipalities. Because this addition may have an effect on the random effects models these are estimated once again with the new dependent variable and presented along with the results of the fixed effects models. Secondly, though the computational procedures allow the estimation of coefficients for variables that are constant over time in the fixed effects models, these coefficients do not have a clear meaning. The regional dummy variables are therefore eliminated from the fixed effects models below.

Table 4.4 shows the results of the random and fixed effects negative binomial models using the new dependent variable. The relation between greater electoral competition and higher homicide rates in the most rural municipalities continues to hold in the fixed effects models suggesting that political competition has an effect not only across municipalities but also over time. Moreover, separate analysis using linear fixed effects regressions and the logged homicide rate as the dependent variable

[15] Please refer to chapter 2 for a detailed explanation of the differences between negative binomial fixed effects models and their linear counterparts.

also showed a positive association between political competition and homicide in the most rural municipalities (Villarreal forthcoming). Not only are the linear fixed effects models better able to isolate the effects of changes over time, but they have the added advantage of eliminating the effects of time-invariant municipal characteristics, thus providing evidence that the association between political competition and homicide in the most rural municipalities is not spurious.[16] It can therefore reasonably be said that changes in electoral competition and party factionalization at the municipal level over time during the 1990s were associated with increases in the homicide rates in these municipalities.

4.9 Conclusions

The results presented in this chapter provide considerable support for the hypothesis that in societies characterized by patronage relations an increase in electoral competition will result in higher rates of homicidal violence. The association between electoral competition and homicide in rural Mexico was found to be significant across municipalities and over time, as well as when controlling for various standard correlates of violent crime. Consistent with the hypothesis that the relation is due to the disruption of patronage networks the effect was found only in rural areas. Unfortunately, there are no direct measures available of the relative power

[16] The coefficients for political competition and party factionalization in non-rural municipalities is negative in the fixed effects models. However, this appears to be a result of the transformation of the dependent variable rather than the method employed since the coefficient is also negative in the random effects model with the new dependent variable.

of caciques across localities, thus making it impossible to directly test the underlying mechanism suggested. Nevertheless, a large literature on patron-client relations indicates they are more common and play a larger role in relatively isolated rural settings. To the extent that greater electoral competition leads to higher homicide by weakening the power of local caciques we would expect a larger effect in rural areas.

Two general conclusions may be derived from the present examination into the origins of violence in Mexican municipalities. First, the Mexican case illustrates the need to explicitly consider the hierarchical nature of social control in order to understand the possible impact of social and political change on crime. Sociological theories that emphasize the importance of a dense network of ties among community members in preventing crime often fail to differentiate between types of social ties, or ties among different social actors. In societies characterized by a hierarchical form of social organization social and political changes that undermine the source of unequal exchange between actors may result in a loss of social control and an increase in violent crime. Rural communities in Mexico may be considered extreme examples of hierarchical organizations. Nevertheless, it may be possible to extend this insight to other contexts where hierarchical social relations are found. For example, youth gangs in the United States frequently exhibit vertical organizational structures. As Martín Sánchez Jankowski (1991) notes, hierarchically organized gangs are less likely to engage in violence than those with other forms of organization because they are able to exert greater discipline over their members: "[T]he more a gang is able to

structure itself as an ideal type of vertical/hierarchical organization, the more overall control it is able to command; and the more control it has, the fewer cases of individual gang violence it will experience." (p. 173). By the same reasoning, events that lead to the weakening of the control exercised by the gang leadership may result in an increase in violence. Thus, broader societal changes that affect older cohorts that tend to occupy positions of leadership within the gang—such as changes in their employment opportunities or a reduction in the age at which they are tried as adults—may have a disproportionate effect on youth violence. A similar situation may hold with respect to hierarchical relations within nuclear and extended families. However, these propositions cannot properly be tested at the aggregate or ecological level, but instead require the careful reconstruction of social networks and the documentation of individual episodes of interpersonal violence (see for example Gould 1999, 2000).

Secondly, the foregoing discussion also points to the need to consider the effect of political control. Sociological theories of crime have generally failed to account for the impact of political processes, while theories of political violence usually address the relation between the type of national political regime and large-scale conflicts. In this chapter I have suggested a theoretical approach that considers the way changes in political structures operate at the local level to produce an increase in interpersonal violence. This increase in local electoral competition must be understood in the context of a broader national democratic transition, which Mexico has in common with many other countries throughout the world. The

argument advanced here should not be confused with the notion that democracy breeds violence. Rather, it is the *transition* to democracy that produces a disruption of patronage networks and a temporary increase in violence. With the routinization of electoral competition and the effective alternation in the party in office will come a balance within the various factions in the community. There will be a disincentive for the group in office at any given time to use violence against opponents for fear that the same will be done against them in the future when they are out of power. Moreover, with democratically elected officials at various levels of the political system the benefits local bosses derive from membership in the old party will disappear, as will the relative impunity with which they were accustomed to operate. And finally, as the power of local officials comes to depend more on public perception of how well they perform their duties and less on the distribution of patronage, there will be a greater incentive to improve policing methods and stem violence in order to gain support at the polls. It may still be too early in Mexico's transition to see these benefits of greater democracy. Nevertheless, separate analyses where the effect of political competition is allowed to vary over time already suggest a decline in its impact on homicide in 2000. It may not be the case that all good things come together, but the Mexican case presents no evidence that citizens are forced to choose between greater democracy and lower levels of violence.

CHAPTER 5

CRIME AND THE URBAN ECOLOGY OF MEXICO CITY

Most ecological theories of crime in urban areas are based on studies of cities in the (post)industrialized West. Yet a large segment of the world population today live in the sprawling urban centers of the developing world (Massey 1996). These centers present important challenges to existing sociological theories insofar as they contain ecological settings not present in the United States or Western Europe, with new forms of community organization and new mechanisms of social control. They also experience markedly different processes of expansion and spatial differentiation. In many ways Mexico City exemplifies the pattern of urban growth in developing countries, albeit in a larger scale. With a population of over 17 million spread out in an area of 1,370 square kilometers, the Mexico City metropolitan area is one of the largest in the world (CONAPO 1998). It witnessed a period of rapid population growth during the 1950s, 60s and 70s with the influx of rural migrants. As low income housing in the central part of the city was depleted, migrants settled in illegal tenements in outlying areas. Each wave of migrants formed new neighborhoods in concentric zones around the Northern and Eastern part of the city, while higher income groups moved South and to the West (Ward 1998 41-86). The types of housing arrangements characteristic of the older sections of the city and the new settlement areas in various stages of development led to different forms of social organization that have an impact on crime. Government policies also affected the

urban ecology of Mexico City. The prohibition of new low-income housing developments in the Federal District from the 1950s to the 1970s contributed to the outward expansion into nearby areas outside its boundaries. The selective legalization of land titles and the provision of services to those more organized in exchange for political support for the regime led to an uneven and disorganized pattern of urban development. The financing and construction of housing projects by government agencies disproportionately benefited the middle class, government bureaucrats and those with formal jobs, but left out many of the urban poor. Similarly, the rehabilitation program after the 1985 earthquake left many residents of the city out, and thus contributed to a worsening social inequality (Ward 1998, pp. 248-249).

In this chapter I examine the ecological correlates of several different types of crimes in a sample of neighborhoods and housing projects in Mexico City. This neighborhood-level approach has two significant advantages over the municipal-level analysis in earlier chapters. First, neighborhoods constitute more appropriate units to study ecological effects than larger entities such as cities or municipalities because they are more likely to coincide with recognizable communities. Neighborhoods encompass areas within which individuals are likely to know others and engage in guardianship. Secondly, because neighborhoods within the Federal District are under the same jurisdiction their crime rates are more directly comparable. Crimes are classified according to the same criteria and aggregate figures are compiled by the same authorities. This greater comparability allows me to analyze other types of

crimes in addition to homicide, including theft and robbery. These other types of crimes constitute a larger percentage of those committed than homicides, and are responsible for the explosive rise in the overall crime rate in Mexico City.

The decline in homicide rates nationwide described in earlier chapters contrasts sharply with the trend in other types of crimes in Mexico City during the same period. Figure 5.1 shows the rates of robbery in public areas, bodily harm and homicide in the Federal District from 1990 to 1999 according to the number of reported offenses. The changes are indeed staggering. While homicides decreased as a proportion of the population after 1995 they actually posted a 37% increase during the decade. The incidence of bodily harm rose 104% and robbery in public areas by an astounding 384%. Table 5.1 shows the rates of more types of crimes along with their corresponding changes. Every single type of crime registered an increase during the decade. The increases were particularly large for property crimes, and those involving the use of violence.

This upward trend suggests that a different social process is taking place in urban areas like Mexico City than in the rest of the country. While rural areas experienced an increase in social control that may be generally attributed to a process of modernization akin to that which took place in the industrialized countries of the West in the nineteenth century, the trend of crimes in Mexico City more closely resembles the increase in the West during the 1960s. By the end of the 1990s the

distribution of crimes by category in the Federal District begins to look a lot more like those in urban areas elsewhere in the world. Unfortunately, there is insufficient information over time to properly answer the crucial question of what ultimately caused the dramatic changes in criminal activity in Mexico City. However, the cross-sectional analysis in this chapter can shed some light as to what types of factors are generally conducive to social control in urban areas and whether they are different from those found to be important in other parts of the country. This information may in turn allow us to make reasonable inferences about the possible causes of changes over time.

In the statistical analysis below I examine the incidence of crime in neighborhoods with different types of housing arrangements. I measure the effect of structural density and home ownership on crime. I analyze the relation between a community's income level and criminal activity, as well as the effect of income inequality. I test the association between family structure and guardianship at the local level. Since heavily commercialized areas tend to attract a large non-resident population and generate more street crime, I also consider the impact of the number of business establishments in a neighborhood. Using an estimate of the number of police in a neighborhood I take into account the effect of formal social control. Finally, following recent developments in neighborhood studies I control for the impact of crime in surrounding neighborhoods (Morenoff, Sampson and Raudenbush 2001).

5.1 Hypotheses and Measures

The sample used in the regression analysis consists of all neighborhoods and housing units that could be matched with those for which the Federal District Attorney General's Office (PGJDF) compiled criminal statistics in 1998. Out of a total of 1,908 neighborhoods and housing units 856 could be matched with those for which GIS boundaries are available based on their names. Together they account for 69% of all crimes reported to the authorities that year. Because the exact boundaries used by the Attorney General's office to gather crime statistics are not available it is impossible to verify whether they coincide precisely with those obtained from a private vendor and used to construct the social indicators entered as predictors in the regression models. However, the relatively large sample size (n=856) makes it unlikely that small discrepancies in the city blocks included in some of the neighborhoods will have a large effect on the regression results. Moreover, because there is likely to be greater agreement on the precise boundaries of older neighborhoods it is reasonable to suspect less discrepancies in the four most central *delegaciones* that compose the Federal District (Cuauhtémoc, Benito Juárez, Miguel Hidalgo, and Venustiano Carranza). In separate regressions not presented here I essentially replicate the results described below using only the neighborhoods in these *delegaciones*, thus providing further evidence that differences in boundary definitions do not affect the main findings.

I examine five different indexes of crime, all of which are estimated using the number of offenses reported to the authorities: the intentional homicide rate ("homicidio doloso"),[1] robbery and theft of homes, robbery in the streets or public areas ("robo a transeúnte"), the total rate of violent crimes (including intentional homicide, rape, robbery of homes, robbery of businesses, robbery in streets, and bodily harm), and the total crime rate. The relative sensitivity of these different indexes of crime to neighborhood conditions not only reveals important information about the underlying social control mechanisms at work, but also serves as a form of validity test of the variables used as predictors in the regression analysis. For instance, because property crimes are affected by the availability of material goods that serve as targets, they should be more positively associated with neighborhoods' income levels than non-property crimes, all else being equal. The complete set of hypotheses regarding the impact of neighborhood characteristics on crime and the variables used to test them are described below.

Resource Deprivation – Ecological studies of urban areas in the United States have often focused on the relation between economic conditions in a community and the level of crime. Theoretical differences have led to conflicting predictions regarding the relative importance of poverty and income inequality. Strain theorists argue that delinquent behavior is a result of frustrated aspirations (Merton 1938).

[1] Article 9 of the Criminal Code of the Federal District defines as "doloso" any crime committed by someone who knows the possible outcome of a criminal act or who is aware of the legal restrictions.

They therefore predict higher crime rates in communities characterized by more inequality (Blau and Blau 1982). On the other hand, social control theorists since Clifford Shaw and Henry McKay's classic study (1942) have argued that poverty weakens a community's ability to enforce social norms. They hypothesize that low aggregate income levels are indirectly associated with more crime (see for instance Sampson and Groves 1989).

A further disagreement arises with regards to the direction of association between a community's income level and the incidence of crime. Social control theorists argue that a lack of economic resources is conducive to higher crime rates because it inhibits organizational participation and generally decreases a community's ability to act collectively (see for instance Kornhauser 1978). On the other hand, routine activity and criminal opportunity theorists predict higher rates of property crimes in more affluent neighborhoods since they often provide more opportunities for theft and robbery (Cohen and Felson 1979; Mayhew, et al. 1976). Cohen and Felson (1979: 589) identify three necessary elements for a predatory crime to take place: "(1) motivated offenders, (2) suitable targets, and (3) the absence of capable guardians against a violation."[2] Variations among communities in the availability of suitable targets and the extent of guardianship may lead to differences in crime rates. Because wealthier communities will generally have more valuable goods which may

[2] According to Felson (1987) a predatory or exploitative offense is that in which "at least one person wrongly take[s] or damage[s] the person or property of another."

be targets for theft, criminal opportunity theory predicts higher rates of property crimes (though not necessarily violent crimes such as homicides) in those communities. In the regression analysis I use several socioeconomic measures to test the ability of the social control and criminal opportunity theories to explain differences in crime rates. By determining the direction of the association between income and crime I am able to ascertain the relative importance of guardianship (which is assumed to increase with income and inhibits crime) and the presence of valuable goods (which obviously increases with income and may encourage crime).

I measure income levels in Mexico City neighborhoods using residents' monthly earnings reported in the 1990 Census. As with other variables in this chapter, the income indicators are obtained by aggregating all census tracts (and appropriately weighed portions of census tracts) contained in each neighborhood using GIS software. I take the percentage of employed individuals earning 2 minimum wages or less (approximately $7.20 U.S. dollars per day in 1990) to be an indicator of a neighborhood's low income level, and the percentage of employed individuals earning more than 5 times the minimum wage as an indicator of a neighborhood's high income level. These measures exclude persons who are considered "economically active" but out of work at the time of the interview. However, such individuals form a very small portion of the population. According to the National Statistics Institute's definitions the percentage of economically active individuals who

were unemployed averaged only 2.6% for the neighborhoods considered in the sample.

A potentially more serious problem with the aggregate income measures based on individual earnings is that they do not take into account the number of dependents per wage earner. Unfortunately, household earnings are not presently available at the census tract-level. Yet another problem is that while the income indicators are derived from 1990 data, in the analysis that follows they are used as predictors for neighborhood crime rates in 1998. It is possible that neighborhoods have undergone significant changes in the interim period. Unfortunately the more recent 1995 Population Count does not contain any direct measures of income, and the definitions of the 2000 census-tract boundaries are not yet available. Nevertheless, there are several variables in the 1995 Count which are related to a neighborhood's income level, and which may serve to validate the indicators based on 1990 data. The adult illiteracy rate and the percentage of children ages 6 to 14 who cannot read and write are rough indicators of education levels in 1995 and should be strongly related to income. Indeed, the percentage of employed individuals earning 2 minimum wages or less in 1990 is strongly correlated with the adult and child illiteracy rates for a

sample of 175 neighborhoods examined (correlations of 0.877 and 0.787 respectively), thus providing some validation for the income variables.[3]

Figure 5.2 and 5.3 show the percentage of high income earners in each neighborhood using different shades of gray, and those with the highest levels of robbery in public areas and homicide respectively using a hatching pattern as in previous chapters. Neighborhoods with higher aggregate income levels clearly exhibit much higher rates of robbery in public areas according to the number of reported offenses. The most affluent neighborhoods such as Lomas de Chapultepec, Guadalupe Inn and San Angel, all in the western part of the city, are among those with the most robberies per person. This pattern supports the criminal opportunity perspective which emphasizes the availability of targets for predatory crimes. Perhaps more surprisingly however, these same neighborhoods are also among those with the highest homicide rates according to figure 5.3, although the locations of homicides appear to be more evenly distributed throughout the city. These simple bivariate relations based on visual inspection may hide the effect of other neighborhood

[3] Because crime rates in a particular neighborhood may be affected not only by the income level of the neighborhood but also by that of adjacent neighborhoods a separate set of socioeconomic indicators was created to account for spatial externalities (Sampson, Morenoff and Earls, 1999). For each neighborhood in the sample the average percentage of low and high income earners for all adjacent neighborhoods (regardless of whether the latter were in the sample) was computed. The average was weighed by the population of each adjacent neighborhood. However, this variable was omitted from the final regression analysis because it was found to be a very strong predictor of a neighborhood's own socioeconomic level. When included in the regression models along with neighborhoods' own socioeconomic level it resulted in an unacceptable level of multicollinearity (VIF greater than 5). This high level of multicollinearity simply indicates that neighborhoods tend to be adjacent to others of similar socioeconomic level.

characteristics. The multivariate analysis below will allow me to properly establish the relation between income and crime net of other factors.

Two additional measures of resource deprivation are computed from the educational attainment levels of neighborhood residents. The percentage of individuals 15 years of age or older with primary education or less and the illiteracy rate among those in the same age group are used as predictors in the regression models. The percentage of individuals with only primary education captures a slightly different dimension of resource deprivation than the two income measures described and may in fact be introduced along with the percentage of high income earners without evidence of multicollinearity. As discussed below, education levels are associated with an increased likelihood of reporting offenses. It is therefore important to control for the education level of residents in the regression models in order to ensure that the effects of the remaining variables are due to differences in offending and not reporting rates across neighborhoods.[4]

Housing Structure – In order to understand the physical layout and internal organization of low-income neighborhoods, and how these in turn may affect crime, we must first consider the historical process of urban growth in Mexico City. During

[4] In addition to the measures of absolute resource deprivation, an index of inequality was also constructed for each neighborhood by dividing the number of high-income earners (those earning over 5 minimum wages) by the number of low-income earners (those earning 2 minimum wages or less). The results of the regression models including the measure of inequality are not reported here but were generally similar to those using the percentage of high-income earners.

the 1950s, 60s and 70s the city experienced the influx of an unprecedented number of migrants from rural areas. While the traditional zone of arrival is thought to have been the central and older section of the city, housing there was soon depleted and migrants began to settle in squatter settlements in the outlying areas. Low-income neighborhoods in the city's Center are primarily composed of *vecindades*, or multi-family buildings that were typically built by converting older elite residences left behind as their wealthy owners moved to newer areas in the Western and Southern parts of the city. Some new vecindades were later built anew along the same model. In a vecindad each family occupies a single room and shares with other tenants a common patio where there are common laundry facilities, and often a common bathroom and kitchen (Ward 1998, pp. 63-65). Since there may be several dozen families in a single vecindad, the population density in the neighborhoods is very high. Yet they are not always characterized by the anonymity commonly associated with large housing units (Sampson 1987; Wilson 1984). Instead, due to the close proximity and sharing of services and common areas, such arrangements may be expected to maximize social interaction, surveillance and guardianship of property. Ethnographic and literary accounts of life in vecindades often make reference to the lack of privacy and residents' complaints of the intrusion of other inhabitants in their personal affairs (Ballent 1998).

Early theories of rural migration to Latin American cities suggested a two-stage process in which migrants first settled in the city's center and later moved to

illegal tenements in the intermediate or outer zones (Turner 1968). More recent studies have found that migrants move directly to the outer sections, with each successive wave forming a new ring (Ward 1998, p. 68). The new tenement areas in the periphery of Mexico City, known as *colonias populares* are made up of makeshift dwellings often located on illegally occupied land. Homes are typically built from substandard materials such as carton and sheet metal, with dirt floors. With time, and if the colonia survives initial government attempts to remove it, building materials are eventually replaced by better ones and services provided, as the colonia becomes more fully incorporated into the larger city. Because the survival of the tenement depends on the organizational strength of its inhabitants, those that survive are usually characterized by strong social cohesion and a sense of solidarity among residents. However, as residents' demands for legalization and services are met, the motivation for neighborhood organizations disappear and older colonias become demobilized and less cohesive. Finally, because the provision of services depends on successfully lobbying government officials, the process of incorporation into the city is tied to the system of patronage whereby colonias are granted services in exchange for political support (Cornelius 1975).

In sum, low-income areas in Mexico City differ significantly in their physical layout and in their internal organization. One key determining factor of a community's organization is its age, which also corresponds roughly to its location within the city. Unfortunately, there is no systematic measure of the age of

neighborhoods within the sample. Therefore, in order to test the difference in crime rates between neighborhoods with different housing arrangements, I rely directly on indicators of the housing stock and access to services. I construct an index of poor housing quality using factor analysis with six variables from the 1990 census: 1) the percentage of dwellings with roofing made of sheet metal, carton and other materials other than cement; 2) the percentage of dwellings with floors made from materials other than cement, tiles, wood or other finishings (i.e., dirt floors); 3) the percentage of dwellings not connected to the public sewage system; 4) the percentage of dwellings without electricity; 5) the percentage of dwellings without running water; and 6) the percentage of single-room dwellings.[5] A reduced form of the housing stock variable was constructed using three of the variables from the 1995 Population Count (the third, forth and fifth variables). This updated variable was strongly correlated with the one from 1990 (correlation of 0.823) for a sample of 175 neighborhoods, therefore providing evidence that differences in the quality of housing stock had not changed significantly between 1990 and 1995.

Neighborhoods with poor housing characteristics and lacking access to services are those that not only have low income levels but are also of relatively recent settlement. Traditional low income neighborhoods in the central section of the city may have similarly low income levels as those on the margins, but they usually

[5] The housing stock variable is similar to the marginality index created by the National Population Council (CONAPO) and used in previous chapters. However, it does not contain any direct measures of the socioeconomic status of local residents.

have a better housing stock and are better connected to the rest of the city. Though recently settled neighborhoods may be expected to share some social and organizational disadvantages with other low income areas, they may on the other hand exhibit higher levels of social control due to the close interaction generated by a joint struggle for the regularization of illegal landholdings and the provision of services. Figure 5.4 shows the location of the neighborhoods with the worst housing stock according to the composite variable as well as those with the highest incidence of robbery in public areas. A visual inspection reveals that the newly created variable accurately identifies the new tenements in the northern and southernmost parts of the city. Moreover, the map indicates a very clear inverse association between the quality of the housing stock and the number of robberies per population. Of course, the effect of the poor housing stock is confounded with that of the lower income levels (and consequently the relative absence of valuable goods that constitute targets) in areas with substandard housing. In the multivariate regressions below I am able to separate these two different effects.

In addition to the housing stock index several other indicators of the housing structure are used as predictors of crime rates in Mexico City neighborhoods in the regression analysis. First, the overall housing density, measured as the number of dwellings per square kilometer, is included in all the models. This indicator is meant to resemble measure of structural density used in ecological studies of crime in the United States (Sampson 1983). Second, the percentage of dwellings made up of units

in a vecindad or apartment building (as opposed mainly to stand-alone houses) according to the 1990 census is also entered as a predictor in some of the models.[6] If social control theorists are correct and higher density housing arrangements lead to increased anonymity and more crime then we should expect higher crime rates in neighborhoods with higher population density and those composed of large apartment complexes and vecindades. Finally, the percentage of dwellings that are owned as opposed to rented is included as a measure of residential stability. Home ownership may be taken as a rough indicator of permanence in a particular neighborhood, and a willingness of residents to take concerted action to maintain the community free of criminal activity.

Commercialization – The extent of commercial activity in a neighborhood may be expected to affect the incidence of crime for three reasons. First, heavily commercialized areas attract more non-residents who come for shopping and entertainment, thus making the actual population at risk higher than the resident population (see Messner and Tardiff 1986). Second, commercial areas provide better targets for various types of property crimes. Shops and restaurants tend to attract people with more disposable income who drive cars and carry more money. Finally, as more businesses move in, the remaining residents are likely to lose control of their neighborhood. When residential units are converted into shops and restaurants, many

[6] Unfortunately, the coding of dwellings in the 1990 Census does not allow the separation of units in a vecindad and apartment buildings.

long-time members of the community are displaced. Others move to avoid traffic and noise. The result is a rapid turnover from which the neighborhood may never recover. Those residents that stay behind become more accustomed to not recognizing people in the streets and may therefore be less likely to detect delinquent behavior. A lax enforcement of zoning restrictions make the over-commercialization of residential areas a greater problem in Mexico City than in most cities in the U.S. Wealthy neighborhoods such as the Colonia del Valle have evolved into high crime areas in part because of this process. In the regression analysis I use the number of businesses in a neighborhood obtained from the 1994 Economic Censuses divided by the resident population as a measure of the extent of economic activity. As shown in figure 5.5 this variable accurately identifies the heavily commercialized neighborhoods in the central section of the city such as Centro, Juárez and Doctores, as well as the wealthy neighborhoods mentioned earlier. The remarkable coincidence between the neighborhoods with the greatest number of businesses and those with the highest incidence of robberies shown in hatching suggests that the extent of economic activity may be an important predictor of property crimes in the Federal District.

Family Structure – In previous chapters I examined the relation between family structure and the incidence of homicide at the municipal level. I found family disruption to be significantly associated with higher homicide rates, while family extension appeared to have opposite effects in urban and rural areas. In rural areas, a large presence of extended family units seemed to be conducive to more social

control and less homicides, whereas in urban municipalities family extension was a symptom of greater social disorganization that led to more violence. Data specifically requested from the National Statistics Institute allows me to test the effect of female headship and family extension for the sample of Mexico City neighborhoods. As in previous chapters, female headship is defined as the percentage of all households headed by women according to the 1990 census. The percentage of nuclear families is again used as an inverse measure of family extension.

Police – It is impossible to properly estimate the deterrent effect (if any) of a greater police presence in a neighborhood using cross-sectional data alone. Though more police officers and patrol cars may in fact deter crime, they may also have been assigned to areas with higher crime rates. Yet in the regression analysis I introduce an estimate of the number of police per 1,000 residents in each neighborhood simply as a control variable along with the other predictors. In order to estimate the police personnel likely to be in a particular neighborhood I multiply the number of police assigned to each delegación by the proportion of surface area of each delegación comprised by the neighborhood.

5.2 Results

Table 5.2 shows the results of the baseline negative binomial regression models for all five indexes of crime. Perhaps the most surprising finding is the consistently high rates of crime in the more affluent areas of Mexico City even when

all other factors are taken into account. The corresponding regression coefficients indicate that an increase of one standard deviation in the percentage of high income earners (those earning more than 5 times the minimum wage) is associated with a 32.0% increase in robbery in public areas and a 17.1% increase in the rate of violent offenses. The only regression model in which income is not a statistically significant predictor is that corresponding to the homicide rate. However, the fact that high income neighborhoods have homicide rates that are statistically no different from those of the rest of the city is itself remarkable if we compare the pattern to that in U.S. urban areas. It is difficult to imagine the highest income neighborhoods in cities like Chicago (the equivalent to areas like San Angel or Lomas de Chapultepec in Mexico City) being among those with the greatest number of robberies and other violent crimes per person or having the same homicide rate as the most disadvantaged inner city neighborhoods. A higher rate of reporting offenses among those better off cannot fully explain this difference since, as will be shown below, the effect of income on reporting rates is mediated through education levels which are controlled in the regression models shown in table 5.2. Lower education levels, measured as the percentage of adults with only primary education or less, are in fact associated with lower rates of reported offenses. Yet they fail to account for the effect of neighborhoods' income level, whose coefficient remains significant.[7]

[7] Although not presented in the tables, regression models using the percentage of low-income earners lead to the same conclusion: lower income neighborhoods experience fewer crimes. Similarly, the ratio of income inequality is associated with higher crime rates.

As expected, the presence of a large number of business establishments is conducive to more crimes, especially robbery in public areas and other violent offenses. Business attract non-residents with money and valuable goods who are prime targets for muggings. Moreover, as suggested earlier, more economic activity may cause a decline in informal social control as residents become accustomed to not recognizing strangers that come to the neighborhood to shop and dine. According to the regression results, one standard deviation increase in the number of business establishments per resident leads to a 27.2% increase in robbery in the streets. This strong effect not doubt explains the high incidence of robbery in the heavily commercialized neighborhoods in the central part of the city shown in the maps above. It also helps explain higher crime rates in some of the older wealthier neighborhoods such as the Colonia del Valle. The lack of enforcement of zoning restrictions has made the transition from affluent residential areas to heavily commercialized ones common in Mexican cities as business establishments seek to cater to local residents and cash in on the status of the high income neighborhoods.

However, the degree of commercialization cannot fully account for the higher rates of crime in affluent neighborhoods. Even when the presence of business establishments is included in the regressions models, a neighborhood's income level continues to be a significant predictor of most types of crimes. Greater opportunities afforded by the presence of valuable goods surely accounts for part of this difference, but what sets high income neighborhoods in Mexico City apart from their equivalent

in cities in the United States is that these greater opportunities are not compensated by mechanisms of formal and informal control. The social ecology of Mexico City, where affluent areas are often less isolated from the rest of the city and where wealth is concentrated in the hands of fewer people, may make it more difficult for residents of high-income neighborhoods to guard against crime. If we add to this the inefficacy of an underpaid, undertrained and corrupt police force we have the conditions for the pattern of high crime rates in the western section of the city described earlier. These conditions may now be changing as wealthy residents have begun to hire more private security forces and isolate themselves in gated communities.[8]

Contrary to expectations based on social disorganization theorists' claim that a higher structural density in inner city areas is conducive to anonymity and a loss of social control, a greater concentration of dwellings in Mexico City neighborhoods is associated with *lower* rates of crime. However, the overall housing density is not a very precise indicator of the social ecology of inner city neighborhoods. Table 5.3 shows the results of the regression models where the percentage of dwellings constituted by apartments and units in vecindades is included as a predictor. A larger presence of these types of high-density housing arrangements is associated with more violent crimes and especially with more robberies in the streets. An increase of one standard deviation in the percentage of apartments and vecindades is associated with

[8] An alternative interpretation for the difference in crime patterns in Mexico City and urban areas in the U.S. is not that higher income areas have more crime, but rather that low income areas in Mexico City have less crime.

a 40.2% increase in these types of robberies, even when the overall housing density is taken into account. A greater percentage of home owners (as opposed to renters) is also conducive to lower crime rates in most of the models considered. Since home ownership may be interpreted as an indicator of residential stability this finding may be thought to support social disorganization theorists' view that residential stability promotes social control at the neighborhood level.

The results of the regression models shown in table 5.4 indicate that peripheral areas characterized by dwellings made of substandard materials and lacking access to services have considerably lower rates of robbery in public areas, violent crimes, as well as a lower overall crime rate, even when controlling for income. These findings are consistent with the hypothesis proposed earlier that the struggle for regularization of land titles and provision of services leads to greater cohesion among residents and lower crime rates in new tenements areas. The coefficients remain significant when the education levels are taken into account in models not shown here, although the introduction of the percentage of individuals with only primary education leads to a high degree of multicollinearity (VIF=6.5). The negative association between poor housing quality and most types of crimes is particularly surprising given the similarity of the housing stock index to the index of marginality that was found to be such a strong predictor of *higher* homicide rates at the municipal level.

Finally, the results of the regression models examining the effect of family structure on victimization rates in Mexico City neighborhoods shown in tables 5.5 and 5.6 confirm the conclusions reached with regards to homicide rates at the municipal level in previous chapters. A higher percentage of female-headed households in a neighborhood is conducive to higher rates of crime, especially robbery in streets. One standard deviation increase in the percentage of households headed by women is associated with an astounding 85.6% rise in these types of crimes even when a neighborhood's income level is included in the regressions. This is by far the largest effect found in the entire study. However, the effect of female headship may be confounded with that of other dimensions of family structure. For example, female-headed households almost invariably include extended family members (probably to provide extra income and childcare necessary for women to seek employment outside the home). The association between female-headship and family extension is so strong at the neighborhood level that the two variables cannot be included in the same regression models without multicollinearity. When introduced separately in the models shown in table 5.6 the percentage of nuclear families (an inverse measure of family extension) was found to be an important predictor of every type of crime. Though more detailed ethnographic research is required to identify the precise causal mechanism, these results clearly suggest that female headship and family extension are two measures of an underlying characteristic of family structure in Mexican urban areas that is highly conducive to a loss of social control and more crime.

5.3 Income and the Likelihood of Reporting a Crime

In the previous section I found that neighborhoods with a large percentage of high-income earners had significantly higher rates of reported offenses. This result was interpreted as supporting a criminal opportunity perspective according to which greater wealth provides more targets for predatory crimes. However, the analyses are based on the number of *reported* offenses in each neighborhood. An objection could be raised that the positive relation between income and crime simply reflects the fact that individuals in higher income neighborhoods are more likely to report crimes. In order to assess the relation between income and the likelihood of reporting a crime a separate analysis was conducted using data from a survey carried out by the newspaper *Reforma* among residents of the Federal District.[9]

In the *Reforma* survey 29.3% of respondents reported having been victims of a crime during the past year. Out of those individuals who had been victimized only 28.3% stated that they had reported the incident to the authorities. A logistic regression predicting the probability of reporting a crime among those victimized indicates that a respondent's income has no statistically significant effect on the likelihood of reporting. Respondents were grouped into 5 age categories (18-24, 25-29, 30-39, 40-49 and 50 or more), 5 educational groups (none, primary, junior high

[9] The survey was conducted in May, 1998. The sample consists of 795 respondents in a random selection of electoral districts within the Federal District.

school, high school, and university), and 5 income categories based on monthly household earnings (less than 800 pesos, 800-1500 pesos, 1500-3000 pesos, 3000-5000 pesos and 5000 pesos or more). A dummy variable was also introduced to indicate whether the respondent was born in the Federal District. As shown in table 5.7 the only demographic factor that increases the likelihood of reporting a crime is the level of education. Regardless of whether respondents' education is included in the analysis, the coefficient corresponding to the income level remains statistically insignificant.[10] This finding supports the conclusion that the positive relation between neighborhood income and crime is due to differences in actual offending rates and not a result of differences in levels of reporting. However, the result is not conclusive since it is based on an analysis of individual-level data from a sample of residents of the entire Federal District. It is possible that a neighborhood's income level may affect the level of reporting by individuals regardless of their own personal income.

5.4 Spatial Dependence of Crime Across Mexico City Neighborhoods

The regression analysis presented so far assumes that the incidence of crime in any particular neighborhood of Mexico City is solely a function of its own structural characteristics. However, as discussed in earlier chapters, crime rates in geographically defined units cannot properly be considered to be independent of each

[10] In separate regressions not presented here dummy variables for primary education and high income earners were used instead of the categorical variables in order to make them consistent with those in the neighborhood study. The coefficients for both variables failed to reach statistical significance.

other. Neighborhood boundaries are often arbitrary and do not always coincide with areas of operation of criminal offenders. In chapter 2 I used a spatial lag model to estimate the effect of the homicide rate in neighboring municipalities on a municipality's own rate. The analysis in that chapter consisted of nearly the entire universe of municipalities. Because crime rates are not available for a large portion of Mexico City neighborhoods and are therefore excluded from the sample, it is not possible to define the contiguity matrix necessary to estimate the spatial lag model. In order to ensure that the findings in the previous section are not due to unmodeled spatial dependence across neighborhoods I developed two different strategies.

The first strategy consisted of estimating the crime rates for the entire universe of neighborhoods using the regression results for the models presented above. These crime rates were then entered as the dependent variable in a spatial lag regression where the contiguity matrix was used to control for spatial dependence. This two-stage approach yielded results that were consistent with those shown in previous tables. However, the use of predicted values led to inflated z-scores for the coefficients, unbelievably high measures of goodness of fit (R-squareds over 0.90) and a likely underestimation of the autoregression coefficient that measures the spatial dependence (ρ was either not statistically significant or slightly negative in most models).[11]

[11] A spatial lag regression model with only the 856 neighborhoods in the sample was also tested. The results were consistent with those shown above. However, because the neighborhoods in the sample are not always contiguous, such a model may be expected to underestimate the degree of spatial dependence.

A second strategy for ensuring that the results of the original regressions are not affected by the spatial dependence of crime rates across neighborhoods relied on the use of the Huber/White/sandwich estimation technique to compute standard errors for the regression coefficients. This technique has the advantage that it produces correct standard error estimates even when cases included in the regression are not completely independent. Observations may be correlated within groups or clusters so long as they are independent across clusters.[12] The difficulty in this situation is how to group together neighborhoods whose characteristics may be correlated. Any grouping of neighborhoods may once again exhibit the same problem of spatial dependence across groups.

In order to group neighborhoods whose crime rates (and other characteristics) may be correlated I used the predicted values of the first round of regressions to estimate values of the local Moran's I statistic. As explained in chapter 2, the Moran's I statistic measures the extent of spatial dependence across geographical units. Figure 5.6 shows the values for Moran's I for all the neighborhoods in the Federal District using the predicted rates of robbery in public areas. Neighborhoods where Moran's I is statistically significant are shaded darker, and four different patterns are used to identify cases with high values surrounded by others with high values, cases with high values surrounded by low values, and so forth. All adjacent neighborhoods in the

[12] See *Stata Release 7.0 User's Guide*, pp. 256-260.

high-high category, and all adjacent neighborhoods in the low-low category were grouped into clusters in a second set of regressions, but this time using the original crime rates and excluding cases with missing values (n=856). Neighborhoods in neither of these two groups were assumed to form clusters by themselves. In other words, they were assumed to be independent.

The grouping of adjacent neighborhoods with high crime rates surrounded by others with high crime rates, and those with low crime rates surrounded with low crime rates, according to Moran's I statistic is justified because spatial dependence is assumed to be positive. It is difficult (though not impossible) to imagine how being next to neighborhoods with high crime rates (or conditions thought to be associated with high crime rates) may lead to lower rates in a neighborhood. This strategy led to the creation of varying amounts of clusters of neighborhoods depending on the crime index under consideration. For the index of robbery in public areas used to calculate the values of Moran's I in figure 5.6 14 clusters were identified.

Table 5.8 shows the results of the new set of regressions using robust standard errors and clustering of neighborhoods for the baseline model specification. Because this technique only affects the standard errors the coefficients are exactly the same as those presented in table 5.2, but with different significance levels. Those coefficients that were previously statistically significant at the 0.05 level and are now not significant are identified with boxes. The results largely hold under the new

technique. The only variable whose significance level drops almost entirely is the estimate of police personnel per 100,000 residents. Once spatial dependence is taken into account, the size of the police force thought to be in each neighborhood appears not to have an effect on most types of crimes.

5.5 Conclusions

The analysis presented in this chapter provides a rare glimpse of how community-level theories of crime originally developed in the context of U.S. urban areas may be applied to cities in developing countries. Some of the results of the study are consistent with existing research while others suggest a different social ecology in this Third World metropolis. Four principal findings may be identified. First, one of the most striking features of the distribution of crime was the extremely high victimization rates in high-income neighborhoods. Even when various structural characteristics were taken into account, areas of the Federal District with a greater proportion of high-income earners had higher rates of robbery and other violent crimes. Although homicide rates were not significantly higher in more affluent neighborhoods, the fact that they were statistically no different from the rest of the city is quite surprising. These findings cannot be entirely attributed to higher rates of reporting by wealthier residents since the effect of income on the likelihood of reporting an offense appears to be mediated by the level of educational attainment which is also included as a predictor in the models.

The higher victimization rates in affluent neighborhoods may be partly explained by a greater presence of valuable goods that are the primary targets of predatory crimes. However, what sets high-income neighborhoods in Mexico City apart from their equivalent in cities in the United States is that these greater opportunities for crime are not compensated by mechanisms of formal and informal control. As noted earlier, the social ecology of Mexico City, where affluent areas are less isolated and where wealth is more heavily concentrated, may make it more difficult for residents of high-income neighborhoods to guard against crime. The government's failure to protect citizens from crime no doubt helps explain the growth of private security forces to protect the wealthy.

The higher victimization rates among those better off has an important political implication. Because those being victimized are better able to make their voices heard and generally have more clout in local and federal politics, crime in Mexico City has become a pressing political issue. So long as a majority of crime takes place among the poor and disenfranchised sectors of society, news about crime may be expected to be relegated to the back pages of newspapers and the scandal sheets. Residents in the rural state of Oaxaca have been dying by homicide at a rate close to four times that in the Federal District for decades without generating the kind of public outcry and reaction by public officials we have seen since the increase in crime in Mexico City in the early 1990s.

The second major finding of the neighborhood study is the large effect that commercialization has on crime rates in Mexico City neighborhoods. The presence of a large number of business establishments was associated with much higher rates of robbery in public areas and other violent crimes. These higher rates may be explained by the fact that businesses attract non-residents with money and valuable goods who are prime targets for predatory crimes. More business activity may also cause a decline in informal social control as long-time residents are displaced and those who stay behind become accustomed to not recognizing strangers that come to the neighborhood to shop and dine. The lack of enforcement of zoning restrictions has encouraged the transition from affluent residential areas to heavily commercialized ones in Mexican cities as restaurants and shops seek to cater to local residents and cash in on the status of the high-income neighborhoods. As residents lose control and crime increases those who can afford it move out to more exclusive areas where a new cycle of the commercialization-displacement process begins. Two prime examples of older wealthy neighborhoods that have become commercialized are the Polanco and Del Valle neighborhoods, both of which have extremely high crime rates.

Housing arrangements were also found to be important correlates of crimes in Mexico City neighborhoods. Although a raw index of housing density was negatively associated with the indexes of crime, a closer examination of the types of dwellings revealed that areas characterized by a grater presence of apartment buildings and

other multi-family structures called vecindades, had higher rates of robbery and violent crimes. As social disorganization theorists have argued, higher density housing arrangements appear to be conducive to greater anonymity and a loss of social control. By contrast, irregular tenements in the outskirts of the city composed of dwellings made of substandard materials and lacking access to services were found to have lower crime rates. Understanding the social dynamics that may lead to lower crime rates in newer tenement areas will require a detailed ethnographic study. However, an intriguing hypothesis I have proposed here is that squatter settlements may exhibit a greater degree of social cohesion than would otherwise be expected based on their income level because the joint struggle for the regularization of land titles and the provision of services serves to unify residents. Participation in social movements generates a strong sense of community and solidarity among residents that may inhibit crime. Ironically, as these communities become more regularized and incorporated into the city, the incentive for collective action may diminish and with it the social capital generated by the struggle. The relationship between territorially-based social movements and criminal activity in urban areas remains an important subject for future studies.

Finally, another surprising finding of the neighborhood study was the importance of family structure. A larger presence of female-headed households and extended families were both associated with much higher crime rates, though it was impossible to distinguish between the effects of these two indicators due to high

levels of collinearity. These measures of the composition of families in Mexico City neighborhoods were among the strongest predictors of crime of all those considered even when basic socioeconomic factors were taken into account. More research into the structure of Mexican families and their effect on entire communities is clearly needed before we can establish the precise causal mechanism involved. However, the fact that female-headed households are less prevalent in lower income areas suggests a different causal relation than that found in the U.S.

CHAPTER 6

MEXICO'S CRIMINAL TRANSITION IN COMPARATIVE PERSPECTIVE

Explanations in the social sciences are often unsatisfying for their inability to sufficiently account for all the variation in the phenomenon of interest, or because in order to do so they introduce so many different factors that they lose coherence. Complex social phenomena such as homicides are particularly difficult to explain in a parsimonious manner. Individuals kill others for many different reasons. In the preceding chapters I have explored a large set of hypotheses and discovered many relations which individually account for very little, but taken together add up to the general notion that Mexico is undergoing a transition from being a high homicide country to being one with a low homicide rate. This transition in Mexico, as in many other places, is a result of a process of modernization that entails the adoption of new forms of social control.[1] This process shares much in common with that experienced by European countries and the United States earlier in their histories but differs from them in some important respects. By contrast with these countries, Mexico has proceeded in what I choose to call its *criminal transition*—in direct reference to the better-known demographic transition—at an accelerated pace. While homicide rates are still declining, certain parts of the country are already witnessing an increase in

[1] I use the term "modernization" here and throughout this chapter because it best conveys the kinds of changes in social institutions that have been conducive to the establishment of norms and practices contrary to the use of violence in everyday life. As I explain below, I do not mean to endorse other aspects of modernization theory with whose criticisms I agree.

other types of crimes that correspond to a different stage in urban development. This increase parallels the one that took place in the advanced capitalist countries of the West during the 1960s and 70s but once again, with some significant differences.

In this concluding chapter I place recent changes in crime in Mexico in a broader historical perspective. First, I describe the long-term trends in homicide and compare them with those in the United States. I argue that trends in Mexico can best be explained in terms of the changes in social norms and practices encouraged by modern institutions. However, I also point out how differences between Mexico's modernization process and that of the advanced capitalist countries of the West have made its transition significantly different. I show how this interpretation of the decline in homicide rates is surprisingly compatible with social control theory.

6.1 Crime and Modernization

A consensus has emerged among experts in European and U.S. history that a gradual decline in interpersonal violence took place from the late-nineteenth until the mid-twentieth century (Gurr 1979, 1981, 1989; Lane 1979, 1986, 1989, 1997; Monkkonen 2001). Contrary to some misconceptions about what were then rural societies, life in towns and villages in early nineteenth-century Europe and the United States was anything but peaceful and harmonious. Conflicts over everyday matters often escalated into fights that resulted in death, all the more surprising given the relative unavailability of firearms and other weapons. Evidence of the long-term

decline in homicidal violence has been found in cities in the United States such as New York and Philadelphia, as well as in such distant places as London, Stockholm and Sidney. Violent crime rates remained low in most of the West until the 1960s and 1970s when a new and different type of crime wave began. This protracted decline followed by a relatively quick rise in crime rates has been described as a U-shaped pattern instead of the monotonic increase that is often assumed. Virtually all countries of the West share this pattern in the evolution of crime, with only a slight variation in the case of the United States where crime rates increased temporarily in the early 1900s and declined once again after the 1930s (Lane 1989: 64; Monkkonen 2001: 11).

Two interrelated processes are generally thought to explain the decline in homicides in Europe and the United States during the late nineteenth century. Both processes may be subsumed under the rubric of modernization. First, this decline coincides with the consolidation of modern states with more powerful and far-reaching institutions of coercion. This era witnessed the appearance of uniformed police forces in most major cities and their growing professionalization, as well as an expansion of states' prosecutorial capacity (Lane 1997: 146-213; Monkkonen 2001: 151-179).[2] While improvements in law enforcement undoubtedly contributed to a

[2] The decentralized nature of police forces in the United States, a result of the country's federalist system, has been suggested as one of the reasons for the slight delay in the decline in homicides relative to countries such as Britain, as well as the generally higher incidence rates (Monkkonen 2001;151-179).

decrease in the use of violence in some places, they were not widespread enough to explain the decline everywhere. A second, more important cause of the drop in violence was the internalization of new norms of conduct more in accordance with modern life and which demanded greater restraint and self-control.

Norbert Elias provides one of the most impressive arguments for the disciplining effects of modern life in his monumental work *The Civilizing Process* (1994 [1939]). He argues that the increased division of labor in modern societies creates a greater interdependence among individuals. This greater interdependence requires people to regulate their conduct in a stable and predictable manner. It forces them to moderate their spontaneous emotions and think more about the consequences of their actions. In sum, the greater differentiation of social functions demands that individuals exercise greater self-restraint, a characteristic that is inculcated through a complex socialization process since childhood. The use of violence is particularly discouraged and becomes unnecessary with the growing monopolization of physical force by the state, which is in fact a prerequisite for the "civilizing" change to take place.

Similarly, Roger Lane (1979, 1986, 1989, 1997) attributes the long-term decline in violent crime in the nineteenth century to what he calls "the urban industrial revolution." He argues that changes in industrial production brought about more organized forms of work and education, and demanded personal habits that

were less conducive to violence. Lane places special emphasis on the influence of schools, factories and offices. Beyond teaching basic skills, public schools promoted the type of behavior needed in the new economy. Students learned "how to do repetitive tasks, cope with boredom and frustration, and curb impulsive behavior and aggression." (Lane 1997: 185) Factory and office jobs rewarded sobriety, punctuality and patience. In time, a new set of values emerged in which self control was appreciated more than physical prowess and a readiness to fight.

Lane (1979) supports his argument that the urban-industrial revolution led to the decline in violent crimes in several ways. The first piece of evidence has to do with the timing of the changes in the levels of crime. Not only does the decline in homicides coincide with urbanization and industrialization, but the increase in crime in the 1970s also corresponds to the decay of industrial society. Second, differences in offending rates between ethnic groups provide evidence of the tempering effects of modern institutions such as schools and factories. Those groups within the U.S. society that were incorporated into the educational system and gained access to the new industrial labor market saw their offending rates decline. Such was the case with Italian and Irish immigrants who were responsible for a disproportionate number of violent crimes in the nineteenth century. However, crime rates remained high among the group that was essentially excluded from the new schools and factories, namely African-Americans. Third, in his study of crime in Philadelphia during the nineteenth century Lane finds that most offenders were unemployed or transient men who were

left out of the new economic order, and were therefore not subjected to the disciplining influence of work.

The available evidence in Mexico also suggests a gradual decline in homicides, but in this case during the second half of the twentieth century and continuing until the present. Figure 6.1 shows the national homicide rate based on the number of alleged offenders from 1940 to 2000.[3] As discussed in earlier chapters, crime rates computed from the number of individuals charged with a crime are inaccurate estimates of true offending rates because they depend on the efficacy of law enforcement institutions and the willingness to prosecute alleged offenders. However, we may reasonably assume an improvement in the efficacy of law enforcement and a decrease in tolerance for violence over time. The fact that the number of prosecuted offenders per population declines despite these changes indicates that the actual homicide rate was indeed decreasing, and probably at a faster rate than shown.[4] Table 6.1 corroborates this declining trend using available data from mortality statistics (Hernández Bringas 1989). The male victimization rate drops each decade with the exception of the period from 1972 to 1982. Because homicide

[3] The number of prosecuted offenders is used to create the graph simply because it is available for more years. As indicated below, the trend is corroborated using mortality statistics. Data for 1940 to 1975 are drawn from INACIPE (1982) and those from 1990 to 1999 taken from reports by the National Statistics Institute. The number of homicides offenders reported for the period 1940-1952 were adjusted by multiplying them times the ratio of convicted offenders to those charged in 1999 in order to make them consistent with those afterwards.

[4] Note in passing the temporary drop in homicides below the trend during the later part of the Second World War (1943-1945) as in the United States despite Mexico's minimal participation in direct troops.

rates based on vital statistics are not affected by changes in law enforcement they provide a more accurate estimate of the actual victimization rates and the true magnitude of their relative decline in the post-War era.[5]

As in the United States and Europe, this decline in homicides coincides with Mexico's era of rapid industrialization and expansion of the public school system. The period between the Second World War and the mid-1970s is often referred to as the "Mexican Miracle" in which the economy grew at an average rate of over 6% each year under the strategy of Import Substitution Industrialization (ISI). As shown in table 6.2 the illiteracy rate, a rough measure of the expansion of the educational system, decreased from 58.2% in 1940 to 17.0% in 1980, a much steeper decline than in the years before or since (INEGI 1994). Similarly, the percentage of the population employed in the primary sector of the economy, that is those dedicated to agriculture and livestock, decreased from 65.4% to 26.0% while those employed in the secondary or industrial sector nearly doubled.[6] This period of profound transformation in the Mexican economy also coincided with the strengthening of the state apparatus, albeit under a single-party system instead of a democratic regime as in most of the West.

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[5] The two time series begin in 1940 or later and do not show whether the onset of the decline in homicides coincides with the period of rapid industrialization or whether it predates it. However, data provided by Ruiz Harrell (1998: 16-30) indicates that crime began to decrease in Mexico City in the 1920s and 30s. Since Mexico City undoubtedly led the country in the advance of modern institutions and social practices, we may reasonably assume that the decline in the national homicide rate began sometime later.

[6] Data for 1980 has an unusually high percentage of missing cases, and judging from the values for 1990, probably underestimates those employed in the industrial and service sectors.

Further evidence that the decline in homicides in Mexico is a result of changes brought about by the process of modernization is provided by the strong association between the National Population Council's index of marginality and municipal homicide rates. As described in chapter 2, the index is based on nine different measures of the quality of housing, access to services, and living standards of residents. It is meant to capture the degree to which residents are marginalized or excluded from the national development process, and may be considered an inverse measure of modernization. In the regression analysis the marginality index was found to be one of the most important predictors of higher homicide rates across municipalities and over time. Similar relations can also be found between municipal homicide rates and improvements in education.

Finally, additional evidence for the modernization thesis is provided by the occupation of individuals charged and sentenced for homicide in state courts. Consistent with Lane's findings for Philadelphia, homicide rates in 1990 are highest among the unemployed (66.5 per 100,000). Offending rates for agricultural laborers are also higher than for industrial workers and office employees (42.6 as opposed to 25.3 and 27.7 per 100,000 respectively).[7] Although, higher rates among rural workers

[7] The homicide offending rate was even higher for transportation workers (70.7 per 100,000) although such a high rate is probably due to differences in the coding of occupational categories in criminal statistics and the 1990 census from which the baseline population is taken. Because the baseline population is made up of individuals 12 years of age or older and criminal statistics only include those charged in adult courts, these figures underestimate the actual offending rates.

may reflect their relative inability to defend themselves against prosecution, this may be compensated by the greater inefficacy of law enforcement in rural areas. Perhaps more importantly however, the relation between unemployment and higher individual offending rates may be spurious. Growing up in disadvantaged areas may both increase the likelihood of offending and reduce the opportunities for employment.

The argument that the social norms and practices encouraged by the introduction of modern work settings and public education are conducive to a decline in interpersonal violence should not be confused with the broader agenda associated with modernization theory. First, this line of reasoning does not commit me to the central notion of modernization theory that a particular value system is a necessary precondition for economic development. In fact, I am not making any claims at all about the causes of development. Nor am I equating the process of modernization that advanced capitalist countries underwent with that experienced by developing countries such as Mexico today. There are indeed important differences. I am merely arguing that insofar as they encourage a set of norms and practices that are conducive to less interpersonal violence the two experiences are similar. The critique of modernization theory made by dependency theorists decades ago that developing countries' relation with the more advanced capitalist nations shaped their development has its parallel in the effect that transnational processes such as international migration and drug traffic have on the criminal transition described earlier. In chapter 2 I showed that the migration of families and the production and

shipment of drugs to the U.S. had significant effects on homicide rates in Mexico. In other words, trends in crime in Mexico cannot be understood in isolation from the broader world context, in the same way as its economic (under)development cannot be understood without reference to its position within the world economy.[8]

The decline in homicide in Mexico is different from that in the industrialized countries in that it coincides with an increase in other types of crimes characteristic of later stages of urbanization. As I have shown in chapter 5, urban areas such as Mexico City are experiencing an upsurge in property crimes at the same time that traditional homicides based on feuds and barroom brawls are probably on the decline. To be sure, some of the new types of crimes involve violence and are indeed responsible for a leveling and perhaps a reversal in the aggregate rate of violent crimes. But the types of crimes involved make this increase more similar to that experienced by the United States in the 1970s than at the turn of the century. In other words, one important difference of the criminal transition in Mexico compared to that in the United States is the compression in time of the process of decline in homicides and increase in more urban property crimes.

This transition from violent crimes to property crimes is clearly illustrated in figure 6.2. The figure shows the evolution of separate indices for "crimes against

[8] Similarly, a proper analysis of the evolution of criminal violence in the United States during the nineteenth and early-twentieth centuries must also take into account the influx of a large number of European immigrants (e.g., Monkkonen 2001: 151-179).

persons" and "crimes against property" as defined by the National Statistics Institute (INEGI 1998b) and recreated using several different sources. The index of crimes against persons includes homicide, bodily harm, rape and kidnappings. Crimes against property include theft, robbery, fraud and harm to others' property.[9] Until the 1970s both indicators decrease steadily and the number of crimes against persons far exceeds property crimes. However, beginning in 1982 and coinciding with the onset of the economic crisis of the 1980s, the rate of property crimes begins to increase dramatically. By 1984 the rate of property crimes overtakes that for crimes against persons and the two indices begin to follow opposite directions. Although the exact year at which they intersect is relatively meaningless since it depends on the exact crimes included in both indicators, the diverging trends, especially after 1993 are undeniable and symptomatic of the criminal transition just described.

Two additional characteristics of figure 6.2 are noteworthy. First, seen in the larger perspective of the postwar years, the increase in property crimes in the 1990s is not nearly as dramatic as that which appears to have taken place in the early 1980s. That earlier increase marked the beginning of the reversal of a long-term decline since the 1940s. Second, changes in property crimes appear to be closely related to economic trends. Each rise in the indicator after 1980 coincides with a worsening of

[9] In the National Statistics Institute's classification system (INEGI 1998b), "crimenes contra las personas" includes "homicidio [doloso]," "lesiones," "violación," "rapto y estupro". "Crimenes contra la propiedad" includes "robo," "abuso de confianza," "fraude," and "daño en propiedad ajena." Both indices are based on the number of offenders tried in state courts.

the national economy, and each decline with a relative improvement: property crimes first increase from 1982 to 1988 precisely during the worst years of the economic crisis characterized by zero growth and extremely high inflation rates; they decline during the first part of the 1990s when economic performance improves and then increase again after 1995 when the economy contracts.

6.2 Homicide and Suicide

The historical decline in homicides in the West is often studied in conjunction with the simultaneous increase in suicides. Both trends are thought to be the result of modern institutions' effect on individual behavior. In their classic work on the subject, Andrew Henry and James Short (1954) argue that both suicide and homicide are forms of aggression that result from frustration. According to Henry and Short, differences in the degree of external restraints imposed on individuals' behavior determine whether this aggression is turned outward toward others or inwards against the self. Those persons who are more accustomed to external restraints, that is those who are forced to conform to others' demands, are more likely to express their frustration by harming others; while those individuals whose behavior is governed by internal restraints will tend to turn their aggression towards themselves. Henry and Short further argue that since lower status individuals are more restrained externally they are more likely to commit homicide rather than suicide while the opposite is true of higher status groups.

To the extent that modern institutions promote internal as opposed to external restraints their growth may be expected to lead to an increase in suicides relative to the number of homicides. This may explain the generally higher rates of suicide and lower levels of homicide in industrialized countries. According to Elias (1994 [1939]) the constant regulation of an individual's own behavior is in fact one of the central defining characteristics of "civilization." Writing well before Henry and Short, Elias had already noted how this self-regulation led to inward aggression: with the civilizing process "the battlefield is... moved within. Part of the tensions and passions that were earlier directly released in the struggle of man and man, must now be worked within the human being." (p. 375)

Suicide rates are notoriously difficult to measure accurately in a country such as Mexico. The stigma associated with suicide frequently leads relatives of the deceased and others to hide the actual cause of death. Nevertheless, available information indicates a considerable increase in suicide during the 1990s at the same time that homicides were on the decline. Figure 6.3 shows the national suicide rate from 1980 to 2000 based on two alternative sources. First, the National Statistics Institute collects detailed information on all deaths by suicide (and suicide attempts) known to authorities in the 1180 offices of the *Ministerio Público* (INEGI 2001). Second, for the years 1985 to 1993 I was able to obtain the number of deaths by suicide from mortality statistics. As with homicide rates, mortality statistics lead to higher estimates. However, both series show a marked increase in suicides, especially

after 1989. This increase provides further evidence that Mexico is undergoing a transition from a country with high homicide and low suicide rates to one with low homicide and high suicide rates, a pattern consistent with the modernization hypothesis.

6.3 Modernization and Social Control Theory

The arguments regarding the tempering effects of modern life put forth by Elias (1994 [1939]), Lane (1979, 1996) and others, and supported by the evidence just provided for the Mexican case, relies on the notion that modern institutions such as schools and factories encourage greater self-restraint. This notion is remarkably consistent with contemporary criminological theories that emphasize "self control" as the key factor inhibiting crime. Perhaps the best-known formulation of self-control theory is Michael Gottfredson and Travis Hirschi's *A General Theory of Crime* (1990). Gottfredson and Hirschi argue that individual's propensity to commit crimes is determined by their ability to "consider the long term consequences of their acts" and therefore restrain themselves from actions that will harm them later on. Self control is established early in life by interactions with parents, and remains more or less constant later in life. While Gottfredson and Hirschi's self control theory marks a considerable departure from earlier formulations of social control theory in its emphasis on psychological processes (see Jensen forthcoming), social control theorists had not ignored the importance of what were called "internal social controls", defined as the feelings of guilt and shame that resulted from the violation

of social norms (Kornhauser 1978: 24). The difference between self control and social control theories of crime has to do with the relative emphasis placed on internal controls as well as the period in life in which the socialization takes place. Contrary to Gottfredson and Hirschi's view that self control is only acquired early in life, Sampson and Laub (1993) find that events in later stages of the life course, including employment may affect individuals' commitment to norms and the likelihood of committing a crime. In sum, since institutions such as schools and factories which serve to exert social control through the internalization of norms may be considered to be a product of modernization, the explanation that the decline in homicide is due to the advent of modernization is consistent with social control theory.

APPENDIX A

TABLES

Table 2.1: Homicide Victimization Rates for Countries Reporting to World Health Organization, 1995

Country	Males	Females	Total
Colombia[1]	146.5	11.7	78.6
Russian Federation	50.0	13.8	30.8
Brazil[2]	48.2	4.5	25.8
Estonia	41.2	5.6	22.2
Kazakhstan	31.1	8.4	19.4
Latvia	27.6	10.1	18.2
Mexico	**31.1**	**3.3**	**17.1**
Rep. of Moldova	26.6	7.4	16.6
Kyrgyzstan	19.3	5.2	12.2
Lithuania	17.2	6.7	11.7
Belarus	16.2	6.7	11.2
Azerbaijan	16.1	2.0	8.9
U.S.A.	**13.9**	**3.9**	**8.9**
Cuba	11.7	3.8	7.8
Costa Rica	9.1	1.4	5.2
Bulgaria	7.6	1.3	4.5
Armenia	7.9	1.2	4.4
Argentina	7.2	1.4	4.2
Romania	6.1	2.2	4.1
Hungary	4.9	2.2	3.5
Croatia	4.7	1.6	3.2
Finland	4.0	1.9	2.9
Poland	4.2	1.5	2.8
Slovenia	3.5	1.3	2.4
Slovak Republic	2.9	1.2	2.0
Canada	2.3	1.1	1.7
Czech Republic	2.3	1.1	1.7
Portugal	2.4	1.1	1.7
Australia	2.0	1.2	1.6
Israel	2.2	0.6	1.4
Italy	2.3	0.5	1.4
Mauritius	2.2	0.6	1.4
Greece	1.9	0.8	1.3
Netherlands	1.5	1.0	1.2
New Zealand	1.8	0.7	1.2
Denmark	1.5	0.8	1.1
Germany	1.4	0.8	1.1
Austria	1.1	1.0	1.0
France	1.3	0.7	1.0
Norway	1.2	0.8	1.0

Source: World Health Organization

[1] Data for Colombia are for 1994

[2] Includes only South, Southeast and Midwestern Brazil

Table 2.2: Homicides Rates in Mexican States, 1990-1998 (per 100,000)

State/Region	1990	1995	2000	%90-95	%90-00
Northwest	16.1	18.6	12.6	15.4	-21.6
Baja California	15.7	18.8	17.7	20.4	13.0
Baja California Sur	3.8	8.5	6.6	125.7	74.9
Sonora	9.1	15.1	9.1	65.9	-0.4
Sinaloa	20.2	25.5	18.1	26.2	-10.6
Nayarit	29.5	21.5	11.6	-27.0	-60.5
Jalisco	15.7	13.0	7.5	-16.9	-52.1
Colima	18.2	12.7	10.5	-30.2	-42.3
Chihuahua	12.5	26.7	19.3	113.4	53.7
Durango	21.4	21.4	11.1	0.1	-48.1
Northeast	8.3	8.1	6.4	-2.4	-23.0
Aguascalientes	6.0	3.9	1.8	-34.0	-69.9
Coahuila	9.2	8.1	5.2	-12.3	-43.4
Nuevo Leon	2.3	3.5	2.8	49.1	22.4
Tamaulipas	11.8	12.7	9.6	7.4	-18.9
Zacatecas	11.4	12.3	5.9	8.0	-48.0
San Luis Potosi	11.7	9.5	11.9	-18.3	2.0
Gulf	11.0	9.4	5.8	-14.4	-47.1
Veracruz	12.5	9.2	6.1	-26.5	-50.9
Tabasco	8.9	13.4	4.9	51.1	-44.5
Campeche	15.3	15.3	9.6	-0.5	-37.6
Yucatan	4.8	3.1	2.6	-34.0	-45.6
Quintana Roo	11.6	10.5	8.5	-9.0	-26.8
Northcentral	17.3	14.2	8.3	-18.1	-52.1
Michoacan	33.0	29.0	15.0	-11.9	-54.7
Guanajuato	9.1	6.4	5.0	-28.9	-44.9
Queretaro	7.8	7.0	7.5	-9.8	-4.1
Hidalgo	10.7	7.4	3.9	-31.0	-63.6
Mexico Valley	26.2	20.3	13.5	-22.2	-48.3
Mexico State	35.1	23.5	15.4	-33.2	-56.3
Federal District	15.4	16.0	10.7	3.8	-30.5
Southcentral	21.5	25.0	14.6	16.5	-32.1
Puebla	12.8	13.0	7.7	1.6	-39.4
Tlaxcala	6.2	8.0	5.8	30.1	-5.8
Morelos	31.8	24.5	15.3	-23.0	-51.9
Guerrero	29.4	43.2	26.1	47.0	-11.1
Oaxaca	40.1	36.6	20.6	-8.6	-48.6
Chiapas	8.5	19.8	10.9	133.1	29.1
National	17.8	17.1	11.0	-4.0	-38.3

Source: INEGI

Table 2.3: Coefficients from the Random Effects Negative Binomial Regression Models of Homicide on Urbanization, 1990-2000

Variables	Model 1	Model 2	Model 3
Demographic Variables			
Ln. Population Density	-0.197**		
	(0.012)		
Percent in Small Towns		0.005**	
		(0.001)	
Dummy Large Cities			-0.310**
			(0.067)
Percent Young Males	0.046**	0.017	0.001
	(0.012)	(0.013)	(0.013)
Percent Indigenous	-0.006**	-0.007**	-0.008**
	(0.001)	(0.001)	(0.001)
Resource Deprivation			
Illiteracy Rate	0.020**	0.017**	0.023**
	(0.002)	(0.002)	(0.002)
Family Structure			
Percent Fem-Headed Households	0.042**	0.028**	0.026**
	(0.004)	(0.005)	(0.005)
Formal Social Control			
Law Enforcement Efficacy	-0.514**	-0.516**	-0.507**
	(0.021)	(0.021)	(0.021)
Geographical Regions			
Mexico Valley	0.860**	0.415**	0.405**
	(0.064)	(0.061)	(0.062)
Northwest	0.188**	0.269**	0.252**
	(0.052)	(0.055)	(0.056)
Center South	0.272**	0.128**	0.069
	(0.048)	(0.048)	(0.049)
Center North	0.122*	-0.045	-0.063
	(0.053)	(0.054)	(0.055)
Dummy 1995	-0.114**	-0.115**	-0.106**
	(0.021)	(0.021)	(0.021)
Dummy 2000	-0.496**	-0.517**	-0.519**
	(0.026)	(0.026)	(0.027)
Constant	-9.489**	-9.762**	-9.298**
	(0.222)	(0.243)	(0.236)
Wald Chi Squared	1956.24	1680.92	1616.80
Log Likelihood	-10941.4	-11031.5	-11047.0
N	5549	5549	5545
Groups	1859	1859	1855

*p<.05 **p<.01 (two-tailed tests)

Table 2.4: Coefficients from the Random Effects Negative Binomial Regression Models of Homicide on Marginality, Income Inequality and Employment, 1990-2000

Variables	Model 1	Model 2	Model 3	Model 4
Demographic Variables				
Ln. Population Density	-0.180**	-0.189**	-0.203**	-0.178**
	(0.013)	(0.013)	(0.013)	(0.013)
Percent Young Males	0.051**	0.056**	0.019	0.064**
	(0.013)	(0.013)	(0.012)	(0.013)
Percent Indigenous	-0.004**	-0.005**	-0.001	-0.006**
	(0.001)	(0.001)	(0.001)	(0.001)
Resource Deprivation				
Marginality Index	0.232**	0.262**		
	(0.027)	(0.027)		
Inequality Ratio		0.518**		
		(0.095)		
Percent Low Income Earners			-0.021**	
			(0.004)	
Percent High Income Earners			-0.027*	
			(0.012)	
Employed 33 hrs or more				-0.012**
				(0.003)
Illiteracy Rate				0.019**
				(0.002)
Family Structure				
Percent Fem-Headed Households	0.044**	0.044**	0.035**	0.039**
	(0.005)	(0.004)	(0.005)	(0.005)
Formal Social Control				
Law Enforcement Efficacy	-0.516**	-0.513**	-0.516**	-0.512**
	(0.021)	(0.021)	(0.021)	(0.021)
Geographical Regions				
Mexico Valley	0.862**	0.882**	0.814**	0.828**
	(0.064)	(0.064)	(0.067)	(0.065)
Northwest	0.221**	0.214**	0.106*	0.208**
	(0.053)	(0.053)	(0.053)	(0.053)
Center South	0.321**	0.342**	0.428**	0.267**
	(0.046)	(0.046)	(0.047)	(0.048)
Center North	0.169**	0.186**	0.169**	0.094
	(0.052)	(0.052)	(0.054)	(0.053)
Dummy 1995	-0.134**	-0.158**	-0.094**	-0.097**
	(0.021)	(0.021)	(0.022)	(0.021)
Dummy 2000	-0.437**	-0.476**	-0.513**	-0.434**
	(0.029)	(0.030)	(0.032)	(0.031)
Constant	-9.274**	-9.325**	-8.292**	-9.381**
	(0.216)	(0.214)	(0.205)	(0.225)
Wald Chi Squared	1921.74	1995.90	1827.86	1966.80
Log Likelihood	-10943.2	-10930.1	-10973.8	-10933.8
N	5547	5547	5549	5549
Groups	1858	1858	1859	1859

*p<.05 **p<.01 (two-tailed tests)

Table 2.5: Coefficients from the Random Effects Negative Binomial Regression Models of Homicide on Dimensions of Family Structure, 1990-2000

Variables	Model 1	Model 2	Model 3
Demographic Variables			
Ln. Population Density	-0.190**	-0.198**	-0.209**
	(0.012)	(0.013)	(0.014)
Percent Young Males	-0.007	0.046**	0.043**
	(0.011)	(0.013)	(0.013)
Percent Indigenous	-0.007**	-0.006**	-0.006**
	(0.001)	(0.001)	(0.001)
Resource Deprivation			
Illiteracy Rate	0.019**	0.019**	0.019**
	(0.002)	(0.002)	(0.002)
Family Structure			
Percent Divorced or Separated	0.126**		
	(0.018)		
Percent Fem-Headed Households		0.042**	0.050**
		(0.005)	(0.007)
Rural * Fem-Headed Households			-0.011
			(0.009)
Urban * Fem-Headed Households			-0.031
			(0.018)
Percent Nuclear Families		-0.004	-0.003
		(0.003)	(0.005)
Rural * Percent Nuclear Families			0.019*
			(0.008)
Urban * Percent Nuclear Families			-0.040*
			(0.016)
Percent Households ≤ 4 members		-0.004	-0.012**
		(0.003)	(0.004)
Rural * Households ≤ 4 members			0.011**
			(0.003)
Urban * Households ≤ 4 members			-0.004
			(0.003)
Formal Social Control			
Law Enforcement Efficacy	-0.514**	-0.513**	-0.512**
	(0.021)	(0.021)	(0.021)
Geographical Regions			
Mexico Valley	0.870**	0.853**	0.856**
	(0.065)	(0.065)	(0.066)
Northwest	0.279**	0.188**	0.182**
	(0.053)	(0.053)	(0.053)
Center South	0.329**	0.257**	0.251**
	(0.048)	(0.049)	(0.050)
Center North	0.254**	0.118*	0.113*
	(0.055)	(0.054)	(0.055)

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 2.5, continued.

Variables	Model 1	Model 2	Model 4
Rural Dummy			-1.805*
			(0.750)
Urban Dummy			3.906**
			(1.430)
Dummy 1995	-0.129**	-0.068	0.043
	(0.023)	(0.049)	(0.053)
Dummy 2000	-0.603**	-0.402**	-0.188
	(0.037)	(0.094)	(0.102)
Constant	-8.325**	-8.997**	-8.748**
	(0.174)	(0.413)	(0.543)
Wald Chi Squared	1893.51	1952.97	2013.50
Log Likelihood	-10960.4	-10940.1	-10915.9
N	5549	5549	5545
Groups	1859	1859	1855

*p<.05 **p<.01 (two-tailed tests)

Table 2.6: Replication of Regression Models Using Alleged Homicide Offenders, 1990-2000

Variables	Model 1	Model 2
Demographic Variables		
Ln. Population Density	-0.140**	-0.130**
	(0.012)	(0.013)
Percent Young Males	0.072**	0.080**
	(0.014)	(0.014)
Percent Indigenous	-0.001	-0.001
	(0.001)	(0.001)
Resource Deprivation		
Illiteracy Rate	0.009**	
	(0.002)	
Marginality Index		0.131**
		(0.029)
Family Structure		
Per Fem-Headed Households	0.046**	0.048**
	(0.005)	(0.005)
Formal Social Control		
Law Enforcement Efficacy	0.082**	0.083**
	(0.009)	(0.009)
Geographical Regions		
Mexico Valley	0.047	0.047
	(0.067)	(0.066)
Northwest	0.096	0.118*
	(0.051)	(0.051)
Center South	-0.080	-0.070
	(0.049)	(0.048)
Center North	-0.098	-0.079
	(0.053)	(0.052)
Dummy 1995	-0.132**	-0.145**
	(0.027)	(0.027)
Dummy 2000	-0.257**	-0.214**
	(0.031)	(0.034)
Constant	-10.845**	-10.839**
	(0.244)	(0.237)
Wald Chi Squared	431.44	436.95
Log Likelihood	-9174.0	-9166.7
N	5549	5547
Groups	1859	1858

*p<.05 **p<.01 (two-tailed tests)

Table 2.7: Coefficients from the Random Effects Negative Binomial Regression Models of Estimated Juvenile Homicide Rates on Marginality and Family Structure, 1990-2000

Variables	Model 1	Model 2	Model 3
Demographic Variables			
Ln. Population Density	-0.117**	-0.106**	-0.121**
	(0.017)	(0.018)	(0.017)
Percent Young Males	0.060**	0.059**	-0.014
	(0.020)	(0.021)	(0.018)
Percent Indigenous	-0.007**	-0.004**	-0.007**
	(0.001)	(0.001)	(0.001)
Resource Deprivation			
Illiteracy Rate	0.020**		0.020**
	(0.003)		(0.003)
Marginality Index		0.196**	
		(0.041)	
Family Structure			
Percent Fem-Headed Households	0.046**	0.047**	
	(0.007)	(0.007)	
Percent Divorced or Separated			0.225**
			(0.027)
Formal Social Control			
Law Enforcement Efficacy	-0.257**	-0.258**	-0.255**
	(0.026)	(0.026)	(0.026)
Geographical Regions			
Mexico Valley	0.382**	0.385**	0.426**
	(0.088)	(0.088)	(0.089)
Northwest	0.114	0.137	0.227**
	(0.069)	(0.070)	(0.069)
Center South	-0.112	-0.057	-0.054
	(0.069)	(0.067)	(0.068)
Center North	-0.260**	-0.207**	-0.053
	(0.075)	(0.074)	(0.078)
Dummy 1995	-0.061	-0.082*	-0.135**
	(0.039)	(0.040)	(0.042)
Dummy 2000	-0.400**	-0.360**	-0.661**
	(0.048)	(0.052)	(0.063)
Constant	-10.747**	-10.447**	-9.390**
	(0.350)	(0.341)	(0.276)
Wald Chi Squared	390.21	375.73	404.66
Log Likelihood	-7488.5	-7491.0	-7478.3
N	5548	5546	5548
Groups	1859	1858	1859

*p<.05 **p<.01 (two-tailed tests)

Table 2.8: Coefficients from the Random Effects Negative Binomial Regression Models of Female Homicide Victimization on Marginality and Family Structure, 1990-2000

Variables	Model 1	Model 2	Model 3
Demographic Variables			
Ln. Population Density	-0.133**	-0.139**	-0.115**
	(0.020)	(0.021)	(0.020)
Percent Young Males	0.134**	0.120**	0.073**
	(0.024)	(0.025)	(0.022)
Percent Indigenous	-0.003	-0.001	-0.004*
	(0.002)	(0.002)	(0.002)
Resource Deprivation			
Illiteracy Rate	0.015**		0.014**
	(0.004)		(0.004)
Marginality Index		0.085	
		(0.050)	
Family Structure			
Percent Fem-Headed Households	0.044**	0.043**	
	(0.008)	(0.008)	
Percent Divorced or Separated		0.085	0.092**
		(0.050)	(0.032)
Formal Social Control			
Law Enforcement Efficacy	-0.539**	-0.544**	-0.541**
	(0.044)	(0.044)	(0.044)
Geographical Regions			
Mexico Valley	1.138**	1.160**	1.113**
	(0.096)	(0.096)	(0.097)
Northwest	0.094	0.096	0.147
	(0.089)	(0.090)	(0.090)
Center South	0.408**	0.484**	0.455**
	(0.083)	(0.080)	(0.082)
Center North	0.189*	0.246**	0.270**
	(0.091)	(0.090)	(0.096)
Dummy 1995	-0.224**	-0.236**	-0.216**
	(0.045)	(0.045)	(0.049)
Dummy 2000	-0.351**	-0.360**	-0.420**
	(0.054)	(0.059)	(0.072)
Constant	-11.167**	-10.680**	-9.834**
	(0.439)	(0.424)	(0.362)
Wald Chi Squared	557.15	540.85	525.34
Log Likelihood	-3877.4	-3882.0	-3889.8
N	5549	5547	5549
Groups	1859	1858	1859

*p<.05 **p<.01 (two-tailed tests)

Table 2.9: Coefficients from the Random Effects Negative Binomial Regression Models of Homicide on Drug Offenses, 1990-2000

Variables	Model 1	Model 2
Demographic Variables		
Ln. Population Density	-0.190**	-0.203**
	(0.012)	(0.012)
Percent Young Males	0.041**	0.036**
	(0.012)	(0.012)
Percent Indigenous	-0.006**	-0.006**
	(0.001)	(0.001)
Resource Deprivation		
Illiteracy Rate	0.020**	0.021**
	(0.002)	(0.002)
Family Structure		
Per Fem-Headed Households	0.041**	0.039**
	(0.004)	(0.004)
Drug Traffic and Production		
Alleged Drug Offenders per 10,000	0.016**	
	(0.003)	
Dummy Alleged Drug Offenses		0.200**
		(0.028)
Formal Social Control		
Law Enforcement Efficacy	-0.515**	-0.515**
	(0.021)	(0.021)
Geographical Regions		
Mexico Valley	0.863**	0.910**
	(0.064)	(0.063)
Northwest	0.169**	0.155**
	(0.052)	(0.051)
Center South	0.276**	0.301**
	(0.048)	(0.047)
Center North	0.125*	0.144**
	(0.052)	(0.052)
Dummy 1995	-0.109**	-0.106**
	(0.021)	(0.020)
Dummy 2000	-0.496**	-0.500**
	(0.026)	(0.026)
Constant	-9.456**	-9.428**
	(0.221)	(0.219)
Wald Chi Squared	1997.94	2086.39
Log Likelihood	-10930.1	-10916.0
N	5549	5549
Groups	1859	1859

*p<.05 **p<.01 (two-tailed tests)

Table 2.10: Coefficients from the Negative Binomial Regression Models of Homicide on International Migration, 2000

Variables	Model 1	Model 2	Model 3	Model 4
Demographic Variables				
Ln. Population Density	-0.225**	-0.237**	-0.232**	-0.226**
	(0.018)	(0.018)	(0.018)	(0.018)
Percent Young Males	0.203**	0.184**	0.185**	0.185**
	(0.023)	(0.023)	(0.023)	(0.023)
Percent Indigenous	-0.006**	-0.007**	-0.007**	-0.007**
	(0.002)	(0.002)	(0.002)	(0.001)
Resource Deprivation				
Illiteracy Rate	0.035**	0.038**	0.037**	0.036**
	(0.004)	(0.004)	(0.004)	(0.004)
Inequality Ratio				
Family Structure				
Percent Fem-Headed Households	0.063**	0.062**	0.060**	0.063**
	(0.007)	(0.007)	(0.007)	(0.007)
Migration				
Percent International Migrants	0.209**	0.156**	0.186**	1.512**
	(0.048)	(0.050)	(0.049)	(0.312)
Percent Non-Migrants		-0.025**		
		(0.007)		
Percent Inter-State Migrants			0.033**	
			(0.010)	
Percent International Male Migrants				-2.201**
				(0.523)
Formal Social Control				
Law Enforcement Efficacy	-0.264**	-0.263**	-0.260**	-0.261**
	(0.031)	(0.031)	(0.031)	(0.031)
Drug Traffic and Production				
Alleged Drug Offenders per 10,000				
Geographical Regions				
Mexico Valley	1.196**	1.151**	1.172**	1.190**
	(0.097)	(0.097)	(0.097)	(0.096)
Northwest	0.145	0.132	0.132	0.143
	(0.078)	(0.077)	(0.078)	(0.077)
Center South	0.406**	0.398**	0.396**	0.387**
	(0.069)	(0.069)	(0.069)	(0.069)
Center North	0.157*	0.166*	0.148	0.184*
	(0.078)	(0.078)	(0.078)	(0.078)
Constant	-12.654**	-10.030**	-12.461**	-12.419**
	(0.381)	(0.837)	(0.386)	(0.384)
Log Likelihood	-3444.6	-3438.3	-3439.3	-3435.5
Chi Squared	471.61	484.37	482.34	489.8
N	1858	1858	1858	1858

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 2.10, continued.

Variables	Model 5	Model 6
Demographic Variables		
Ln. Population Density	-0.241**	-0.204**
	(0.019)	(0.019)
Percent Young Males	0.184**	0.180**
	(0.023)	(0.023)
Percent Indigenous	-0.007**	-0.007**
	(0.002)	(0.002)
Resource Deprivation		
Illiteracy Rate	0.038**	0.036**
	(0.004)	(0.004)
Inequality Ratio	0.626**	
	(0.188)	
Family Structure		
Percent Fem-Headed Households	0.058**	0.059**
	(0.007)	(0.007)
Migration		
Percent International Migrants	0.180**	0.192**
	(0.049)	(0.048)
Percent Non-Migrants		
Percent Inter-State Migrants		
Percent International Male Migrants		
Formal Social Control		
Law Enforcement Efficacy	-0.260**	-0.263**
	(0.031)	(0.031)
Drug Traffic and Production		
Alleged Drug Offenders per 10,000		0.035**
		(0.008)
Geographical Regions		
Mexico Valley	1.223**	1.176**
	(0.098)	(0.096)
Northwest	0.141	0.088
	(0.078)	(0.078)
Center South	0.447**	0.407**
	(0.070)	(0.069)
Center North	0.182*	0.158*
	(0.079)	(0.078)
Constant	-12.391**	-12.416**
	(0.389)	(0.384)
Log Likelihood	-3438.6	-3435.3
Chi Squared	483.73	490.3
N	1858	1858

*p<.05 **p<.01 (two-tailed tests)

Table 2.11: Coefficients from the Spatial Lag Model of the Logged Homicide Rate on Marginality Using Instrumental Variables Method, 1990-2000

	1990		2000	
Variables	Model 1	Model 2	Model 3	Model 4
Spatial Proximity		0.306**		0.318**
		(0.045)		(0.064)
Demographic Variables				
Ln. Population Density	-0.206**	-0.125**	-0.281**	-0.161**
	(0.012)	(0.011)	(0.013)	(0.014)
Percent Young Males	-0.026	-0.011	0.003	-0.022
	(0.014)	(0.013)	(0.014)	(0.014)
Percent Indigenous	0.000	-0.001	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Resource Deprivation				
Marginality Index	0.118**	0.095**	0.135**	0.141**
	(0.025)	(0.023)	(0.029)	(0.026)
Family Structure				
Percent Fem-Headed Households	0.026**	0.015**	0.019**	0.006
	(0.005)	(0.005)	(0.005)	(0.005)
Formal Social Control				
Law Enforcement Efficacy	-0.408**	-0.393**	-0.129**	-0.156**
	(0.017)	(0.017)	(0.021)	(0.021)
Geographical Regions				
Mexico Valley	0.913**		0.896**	
	(0.071)		(0.078)	
Northwest	0.039		0.112*	
	(0.053)		(0.055)	
Center South	0.137**		0.357**	
	(0.045)		(0.048)	
Center North	-0.066		-0.002	
	(0.053)		(0.056)	
Constant	-7.520**	-5.131**	-8.080**	-4.949**
	(0.232)	(0.432)	(0.224)	(0.594)
R-squared	0.415	0.391	0.306	0.281
N	1851	1851	1849	1849
Moran's I	0.208**	0.083**	0.238**	0.097**
Lagrange Multiplier	211.4**	6.59*	276.1**	4.78*

*p<.05 **p<.01 (two-tailed tests)

Table 2.12: Comparison of Random Effects, Population Average and Fixed Effects Negative Binomial Regression Models of Homicide on Urbanization, 1990-2000

Variables	Random Effects	Pop. Average	Fixed Effects
Demographic Variables			
Ln. Population Density	-0.259**	-0.262**	-0.751**
	(0.010)	(0.016)	(0.038)
Percent Young Males	-0.004	0.013	-0.024
	(0.009)	(0.015)	(0.013)
Percent Indigenous	-0.002*	-0.001	0.001
	(0.001)	(0.001)	(0.001)
Resource Deprivation			
Illiteracy Rate	0.012**	0.012**	0.021**
	(0.002)	(0.003)	(0.004)
Family Structure			
Percent Fem-Headed Households	0.014**	0.023**	-0.035**
	(0.004)	(0.006)	(0.007)
Formal Social Control			
Law Enforcement Efficacy	-0.341**	-0.235**	-0.251**
	(0.013)	(0.017)	(0.014)
Geographical Regions			
Mexico Valley	0.759**	0.994**	
	(0.057)	(0.093)	
Northwest	0.101*	0.117	
	(0.044)	(0.071)	
Center South	0.302**	0.331**	
	(0.039)	(0.063)	
Center North	0.085	0.139	
	(0.044)	(0.072)	
Dummy 1995	-0.044**	-0.009	0.177**
	(0.015)	(0.031)	(0.021)
Dummy 2000	-0.409**	-0.286**	-0.084**
	(0.019)	(0.034)	(0.033)
Constant	-6.376**	-8.109**	-3.224**
	(0.171)	(0.264)	(0.332)
Wald Chi Squared	2918.01	735.66	1586.90
Log Likelihood	-12950.7		-6713.7
N	5549	5549	5544
Groups	1859	1859	1854

*p<.05 **p<.01 (two-tailed tests)

Table 2.13: Comparison of Random Effects, Population Average and Fixed Effects Negative Binomial Regression Models of Homicide on Resource Deprivation, 1990-2000

Variables	Random Effects	Pop. Average	Fixed Effects
Demographic Variables			
Ln. Population Density	-0.246**	-0.248**	-0.759**
	(0.010)	(0.017)	(0.038)
Percent Young Males	0.000	0.016	-0.034**
	(0.010)	(0.015)	(0.013)
Percent Indigenous	-0.001	-0.001	0.001
	(0.001)	(0.001)	(0.001)
Resource Deprivation			
Marginality Index	0.151**	0.155**	0.151**
	(0.020)	(0.034)	(0.042)
Family Structure			
Percent Fem-Headed Households	0.016**	0.024**	-0.036**
	(0.004)	(0.006)	(0.007)
Formal Social Control			
Law Enforcement Efficacy	-0.341**	-0.235**	-0.251**
	(0.013)	(0.017)	(0.014)
Geographical Regions			
Mexico Valley	0.760**	0.998**	
	(0.057)	(0.093)	
Northwest	0.125**	0.143*	
	(0.044)	(0.071)	
Center South	0.322**	0.346**	
	(0.038)	(0.062)	
Center North	0.110*	0.168*	
	(0.044)	(0.071)	
Dummy 1995	-0.055**	-0.003	0.162**
	(0.015)	(0.032)	(0.021)
Dummy 2000	-0.365**	-0.240**	-0.077*
	(0.022)	(0.039)	(0.037)
Constant	-6.285**	-7.997**	-2.662**
	(0.165)	(0.253)	(0.300)
Wald Chi Squared	2919.36	739.36	1546.8
Log Likelihood	-12944.1		-6716.02
N	5547	5547	5543
Groups	1858	1858	1854

*p<.05 **p<.01 (two-tailed tests)

Table 3.1: Coefficients from the Negative Binomial Regression Models of Homicide on Land Scarcity, 1990 (Hypothesis 1)

Variables	Model 1	Model 2	Model 3	Model 4
Plot Size and Crop Yields				
Log. Ave. Plot Size	0.160*			
	(0.069)			
Log Persons per Ha.		-0.126		
		(0.066)		
Percent units ≤ 5 Ha.			-0.008**	
			(0.002)	
Log. Land Inequality				0.029
				(0.029)
Maize Yields	0.123	0.137	0.137	0.166
	(0.116)	(0.115)	(0.115)	(0.122)
Demographic Variables				
Ln. Population Density	-0.196**	-0.216**	-0.289**	-0.277**
	(0.068)	(0.067)	(0.048)	(0.059)
Percent Young Males	-0.006	0.000	0.007	-0.007
	(0.047)	(0.047)	(0.047)	(0.050)
Percent Indigenous	-0.011**	-0.011**	-0.010**	-0.014**
	(0.002)	(0.002)	(0.002)	(0.002)
Resource Deprivation				
Illiteracy Rate	0.040**	0.040**	0.042**	0.043**
	(0.005)	(0.005)	(0.005)	(0.006)
Family Structure				
Percent Fem-Headed Households	0.027	0.030*	0.033*	0.020
	(0.015)	(0.015)	(0.015)	(0.016)
Formal Social Control				
Law Enforcement Efficacy	-0.414**	-0.415**	-0.401**	-0.407**
	(0.066)	(0.066)	(0.065)	(0.067)
Geographical Regions				
Mexico Valley	1.107**	1.088**	1.180**	0.951**
	(0.238)	(0.238)	(0.240)	(0.261)
Northwest	0.064	0.071	0.006	0.024
	(0.180)	(0.180)	(0.183)	(0.188)
Center South	0.154	0.145	0.124	0.074
	(0.136)	(0.136)	(0.133)	(0.148)
Center North	0.023	0.021	0.033	-0.047
	(0.160)	(0.159)	(0.160)	(0.169)
Constant	-9.409**	-9.247**	-8.592**	-8.557**
	(0.851)	(0.820)	(0.771)	(0.822)
alpha	0.838**	0.839**	0.829**	0.878**
	(0.090)	(0.090)	(0.089)	(0.097)
Chisquare	167.42	165.84	173.41	151.98
Loglike	-1192.81	-1200.79	-1189.81	-1081.1
N	682	690	682	604

*p<.05 **p<.01 (two-tailed tests)

Table 3.2: Coefficients from the Negative Binomial Regression Models of Homicide on Land Scarcity Indices, 1990 (Hypothesis 1)

Variables	Model 1	Model 2
Plot Size and Crop Yields		
Land Scarcity Index 1	-0.182	
	(0.098)	
Land Scarcity Index 2		-0.406**
		(0.078)
Maize Yields	0.148	0.067
	(0.122)	(0.122)
Demographic Variables		
Ln. Population Density	-0.227**	
	(0.066)	
Percent Young Males	-0.007	-0.007
	(0.049)	(0.050)
Percent Indigenous	-0.014**	-0.014**
	(0.002)	(0.003)
Resource Deprivation		
Illiteracy Rate	0.044**	0.042**
	(0.006)	(0.006)
Family Structure		
Percent Fem-Headed Households	0.024	0.029
	(0.016)	(0.016)
Formal Social Control		
Law Enforcement Efficacy	-0.404**	-0.425**
	(0.067)	(0.067)
Geographical Regions		
Mexico Valley	0.994**	0.857**
	(0.260)	(0.264)
Northwest	0.022	0.098
	(0.186)	(0.188)
Center South	0.106	0.101
	(0.148)	(0.152)
Center North	-0.032	-0.133
	(0.169)	(0.170)
Constant	-8.847**	-9.455**
	(0.841)	(0.838)
alpha	0.868**	0.918**
	(0.096)	(0.099)
Chisquare	154.38	144.05
Loglike	-1079.89	-1085.06
N	604	604

*p<.05 **p<.01 (two-tailed tests)

Table 3.3: Coefficients from the Negative Binomial Regression Models of Homicide on Land Ownership and Organization of Agricultural Production, 1990 (Hypotheses 2 and 3)

Variables	Model 1	Model 2	Model 3	Model 4
Collective Ownership				
Percent Ejido Surface Area		0.010**	0.010**	0.011**
		(0.002)	(0.002)	(0.002)
Percent Communal Surface Area		0.020**	0.020**	0.019**
		(0.003)	(0.003)	(0.003)
Organization of Agricultural Production				
Percent Individual Production			0.112*	
			(0.050)	
Percent Subsistence Agr. Units				0.003
				(0.003)
Plot Size and Crop Yields				
Land Scarcity Index 2	-0.406**	-0.575**	-0.586**	-0.565**
	(0.078)	(0.079)	(0.079)	(0.079)
Maize Yields	0.067	0.117	0.147	0.165
	(0.122)	(0.117)	(0.118)	(0.122)
Demographic Variables				
Percent Young Males	-0.007	-0.028	-0.018	-0.025
	(0.050)	(0.049)	(0.049)	(0.048)
Percent Indigenous	-0.014**	-0.016**	-0.015**	-0.016**
	(0.003)	(0.002)	(0.003)	(0.002)
Resource Deprivation				
Illiteracy Rate	0.042**	0.045**	0.043**	0.042**
	(0.006)	(0.006)	(0.006)	(0.006)
Family Structure				
Percent Fem-Headed Households	0.029	0.036*	0.038*	0.032*
	(0.016)	(0.016)	(0.016)	(0.016)
Formal Social Control				
Law Enforcement Efficacy	-0.425**	-0.368**	-0.355**	-0.360**
	(0.067)	(0.065)	(0.065)	(0.065)
Geographical Regions				
Mexico Valley	0.857**	0.886**	0.936**	0.849**
	(0.264)	(0.244)	(0.243)	(0.244)
Northwest	0.098	-0.127	-0.136	-0.130
	(0.188)	(0.186)	(0.186)	(0.186)
Center South	0.101	-0.151	-0.154	-0.104
	(0.152)	(0.150)	(0.149)	(0.153)
Center North	-0.133	-0.114	-0.119	-0.108
	(0.170)	(0.160)	(0.159)	(0.160)
Constant	-9.455**	-9.852**	-21.052**	-10.007**
	(0.838)	(0.813)	(5.081)	(0.820)
alpha	0.918**	0.734**	0.718**	0.731**
	(0.099)	(0.086)	(0.085)	(0.086)
chisquare	144.05	200.16	205.24	201.89
loglike	-1085.06	-1057	-1054.46	-1056.14
n	604	604	604	604

*p<.05 **p<.01 (two-tailed tests)

Table 3.4: Coefficients from the Negative Binomial Regression Models of Homicide on Land Scarcity, Collective Ownership, Agricultural Organization and Production of Cash Crops, 1990

Variables	Model 1	Model 2
Collective Ownership		
Percent Ejido Surface Area	0.011**	0.011**
	(0.002)	(0.002)
Percent Communal Surface Area	0.020**	0.020**
	(0.003)	(0.003)
Organization of Agricultural Production		
Percent Individual Production	0.087	
	(0.051)	
Percent Subsistence Agr. Units		0.005
		(0.003)
Percent Coffee Production	0.008**	0.009**
	(0.003)	(0.003)
Percent Cattle Production	0.009*	0.008
	(0.004)	(0.004)
Plot Size and Crop Yields		
Land Scarcity Index 2	-0.506**	-0.505**
	(0.094)	(0.095)
Maize Yields	0.126	0.158
	(0.118)	(0.122)
Demographic Variables		
Percent Young Males	-0.020	-0.027
	(0.049)	(0.049)
Percent Indigenous	-0.017**	-0.018**
	(0.003)	(0.003)
Resource Deprivation		
Illiteracy Rate	0.042**	0.040**
	(0.006)	(0.006)
Family Structure		
Percent Fem-Headed Households	0.043**	0.038*
	(0.016)	(0.017)
Formal Social Control		
Law Enforcement Efficacy	-0.354**	-0.360**
	(0.065)	(0.065)
Geographical Regions		
Mexico Valley	0.833**	0.764**
	(0.251)	(0.249)
Northwest	-0.176	-0.173
	(0.185)	(0.184)
Center South	-0.236	-0.201
	(0.155)	(0.156)
Center North	-0.152	-0.142
	(0.159)	(0.160)

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 3.4, continued.

Variables	Model 1	Model 2
Constant	-19.020**	-10.443**
	(5.129)	(0.844)
alpha	0.710**	0.719**
	(0.083)	(0.084)
chisquare	215.45	214.74
loglike	-1049.36	-1049.71
n	604	604

*p<.05 **p<.01 (two-tailed tests)

Table 4.1: Coefficients from the Random Effects Negative Binomial Regression Models of Homicide on Political Competition and Party Factionalization, 1990-2000

Variables	Model 1	Model 2	Model 3	Model 4
Political Process				
Proportion of Votes vs. PRI	0.070	0.007		
	(0.079)	(0.089)		
75% Rural * Prop. Votes vs. PRI		0.090		
		(0.215)		
100% Rural * Prop. Votes vs. PRI		0.490**		
		(0.187)		
Party Factionalization			0.009	-0.001
			(0.024)	(0.027)
75% Rural * Party Factionalization				-0.024
				(0.070)
100% Rural * Party Factionalization				0.196**
				(0.069)
Demographic Variables				
Ln. Population Density	-0.178**	-0.171**	-0.178**	-0.171**
	(0.014)	(0.014)	(0.014)	(0.014)
Percent Young Males	0.025	0.029*	0.026	0.029*
	(0.013)	(0.013)	(0.013)	(0.013)
Percent Indigenous	-0.008**	-0.008**	-0.008**	-0.008**
	(0.001)	(0.001)	(0.001)	(0.001)
Resource Deprivation				
Illiteracy Rate	0.022**	0.021**	0.021**	0.021**
	(0.002)	(0.002)	(0.002)	(0.002)
Family Structure				
Percent Fem-Headed Households	0.041**	0.042**	0.041**	0.042**
	(0.005)	(0.005)	(0.005)	(0.005)
Formal Social Control				
Law Enforcement Efficacy	-0.469**	-0.472**	-0.470**	-0.473**
	(0.022)	(0.022)	(0.022)	(0.022)
Geographical Regions				
Mexico Valley	1.000**	0.987**	0.995**	0.985**
	(0.072)	(0.072)	(0.072)	(0.072)
Northwest	0.181**	0.189**	0.182**	0.189**
	(0.055)	(0.054)	(0.055)	(0.054)
Center South	0.181**	0.182**	0.179**	0.183**
	(0.052)	(0.052)	(0.052)	(0.052)
Center North	0.087	0.086	0.088	0.088
	(0.055)	(0.055)	(0.055)	(0.055)
75% Rural		0.006		0.076
		(0.087)		(0.138)
100% Rural		-0.035		-0.229
		(0.074)		(0.127)

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 4.1, continued.

Variables	Model 1	Model 2	Model 3	Model 4
Dummy 1995	-0.114**	-0.120**	-0.112**	-0.119**
	(0.023)	(0.023)	(0.023)	(0.023)
Dummy 2000	-0.471**	-0.474**	-0.463**	-0.471**
	(0.033)	(0.033)	(0.033)	(0.033)
Constant	-9.132**	-9.208**	-9.135**	-9.207**
	(0.242)	(0.245)	(0.244)	(0.248)
Wald Chi Squared	1553.22	1564.45	1550.38	1562.31
Log Likelihood	-9679.95	-9674.62	-9680.28	-9674.36
N	5162	5162	5162	5162
Groups	1811	1811	1811	1811

*p<.05 **p<.01 (two-tailed tests)

Table 4.2: Coefficients from the Random Effects Negative Binomial Regression Models of Homicide on Political Competition and Party Factionalization Controlling for PRI in Office, 1990-2000

Variables	Model 1	Model 2	Model 3	Model 4
Political Process				
Proportion of Votes vs. PRI	0.059	-0.011		
	(0.088)	(0.102)		
75% Rural * Prop. Votes vs. PRI		0.029		
		(0.234)		
100% Rural * Prop. Votes vs. PRI		0.502*		
		(0.219)		
Party Factionalization			0.001	-0.008
			(0.024)	(0.027)
75% Rural * Party Factionalization				-0.037
				(0.071)
100% Rural * Party Factionalization				0.188**
				(0.072)
PRI in Office	0.017	0.012	0.007	0.014
	(0.032)	(0.035)	(0.029)	(0.030)
75% Rural * PRI in Office		-0.069		-0.089
		(0.145)		(0.135)
100% Rural * PRI in Office		0.011		-0.063
		(0.143)		(0.129)
Demographic Variables				
Ln. Population Density	-0.178**	-0.171**	-0.177**	-0.171**
	(0.013)	(0.014)	(0.014)	(0.014)
Percent Young Males	0.027*	0.030*	0.028*	0.030*
	(0.013)	(0.013)	(0.013)	(0.013)
Percent Indigenous	-0.008**	-0.008**	-0.008**	-0.008**
	(0.001)	(0.001)	(0.001)	(0.001)
Resource Deprivation				
Illiteracy Rate	0.021**	0.020**	0.021**	0.020**
	(0.002)	(0.002)	(0.002)	(0.002)
Family Structure				
Percent Fem-Headed Households	0.040**	0.041**	0.040**	0.041**
	(0.005)	(0.005)	(0.005)	(0.005)
Formal Social Control				
Law Enforcement Efficacy	-0.468**	-0.470**	-0.469**	-0.471**
	(0.021)	(0.021)	(0.021)	(0.021)
Geographical Regions				
Mexico Valley	0.985**	0.973**	0.982**	0.972**
	(0.072)	(0.072)	(0.072)	(0.072)
Northwest	0.179**	0.185**	0.178**	0.186**
	(0.054)	(0.054)	(0.055)	(0.054)
Center South	0.182**	0.183**	0.181**	0.184**
	(0.052)	(0.052)	(0.052)	(0.052)
Center North	0.095	0.094	0.096	0.096
	(0.055)	(0.055)	(0.055)	(0.055)

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 4.2, continued.

Variables	Model 1	Model 2	Model 3	Model 4
75% Rural		0.085		0.177
		(0.183)		(0.201)
100% Rural		-0.056		-0.168
		(0.176)		(0.199)
Dummy 1995	-0.129**	-0.133**	-0.126**	-0.131**
	(0.023)	(0.023)	(0.023)	(0.023)
Dummy 2000	-0.483**	-0.484**	-0.475**	-0.480**
	(0.033)	(0.033)	(0.033)	(0.033)
Constant	-9.101**	-9.165**	-9.084**	-9.159**
	(0.245)	(0.249)	(0.246)	(0.250)
Wald Chi Squared	1641.11	1652.74	1638.61	1651.56
Log Likelihood	-9625.18	-9619.94	-9625.4	-9619.25
N	5162	5162	5162	5162
Groups	1811	1811	1811	1811

*p<.05 **p<.01 (two-tailed tests)

Table 4.3: Coefficients from the Random Effects Spatial Lag Model of Homicide Rate on Political Competition and Party Factionalization Estimated Using Instrumental Variables Method, 1990-2000

Variables	Model 1	Model 2	Model 3	Model 4
Spatial Proximity	0.351**	0.370**	0.352**	0.372**
	(0.039)	(0.033)	(0.039)	(0.033)
Political Process				
Proportion of Votes vs. PRI	-0.091	-0.072		
	(0.054)	(0.064)		
75% Rural * Prop. Votes vs. PRI		0.063		
		(0.150)		
100% Rural * Prop. Votes vs. PRI		0.223*		
		(0.088)		
Party Factionalization			-0.050**	-0.034
			(0.018)	(0.020)
75% Rural * Party Factionalization				-0.027
				(0.049)
100% Rural * Party Factionalization				0.078*
				(0.032)
Demographic Variables				
Ln. Population Density	-0.199**	-0.149**	-0.196**	-0.147**
	(0.012)	(0.011)	(0.012)	(0.011)
Percent Young Males	-0.017*	-0.004	-0.017*	-0.004
	(0.008)	(0.008)	(0.008)	(0.008)
Percent Indigenous	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Resource Deprivation				
Illiteracy Rate	0.004**	0.002	0.004**	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Family Structure				
Percent Fem-Headed Households	0.010**	0.012**	0.010**	0.012**
	(0.003)	(0.003)	(0.003)	(0.003)
Formal Social Control				
Law Enforcement Efficacy	-0.179**	-0.183**	-0.179**	-0.183**
	(0.010)	(0.010)	(0.010)	(0.010)
Geographical Regions				
Mexico Valley	0.668**	0.586**	0.664**	0.582**
	(0.072)	(0.065)	(0.071)	(0.065)
Northwest	-0.008	0.016	-0.008	0.016
	(0.041)	(0.038)	(0.041)	(0.038)
Center South	0.198**	0.175**	0.194**	0.173**
	(0.038)	(0.035)	(0.038)	(0.035)
Center North	0.022	0.017	0.019	0.016
	(0.042)	(0.038)	(0.042)	(0.038)

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 4.3, continued.

Variables	Model 1	Model 2	Model 3	Model 4
75% Rural		-0.063		0.007
		(0.063)		(0.100)
100% Rural		0.386**		0.315**
		(0.039)		(0.063)
Dummy 1995	0.007	-0.019	0.013	-0.014
	(0.019)	(0.019)	(0.019)	(0.019)
Dummy 2000	-0.223**	-0.252**	-0.208**	-0.240**
	(0.024)	(0.024)	(0.024)	(0.024)
Constant	-7.701**	-8.140**	-7.656**	-8.106**
	(0.143)	(0.141)	(0.144)	(0.143)
R^2 within	0.148	0.145	0.148	0.146
R^2 between	0.523	0.592	0.525	0.592
R^2 overall	0.437	0.490	0.439	0.490

Notes: N=5,148 (1,806 groups). *p<.05 **p<.01 (two-tailed tests)

Table 4.4: Comparison of Random Effects and Fixed Effects Negative Binomial Regression Models of Homicide on Political Competition and Party Factionalization, 1990-2000

Variables	Random Effects	Fixed Effects	Random Effects	Fixed Effects
Political Process				
Proportion of Votes vs. PRI	-0.128*	-0.206**		
	(0.062)	(0.075)		
75% Rural * Prop. Votes vs. PRI	0.231	0.112		
	(0.150)	(0.170)		
100% Rural * Prop. Votes vs. PRI	0.384**	0.304*		
	(0.115)	(0.133)		
Party Factionalization			-0.069**	-0.080**
			(0.019)	(0.023)
75% Rural * Party Factionalization			0.031	-0.020
			(0.049)	(0.055)
100% Rural * Party Factionalization			0.143**	0.106*
			(0.042)	(0.049)
Demographic Variables				
Ln. Population Density	-0.210**	-0.597**	-0.206**	-0.593**
	(0.011)	(0.049)	(0.011)	(0.050)
Percent Young Males	-0.015	-0.052**	-0.015	-0.053**
	(0.010)	(0.014)	(0.010)	(0.014)
Percent Indigenous	-0.002**	0.022**	-0.002**	0.021**
	(0.001)	(0.005)	(0.001)	(0.005)
Resource Deprivation				
Illiteracy Rate	0.008**	-0.001	0.008**	-0.001
	(0.002)	(0.006)	(0.002)	(0.006)
Family Structure				
Percent Fem-Headed Households	0.017**	-0.040**	0.017**	-0.041**
	(0.004)	(0.008)	(0.004)	(0.008)
Formal Social Control				
Law Enforcement Efficacy	-0.317**	-0.241**	-0.317**	-0.240**
	(0.013)	(0.015)	(0.013)	(0.014)
Geographical Regions				
Mexico Valley	0.872**		0.871**	
	(0.059)		(0.059)	
Northwest	0.132**		0.132**	
	(0.043)		(0.043)	
Center South	0.288**		0.285**	
	(0.040)		(0.040)	
Center North	0.090*		0.090*	
	(0.044)		(0.044)	
75% Rural	-0.090	0.039	-0.077	0.106
	(0.063)	(0.087)	(0.098)	(0.121)
100% Rural	0.323**	0.221*	0.183*	0.121
	(0.049)	(0.097)	(0.079)	(0.120)

*p<.05 **p<.01 (two-tailed tests)

(continued)

Table 4.4, continued.

Variables	Random Effects	Fixed Effects	Random Effects	Fixed Effects
Dummy 1995	-0.052**	0.149**	-0.042**	0.156**
	(0.016)	(0.024)	(0.016)	(0.024)
Dummy 2000	-0.362**	-0.104**	-0.341**	-0.090*
	(0.023)	(0.039)	(0.023)	(0.039)
Constant	-5.787**	-3.090**	-5.697**	-2.971**
	(0.204)	(0.374)	(0.207)	(0.376)
Wald Chi Squared	2430.47	999.89	2431.05	1004.68
Log Likelihood	-11397.5	-5729.24	-11393.9	-5725.84
N	5162	5154	5162	5154
Groups	1811	1803	1811	1803

*p<.05 **p<.01 (two-tailed tests)

Table 5.1: Crime Rates in the Federal District and Percentage Increase Based on Cases Reported to Authorities (1990-1998) (per 100,000)

Type of Crime	1990	1998	%Change
Robbery in Public Areas	119.2	499.7	319.0
Robbery of Cargo	80.6	227.1	181.8
Vehicle Theft/Robbery	186.6	551.0	195.3
with violence	41.9	230.0	448.9
without violence	144.6	320.9	121.9
Burglary	58.0	98.1	69.3
with violence	6.1	9.6	56.5
without violence	51.8	88.5	70.8
Theft/Robbery of Business	110.6	197.5	78.6
with violence	26.6	69.3	161.0
without violence	84.0	128.2	52.5
First Degree Homicide	7.5	11.1	48.1
Bodily Harm	136.9	286.5	109.3
All Crimes	1619.2	2781.2	71.8

Table 5.2: Coefficients from the Negative Binomial Regression Models of Crime on Income Levels and other Neighborhood Characteristics, 1998

Variables	Homicide	Homes	Public Areas	Violent Crimes	Total
Demographic Variables					
Housing Density	-0.005	-0.032**	-0.010	-0.016*	-0.022**
	(0.013)	(0.008)	(0.010)	(0.008)	(0.008)
Percent Young	-0.040	-0.015	0.011	0.013	0.016
	(0.031)	(0.018)	(0.022)	(0.020)	(0.019)
Resource Deprivation					
Percent High Income	0.008	0.030**	0.030**	0.017**	0.014*
	(0.012)	(0.006)	(0.008)	(0.007)	(0.007)
Percent primary education or less	0.013	0.002	-0.009	-0.002	-0.016**
	(0.010)	(0.006)	(0.007)	(0.006)	(0.006)
Residential Stability					
Percent Home Ownership	-0.007	-0.007**	-0.031**	-0.020**	-0.014**
	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)
Commercialization					
Business Establishments per pop.	1.851	0.774	3.730**	3.104**	2.704**
	(1.129)	(0.727)	(0.996)	(0.827)	(0.795)
Formal Social Control					
Police Personnel	0.041*	-0.030	0.102**	0.080**	0.085**
	(16.093)	(19.640)	(19.570)	(0.016)	(14.880)
Constant	-7.704**	-5.881**	-4.091**	-4.109**	-2.925**
	(1.330)	(0.767)	(0.953)	(0.833)	(0.800)
Log Likelihood	-815.545	-2109.09	-3112.71	-3745.58	-4723.72
Chi Squared	25.15	110.69	366.73	264.76	298.64
N	856	856	856	856	856

*p<.05 **p<.01 (two-tailed tests)

Table 5.3: Coefficients from the Negative Binomial Regression Models of Crime on Housing Structure, 1998

Variables	Homicide	Homes	Public Areas	Violent Crimes	Total
Demographic Variables					
Housing Density	-0.010	-0.028**	-0.030**	-0.027**	-0.027**
	(0.014)	(0.009)	(0.010)	(0.009)	(0.008)
Percent Young	-0.036	-0.016	0.019	0.016	0.005
	(0.030)	(0.018)	(0.022)	(0.019)	(0.018)
Resource Deprivation					
Percent High Income	-0.005	0.030**	0.032**	0.015**	0.025**
	(0.007)	(0.004)	(0.005)	(0.004)	(0.004)
Housing Structure					
Percent Apts. and Vecindades	0.002	-0.003	0.015**	0.008**	0.006*
	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)
Residential Stability					
Percent Home Ownership	-0.003	-0.010**	-0.019**	-0.013**	-0.011**
	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)
Commercialization					
Business Establishments per pop.	1.901	0.862	3.466**	2.986**	2.490**
	(1.119)	(0.724)	(0.995)	(0.836)	(0.782)
Formal Social Control					
Police Personnel	0.040*	-0.025	0.075**	0.067**	0.072**
	(16.049)	(19.597)	(19.488)	(0.016)	(14.78)
Constant	-7.555**	-5.512**	-5.956**	-4.998**	-3.536**
	(1.357)	(0.806)	(0.991)	(0.867)	(0.825)
Log Likelihood	-816.322	-2108.39	-3100.66	-3740.59	-4724.51
Chi Squared	23.59	112.08	390.83	274.75	297.06
N	856	856	856	856	856

*p<.05 **p<.01 (two-tailed tests)

Table 5.4: Coefficients from the Negative Binomial Regression Models of Crime on Quality of Housing Stock and Access to Services, 1998

Variables	Homicide	Homes	Public Areas	Violent Crimes	Total
Demographic Variables					
Housing Density	-0.014	-0.030**	-0.029**	-0.027**	-0.034**
	(0.014)	(0.009)	(0.010)	(0.009)	(0.009)
Percent Young	-0.041	-0.013	0.002	0.009	0.005
	(0.030)	(0.018)	(0.021)	(0.019)	(0.018)
Resource Deprivation					
Percent High Income	-0.010	0.031**	0.021**	0.009	0.017**
	(0.009)	(0.005)	(0.006)	(0.005)	(0.005)
Housing Structure					
Quality of Housing Stock	-0.092	0.039	-0.292**	-0.162**	-0.187**
	(0.091)	(0.056)	(0.063)	(0.055)	(0.051)
Residential Stability					
Percent Home Ownership	-0.004	-0.007**	-0.028**	-0.018**	-0.015**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Commercialization					
Business Establishments per pop.	1.881	0.809	3.459**	3.000**	2.513**
	(1.117)	(0.726)	(0.980)	(0.828)	(0.784)
Formal Social Control					
Police Personnel	0.040*	-0.029	0.090**	0.076**	0.077**
	(16.04)	(19.589)	(19.164)	(0.016)	(14.464)
Constant	-7.191**	-5.894**	-3.934**	-4.015**	-2.925**
	(1.308)	(0.765)	(0.936)	(0.828)	(0.793)
Log Likelihood	-815.914	-2108.92	-3103.1	-3741.33	-4720.87
Chi Squared	24.41	111.01	385.96	273.26	304.33
N	856	856	856	856	856

*p<.05 **p<.01 (two-tailed tests)

Table 5.5: Coefficients from the Negative Binomial Regression Models of Crime on Female-Headed Households, 1998

Variables	Homicide	Homes	Public Areas	Violent Crimes	Total
Demographic Variables					
Housing Density	-0.013	-0.036**	-0.039**	-0.033**	-0.032**
	(0.014)	(0.009)	(0.010)	(0.009)	(0.008)
Percent Young	-0.020	-0.005	0.096**	0.057**	0.033
	(0.033)	(0.019)	(0.024)	(0.021)	(0.019)
Resource Deprivation					
Percent High Income	-0.011	0.026**	0.013**	0.004	0.018**
	(0.009)	(0.004)	(0.005)	(0.005)	(0.005)
Family Structure					
Percent Fem-Headed Households	0.022	0.011	0.104**	0.059**	0.041**
	(0.017)	(0.010)	(0.012)	(0.011)	(0.010)
Residential Stability					
Percent Home Ownership	-0.001	-0.005	-0.015**	-0.011**	-0.010**
	(0.005)	(0.003)	(0.004)	(0.003)	(0.003)
Commercialization					
Business Establishments per pop.	1.739	0.662	2.687**	2.502**	2.170**
	(1.135)	(0.734)	(0.872)	(0.777)	(0.742)
Formal Social Control					
Police Personnel	0.041**	-0.034	0.057**	0.058**	0.067**
	(16.058)	(20.135)	(18.054)	(0.016)	(14.494)
Constant	-8.688**	-6.525**	-10.582**	-7.562**	-5.245**
	(1.671)	(0.979)	(1.188)	(1.029)	(0.977)
Log Likelihood	-815.649	-2108.56	-3078.55	-3730.61	-4719.56
Chi Squared	24.94	111.75	435.04	294.7	306.95
N	856	856	856	856	856

*p<.05 **p<.01 (two-tailed tests)

Table 5.6: Coefficients from the Negative Binomial Regression Models of Crime on Family Extension, 1998

Variables	Homicide	Homes	Public Areas	Violent Crimes	Total
Demographic Variables					
Housing Density	-0.021	-0.038**	-0.039**	-0.032**	-0.031**
	(0.013)	(0.009)	(0.010)	(0.008)	(0.008)
Percent Young	-0.001	0.002	0.088**	0.054**	0.032
	(0.031)	(0.019)	(0.023)	(0.020)	(0.019)
Resource Deprivation					
Percent High Income	-0.014	0.025**	0.025**	0.011**	0.023**
	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)
Family Structure					
Percent Nuclear Families	-0.048**	-0.021*	-0.095**	-0.055**	-0.040**
	(0.015)	(0.009)	(0.010)	(0.009)	(0.008)
Residential Stability					
Percent Home Ownership	0.006	-0.002	-0.013**	-0.008*	-0.008*
	(0.005)	(0.003)	(0.004)	(0.003)	(0.003)
Commercialization					
Business Establishments per pop.	1.367	0.512	2.429**	2.307**	2.015**
	(1.144)	(0.731)	(0.817)	(0.747)	(0.719)
Formal Social Control					
Police Personnel	0.040*	-0.040*	0.053**	0.058**	0.068**
	(16.016)	(20.374)	(17.924)	(0.015)	(14.318)
Constant	-5.997**	-5.300**	-1.812	-2.677**	-1.807*
	(1.333)	(0.793)	(0.943)	(0.850)	(0.825)
Log Likelihood	-810.89	-2106.27	-3072.2	-3726.7	-4716.31
Chi Squared	34.46	116.32	447.75	302.53	313.45
N	856	856	856	856	856

*p<.05 **p<.01 (two-tailed tests)

Table 5.7: Coefficients from the Logistic Regression of Reporting on Respondents Characteristics, 1998

Variable	Coef.	Std. Error	z	P>|z|
Male	0.184	0.348	0.529	0.597
Age	-0.002	0.130	-0.014	0.989
Education	0.414	0.189	2.193	0.028
Income	0.055	0.150	0.368	0.713
Born in Fed. District	0.242	0.450	0.538	0.590
Constant	-2.940	0.857	-3.432	0.001
Log-likelihood	-111.712			
Prob>chi2	10.82			
n	193			

Notes: Coefficients reported are log-odds ratios. Only cases in which respondents reported being victims of a crime during the past year are included in the analysis. The total sample size is 795.
*p<.05 **p<.01 (two-tailed tests)
Source: *Reforma* Survey, May, 1998.

Table 5.8: Coefficients from the Negative Binomial Regression Models of Crime on Income Levels and other Neighborhood Characteristics Using Robust Standard Errors and Clustering, 1998

Variables	Homicide	Homes	Public Areas	Violent Crimes	Total
Demographic Variables					
Housing Density	-0.005	-0.032**	-0.010	-0.016	-0.022
	(0.016)	(0.010)	(0.015)	(0.014)	(0.014)
Percent Young	-0.040	-0.015	0.011	0.013	0.016
	(0.033)	(0.018)	(0.036)	(0.026)	(0.028)
Resource Deprivation					
Percent High Income	0.008	0.030**	0.030**	0.017*	0.014
	(0.011)	(0.008)	(0.010)	(0.008)	(0.009)
Percent primary education or less	0.013	0.002	-0.009	-0.002	-0.016*
	(0.009)	(0.006)	(0.010)	(0.006)	(0.007)
Residential Stability					
Percent Home Ownership	-0.007	-0.007**	-0.031**	-0.020**	-0.014**
	(0.004)	(0.003)	(0.005)	(0.005)	(0.005)
Commercialization					
Business Establishments per pop.	1.851	0.774	3.730**	3.104**	2.704**
	(1.178)	(0.594)	(1.313)	(1.145)	(1.010)
Formal Social Control					
Police Personnel	0.041*	-0.030	0.102	0.080	0.085
	(0.020)	(0.019)	(0.057)	(0.054)	(0.050)
Constant	-7.704**	-5.881**	-4.091**	-4.109**	-2.925**
	(1.406)	(0.782)	(1.365)	(1.121)	(1.121)
Log Likelihood	-815.545	-2109.09	-3112.71	-3745.58	-4723.72
Chi Squared	28.02	92.87	156.82	198.17	291.66
N	856	856	856	856	856

Note: Coefficients whose significance level dropped below 0.05 using the clustering technique are highlighted.
*p<.05 **p<.01 (two-tailed tests)

Table 6.1: Homicide Victimization Rates in Mexico Based on Vital Statistics, 1940-2000 (per 100,000)

Year	Males	Females
1950	88	7
1965	37	3
1972	27	3
1982	34	3
1990	32	4
2000	20	3

Sources: Hernández Bringas (1989) and INEGI

Table 6.2: Illiteracy Rates and Employment by Sector of the Economy in Mexico, 1900-1990

		Percent Employed by Sector of Economy		
Year	Illiteracy Rate	Primary Sector	Secondary Sector	Tertiary Sector
1900	77.7	61.9	15.7	16.3
1910	72.3	67.2	15.1	16.6
1921	66.2	71.4	11.5	9.3
1930	61.5	70.2	14.4	11.4
1940	58.2	65.4	12.7	19.1
1950	43.2	58.3	16.0	21.5
1960	33.5	54.2	19.0	26.1
1970	23.7	39.4	23.0	31.9
1980	17.0	26.0	20.4	23.8
1990	12.6	22.7	27.8	46.1

Sources: INEGI (1994)

APPENDIX B

FIGURES

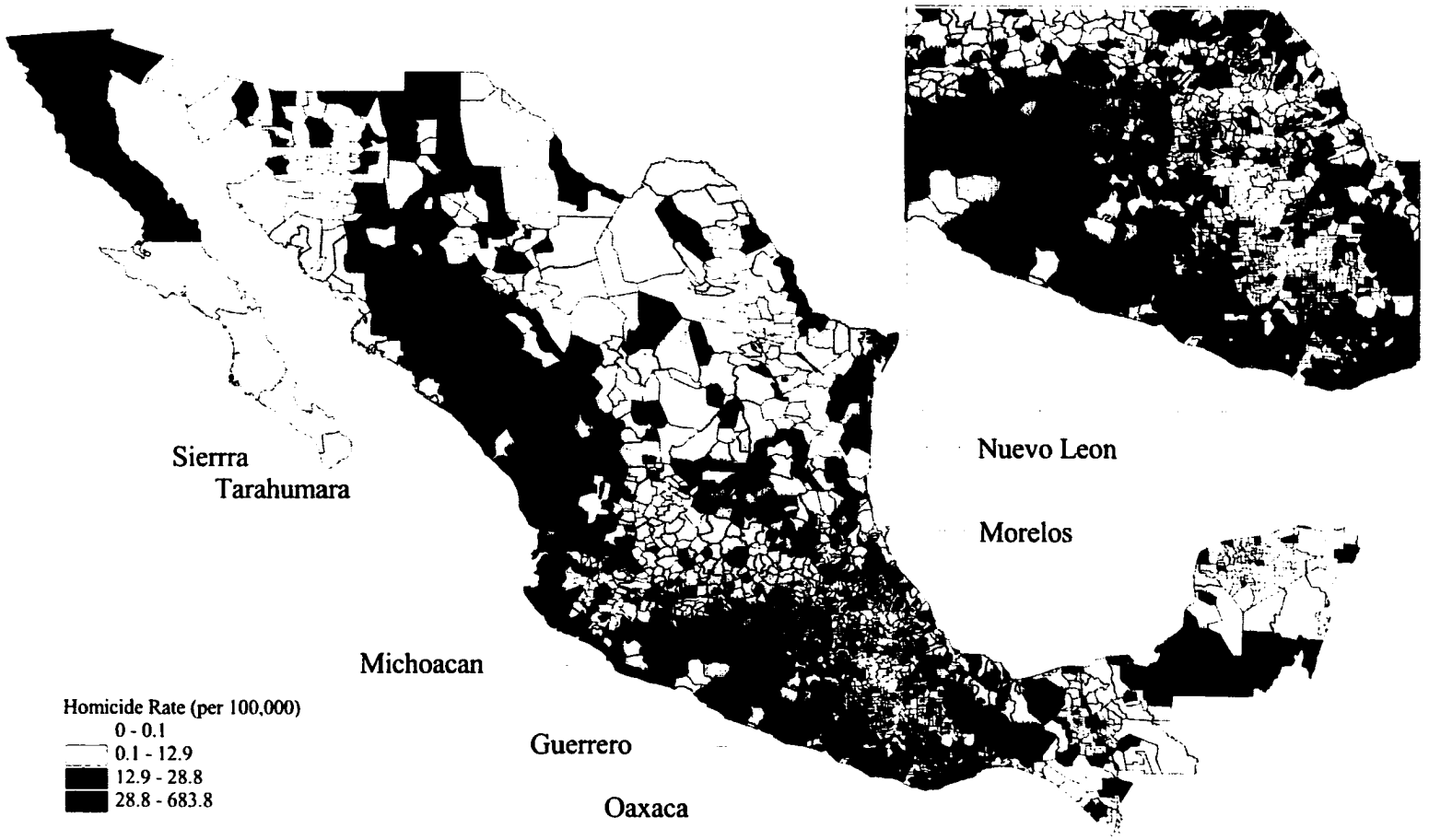
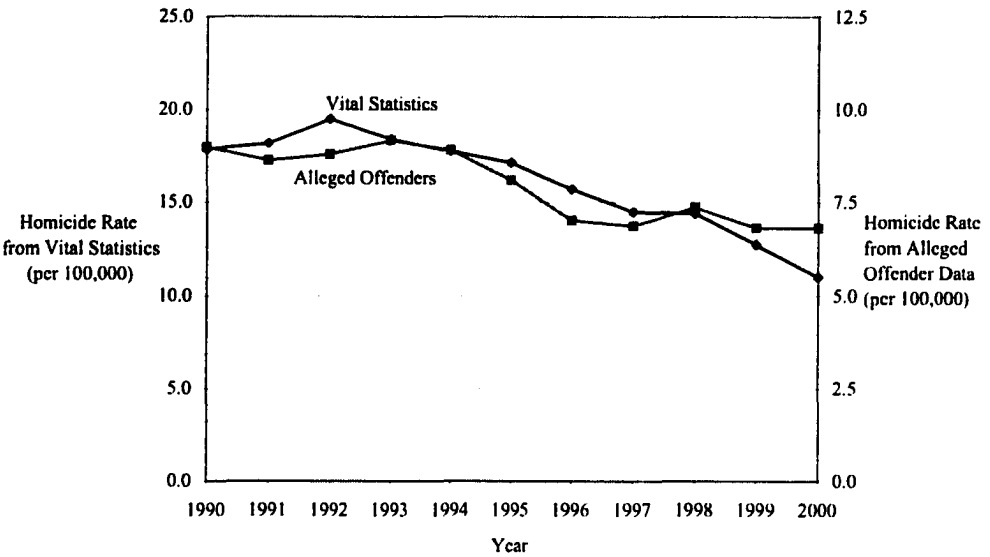


Figure 2.1: Homicide Rate in Mexican Municipalities, 1990

Figure 2.2: National Homicide Rate Based on Vital Statistics and Alleged Offenders, 1990-2000



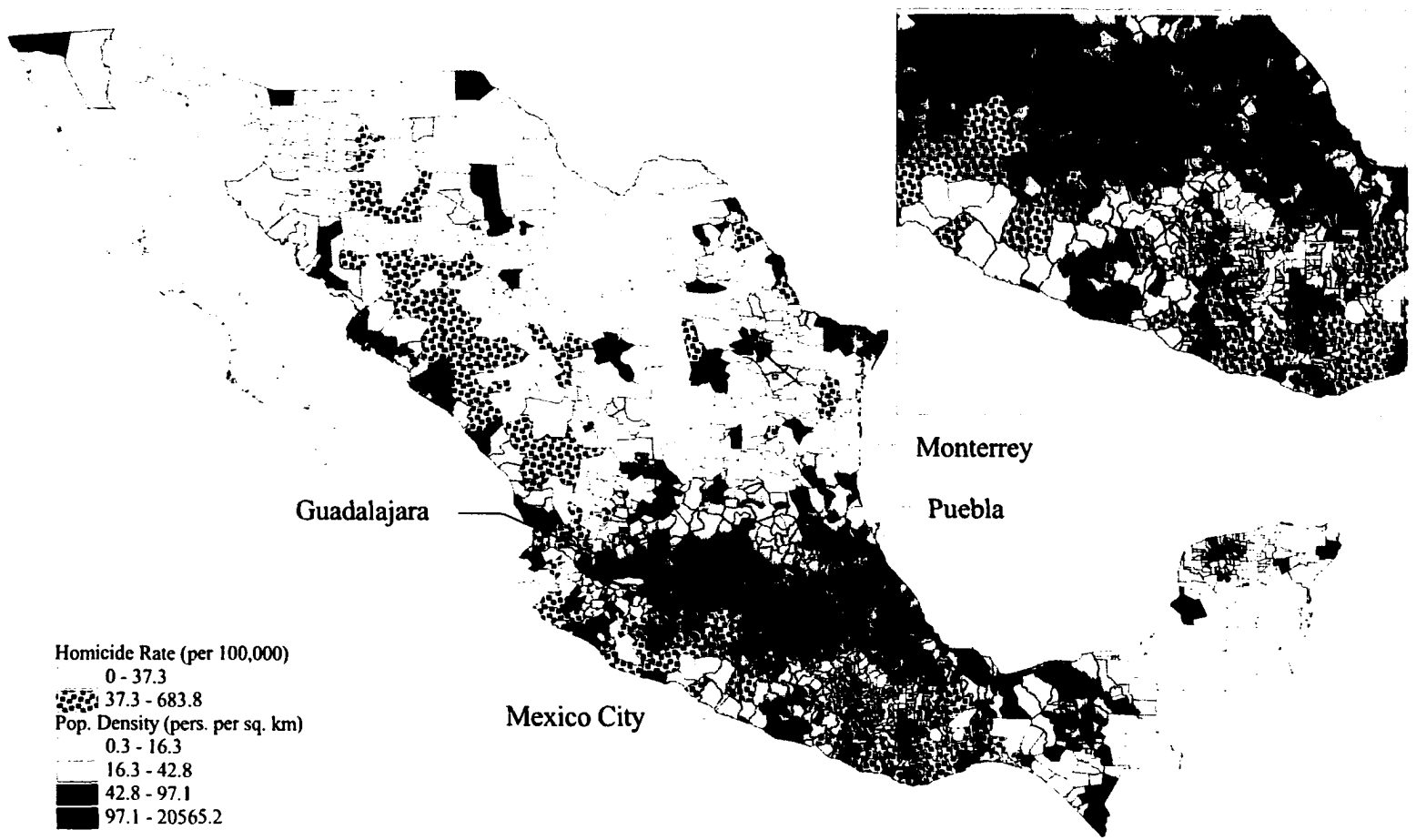


Figure 2.3: Homicide Rate and Population Density in Mexican Municipalities, 1990

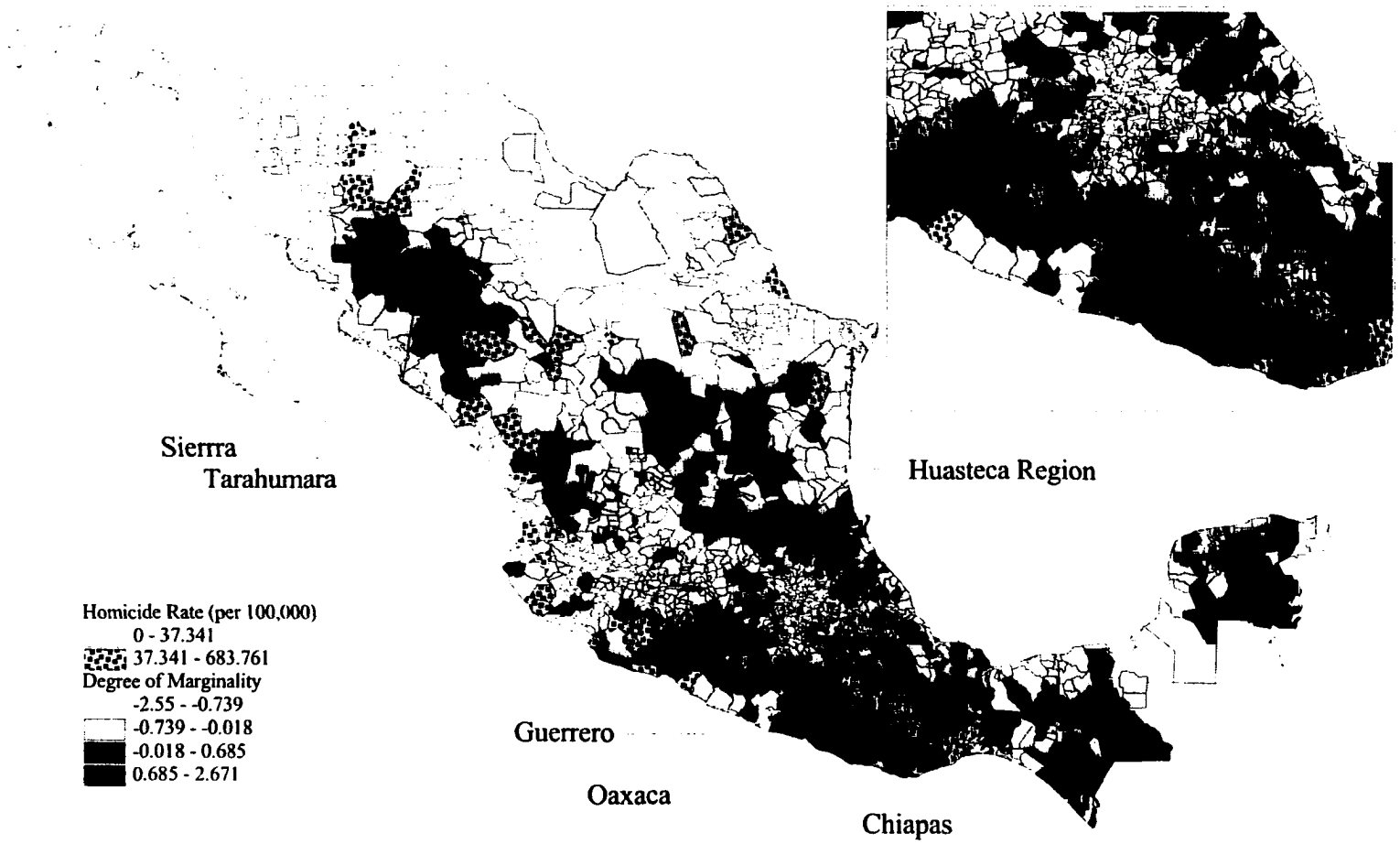


Figure 2.4: Homicide Rate and Poverty in Mexican Municipalities, 1990

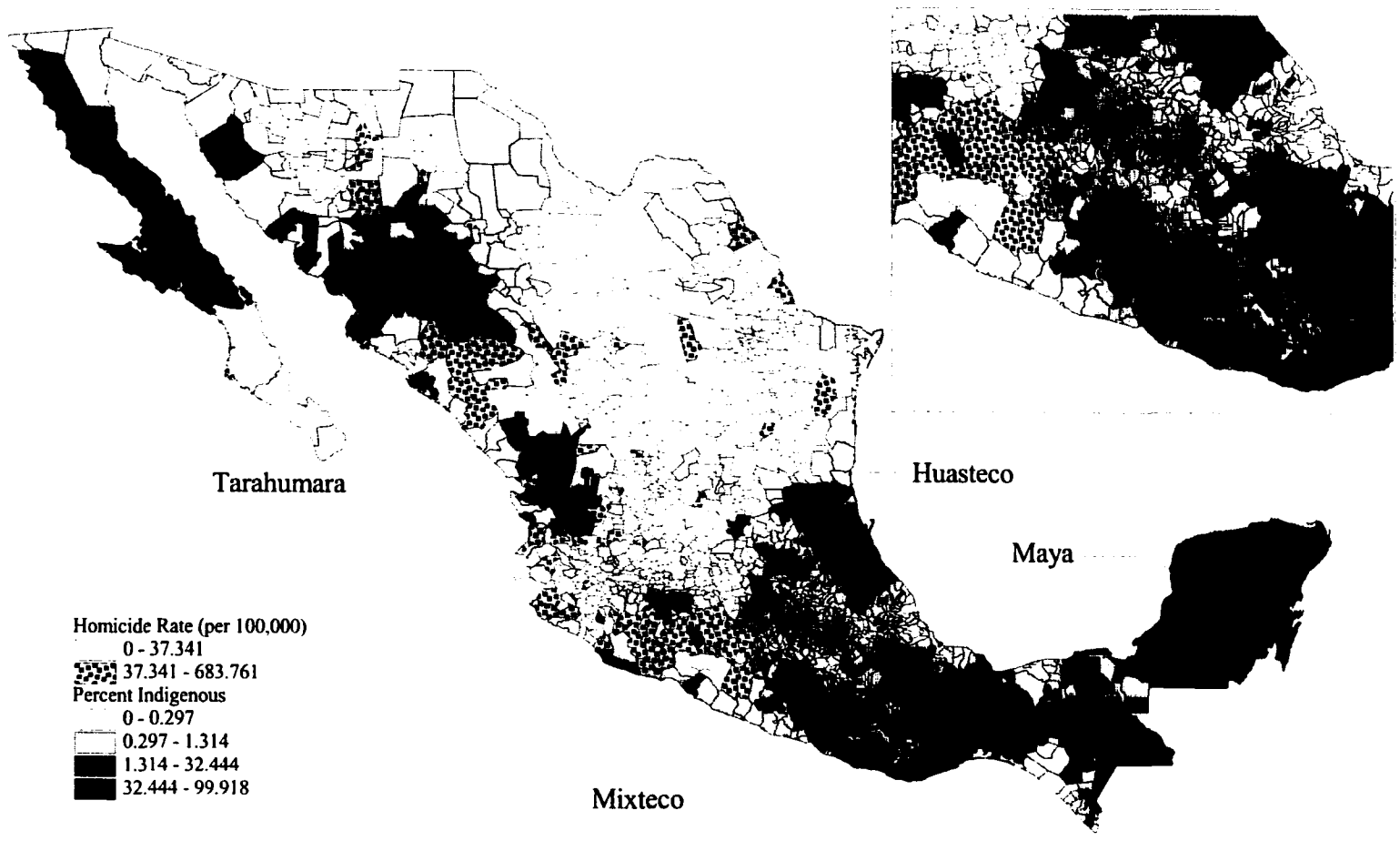


Figure 2.5: Homicide Rate and Indigenous Population in Mexican Municipalities, 1990

Figure 2.6: Age-Specific Homicide Victimization Rates in Mexico, 1990

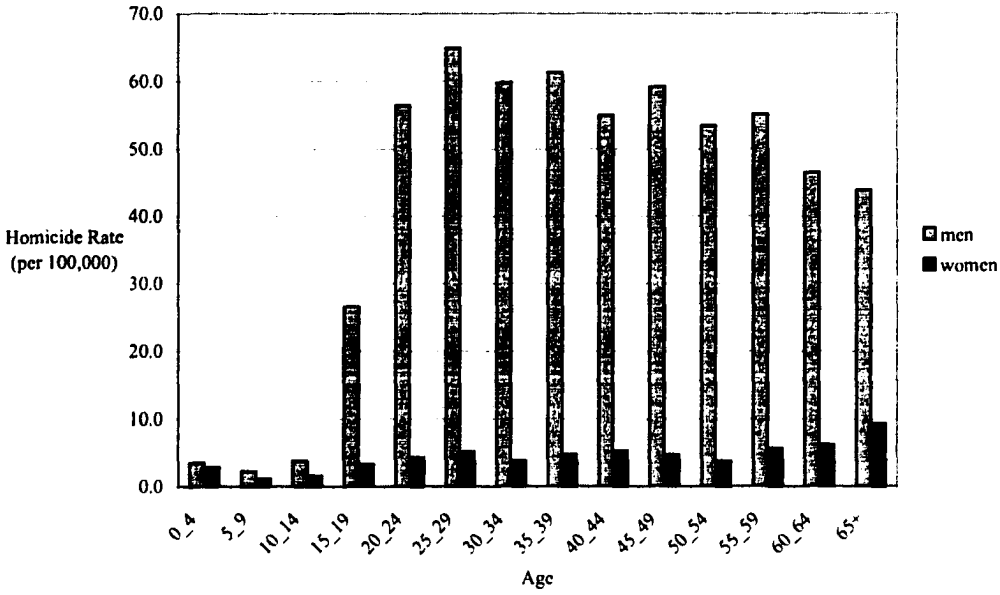
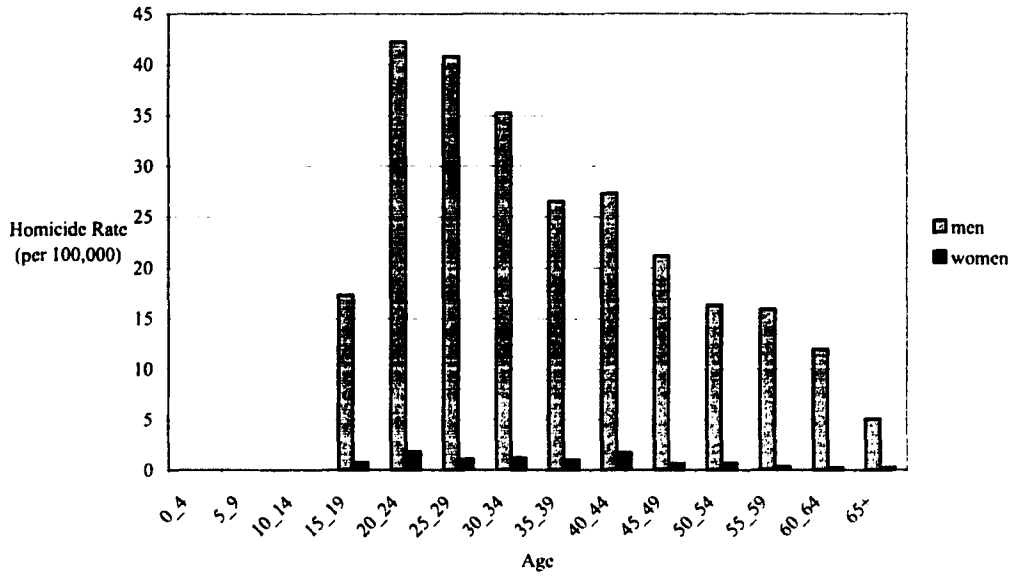


Figure 2.7: Age-Specific Homicide Offending Rates in Mexico, 1990



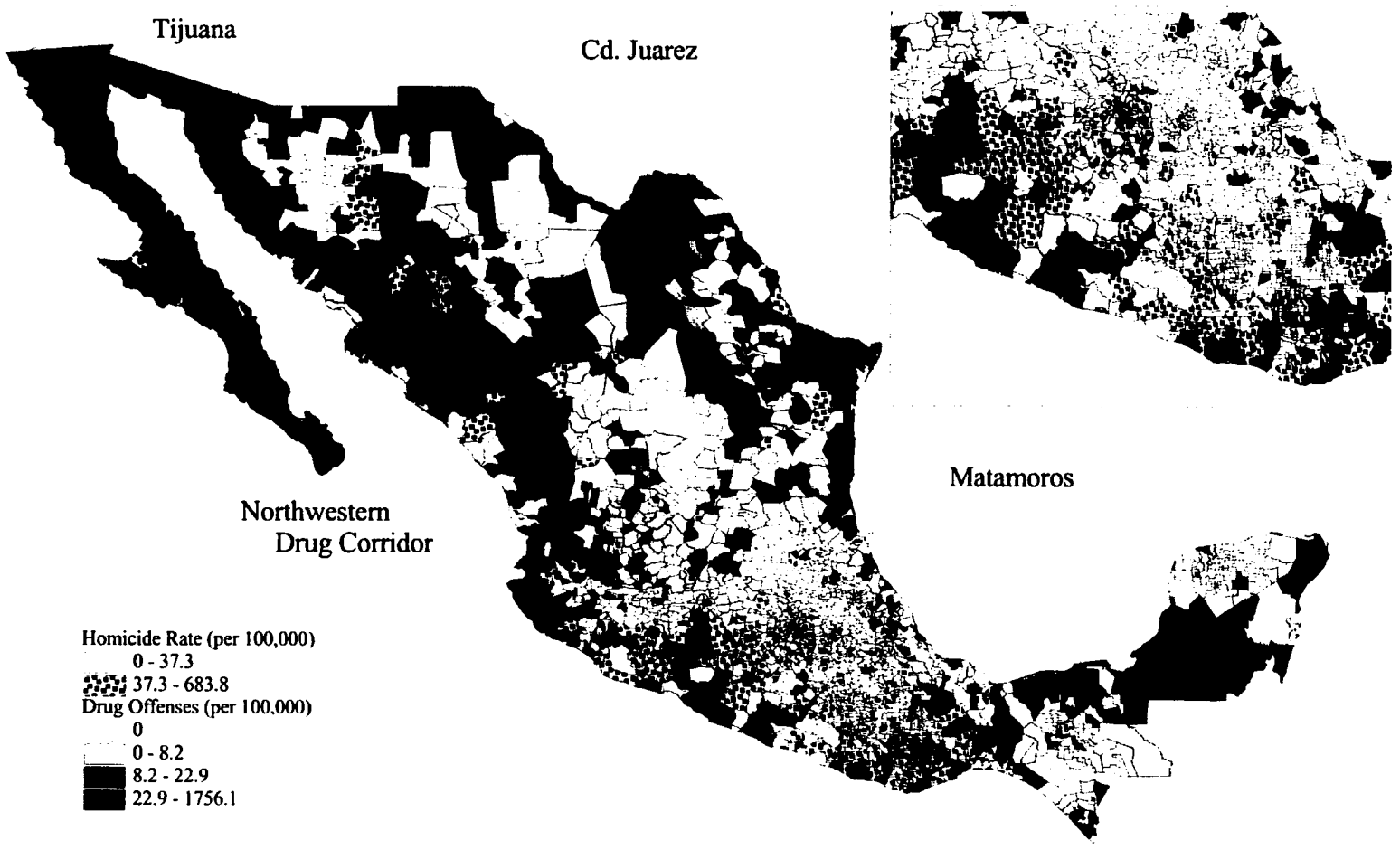


Figure 2.8: Homicide Rate and Drug Offenses in Mexican Municipalities, 1990

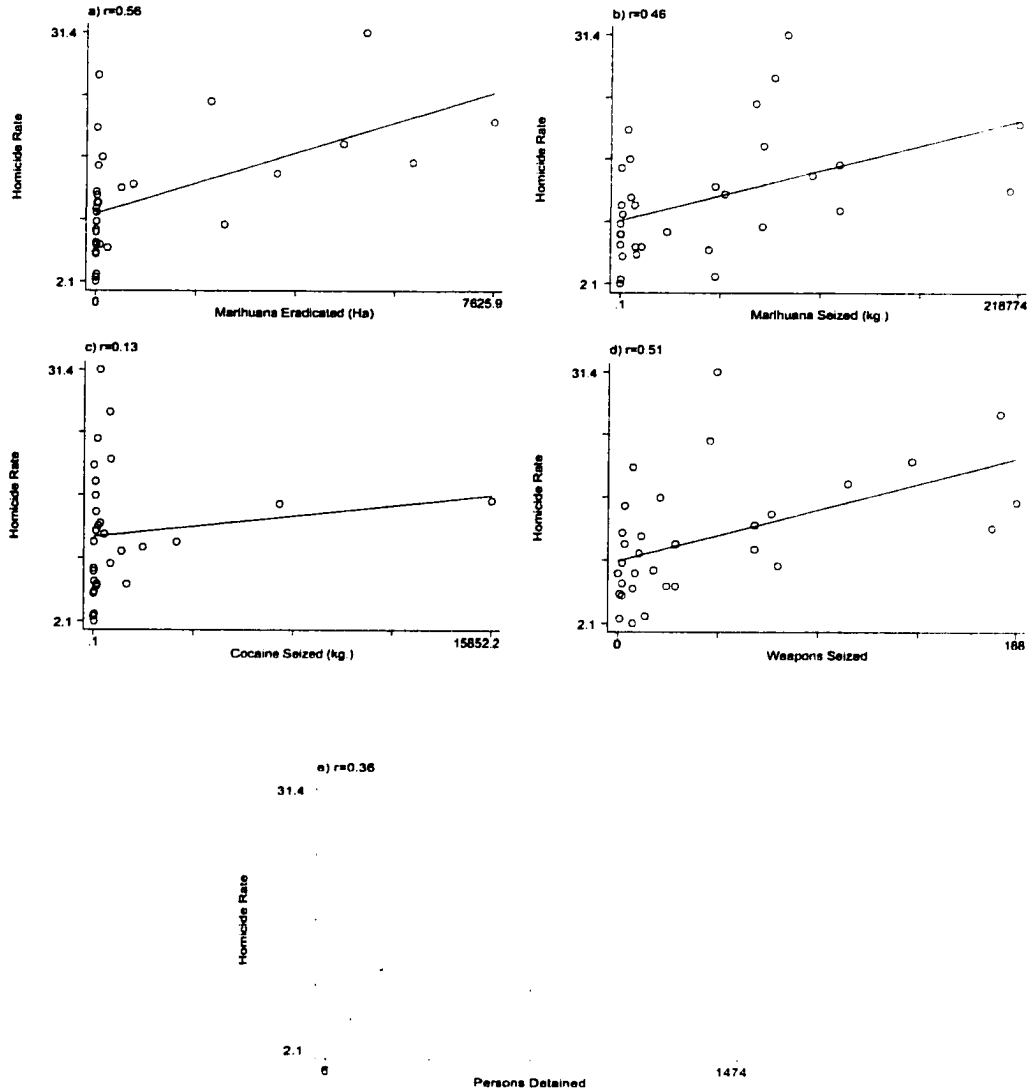


Figure 2.9: Bivariate Relations between State Homicide Rates and Measures of Drug Production and Traffic, 1999

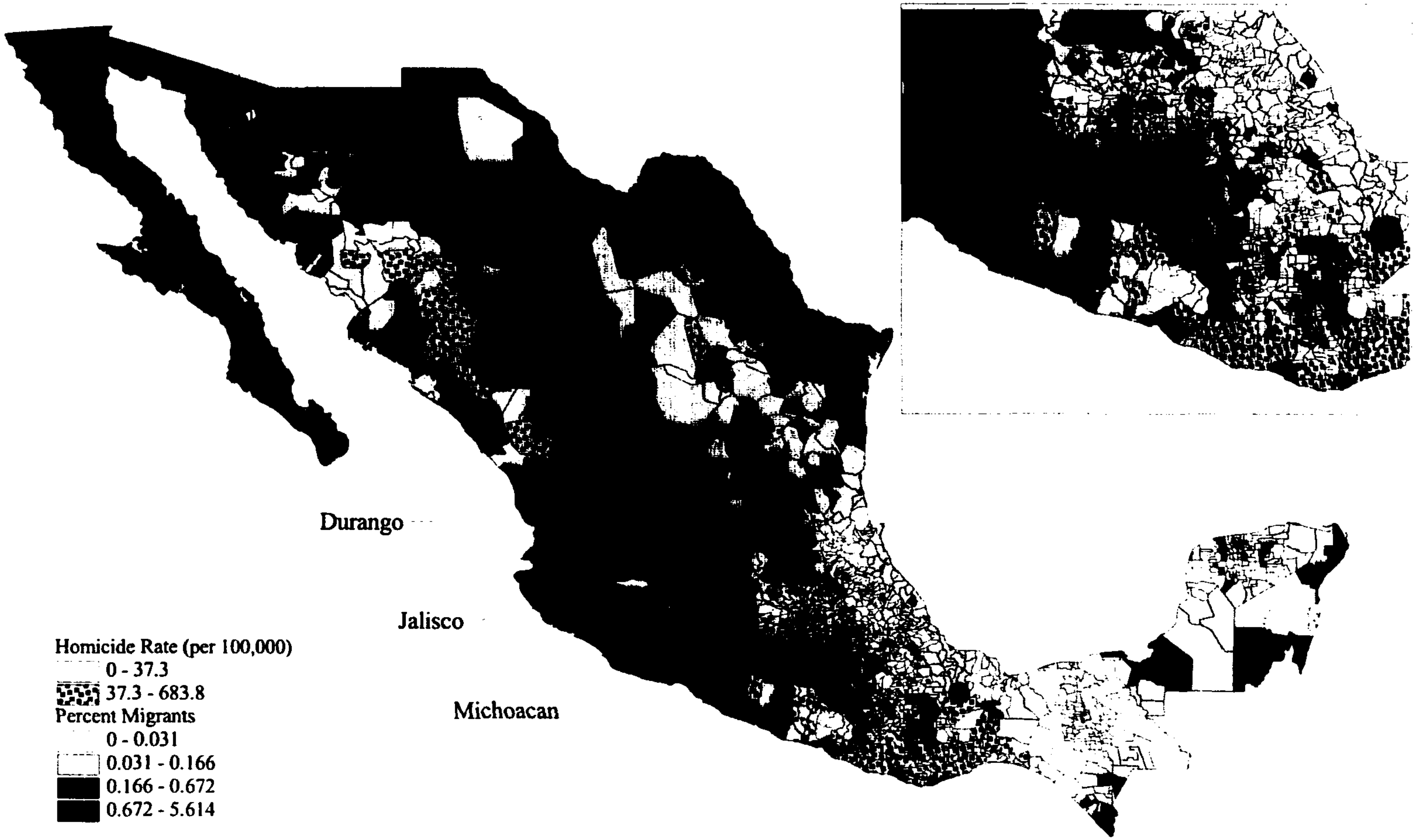


Figure 2.10: Homicide Rate and Migration from Mexican Municipalities, 2000

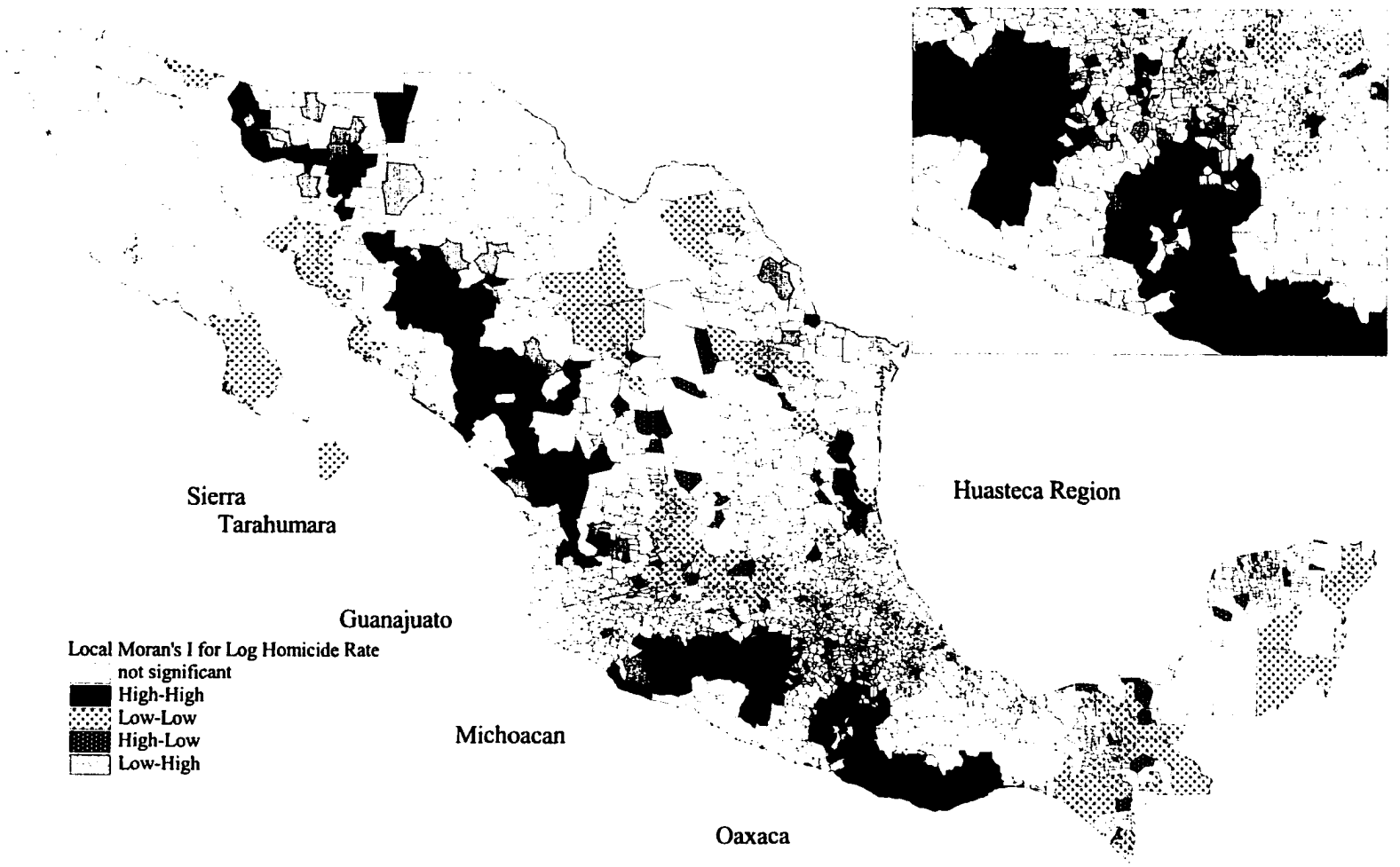


Figure 2.11: Local Moran's I for Homicide Rates in Mexican Municipalities, 1990

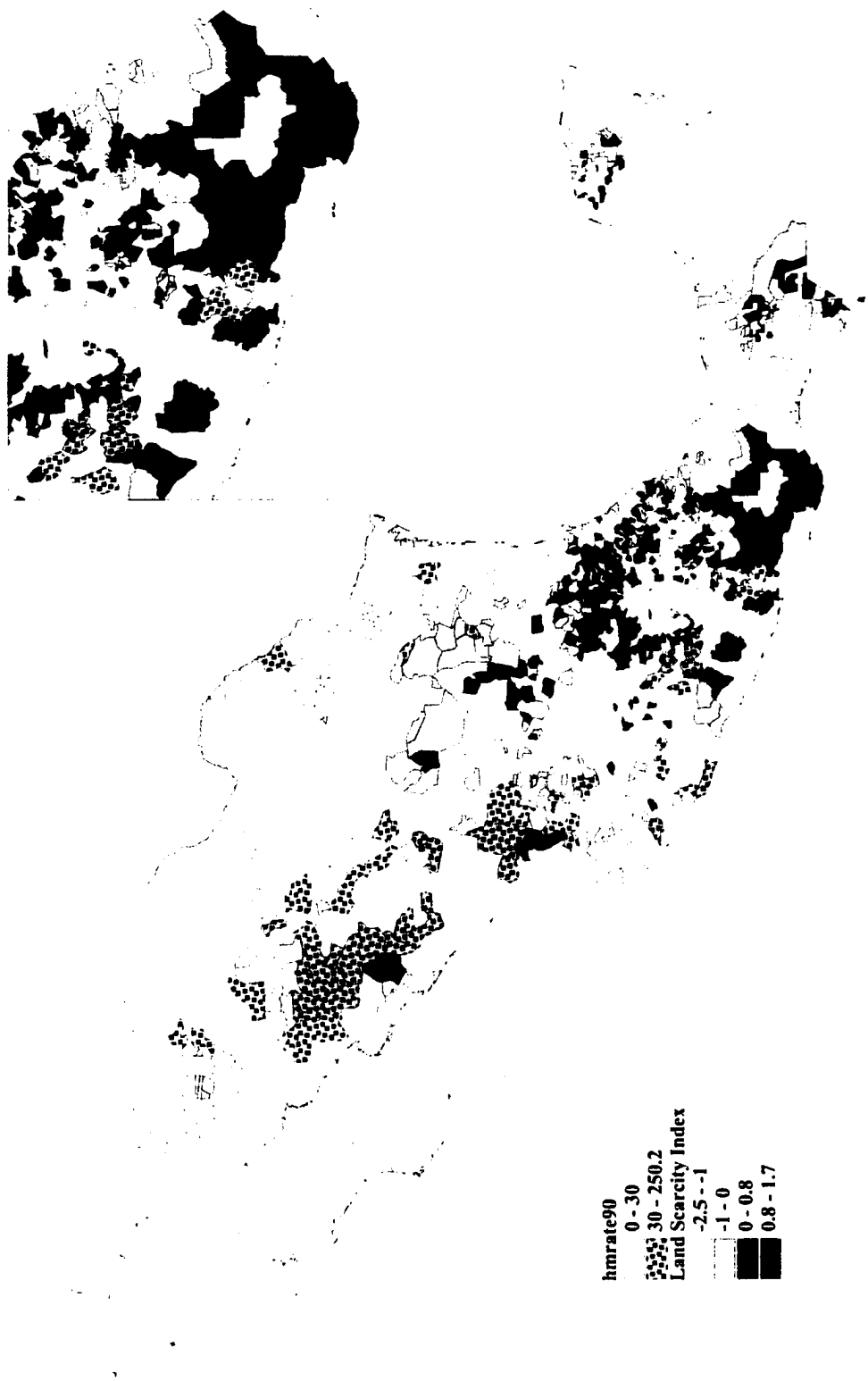


Figure 3.1 Homicide Rate and Land Scarcity in Rural Municipalities, 1990

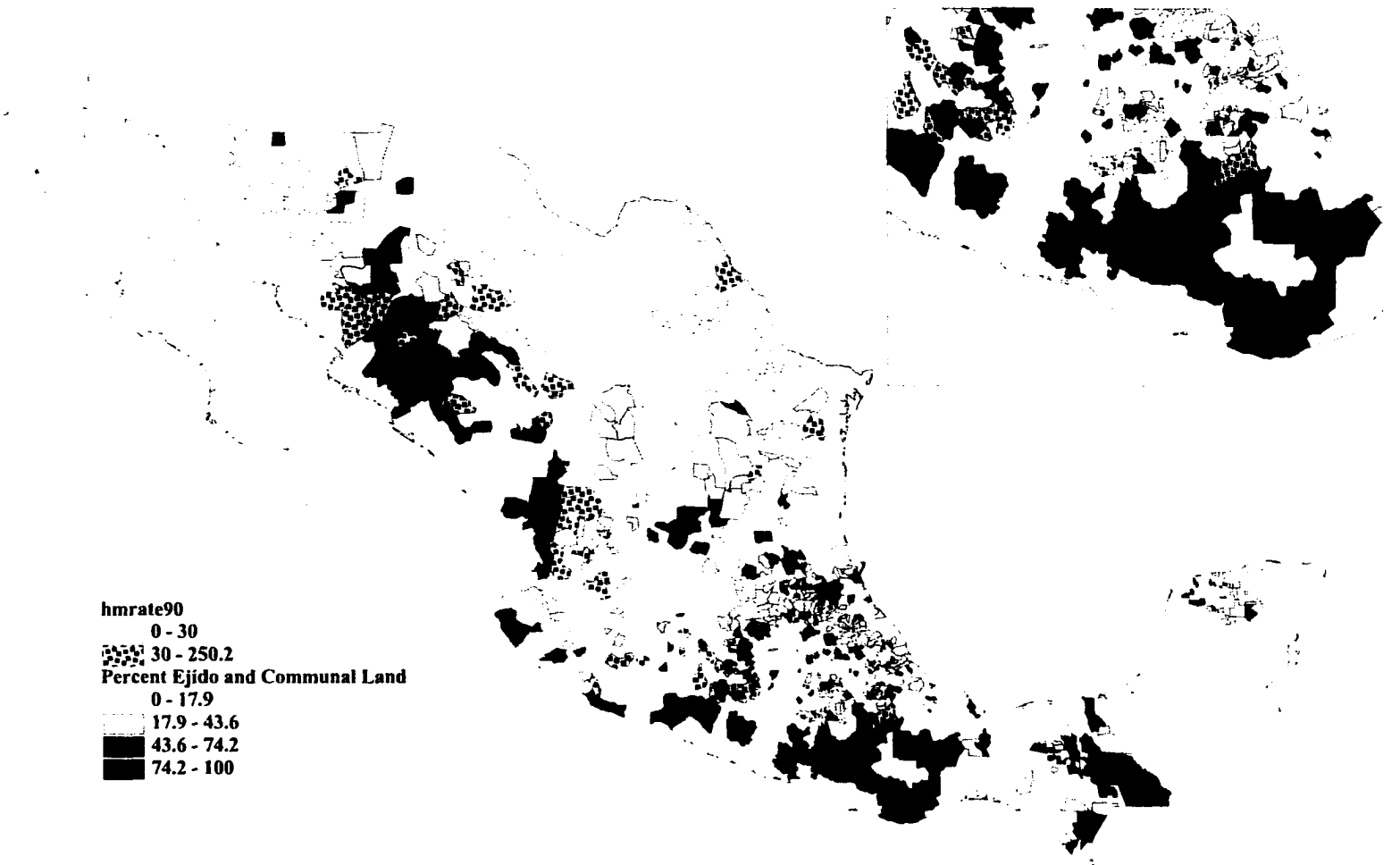


Figure 3.2 Homicide Rate and Percent Ejido and Communal Lands in Rural Municipalities, 1990

Figure 4.1: Average Proportion of Votes Against the PRI in Municipal Elections, 1980-2000

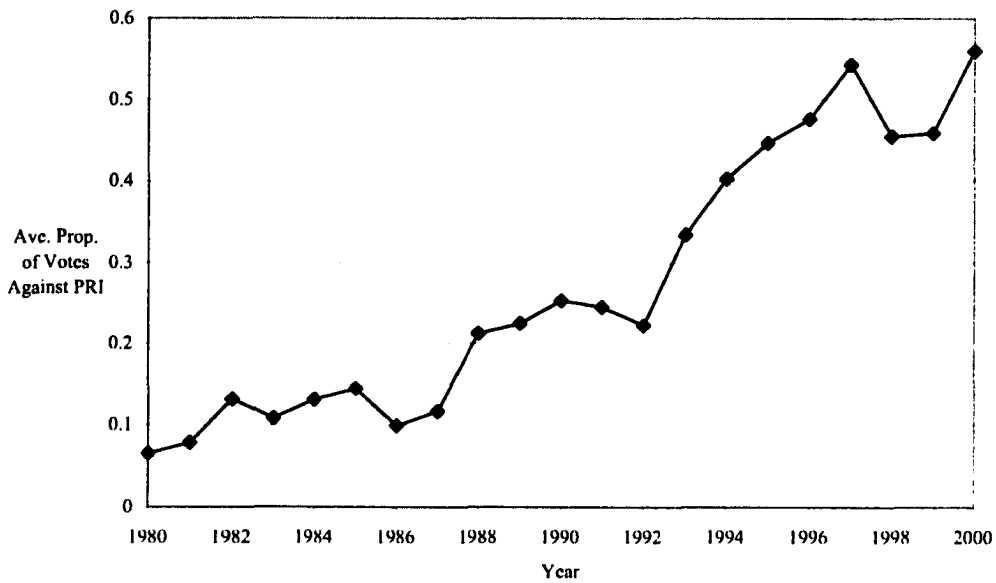
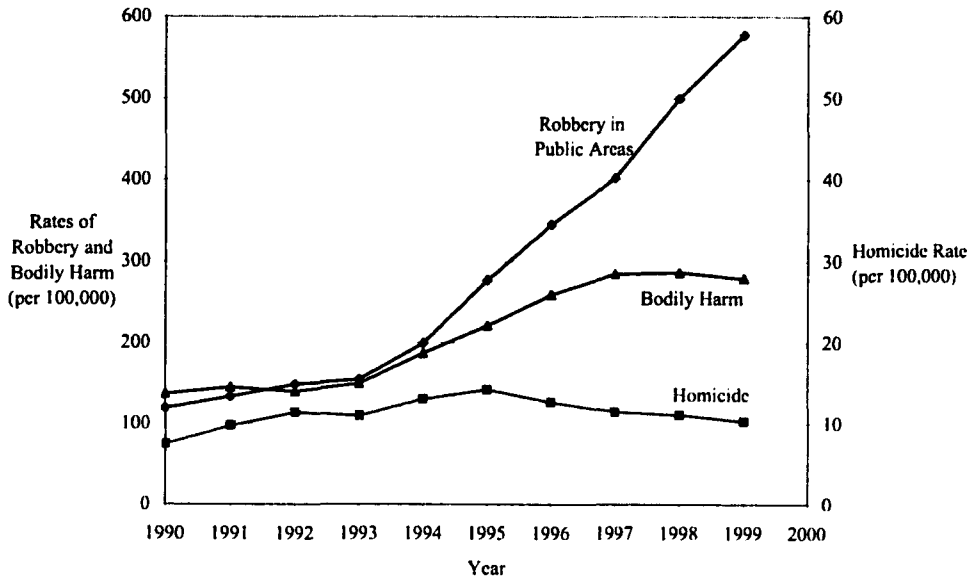


Figure 5.1: Rates of Robbery in Public Areas, Bodily Harm and Homicide in the Federal District, 1990-1999



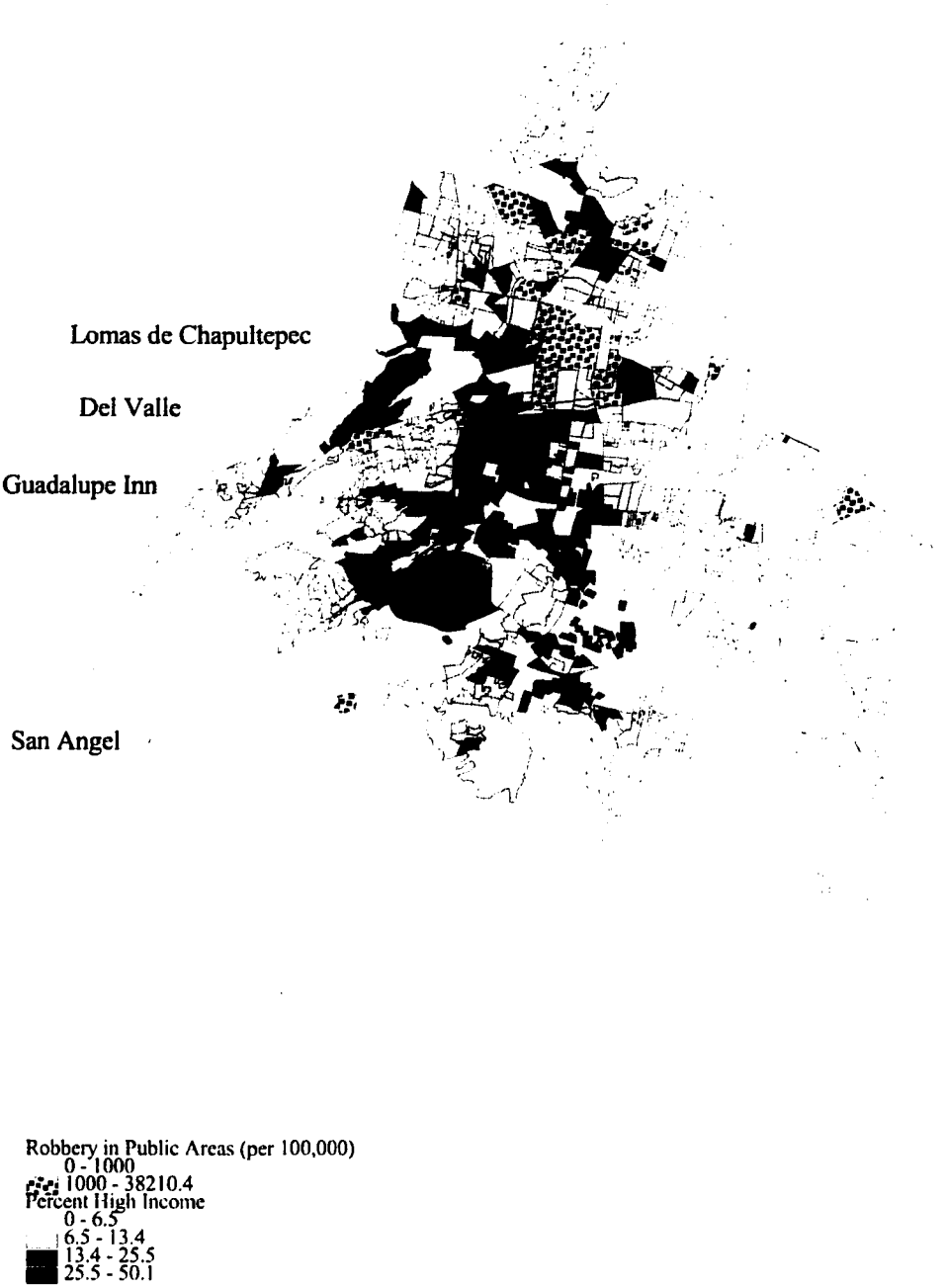


Figure 5.2: Robbery in Public Areas and Income Levels in Mexico City Neighborhoods, 1998

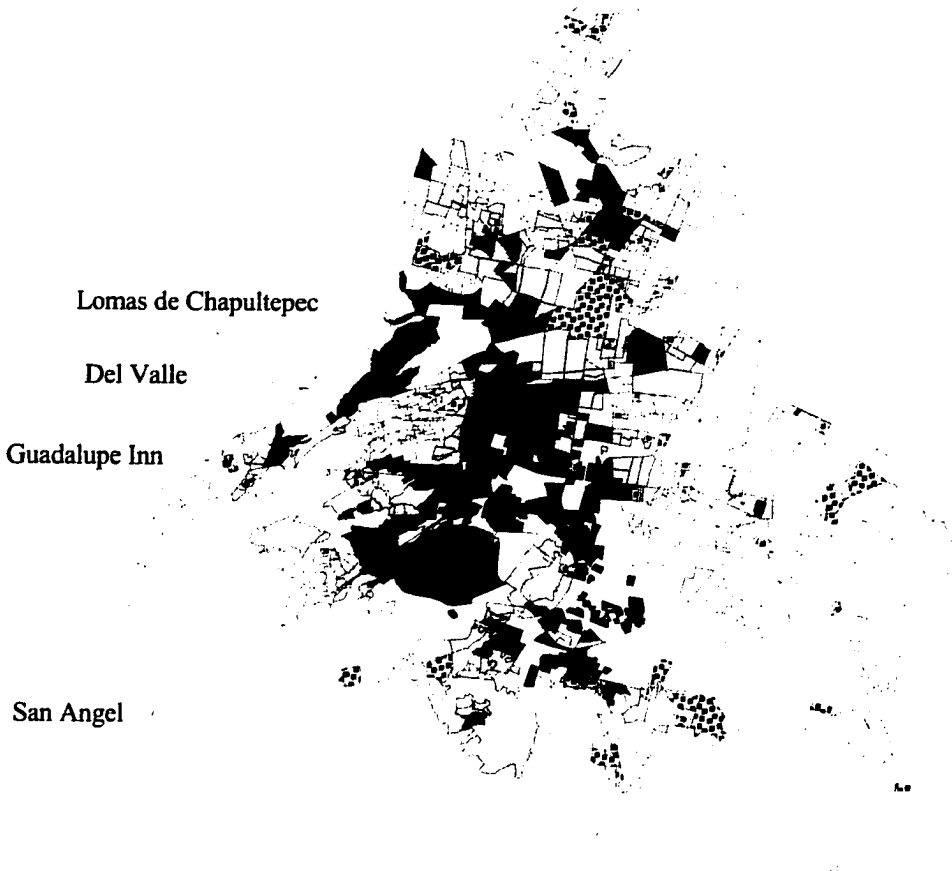


Figure 5.3: Homicide Rates and Income Levels in Mexico City Neighborhoods, 1998

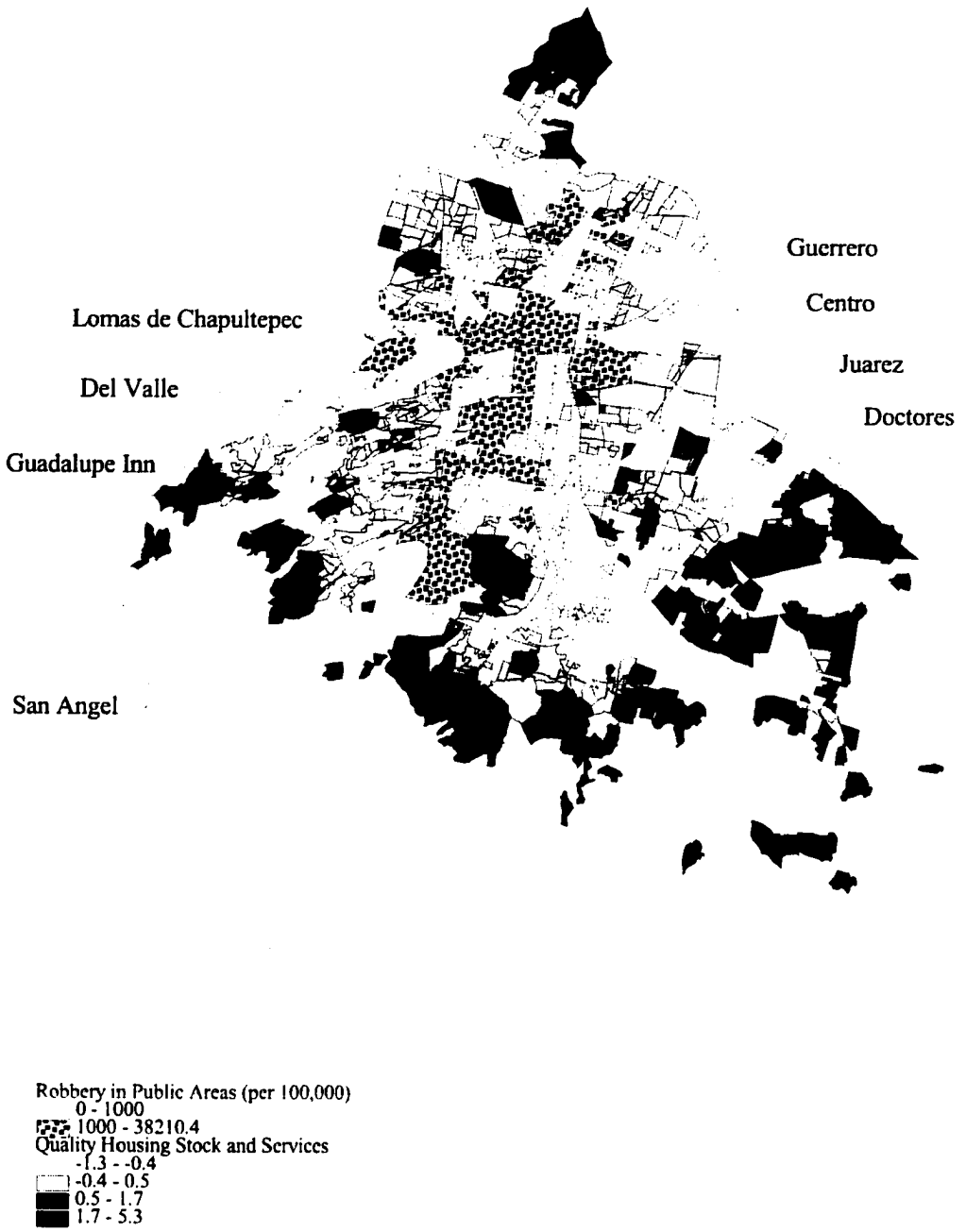


Figure 5.4: Robbery in Public Areas and Quality of Housing Stock in Mexico City Neighborhoods, 1998

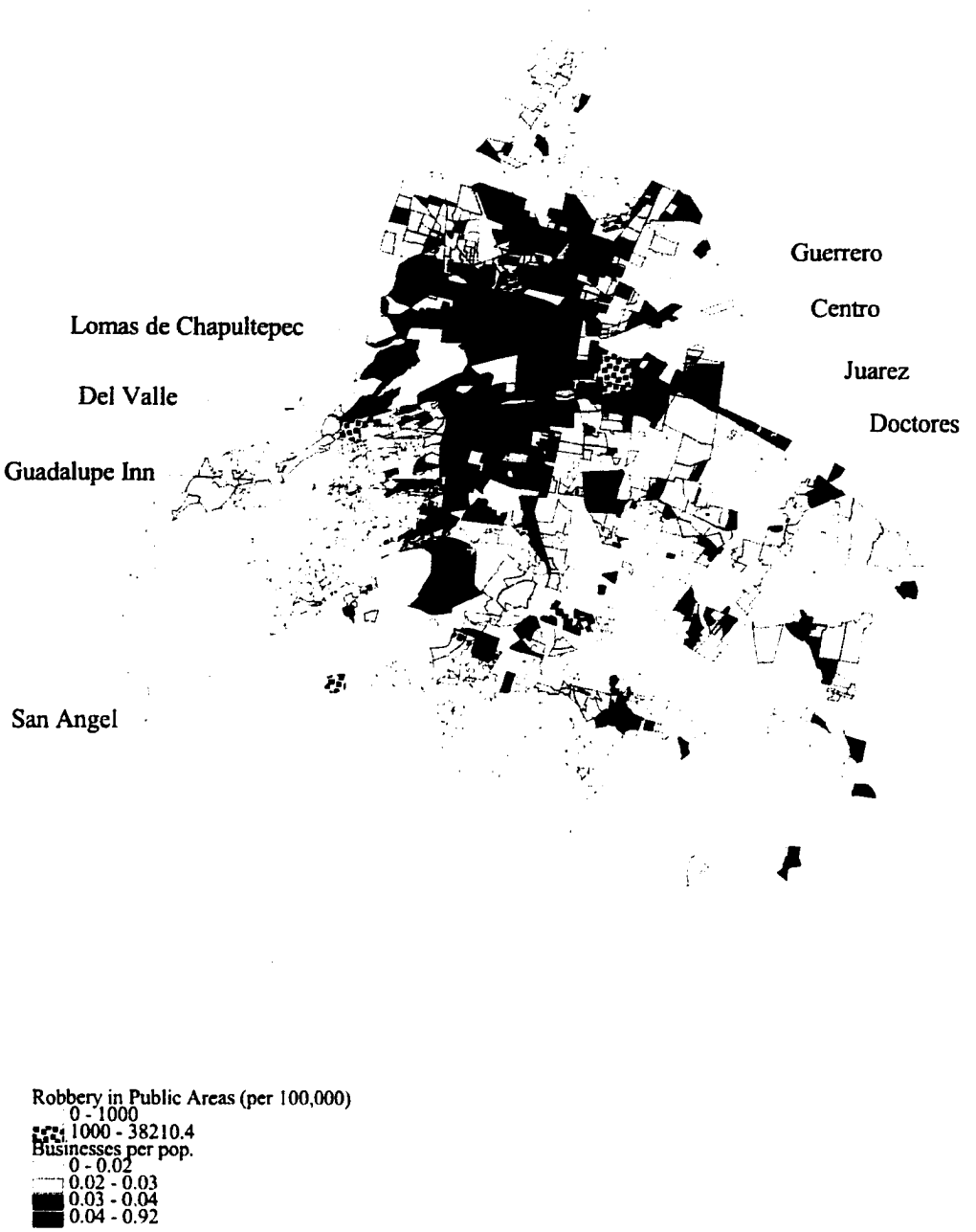


Figure 5.5: Robbery in Public Areas and Degree of Commercialization in Mexico City Neighborhoods, 1998

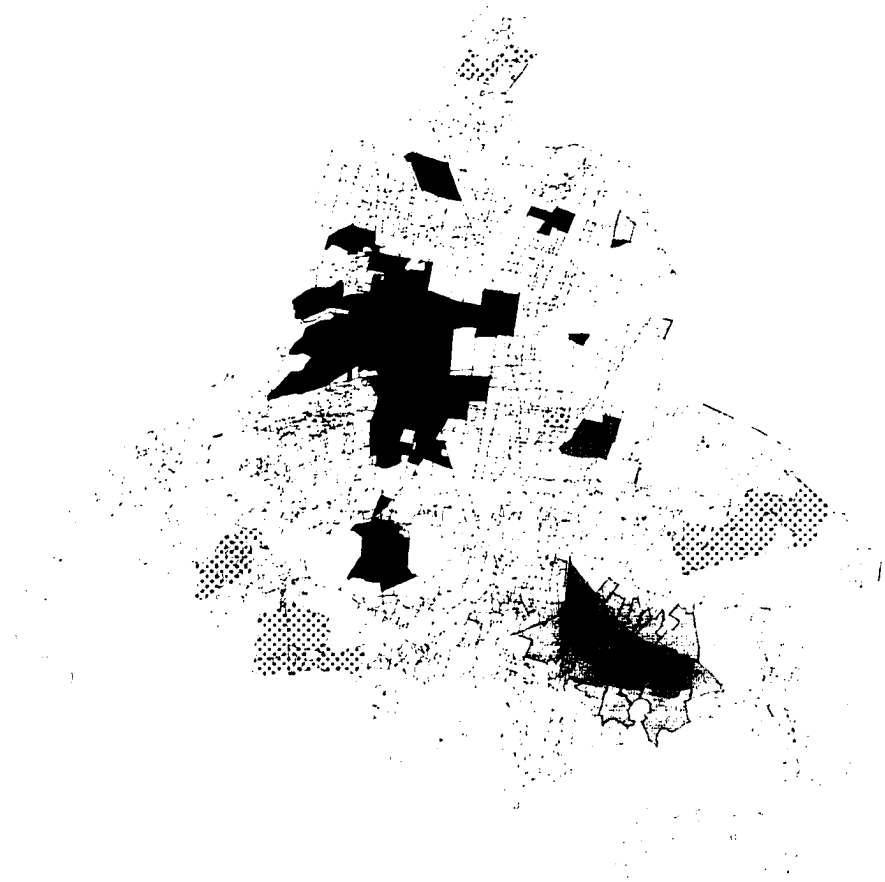


Figure 5.6: Local Moran's I for Robbery in Public Areas Used to Create Neighborhood Clusters

Figure 6.1: Homicide Rate in Mexico Based on Prosecuted Offenders, 1940-2000

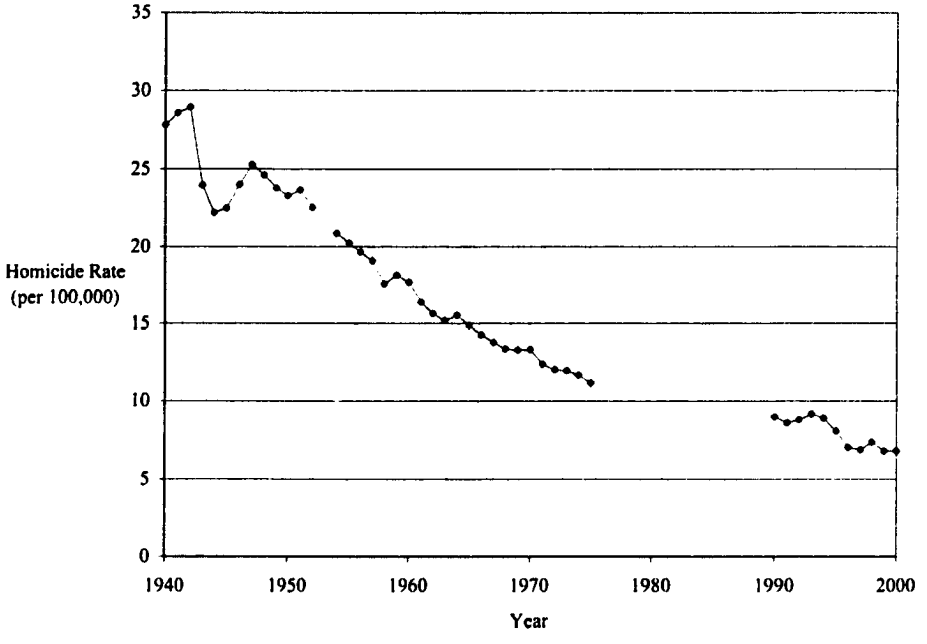


Figure 6.2: Property Crimes and Crimes Against Persons in Mexico, 1940-1999

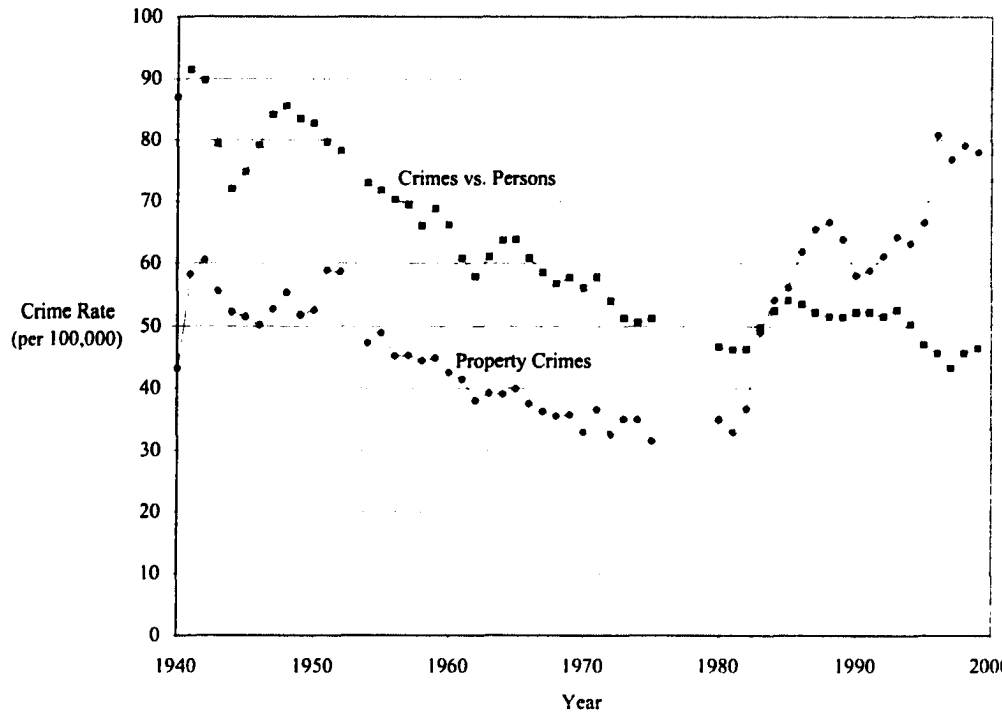
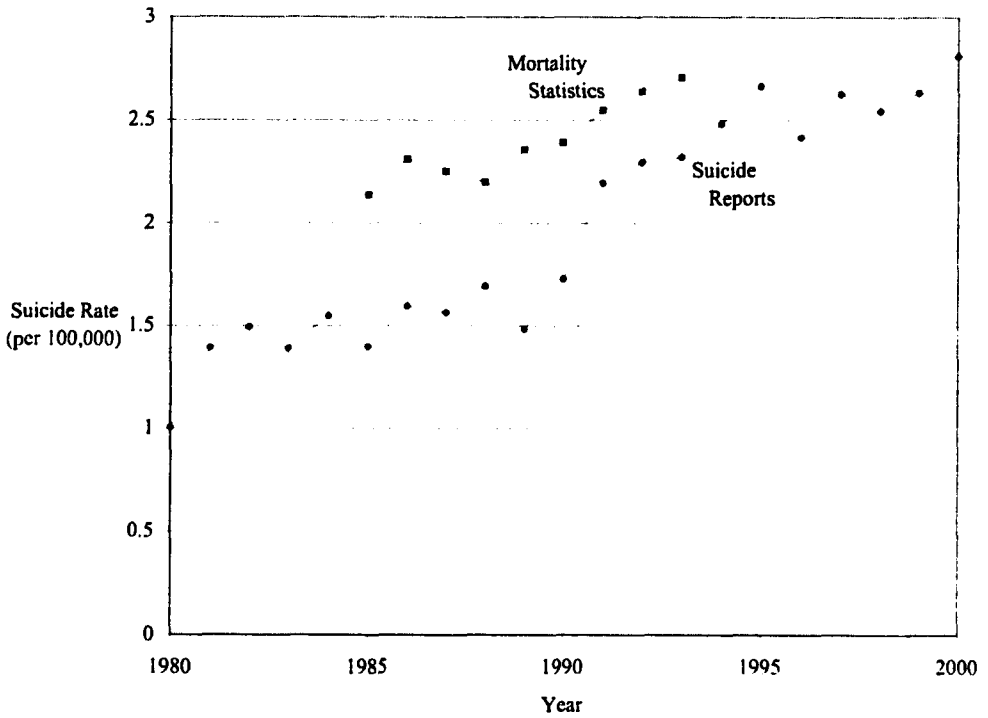


Figure 6.3: Suicide Rate in Mexico, 1980-2000



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