

RESEARCH ARTICLE

What Explains Criminal Violence in Mexico City? A Test of Two Theories of Crime

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There are competing theories of what drives crime in cities and neighbourhoods. Two widely cited theoretical approaches focused on social disorganization and institutional anomie propose different explanations for the causes and dynamics of criminality. Yet these theories are seldom empirically tested, much less acknowledged, outside of North America and Western Europe. This article considers their applicability in Mexico's capital, a sprawling metropolis of more than 20 million people. The authors administer spatial and general statistical tests to explain the geographical patterns of crime rates across multiple forms of criminality. The assessment demonstrates that both theories accurately predict the spatial distribution of crime. The article concludes with a host of policy conclusions, emphasizing social crime prevention over more traditional law and order measures. and consolidating families, parents and childcare.

Keywords: crime; violence; cities; social disorganization; institutional anomie; geographically weighted regression; Mexico

Introduction

An accurate and granular understanding of crime patterns at the city and neighbourhood scale is essential for intelligent policing and crime prevention. While crime reduction strategies are frequently advocated and adopted at the national level, their application is invariably subnational. It is state, municipal and city governments that are ultimately responsible for overseeing the day-to-day business of policing and prevention.

Interventions can vary from the strategic deployment of policing assets in “hot spots” to the creation of community watch committees, measures targeting at-risk youth, and programs designed to promote community cohesion. All of these activities are adopted at the street level. And while all of them are likely relevant, not all of them are equally effective.

Criminologists and geographers have repeatedly shown how the distribution of criminal violence and property crime is highly spatially concentrated (Aselin et al 2000, Freeman et al 1996, Ratcliffe 2003). In most urban settings a disproportionate amount of criminal violence and property crime tends to be hyper-concentrated in a

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relatively confined area (Muggah 2015). A constructive way to apprehend what drives particular spatial patterns of criminality is by empirically testing specific theories using insights from geography. Such an approach can overcome common policy errors related to misunderstanding why crime emerges and how it is distributed over time and space. A theoretically informed perspective can potentially improve measures to prevent and reduce crime by reducing the gap between perception and reality.

There are immense effectiveness and efficiency gains to be achieved by a more robust theoretical understanding of what drives specific types of crime, their institutional and structural dynamics, and appropriate measures to prevent them over time. Mexico City's authorities spent at least \$1.05 billion on public security in 2014, the equivalent of \$124 per resident.¹ A recent survey reveals that almost one third (31.7 percent) of the adult population was a victim of crime in the previous year. Almost half of all adults (46.3 percent) report feeling insecure in their neighbourhoods and close to two thirds (62.8 percent) do not trust their local police. But given the apparent widespread prevalence of crime – where should scarce resources be deployed? In Mexico City, as in so many other settlements, there is a pronounced disconnect between awareness of crime, spending on public security, and actual results in relation to personal safety.

This article considers two competing theories of crime to help resolve these conundrums and better predict the distribution of crime in Mexico's capital. Both social disorganization theory and institutional anomie theory are defined in the opening section. As expected, the authors detect a high degree of concentration of crime in particular areas of the metropolitan region. Roughly two thirds of all criminal investigations occur within a 37 mile radius from the geographic center of the sprawling city. What is more, just ten hot spot municipalities account for more than one quarter of all reported crimes. In criminal science literature, a hot spot consists

of an demarcated space with significantly higher levels of reported crime than adjoining or neighboring areas (Braga et al 2012). More fundamentally, the regression analysis detects a strong effect of social disorganization measures on the prevalence of crime. These findings have policy and programming implications since crime prevention measures based on either social disorganization or institutional anomie premises can generate spatially heterogeneous policy effects.

Defining place

It is widely accepted that crime concentrates in specific spatial, temporal, and social places. Across the Americas, between one and five per cent of city street addresses account for up to 99 per cent of homicidal violence (Weisburd et al 2011; Mejia et al 2014).² Likewise, criminality is often highly correlated with specific days of the week, times of day, and locations and settings. Predictably, most crime prevention interventions are also place-oriented. It is worth noting that a 'place' is not an abstract idea but rather a concrete or fixed entity. It is a location with a physical representation and an emotional quotient (Vilalta 2013). Places are not distinguished exclusively by their geographic, demographic or socio-economic composition, but also by the practices, ideologies, values and behaviours of those living in them. A place can be a municipality or city such as Mexico, but also a neighbourhood, a park, a bar, a street or an alley. Anthropologically speaking, it can also be an area where a community lives and self-identifies.

Not surprisingly, theory predicts that high-crime places tend to be different than low-crime places. When considering those areas affected by 'high' levels of crime, there are also distinctions between socially disorganized places and settings exhibiting anomie among their residents. Specifically, a socially disorganized place exhibits above-average crime due to concentrated disadvantage (e.g. above average poverty, high residential

mobility, excess male youth populations, and disrupted and fragmented families) and weak collective efficacy (e.g. limited trust and willingness to help others and low willingness to exercise informal controls for the public good). By way of contrast, a place featuring anomie also frequently experiences comparatively high rates of crime, but for different reasons. There crime arises owing to cultural and social norms and related pressures (e.g. to achieve monetary success) that in turn may distort and undermine critical institutions (e.g. family, church, schools, parties). Crime therefore arises when legitimate opportunities are unequally distributed and certain segments of society have no way to attain basic social and economic goals.

While both social disorganization theory and institutional anomie theory offer important insights into hot spots and hot individuals, they potentially yield very different policy and programming solutions. Generally, crime prevention policies for what might be characterized as socially disorganized places in Mexico might focus on the ecological characteristics of high crime areas. The goal would likely be to strengthen collective efficacy through highly targeted poverty reduction, enabling community cohesion and increasing youth supervision. Meanwhile, crime prevention measures for places suffering from anomie would likely entail reinforcing social institutions such as fragmented families, faith-based organizations, and political channels for dialogue. They might also emphasize more formal measures to prevent crime, such as changes in the built environment, specific forms of education, access to health and targeted employment. And while crime will be difficult to prevent in both socially disorganized and areas with a high levels of anomie, it is also more persistent and resistant in the latter settings. This is because it is particularly challenging to transform belief and value structures latent in a community as compared to reforming a neighbourhoods' socio-economic conditions and informal social controls.

Theories

Before testing social disorganization and institutional anomie theories in Mexico's largest city, it is important to consider their origins and characteristics. Both theoretical approaches offer immense predictive power and have been explored in the context of North American and Western European cities. Key exponents of both traditions include Sampson and Groves (1989), Bursik and Grasmick (1993), Sampson et al (1997, 2002), Messner and Rosenfeld (1997), and Baumer and Gustafson (2007) among others. Yet neither theory has been extensively tested outside of an upper-income setting – whether Mexico or otherwise. Part of the reason for this is that each emerges from intellectual moorings associated with the Chicago schools of human ecology and sociology. Social scientists have been loath to test the theory in what are often considered data poor environments. And yet they each offer, to varying degrees, a compelling framework for examining criminal dynamics in the so-called global South.

Social disorganization theory builds on concepts emerging in human ecology and so-called concentric circles in the first half of the twentieth century.³ It assumes that the growth and functional organization of a city is not a random process. Rather, identifiable patterns emerge in cities – beginning first in Chicago where the theory emerged – as a result of four social processes: invasion, conflict, accommodation and assimilation (Muncie and McLaughlin 2001). An unfortunate but natural by-product of these 'natural' social processes is crime. As such, a basic premise of social disorganization theory is that crime is produced by naturally occurring socio-pathological conditions in communities or events that are time and place specific. Social disorganization theory also owes an intellectual debt to a host of scholars in North American and Western European university criminology and sociology departments.

Intriguingly, the term 'social disorganization' was first introduced by Hall (1904) to

set out an ethical explanation of crime. Early pre-Chicago School criminological studies unwittingly made use of human ecology approaches. For example, Breckinridge and Abbott (1912) examined the geographic distribution of the homes of juvenile delinquents in Chicago and found that a disproportionate number were located in a small selection of neighbourhoods. Likewise, Burt (1925) found that areas in London with the highest crime rates were bordering the central business district and the areas with lowest crime rates were located around the periphery.⁴

Meanwhile, the theorizing on 'concentric circles' also contributed to advancing social disorganization theory. Scholars such as Burgess (1925) determined that cities could be divided into circles – or areas – according to their functions. Areas featuring higher crime were 'transitional' – places that are changing from commercial to residential use. The theory was tested by Shaw and McKay (1942) who observed that in these transitioning areas, crime rates remained stable over time even if the ethnic composition of the population changed. They determined that there must be some reason for crime to remain in some places and not in others.⁵

Thus, in its original formulation social disorganization predicts that spatial variation in crime within cities depends on levels of poverty, ethnic heterogeneity, and rapid population growth.⁶ The basic argument is that these factors weaken social bonding and therefore reduce the capacity of communities to manage and regulate themselves or monitor the behaviour of their members. Taken together, proponents of social disorganization theory contend that structural factors (e.g. principally deindustrialization, migration, and socioeconomic segregation) can spatially concentrate the disadvantaged, weaken the social fabric of communities, undermine the quality and quantity of bonding, and increase antisocial behaviour, including criminality (**Figure 1**).

Social disorganization theory was recently updated with the concept of 'collective

efficacy' (Sampson et al. 1997). Collective efficacy refers to the degree of social cohesion between residents of a given community and their preparedness to act on behalf of the common good. Areas exhibiting low levels of collective efficacy are characterized by low levels of civic participation, sparsely distributed friendship networks and unsupervised teenage peer groups. Contemporary proponents of social disorganization thus predict that the greater the level of collective efficacy the lower the level of crime and violence. Likewise, the lower the level of collective efficacy, the higher the rates of criminality and victimization. The theory was tested and confirmed in Chicago (Sampson et al. 1997), resulting in a widespread commitment to promoting collective efficacy as a means of preventing crime.

Social disorganization theory is commonly applied to examine a wide range of relationships between space, place, concentrated disadvantage and criminal behaviour. Scholars have considered the tendency of criminals to live geographically close to their victims (Vilalta, 2010; Van Dijk 1990), the endemic character of crime hotspots (Eck and Weisburd 1995), high crime rates in residential areas with high percentages of rented dwellings and large housing projects (Bottoms and Wiles 1986; Block and Block 1995), and the probability of criminal behaviour when growing up in crime-affected areas (Krivo and Peterson 1996; Reiss and Rhodes 1961).⁷ The underlying assumption of many of these models is that the higher the crime density in a community, the greater the probability of finding accomplices due to their tight communication network (Reiss 1986; Singer 1981).

Institutional anomie theory (IAT) has a somewhat different intellectual trajectory having only emerged in the past two decades. Indeed, Messner and Rosenfeld (1997, 2001) put forward anomie theory on the basis of Merton's conceptualization of a relationship between weak normative and social controls and criminal behaviour.⁸ This theory draws explicitly on Merton's formulation of

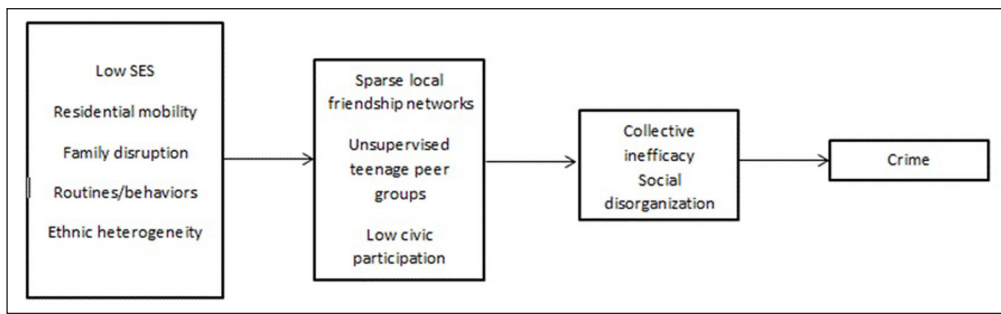


Figure 1: Social disorganization theory: structures and processes. *Source:* Adapted from Sampson and Groves (1989) and Sampson (2011).

anomie by attaching crime to the dynamic relationship between cultural and social structures. IAT proposes that cultural structures – defined as sets of normative values – can contribute to a condition of moral decay, the erosion of bonds between individuals in a community, and fragmentation and declining self-regulation. Messner and Rosenfeld show how profit-driven societies that push social relations toward utilitarian ends can generate anomie. This is because priority is given over to materialistic and instrumental goals.

At the center of IAT is a range of social institutions. According to its chief exponents, social institutions are composite elements of a given economy, polity and culture that regulate or balance goals and norms. Messner and Rosenfeld (2001) contend that social institutions have four basic functions: adaptation, goal attainment, integration, and pattern maintenance. In their view, economic institutions such as the market shape adaptation (i.e. to meet the physical and material needs). Political institutions such as laws and governance arrangements (or polity) regulate goal attainment. Meanwhile, religious, educational, and familial institutions condition the integration and the maintenance of cultural patterns.

For one, economic institutions are critical for creating stable employment and livelihoods. But disruption to such institutions can undermine social structures that give rise to crime. Specifically, the lack of jobs,

living wages, credit, and public investment can generate knock-on effects. Likewise, economic recession and inflation may force disadvantaged individuals into states of anomic deprivation and psychic stress. As such, institutional anomie may develop faster in places where the economic context is not favourable to accomplish socially desirable goals.

Polity, as defined above, is a necessary condition for achieving prosperity and social equality. But anomie can arise when one element of polity – such as the rule of law – is unevenly and unequally applied. A weak rule of law in one place – contributing to so-called un- or under-governed spaces – may stimulate criminal behavior. This is because a weak polity can undermine the coherence of community and solidarity (Messner and Rosenfeld 2001; Bjerregaard and Cochran 2008). In such situations, cultural structures fail in their primordial normative function. This combination of a weak rule of law and materialistic influences can induce some members of society to pursue crime.

Finally, basic cultural institutions are essential for engendering social equality (Bjerregaard and Cochran 2008; Maume and Lee 2003). However, when institutions such as family or associative groups are disrupted, this can impede social integration and pattern maintenance. Social institutions are necessary but do not play equal roles (Messner and Rosenfeld 2001). Each society gives a priority to one or another social institution, providing it with a national ethos. However,

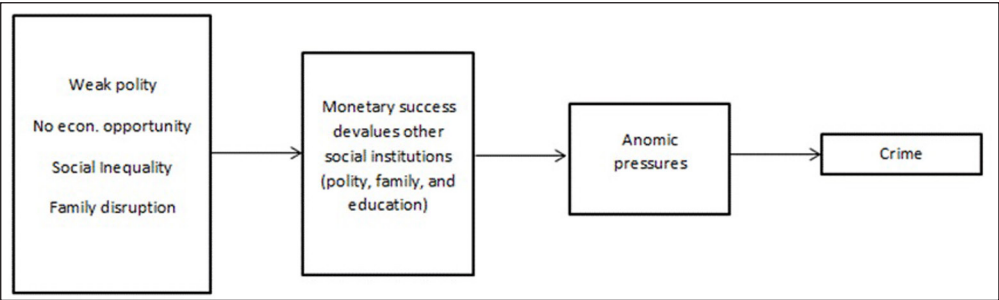


Figure 2: Institutional anomie theory: institutions and processes. *Source:* Adapted from Messner and Rosenfeld (1997) and Rosenfeld and Messner (2010).

when imbalance occurs, it can induce people to commit a crime in the pursuit of economic gain (Messner and Rosenfeld 2001).⁹

Thus, when social institutions – whether economic, political, or cultural – are threatened, strained or collapse, crime is more likely (**Figure 2**). The relationship between the strength of social institutions and aggregated crime rates is tested in different countries and for different crimes (Messner and Rosenfeld 1997; Chamlin and Cochran 1995; Piquero and Piquero 1998; Savolainen 2000; Maume and Lee 2003; Schoepfer 2004; Kim and Pridemore 2005; Bjerregaard and Cochran 2008; Stults and Baumer 2008). Overall, the studies reviewed tend to support the theory.

Data and Methods

Both social disorganization and anomie theory have helped predict crime in North American and Western European cities. But there is considerably less insight into whether these theoretical approaches apply in middle- and lower-income settings. As such, there is comparatively little insight into which theory is most applicable and, as a result, which policy options are most appropriate. A first step to determining the relevance of specific theoretical approaches is subjecting them to empirical testing. The following section introduces a preliminary attempt to assess the relationships between specific social disorganization and

anomie variables and criminal violence in Mexico City.

The dependent variable is the rate of criminal investigations initiated in 2010. In Mexico, criminal investigations occur only after a crime has been reported to the police either by the victim or by any authority. The authority responsible for initiating a criminal investigation is the Public Attorney (*Ministerio Publico*).¹⁰ It should be stressed that reporting rates are low and not all reported crimes to police result in a criminal investigation. As such, this measure offers a conservative estimate of the real prevalence of crime. Indeed, a much better measure of crime is the victimization rate. Unfortunately, Mexico lacks reliable reporting on victimization at the municipal level and studies on the geography of factual criminal victimization are not easily performed within cities or metropolitan areas.

Meanwhile, the independent variables selected for this study are wide-ranging including measures social inequality, female-headed households, voter turn-out and many others. These variables are ‘structure’ versus ‘process’ variables and were selected as proxies for social disorganization and anomie (see **Figure 3**). These structure type variables depict the concepts of concentrated economic deprivation, inequality, social controls, as well as non-economic institutions. Most of these variables have already been applied in previous tests of social disorganization and

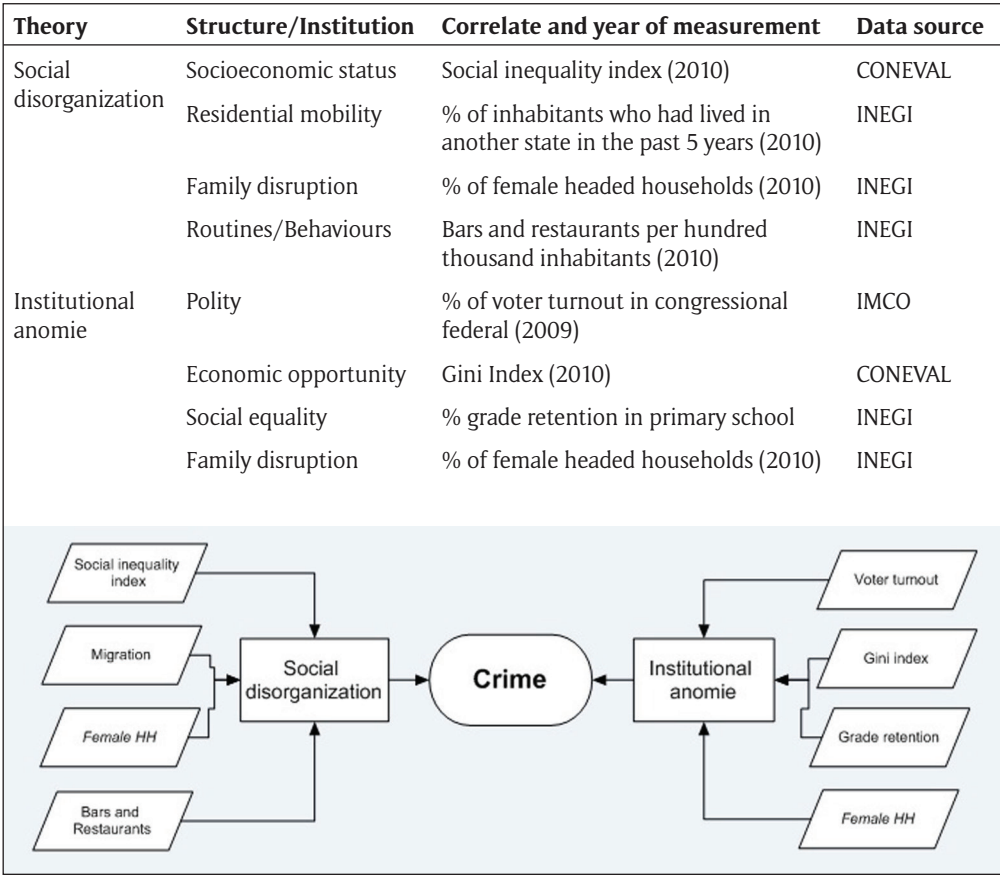


Figure 3: The correlates and data sources of social disorganization and institutional anomie theory. *Source:* authors.

institutional anomie theory (Vilalta 2014; Bjerregaard and Cochran 2008; Ceccato and Haining 2008; Stults and Baumer 2008; Kim and Pridemore 2005; Maume and Lee 2003; Savolainen 2000). On the whole, these variables can portray different types of municipalities (i.e. places) in the MCMA that are linked to conditions that either favour or dissuade crime and delinquency (Kubrin and Weitzer 2003). Information was retrieved from three different sources.¹¹ **Figure 3** presents each independent variable associated with the corollary theory.

The present study employs both traditional statistics and spatial methods to test the explanatory power of both social disorganization and institutional anomie theories of crime in Mexico City. Ordinary least squares

(OLS) regression with standard robust errors was used as first step in the test of both theories and statistical interactions between concepts, particularly of those associated with IAT.¹² Interaction terms were added to the IAT model in order to test the hypothesis that the relationship between crime rates and IAT correlates varies at different levels of economic opportunity (as indicated by the Gini coefficient) and at each of the measures of the strength of the non-economic social institutions (i.e. polity, social equality, and family).

However, OLS cannot detect spatial heterogeneity as relationships are assumed to be spatially stationary (i.e. space independent). However, if spatial heterogeneity is present, as will be demonstrated, data will not

adequately fit the OLS model and significance tests will be deceptive (Vilalta, 2013). More specifically, if spatial heterogeneity is present in the dataset, intercept and slope estimates will be biased. The reason is that local relationships will cancel each other out in the calculation of the global estimates.

As such, the statistical techniques adopted here to describe the spatial patterns of crime rates include Moran's global and local autocorrelation coefficients. These coefficients are calculated according to the original formulations (Moran 1950):

$$I = \frac{n \sum_j \sum_j w_{ij} (y_i - \bar{y})(y_j - \bar{y})}{\sum_i \sum_j w_{ij} \sum_i (y_i - \bar{y})^2}$$

Where n is the number of spatial units, y_i and y_j are the values of the dependent variable in the neighbouring areas i and j , $\bar{y}$ is the arithmetic mean, and W_{ij} is the array of neighbours. Coefficients cannot exceed values of 1 or -1. Positive values suggest spatial clustering, whereas negative values suggest spatial dispersion. Coefficients around zero suggest a spatially random arrangement.

The significance of the global coefficient is conducted under a standard normal distribution of probabilities calculated by (Lee and Wong 2005):

$$Z = \frac{I - E_I}{\sqrt{Var I}}$$

Where the expected value E_I of the coefficient under the null hypothesis is estimated by (Lee and Wong 2005):

$$E_I = -\frac{1}{(n-1)}$$

where the same notation as above applies.

And the variance of the global coefficient ($Var I$) is estimated from the sample in the following manner (Rogerson 2009):

$$Var I = \frac{1}{2n}$$

Local coefficients of spatial autocorrelation (LISA) derive from the Global Moran I spatial autocorrelation coefficients, as the sum of LISA coefficients is either equal or proportional to the global coefficient (Anselin 1995). Local coefficients (LISA) are calculated in the following manner (Lee and Wong 2005):

$$I_i = z_i \sum_j w_{ij} z_j$$

where Z_i and Z_j are calculated by (Lee and Wong 2005):

$$z_i = \frac{(y_i - \bar{y})}{s}$$

where same notation as above applies.

A local coefficient is calculated for each municipality based on neighbouring municipalities. LISA coefficient values may be above 1 or below -1. Statistically significant positive values indicate spatial clusters, whereas significant negative values indicate spatial outliers. Spatial clusters are groups of similar municipalities, whereas spatial outliers are groupings of dissimilar municipalities. In this sense there are five types of LISA coefficients (Wang 2011): Not significant, High-High (HH, high values surrounded by high values), Low-Low (LL, low values surrounded by low values), Low-High (LH, low values surrounded by high values), and High-Low (HL, high values surrounded by low values). In this way LISA coefficients allow to detect crime hot spots (HH or HL) and cold spots (LL or LH). The significance of LISA coefficients are also tested in a normal distribution of standardized coefficients.

After describing spatial patterns, we tested the theories using a geographically weighted regression (GWR) approach. The GWR model extends the traditional OLS regression model by allowing parameters to vary across space

(Fotheringham et al. 2002). The GWR model is written as (Vilalta 2013):

$$\hat{y}_i = a_i \sum_{j=1}^k b_{ij} x_{ij} + e_i$$

Where $\hat{y}_i$ is the predicted value of the dependent variable y in municipality i , a_i is the constant (i.e. the point at which the line crosses the predicted values when x is equal to zero), b_{ij} is a coefficient representing the slope of the line, and x_{ij} is the observed value of the independent variable for the j observation in municipality i , for k number of independent variables. This model assumes that observations in places are dependent of each other (i.e. spatially variant). The location of each municipality is given by its geographic centroid or arithmetic mean centre. The geographic centroid is the optimal location since it represents the closest point to all area limits.

GWR provides a probabilistic model for each municipality (i.e. the goal of GWR is local estimation). GWR is administered in several steps. First, it is necessary to find an appropriate weighting function. In a GWR context, weighting functions are called spatial kernel functions. Spatial kernels are used to define spatial neighbours and their weights. In this case, weights were calculated with a negative exponential continuous function of the square distance among geographic centroids. For each place the data will be weighted differently, so that results will be unique to that place (Fotheringham et al. 2002). The weighting function is written as (Fotheringham et al. 1998):

$$w_{ij} = \exp\left(-\frac{d_{ij}^2}{b^2}\right)$$

where w_{ij} are the weights given between places i and j , d is the Euclidean distance between both, and b is the bandwidth. In this way, larger weights are given to closer places and smaller weights to farther places.

In traditional OLS, all places have the same weight as if all places shared the same location ($\beta = 0$). In GWR, this assumption is avoided in order to conform to Tobler's first Law of Geography. It must be considered that the weighting function, once it is calibrated, it is assumed constant across space (Brunsdon et al. 1996). The weight of each location was computed using adaptive kernels. The bandwidth method, which gives the area of influence of each municipality, was the Cross-Variation (CV) method, which is based on the minimum variance principle.

Empirical Findings

The assessment generated results that can be presented in five steps. First, we present the case study and descriptive statistics. Second, we calculate global and local spatial autocorrelation coefficients in order to identify the level of spatiality in the dependent variable (DV). Third, we calculate correlations between the measures representing each theory with the dependent variable, that is, the rate of crime for all crimes. We use Pearson's linear correlation coefficients for this purpose. All variables were transformed to Z values prior to inferential analyses. Fourth, we test the prediction that higher levels of social disorganization and institutional anomie should be related to higher crime rates. In this step, a number of interactions between theories and between concepts in each theoretical framework are detected. Fifth, we used a geographically weighted regression (GWR) model to estimate the magnitude of the covariation between the dependent variable and each of the theoretical measures. A map showing the resulting local coefficients of determination (local R^2) is included.

At the outset, it is important to set out the dimensions of the Mexico City Metropolitan Area (MCMA). The MCMA consists of 76 municipalities, including the Distrito Federal (16), state of Mexico (49) and the state of Hidalgo (1). Taken together, it consists of a total area of 3,037 square miles and total population of 20,116,842 inhabitants in

2010, the equivalent of a density of 6,623 inhabitants per square mile. It should be noted that the population density is not uniform across all MCMA municipalities – 68 per cent of the population live within a 27 miles radius from the geographical center. And while the MCMA comprises an immense urban territory, the population growth rate has declined considerably over time. The annual growth rate for the 2000–2010 period was just 0.9 per cent.

It is also critical to highlight the overall crime rates in the MCMA jurisdiction. Contrary to popular narratives of spiraling crime in Mexico, the MCMA region exhibits a comparatively low crime rate. Indeed, overall rates of criminal violence have diminished considerably in Mexico since the middle of the twentieth century even if they've risen over the past decade. In MCMA, the municipal average crime rates reported in criminal investigations amounted to 1,471 in year 2010, with a standard deviation of 1,033 criminal investigations. It should be noted, however, that there was a very wide spatial variation in crime rates across municipalities in the metropolitan area (see **Table 1**).

Moran's I global spatial coefficients revealed crime rates to be positively spatially dependent ($I = 0.499$, $p < 0.001$).¹³ That is, high crime municipalities tend to spatially cluster. **Map 1** displays the geography of

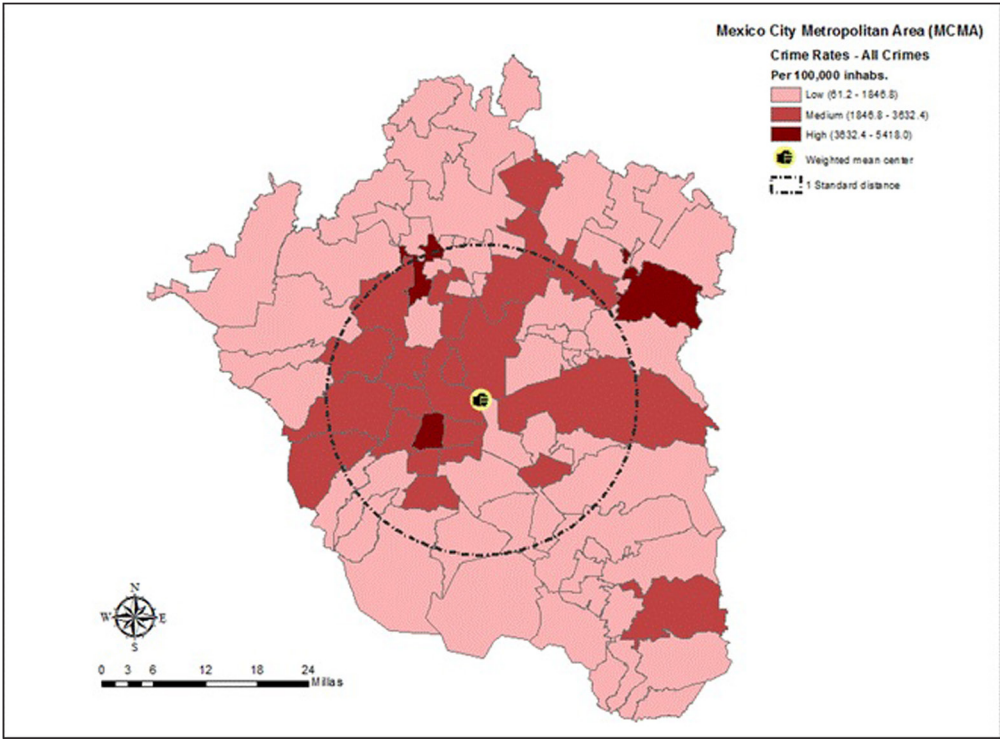
crime rates, demonstrating how criminality tends to concentrate in just a few municipalities, mostly at the geographic center of the MCMA. Both the geographical centroid of crime rates and a circle depicting one standard distance from the centroid are shown. The standard distance implies that approximately 68 per cent of all criminal investigations lie within a 37 mile radius from the geographic centroid. Even so, there are substantial spatial variations among the municipalities across the MCMA. In total, 20 out of 76 municipalities account for 50 per cent of the criminal investigations.

Not surprisingly, there are also specific places where crime reporting is especially clustered. Local spatial autocorrelation coefficients reveal ten hot spots (9 HH, 1 HL). **Map 2** shows these hotspots to be located mainly in the central part of the metropolitan area (mostly within the Federal District part of the MCMA). One hotspot (i.e. Otumba) is located in the fringes of the MCMA within the state of Mexico and bordering with the state of Puebla. Overall, these ten hotspot municipalities account for 27.4 per cent of all crimes in the MCMA (see **Table 2**).

The correlations between municipal crime rates and social disorganization and institutional anomie theory measures are presented in **Table 2**. There are many significant correlations. In line with what is predicted by

	Mean	S. D.
Rates for all crimes (per 100,000)	1471.6	1033.5
Social lag index	−1.146	0.403
Migration %	5.4%	5.1%
Bars/restaurants (per 100,000)	10.6	17.8
Female HH %	20.3%	4.7%
Voter turnout %	54.2%	10.6%
Gini index	0.402	0.034
Grade retention % (primary school)	96.9%	1.3%

Table 1: Descriptive statistics for variables included in the analysis.
Note: All variables transformed to Z values prior to inferential analyses (n = 76).



Map 1: Spatial distribution of crime rates, 2010. *Source:* authors based on 2010 crime data (INEGI).

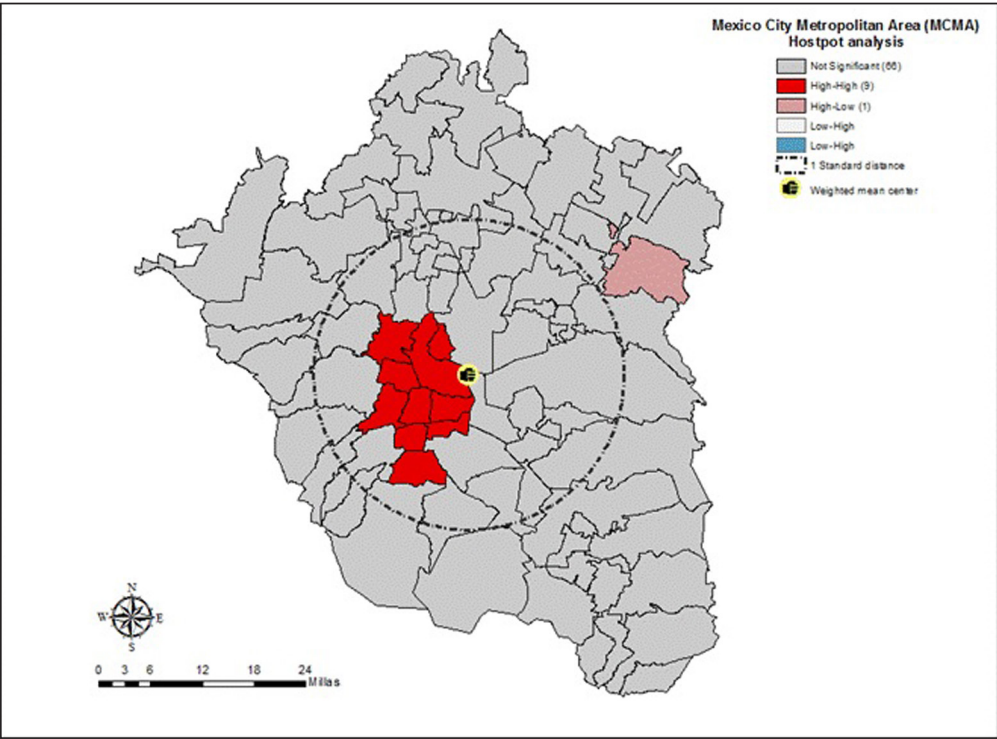
Type of hotspot	State	Municipality	Crime rate for all crimes (2010)**
High-High	Distrito Federal	Cuauhtemoc	5,418.1
High-Low	Estado de Mexico	Otumba	4,048.8
High-High	Distrito Federal	Benito Juarez	3,561.7
High-High	Distrito Federal	Miguel Hidalgo	3,522.8
High-High	Distrito Federal	Venustiano Carranza	2,979.3
High-High	Estado de Mexico	Tlalnepantla de Baz*	2,661.7
High-High	Distrito Federal	Azcapotzalco	2,267.6
High-High	Distrito Federal	Coyoacan	2,152.9
High-High	Distrito Federal	Iztacalco	2,107.8
High-High	Distrito Federal	Gustavo A. Madero	1,990.6

Table 2: Crime hot spots, 2010.

Source: Author calculations based on 2010 crime data (INEGI).

*This municipality is made-up of two separated geographical areas.

**Criminal investigations per hundred thousand inhabitants.



Map 2: Crime hotspots, 2010. *Source:* Author calculations based on 2010 crime data (INEGI).

both theories, crime rates correlate negatively with social development lag levels and voter turnout and positively with migration, bars/restaurants, female headed households and income inequality, the latter represented by the Gini index. Grade retention in primary school does not seem to correlate with crime rates. Even so, it is kept in the GWR equation models as it has been predicted that areas with higher numbers of early school drop-outs will suffer from antisocial behaviors and crime. Overall, relationships were in the direction of what was predicted by the two theories.

As a preliminary step, OLS regression was used to test whether social disorganization or institutional anomie or a combination of both can predict crime rates in the study area. We normalized all data to Z values. **Table 4** shows the regression results. Results strongly suggest that there is a significant linear relation between the proportion of

female-headed households and crime rates for all crimes. Crime rates increase half a standard deviation ($s = 1,033$) with one standard deviation increase in the percent of female headed households ($s = 4.7\%$). This is a strong relationship (see **Figure 4**).

One interesting result is the loss of statistical significance of the social lag index and migration rates as social disorganization correlates when IAT correlates are included in the model (**Table 3**). The loss of significance of these two social disorganization correlates is due to the decrease in the size of the coefficients rather than to the increase of the standard errors or to the inclusion of the IAT interaction terms.¹⁴ In fact, significance tests show a highly significant contribution of the interaction terms in models 2 and 3. Holding all other variables constant, the Gini coefficient and voter turnout interaction increases its importance (Z or beta coefficient) by 14 percent. Only the grade retention correlate

	Social lag index	Migration	Bars / restaurants	Female HH	Voter turnout	Gini index	Grade retention
Rates for all crimes	-0.618**	0.230*	0.382**	0.694**	-0.554**	0.449**	-0.065
Social lag index		-0.275*	-0.182	-0.650**	0.634**	-0.393**	0.164
Migration			0.050	-0.027	-0.271*	0.055	-0.513**
Bars / restaurants				0.429**	-0.078	0.307**	0.213
Female HH					-0.666**	0.487**	0.199
Voter turnout						-0.383**	0.112
Gini index							0.313**

Table 3: Zero order correlations between variables included in the analysis.

Source: Author calculations based on 2010 crime data and socioeconomic data (INEGI, IMCO, CONEVAL).

	Model 1 Social Disorganization	Model 2 Institutional Anomie	Model 3 Full model
Social lag index	-0.217*	—	-0.095
Migration %	0.178**	—	0.111
Bars/restaurants per capita	0.115	—	0.022
Female HH %	0.508***	0.500***	0.491***
Voter turnout %	—	-0.080	-0.025
Gini index	—	0.356***	0.296***
Grade retention %	—	-0.261***	-0.163
Gini*Female HH%	—	0.260***	0.225**
Gini*Voter turnout %	—	0.164**	0.188**
Gini*Grade retention %	—	-0.239***	-0.223***
intercept	0.001	0.010	0.031
R ² adjusted	0.542	0.564	0.558

Table 4: OLS regression analysis of crime rates on measures of social disorganization and institutional anomie theories w/interactions.

Note: Significance of the coefficients based on robust standard errors.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

lost statistical significance after the inclusion of the interaction terms. These findings might suggest IAT as a stronger theory with a broader scope than social disorganization, at least in this region and at this level of geographical analysis. However, it should be recalled that the female-headed households correlate is a main effect of both theoretical

traditions, it is the strongest predictor in all models, and it conceptually connects both theories.

The table above features the results of the GWR regression models again testing the relationship between social disorganization and institutional anomie measures (**Table 4**). GWR regression is used to assess potential

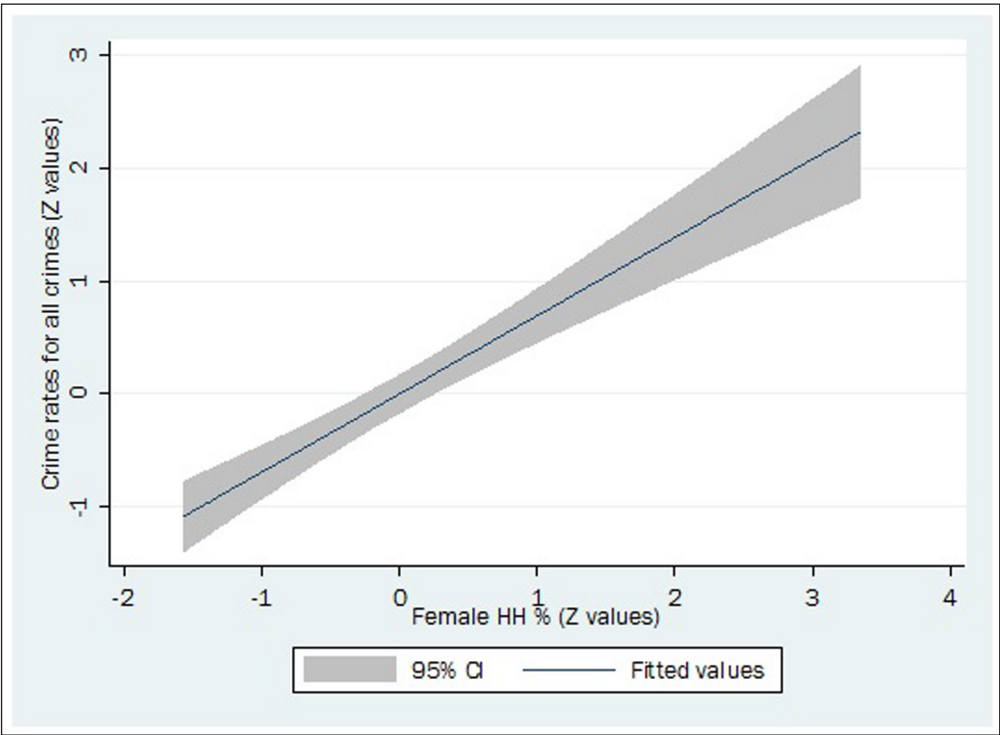


Figure 4: Female-headed households as the strongest predictor of crime rates for all crimes
Source: Author calculations.

spatial heterogeneity that accompanies geographically aggregated crime rates (Vilalta 2014; Graif and Sampson 2009; Waller et al. 2007). Three models were tested: one for each theory and one for the simultaneous test of both theories. Overall, each of the models were robust with R^2 adjusted values above the 0.500 mark with only 76 observations (i.e. municipalities).

Based on the GWR approach, both theories are similarly capable to predict crime rates across the MCMA. The model that slightly best captures the covariance structure of the data is social disorganization theory model 1 (R^2 adjusted = 0.571). All correlates have statistically significant local coefficients, that is, all are able to predict crime rates in most if not all municipalities (Table 5). Thus, in accordance with the underlying assumptions social disorganization theory discussed above, crime rates are higher in municipalities exhibiting lower levels of social lag index and higher

levels of family disruption, migration rates, and routines/behaviors conducive to crime.

Meanwhile, the institutional anomie theory model 2 also shows strong predictive capabilities (R^2 adjusted = 0.564). In this case, only voter turnout (i.e. polity) was not able to predict crime rates in any place or municipality within the MCMA. It seems then that family disruption, lack of economic opportunity, social inequality, and interactions drive up crime rates in the MCMA (Table 5). It must be noted that the negative sign of the Gini*Grade retention coefficient is a sign reversal probably due to omitted variable bias and/or confounding factors. On the other hand, the common measure of family disruption levels present in both theories, that is, the percentage of female-headed households, held statistical significance for both models. Meanwhile, when the theories were tested together (model 3), social disorganization theory measures reduced

	Model 1 Social Disorganization	Model 2 Institutional Anomie	Model 3 Full model
Social lag index	-0.262	–	-0.113
Migration %	0.175	–	0.106
Bars/restaurants per capita	0.133	–	0.037
Female HH %	0.467	0.494	0.461
Voter turnout %	–	-0.079	-0.040
Gini index	–	0.352	0.287
Grade retention %	–	-0.258	-0.167
Gini*Female HH%	–	0.257	0.225
Gini*Voter turnout %	–	0.162	0.180
Gini*Grade retention %	–	-0.236	-0.222
Intercept	-0.002	-0.011	0.026
R ² adjusted	0.571	0.564	0.568
Bandwidth size	51	76	62

Table 5: GWR regression analysis of crime rates on measures of social disorganization and institutional anomie theories w/o interactions (mean values).
Note: Mean values of local standardized beta coefficients reported (n = 76).

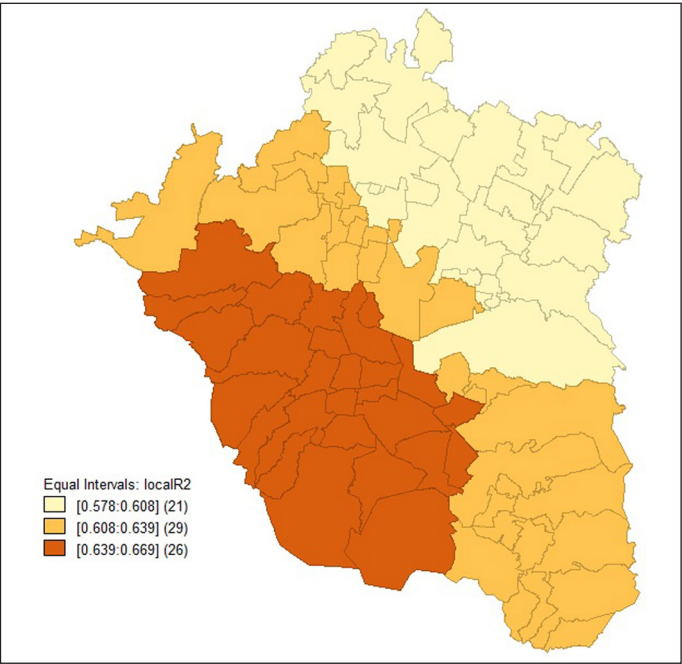
their predictive capacity controlling for institutional anomie theory measures. The family disruption measure for both variables remained strong and statistically significant for all municipalities.

One additional analysis was conducted to examine the spatial adequacy of the theories. We explored whether the theoretical models could predict crime rates uniformly across MCMA. In other words, if place does not matter, will policy actions have the same effect regardless of where they are targeted? **Maps 3, 4** and **5** show the spatial fit for each theoretical model measured by the local coefficients of determination (Local R²). A clear geographical pattern of the spatial fit of each theory can be detected. Overall, social disorganization and institutional anomie theories offer a better fit for the Federal District over the State of Mexico municipalities in the southwest of the MCMA area. This is evidence that previous theoretical models vary significantly in their capacity to predict crime rates depending upon the municipal social

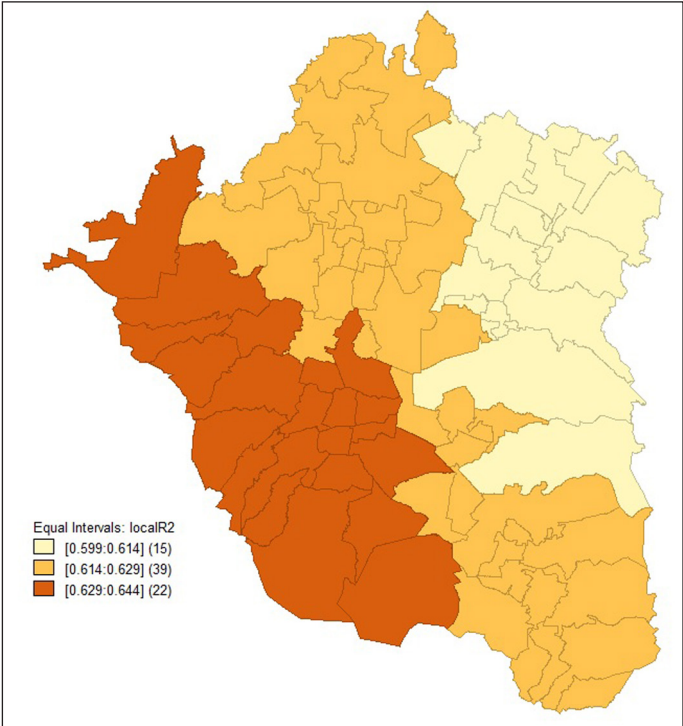
disorganization and institutional anomie characteristics. Therefore, crime prevention measures based on either social disorganization or institutional anomie premises may have varying effects from one municipality to another (i.e. spatially heterogeneous policy effects)

Discussion

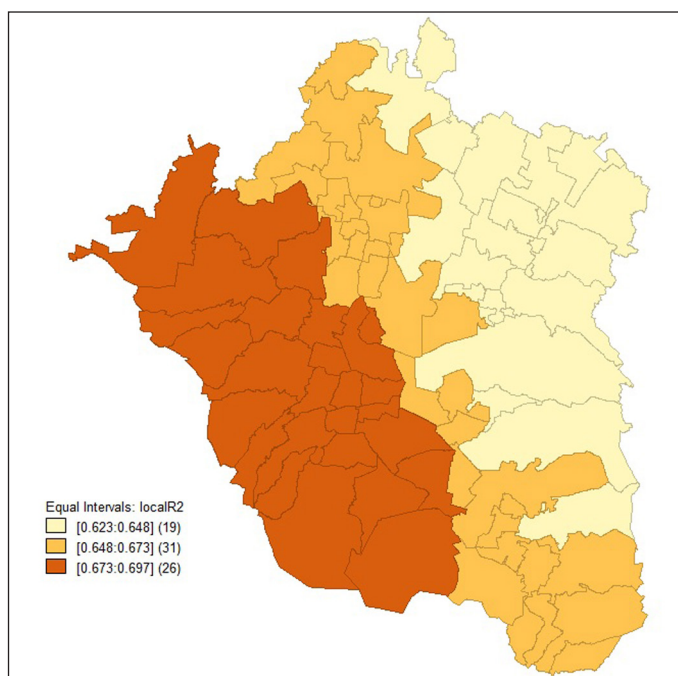
We found that MCMA municipalities vary significantly in their crime rates and that these variations cannot be fully explained by a single macro theory. In other words, the MCMA does not consist uniformly of socially disorganized or institutionally anomic municipalities. These findings highlight the importance of recognizing that the MCMA is spatially heterogeneous in both its problems and its likely policy solutions. Put succinctly, there are some clusters in the MCMA where some interventions would be more effective than others. One group may require more measures to support parental institutions while others may need more



Map 3: Social disorganization theory model: GWR local coefficients of determination, 2010.
Source: Author calculations.



Map 4: Institutional anomie theory model: GWR local coefficients of determination, 2010.
Source: Author calculations.



Map 5: Social disorganization and Institutional theory model: GWR local coefficients of determination, 2010. *Source:* Author calculations.

support for informal social controls at the neighbourhood scale.

There are some areas of convergence across both social disorganization and institutional anomie theories. Specifically, family disruption as measured by the percentage of female-headed households was the main predictor of crime rates. Moreover, almost one in every three households in the MCMA area in 2010 was headed by a female.¹⁵ Not only is this a sizeable proportion, but it is also increasing. Between 2000 and 2010, the proportion of female-headed households increased from 25.7 percent to 31.3 percent. At this rate, we can expect the proportion to increase to 40 percent by 2020. Minors living in such households reportedly exhibit a proclivity towards anti-social and criminal behaviour. This is probably due to the fact that single mothers are often required to be out of the home for long periods to work and supervision tends to be more episodic (Vilalta and Muggah 2014).

What is more, single-headed female households tend to also feature lower levels of income that is also a characteristic of typical offending groups.

The implications of these findings are arguably more radical than they might first appear. The most common response to crime tends to involve increasing police deployments, raising penalties on would-be offenders, and increased incarceration. Yet the insights raised from testing these two theories suggest that targeted prevention is central to reduce crime in the MCMA. At the moment, social crime prevention policies are virtually non-existent. Notwithstanding a growing discourse around violence prevention, it continues to be confined to wishful thinking rather than pragmatic interventions. While the government and law enforcement agencies in Mexico cannot be held responsible for restoring family structures, they could, however, redouble investments in social protections and

targeted subsidies for working families, single-headed female households, and unsupervised youth – not least due to their crime prevention impacts.

There are many federal and metropolitan policies in place to support especially vulnerable groups such as female-headed households. Yet these are still not reaching those most in need. A key federal program is the Elementary Education Aid Program for Teenage and Pregnant Mothers (PROMAJOVEN), which offers basic education to those living in acute vulnerability. However, a recent study shows that in 2012, only 14,000 pregnant girls and young mothers nationwide had been given a scholarship, thus resulting in a total exclusion rate of 95.1 per cent (Merino and Vilalta 2014). Another federal program offers childcare support for single parents with minors under four years old.¹⁶ Yet the proportion of qualifying parents that failed to participate in 2012 was 70.6 per cent (Merino and Vilalta 2014). Meanwhile, a municipal initiative offers food support for single mothers of children under 15 in the Federal District of the MCMA.¹⁷ However, only mothers living in 28 of 48 municipalities are eligible to participate.

It is evident that if the MCMA authorities were to get serious about crime prevention, they would need to think comprehensively about solutions. Of course the above-mentioned social policies for single parents must be extended and expanded. But there must be efforts to prevent family disruption before it occurs – that is strengthening and consolidating families, parents and childcare. What is needed is a conversation between proponents of crime prevention and social and economic policy authorities. The artificial silos separating them are potentially damaging.¹⁸ Comprehensive crime prevention must combine elements of law enforcement together with preventive policies that seek to limit family disruption and associated vulnerabilities (e.g. food poverty, childcare needs, etc.) rather than only address strategies around mitigating

its consequences (e.g. alcoholism, drug-use, intra-family violence, etc.).

There are signs that MCMA government officials are pursuing strategies to reduce crime rates. Some of these entail the widespread deployment of policing assets. Other measures – including primary and secondary prevention – are generic and unspecific. But if crime rates are to be genuinely brought under control, more targeted interventions are required. As noted above, crime rates in the MCMA strongly correlate with economic inequality as measured by the Gini coefficient. This finding points to the need for highly localized social development interventions. The lack of economic opportunity is a pressing concern for many young people. In fact, economic inequality and other non-economic institutions such as polity (voter turnout) and family disruption (female headed households) appear to be mutually reinforcing. In Mexico, elsewhere, there is an urgent need to dispense with tough on crime and bland development rhetoric, and resource practical measures that reduce social disorganization and anomie in the city.

Competing Interests

The authors declare that they have no competing interests.

Notes

¹ That amounts to 13,729,804,038 pesos. Source: *Decreto de presupuesto de egresos del Distrito Federal para el ejercicio fiscal 2014*.

² See NIJ (2014) and Braga et al (2012) for more on hotspot mapping and policing.

³ Human ecology is 'the attempt to investigate the processes by which the biotic balance and social balance are maintained once they are made, and the processes by which the biotic balance and social balance are affected in where there is a transition from one relative to another order' (Park 1936: 15).

- ⁴ See Walker (2009) for an historic account of social disorganization theory.
- ⁵ Overall, the rise of human ecology and the popularization of the Chicago school would not emerge until 1921 with the work of Park and Burgess (1921) who directly built upon the work of Breckinridge and Abbott. They also adopted developmental ecology concepts from Warming et al. (1909), namely, 'symbiosis', 'domination' and 'succession'.
- ⁶ More recent iterations of the theory – including Sampson and Wilson (1995) – have also incorporated race and inequality as factors influencing self-regulation.
- ⁷ There is also evidence that neighbourhoods suffering from political neglect suffer from higher crime rates (Ackerman and Murray 2004; Kubrin and Weitzer 2003).
- ⁸ This idea is correspondingly based on Durkheim's concept of anomie as the widespread abandonment of ideals and standards governing social relations.
- ⁹ For example, some contend that the so-called 'American Dream' is a national ethos that privileges economic institutions over non-economic institutions. Consequently, high crime rates in the United States are considered a natural, or 'normal' in Durkheimian terms, phenomenon. They are a product of an 'imbalance' between the (dominant) goal of individual material success and the society's otherwise frail core institutions (Barlow and Decker, 2010; Messner and Rosenfeld, 2001).
- ¹⁰ These data are available on the website of the National Institute for Statistics and Geography (INEGI).
- ¹¹ See the Instituto Nacional de Estadística y Geografía (INEGI), Instituto Mexicano para la Competitividad (IMCO), and Consejo Nacional de Evaluación de la Política de Desarrollo Social (CONEVAL).
- ¹² As one referee correctly noted.
- ¹³ Calculated with an adjusted first order neighbour matrix.
- ¹⁴ Same findings regarding the loss of significance of social disorganization correlates apply with or without IAT interaction terms.
- ¹⁵ This figure is different from the municipality average.
- ¹⁶ They are given 900 pesos per month (i.e. approximately \$72) for a maximum of three minors per parent.
- ¹⁷ They are given an electronic voucher with a total of 269 pesos per month (i.e. \$21.5) exchangeable for food only.
- ¹⁸ This is what happened in Ciudad Juárez, Mexico. See Vilalta and Muggah (2014).

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