Abstract:

This article studies the relation between crime and inequality and between crime and poverty in Mexico using reported crime data from 1963 municipalities from the years 2000 and 2005. It uses two measures of crime, property and violent crime, and two measures of inequality, one for income and one for education; it also distinguishes between the concepts of mean income and poverty (marginality). The results show a positive relation between crime and inequality and poverty in cross section regressions. When we control for heterogeneity, the relation between violent crime and poverty is lost and the regressions lose much of their explanatory power. This means that although there is a strong relation between crime and variables such as inequality, poverty, migration and others, once a higher level of crime is reached, perhaps governments cannot use these variables to decrease it.

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1. INTRODUCTION

Three of the main problems of Mexico are the level of criminality, the unequal distribution--of income and education--and poverty. This article seeks to establish if there is evidence of the existence of a positive relation between crime and inequality and crime and poverty at the municipality level in Mexico, using reported crime data from the years 2000 and 2005. It makes use of two measures of crime, property and violent crime, and two measures of inequality, one for education and one for income. Even when it may be apparent that inequality and crime are positively related, this positive relation between property crime and inequality has been seek without plenty success recently by Brush (2007), Choe (2008) and Kelly (2000) among others. In other cases the results are disputed. For example, Fajnzylber, Lederman and Loayza (2002) find a positive relationship between violent crime and inequality using country data; however this result is disputed by Neumayer (2005), who attributes that relation to heterogeneity.

We use municipality data, which is the equivalent to use U.S. county data as in Brush (2007) and Kelly (2000). Studies using municipality (or county) data are very similar to studies using micro data. Consequently, we collected information on variables generally used in this kind of studies: on crime, inequality, poverty, migration, sex of the head of the household, education, proportion of young population, mean income, total population and population density, for 1963 Mexican municipalities for the years 2000 and 2005 from the sources that are described in the data section.

To verify the results of 2000 with those for 2005, we use information from INEGI (2010c) 2005 "Population Count". But this Population Count does not contain information about income; therefore, we estimate income and Gini coefficients using information from 2000. This procedure allows us to run education and income inequality cross sectional regressions for each year and put side by side the results of both years (Table 2). But it does not allow us to run equations in differences for income inequality; therefore, we only consider education inequality when we use equations in differences.

Data are obtained from different sources and the source of each variable is emphasized in order that the results can be reproduced. In Mexico, crimes are divided between federal and common (federal states) law. In the first jurisdiction are included crimes that usually affect people: theft, murder, rape, kidnapping and fraud. These crimes account for more than 82% of criminal activity. The federal jurisdiction refers to those crimes that affect health, economy and national security, as smuggling, tax fraud, environmental crimes and drug trafficking. This study refers to crimes falling within the jurisdiction of common law. Of all crimes reported, we take those considered violent and those against property.

2. DATA

We collect information about property and violent crime from data of alleged offenders of INEGI (2010a), and INEGI collects this information directly from each municipality. Property crime includes theft, damage and dispossession. Violent crime includes murder, rape, kidnapping and assault. Since many municipalities are very small, those municipalities that do not report any kind of crime, not in 2000 nor in 2005, are not taken into account in this study. The number of offenses corresponding to 1,963 municipalities is shown in Table 1.

An index for poverty or marginality, for each municipality of Mexico for the years 2000 and 2005, is found in CONAPO (2001, 2006); we consider municipalities in poverty as those below the median. This index does not depend on the average income; rather, it measures municipal marginality (This index is built from nine indicators of social exclusion. For example, percentage of the population 15 years and older who are illiterate, percentage of people living in homes without electricity, percentage of households without drainage or sanitary service exclusively of the household, percentage of households without running water, and so on. With another variable, income per capita, we control for income.). INEGI (2010b, 2010c) provides us with information about migration, the proportion of households with a female head, education, the proportion of young people and population. Migration is measured as the fraction of the population who lived in a different municipality five years ago; it is used as a measure of mobility (Kelly, 2000). Female head is a proxy for family instability as it is used by Ehrlich (1973) and Kelly (2000). We measure Education with the proportion of the population with 12 or more years of education. Proportion of young people is measured as the proportion of people between 15 and 24 years of age. This variable is also used by Brush (2007), Choe (2008) and Kelly (2000). From PNUD-Mexico (2008) we take data of the mean per capita income, but the information for the year 2005 is estimated from the year 2000. We measure

density, as the population divided by the municipality area; crowded cities are high density and rural towns are low density.

We use two measures of inequality, one for education and one for income. Following Aitchison and Brown (1963) and Kelly (2000), we construct an estimate of the Gini coefficient for inequality in education, assuming a log normal distribution for years of education in each municipality. Two points in the distribution are required; therefore, we take the proportion of people aged over 24 with fewer than 10 and fewer than 13 years of education. These levels are important in Mexico: the first represents secondary education and the second access to university education. We obtain the Gini coefficients of income from CONAPO (2005) for the year 2000, but as we do not have income information for the year 2005 we use the same Gini coefficient as a proxy variable for the year 2005 (The Gini coefficients are very stable through time. As there is no information about income at the municipality level in the year 2005, we use the Gini coefficients of 2000. The results show that the relation between inequality and crime is about the same in both years.). This estimation does not allow us to estimate the difference equation for inequality in income

Due to the lack of data on security spending by municipality, and the inefficiency of the Mexican judicial system, we ignore this variable.

3. METHODOLOGY AND RESULTS

We preferred not to use logarithms since there are a large number of municipalities that reported zero violent crime or zero property crime (about 1300 municipalities each year). We would lose that valuable information. We also found that the number of crimes per municipality is not concentrated in a small range of values, but, on the contrary, it goes from zero to 5,015 crimes against property; that is, the distribution of crimes does not follow a Poisson distribution.

We use least squares with robust variance estimates to analyze the effect of inequality on the level of crime. Least squares have been successfully used recently by authors such as Brush (2007) and Choe (2008). We prefer not to use logarithms since there are a large number of municipalities that reported zero violent crimes or zero crimes against property. The results for the cross-sectional data are presented in Table 2.

To control for the heterogeneity of municipalities, see Table 3, we use equations in differences subtracting the 2000 values from the 2005 values. The results for the variables Gini of income

and income per capita are not presented in this Table because the income information for 2005 is estimated from the year 2000. Besides, as the variables log population and density have Spearman correlation coefficients between 2000 and 2005 of over 0.996, we present the results with and without these variables.

Table 2 shows that almost all the Gini coefficients are positive and significantly different from zero. Even more, columns (1) and (3) of Table 3 show that the Gini coefficient is significant for property crime when we run the equation in differences. An increase in inequality results in increased property crime in Mexico. This result is important, because although other researchers such as Kelly (2000) and Chloe (2008) establish the relation between inequality and poverty crime in cross section regressions, this relation becomes insignificant when they use panel data.

The same result applies to poverty; there is a positive relation between poverty and property and violent crimes in the cross-sectional regressions, suggesting that increased poverty leads to increased crime. The relation between property crime and poverty is also significant in the equation in differences, but the statistical significant relation between poverty and violent crime is gone.

We also find a positive (non-significant) relation between the proportion of migrants and crime in the cross-sectional regressions, as in Kelly (2000) for the USA, but the coefficient changes to negative and significant in the equation in differences. Apparently, municipalities where the proportion of migrants is increasing, say from 4% to 6%, have less crime. It appears that municipalities with less crime will attract more migration, as predicted by Tiebout (1956). We find a positive and significant relation between crime and female head, a proxy for family instability, in the cross-sectional regressions. The signs for education are positive, when significant, in the cross-sectional regressions. It is possible that people with more education would ask for more control of the criminal activities and this could generate more criminal complaints. It has a significant negative sign for violent crime in the equation in differences, as predicted by Lochner (2004).

In the last two columns of Table 3 we present the results without the variables income per capita, log population and density. The signs are the same but some of the variables, such as Gini education, gain significance and others, such as female head, lose it. Our cross-sectional results have high R-squares, between 0.41 and 0.52, as in the studies of Choe (2008) and Ehrlich (1973), but our equations in differences show low R-squares, between 0.01 and 0.03, capturing the importance of crime heterogeneity of the municipalities. When we use equations in differences we control for municipal heterogeneity, but we loss good information of the variables and we have problems of measurement, as discussed by Angrist and Pischke (2009). In our case the R-squares are very small.

This means that, even when poverty and inequality are significant explanatory variables, once the high levels of crime are established, governments cannot use the variables used in this study to reduce crime in the short run.

4. CONCLUSION

There are two main conclusions to this article. The first is that inequality in education and poverty (marginality) are positively related to property crime, but these inequalities are not necessarily related to violent crime. The second main conclusion refers to the loss in the value of the [R.sup.2] in the equations in differences: this shows that the changes in crime in Mexico are obeying also other variables. For example, they can be obeying unmeasured factors such as corruption, quality of police and quality of judges and prosecutors. Once the crime is established by variables such as the ones discussed in this article, the number of crimes will not change by merely changing the values of these variables.

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Table 1. Alleged Offenders Statistics

	2000	2005
Offenses	219,083	247,934
Violent	18,587	19,288
Property	79,681	98,521
Other	120,815	130,125

Source: Inegi 2010a.

Table 2. Cross-Section OLS Results for 2000 and 2005

	Property 2000	Property 2005	Violent 2000	Violent 2005
Gini education	189.1	87.1	23.6	8.6
	(7.01) ***	(4.08) ***	(5.32)***	(2.92)***
Gini income				
Poverty	16.6	36.6	1.70	4.6
	(2.37) ***	(4.36) ***	(1.59)	(3.99) ***
Migration	296.4	86.0	64.5	35.4
	(1.08)	(0.23)	(1.74)	(0.76)
Female head	50.1	173.8	17.7	28.7
	(1.02)	(3.00) ***	(2.36) ***	(4.05) ***
Education	679.1	21.2	82.4	-3.5
	(4.71) ***	(0.16)	(3.55) ***	(-0.19)
Constant	-601.4	-518.0	-105.2	-81.0
	(-8.50) ***	(-7.09) ***	(-9.07) ***	(-8.76) ***
[R.sup.2]	0.450	0.410	0.516	0.476

	Property 2000	Property 2005	Violent 2000	Violent 2005
Gini education				
Gini income	60.7	107.6	12.3	14.9
	(3.03) ***	(3.34) ***	(3.88) ***	(4.04) ***
Poverty	42.8	38.8	4.74	4.6
	(4.99) ***	(4.45) ***	(3.58) ***	(3.76) ***
Migration	153.0	11.2	46.9	27.0
	(0.54)	(0.03)	(1.25)	(0.58)
Female head	109.0	187.7	23.6	29.2
	(2.19) **	(3.23) ***	(3.06) ***	(4.14) ***
Education	264.3	-25.9	33.0	-6.6
	(2.53) ***	(-0.21)	(2.03) **	(-0.39)
Constant	-439.6	-545.4	-88.1	-86.7
	(-7.84) ***	(-7.03) ***	(-9.54) ***	(-8.85) ***
[R.sup.2]	0.433	0.410	0.507	0.477

Note: Robust variance estimates. In parentheses are shown the statistical t estimated with robust standard errors. Asterisks *** and ** denote significance at the 1% and 5% levels, respectively. There are 1963 observations. Other variables included: proportion of population aged 15 to 24, income per capita, density and log population.

Table 3. Results in First Differences

	Property	Violent	Property	Violent
	(All variables) (a)		(Some omitted variables) (a)	
Gini education	39.5	1.2	48.0	2.5
	(4.06)	(1.05)	(4.69)	(2.07)
Poverty	4.1	-0.5	5.3	-0.4
	(1.94)	(-0.74)	(2.59)	(-0.55)
Migration	-638.9	-87.4	-570.7	-78.3
	(-3.93)	(-2.82)	(-3.7)	(-2.61)
Female head	78.2	4.7	60.2	2.7
	(2.20)	(0.92)	(1.69)	(0.53)
Education	34.6	-31.6	80.7	-23.5
	(0.41)	(-2.11)	(1.02)	(-1.65)
Constant	9.1	0.55	10.4	0.9
	(2.43)	(1.08)	(2.96)	(1.68)
[R.sup.2]	0.039	0.020	0.034	0.015

Note: Robust variance estimates. In parentheses are shown the statistical t estimated with robust standard errors. Asterisks *** and ** denote significance at the 1% and 5% levels, respectively. 1963 observations. a. Other variables included in the two first columns are age 15 to 24, income per capita, density and log population. The last three variables are not included in the regression presented in the last two columns.