Economics Letters 104 (2009) 40–42

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Income inequality and pecuniary crimes

Luiz Guilherme Scorzafave *,[1], Milena Karla Soares

School of Economics, Business and Accounting of Ribeirão Preto-University of São Paulo (FEA-RP/USP), Brazil

ARTICLE INFO

Article history:
Received 22 October 2007
Received in revised form 17 March 2009
Accepted 26 March 2009
Available online 2 April 2009

Keywords:
Inequality
Criminality
Pecuniary crime
Brazil

JEL classification:
D3
D6
K4

ABSTRACT

This paper verifies the relationship between income inequality and pecuniary crimes. The elasticity of pecuniary crimes relative to inequality is 1.46, corroborating previous literature. Other factors important to decrease criminality are expanding job opportunities and a more efficient legal system.

1. Introduction

The debate concerning the relationship between high income inequality and high criminality is growing in many countries, where these two phenomena have ways been present. According to Becker (1968), income inequality can be a proxy for the disparity between ill-gotten and legal gains. So, we expect inequality to be positively related to crime rates, particularly of those crimes involving pecuniary gains. In this paper we expand the definition of pecuniary crime to include drug trafficking, while previous papers in the literature only deal with property crimes[2]. As a unit of analysis, we use the municipalities[3] in São Paulo State, Brazil, and as the dependent variable we work with the average pecuniary crime rate per 100,000 inhabitants between 2002 and 2004. In order to avoid potential endogeneity, lagged independent variables are used.

The literature about criminality points to the fact that criminal behavior is the result of the interaction of three factors: a) moral cost; b) law enforcement and police efficiency; and c) economic incentives individuals face.

Moral cost is related to the psychological punishment – like guilt and remorse – that individuals attribute to themselves. The influence of economic incentives mainly affects crimes with pecuniary gains, where individuals balance the income they could obtain in legal work against that coming from criminal activity. We expect that the larger the disparity between criminal and legal gains is, the greater will be the likelihood of committing a crime. Finally, enforcement power is related to the probability of arrest and the severity of the punishment applied.

Economic incentives and enforcement are the main factors analyzed in the economic approach to criminality. This approach supposes that agents are rational and decide whether or not to commit a crime by comparing the expected utility of crime and of legal work. It is a choice under risk, so the agent's behavior results from an expected utility maximization. If the expected utility of crime exceeds the utility of legal work, the individual commits the crime. Income inequality measures the difference between criminal gains (related to potential victims' wealth) and legal work income attainable. So, as inequality gets bigger, more people have incentives to commit crimes.

Kelly (2000) points to a positive and significant effect of inequality on violent crimes, but not on property crimes. Mendonça et al. (2003) find unitary elasticity to the relationship between the Gini Index and criminality, measured by the homicide rate. Zhang (1997) indicates that the elasticity of property crimes in relation to the Gini Index is 1.65. Also, Fajnzylber et al. (2002) conclude that inequality has a

* Corresponding author. Avenida dos Bandeirantes, 3900-FEARP, 14040-900-Ribeirão Preto, SP, Brazil. Tel.: +55 16 3602 4752; fax: +55 16 3633 4488.
E-mail address: scorza@usp.br (L.G. Scorzafave).

[1] The authors thank Walter Belluzzo Junior, Alexandre Sartoris and Danilo Igliori for helping with spatial data and the participants at seminar at FEA-RP/USP and an anonymous referee for helpful comments.

[2] A few examples of property crimes are hijacking, shoplifting, fraud, burglary and robbery.

[3] The local political division in Brazil is the municipality, which is roughly equivalent to a county, but is governed by a single mayor and a municipal council.

0165-1765/$ – see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.econlet.2009.03.021

positive and significant impact on homicides and robbery in various countries. Brush (2007) finds a positive effect of inequality on crime rates in a cross-section analysis, but obtains an opposite result when using time series. Finally, Choe (2008), using panel data from U.S. states, finds a positive impact of the Gini Index on burglary and robbery, but fails to find an impact on property crimes.

In this paper, we deal simultaneously with two common problems of criminal data. First, if criminal data is under-reported and if the under-report ratio is correlated with covariates, OLS estimation will be biased. In order to avoid this problem, we correct the official crime statistics using data from a victimization survey for São Paulo State. Second, if there is some spatial dependence in criminal activity across municipalities, we should take this fact into consideration. So, after testing for the presence of this effect, we estimate a spatial autoregressive model and a spatial error model (Anselin, 1988) to incorporate spatial dependence in the analysis.

2. Data and results

All variables in this work are measured at the municipal level. São Paulo State was chosen because it contains the biggest and most trustworthy data set regarding crime incidence in Brazil.

The dependent variable is the average pecuniary crime rate per 100,000 inhabitants in the years 2002, 2003 and 2004, calculated according to criminality and population data in those years, available at the site of SEADE (Fundação Sistema Estadual de Análise de Dados — São Paulo, the São Paulo State Data Analysis System). Using averages avoids statistical distortions of a particular year, mainly in small municipalities. We consider pecuniary crimes as those involving any pecuniary gains. Other papers, however, do not include drug dealing among pecuniary crimes, restricting their analyses to property crimes. We considerer, however, that drug trafficking involves important pecuniary gains, so we include this kind of crime as pecuniary, something that is new in the literature.

The explanatory variables and their sources are presented in Table 1. In order to avoid endogeneity, we used lagged variables (measured in 2000 and 2001). One of the variables is lagged over more than ten years: percentage of adolescent mothers in 1991, as a measure of household disruption during childhood of young people in the period of interest (2002 to 2004).

All independent variables have already been employed in other papers, except the variable "religion" (percentage of people without religion). It is a proxy of social linkages, since religious groups can help in peoples' social inclusion. Consequently, we suppose that municipalities with a higher proportion of people without religion have a higher crime rate. Although the fact that someone declares a religious faith or belief does not necessarily imply that he or she effectively belongs to a religious group, we believe that this variable is a good proxy for social inclusion in religious groups.

So, among the explanatory variables, the following are associated with moral cost: school attendance, adolescent mothers, people without religion, people between 15 and 17 years old and migration. Income inequality, median income and unemployment are related to economic incentives. Crime risk is a proxy for enforcement. Finally, as there is evidence in the literature that there are more crimes in big cities, variables for urbanization and dummies for metropolitan regions were included.

In order to overcome the under-reporting problem of official criminal statistics, we use a victimization survey conducted in São Paulo State in 1998 (Life Conditions Survey-SEADE), which permits the estimation of under-reporting rates for different regions of that state[4]. This procedure is similar to that of Glaeser and Sacerdote (1999), which relates the under-reporting with total population of the municipality.

To encompass the spatial nature of criminal data, we estimated the following spatial model:

$$\text{crime} = \rho W\text{crime} + X\beta + u$$
$$u = \lambda Wu + e$$
$$e \sim N\left(0, \sigma^2 I\right)$$

where X encompasses the independent variables of Table 1 and W is a spatial weight matrix. If $\lambda = 0$, we obtain the spatial auto-regressive model (SAR) in LeSage (1999) notation. If $\rho = 0$, we obtain the spatial error model (SEM). Following Fingleton and Igliori (2005), we

Table 1
Regressors.

Source: United Nations Development Program, 2003	
Urbanization	Percentage of urban population in 2000
Adolescent mothers in 1991	Percentage of females between 15 and 17 years old with children in 1991
People between 15–17 years old	Percentage of people between 15 and 17 years old in 2000
School attendance	School attendance rate* in 2000
Income inequality	Fraction of total income appropriated by the poorest 20% in 2000
	Fraction of total income appropriated by the richest 20% in 2000
	Rate of average income of the richest 20% and average income of the poorest 40% in 2000
	Gini Index (household per capita income) in 2000
	Theil-L Index (household per capita income) in 2000
Source: population census microdata, IBGE, 2000	
Unemployment	Unemployment rate in 2000
Metropolitan	Dummies for metropolitan regions
Median income	Median household per capita income in 2000
People without religion	Percentage of people without declared religion in 2000
Source: Fundação Sistema Estadual de Análise de Dados, 2006	
Migration	Net migration rate (by thousand inhabitants in 2000)
Source: São Paulo Government	
Crime risk	Rate of imprisonment and number of crimes in 2001

*Rate of total number of people that are enrolled in school and the population between 7 and 22 years old.

Table 2
Regressions.

	Dependent variable: ln(crimes involving pecuniary gains)			
	I	II	III	IV
Constant	4.676***	5.211***	0.449	5.573***
Gini	2.581***	2.782***	2.888***	2.777***
Median income	0.005***	0.005***	0.003***	0.004***
Unemployment	0.013***	0.015***	0.010***	0.016***
Risk	−1.888***	−1.713***	−1.680***	−1.671***
School attendance	−0.007*	−0.008*	−0.002	−0.006
Adolescent mother in 1991	0.010*	0.010*	0.010**	0.010**
People without religion	0.021***	0.029***	0.019***	0.017***
People 15–17 years old	0.067*	0.074*	−0.015	0.015
Migration	0.007***	0.007***	0.004***	0.004***
Urbanization	0.004***	0.003**	0.005***	0.005***
Metropolitan	−0.165**	−0.037	−0.193***	−0.057
P	–	–	0.634***	–
λ	–	–	–	0.838***
Moran's I	12.52***	11.75***		
LM-error	137.71***	120.65***		
LM-lag	140.41***	118.61***		
R^2	0.491	0.526	–	–
Observations	639	639	639	639

*Significant at 10%; **Significant at 5% level; ***Significant at 1% level.

[4] We assume that the under-reporting rate is the same in every municipality of each region, although the survey was conducted only in municipalities with more than 50,000 inhabitants.

Table 3
Elasticity of crimes in relation to income inequality.

Model	Mean elasticity	Minimum elasticity	Maximum elasticity
OLS	1.36	1.09	1.89
OLS corrected	1.46	1.18	2.04
SAR	1.52	1.22	2.12
SEM	1.46	1.17	2.04

construct a normalized spatial weight matrix such that the spatial influence decays non-linearly with distance across municipalities. So, the elements w_{ij}^{*} of the matrix are:

$$w_{ij}^{*} = \frac{w_{ij}}{\sum_{j} w_{ij}} \text{ if } i \neq j, \quad \text{and} \quad 0 \quad \text{otherwise},$$

where $w_{ij} = 1/d_{ij}^{2}$ and d_{ij} is the distance between municipalities i and j.

In Table 2, we present four estimated models. In column (I), we ran ordinary least squares regressions, robust to heteroskedasticity, with the explanatory variables presented in Table 1, but considering neither spatial effects nor the correction of under-reporting rate for criminal data. In column (II) we estimated the model by OLS after just correcting for under-reporting in criminal data. In (III) we present the SAR model and in (IV) the SEM, both estimated by maximum likelihood with corrected data.

The Moran's I, LM-error and LM-lag tests are highly significant, indicating the presence of spatial correlation and that OLS models are misspecified.

We use the Gini Index as a measure of income inequality. The estimated parameter is positive and significant, and the estimates are very stable in all specifications[5]. The other variables related to economic incentives (median income and unemployment) are also significant, like the crime risk. The estimated parameter for urbanization is positive, as we expected.

Of the variables related to moral cost, school attendance and people between 15 and 17 years old are not significant in the spatial models. On the other hand, adolescent mothers, people without religion and migration are significant in all estimations. Finally, the estimated ρ and λ are both significant, reflecting the spatial effects of criminal activity. Thus, these results show an influence of inequality on criminal activity, even after controlling for spatial effects and under-reporting in criminal data.

Next, we calculate the elasticity of pecuniary crime in relation to income inequality for each municipality for the OLS, SAR and SEM models. The values are in Table 3.

The estimated elasticity to the Gini Index ranges from 1.17 to 2.04 for the SEM. On average, the elasticity is 1.46, because the mean Gini Index in the sample is 0.525. These values are close to those found in other papers. The estimated elasticity is similar in the SAR model.

3. Conclusion

The results here allow us to conclude that income inequality has a positive effect on pecuniary crime rates, so that it can be a good proxy for the difference between criminal and legal work gains, even when spatial effects and under-reporting in criminal data are considered simultaneously. The estimated elasticity of property crime in relation to the Gini Index is, on average, 1.46, corroborating previous results.

We can evaluate the directions that public policy should follow. The effort to diminish the high inequality in Brazil has the additional effect of reducing criminality, at least in crimes involving pecuniary gains. Nevertheless, we cannot forget other policies that could reduce criminality: better economic conditions, with smaller unemployment rates, for instance, would also contribute to this process. Finally, a more effective policing and legal system are important factors that can contribute to reduce criminality.

References

Anselin, L., 1988. Spatial Econometrics: Methods and Models. Kluwer, Dordrecht.
Becker, G., 1968. Crime and punishment: an economic approach. Journal of Political Economy 76, 169–217.
Brush, J., 2007. Does income inequality lead to more crime? A comparison of cross-sectional and time series analyzes of United States counties. Economic Letters 96, 264–268.
Choe, J., 2008. Income inequality and crime in the United States. Economic Letters 101, 31–33.
Fajnzylber, P., Lederman, D., Loyaza, N., 2002. Inequality and violent crime. Journal of Law and Economics 45, 1–40.
Fingleton, B., Igliori, D., 2005. Cluster dynamics: new evidence and projections for computing services in Great Britain. Journal of Regional Science 45, 283–311.
Glaeser, E., Sacerdote, B., 1999. Why is there more crime in cities? Journal of Political Economy 107 (S6), S225–S229.
IBGE, 2000. Population Census Microdata, CD-ROM.
Kelly, M., 2000. Inequality and crime. The Review of Economics and Statistics 82, 530–539.
LeSage, J., 1999, Spatial Econometrics. Unpublished manuscript, http://www.rri.wvu.edu/WebBook/LeSage/etoolbox/index.html, 1999.
Mendonça, J., Loureiro, P., Sachsida, A., 2003. Criminalidade e desigualdade social no Brasil. IPEA Discussion Paper, vol. 967. http://www.ipea.gov.br/pub/td/2003/td_0967.pdf.
United Nations Development Program, 2003. Human Development Atlas in Brazil: 1991-2000.
Fundação Sistema Estadual de Análise de Dados, 2006. Informações dos Municípios Paulistas. http://www.seade.gov.br/produtos/imp/index.php.
Zhang, J., 1997. The effect of welfare programs on criminal behavior: a theoretical and empirical analysis. Economic Inquiry 25, 120–137.

[5] We also estimated the model using the other inequality measures presented in Table 1. The results were roughly the same.