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Economic and sociological determinants of crime in Colombia

Determinantes económicos y sociológicos del crimen en Colombia

Determinantes econômicos e sociológicos do crime na Colômbia

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Abstract

From the panel data for the Regions of Colombia 1993-2013, the crime rate (homicide and theft) was estimated using the method of ordinary least squares, based on the model developed by Ehrlich (1973). In this way, it was possible to minimize econometric problems, such as the endogeneity of the explanatory variables, and measurement errors due to the omission of real crime rates. The regressions allow us to conclude that the degree of poverty, measured in terms of the NBI, generates a negative effect on the crime rate; population density has positive effects for the crimes of homicide and theft; likewise, the schooling rate positively affects common theft; The police efficiency rate is significant, but not for the Gini coefficient, for homicide crimes and not for theft. The regional fixed effects show the specific characteristics of the regions of Colombia do not explain the differences in crime rates.

Key words: Economy of crime, theft, homicide, population density

Resumen

A partir de datos panel para las Regiones de Colombia 1993-2013, se estimó la tasa de criminalidad (homicidio y hurto) utilizando el método de los mínimos cuadrados ordinarios, basados en el modelo desarrollado por Ehrlich (1973). De esta forma, fue posible minimizar los problemas econométricos, tales como la endogeneidad de las variables explicativas, y los errores de medición por la omisión de las tasas reales de delitos. Las regresiones permiten concluir que el grado de pobreza, medidos en términos del NB I, genera un efecto negativo en la tasa de criminalidad; la densidad poblacional tiene efectos positivos para los delitos de homicidio, y hurto; de igual forma, la tasa de escolaridad incide positivamente en hurto común; la tasa de eficiencia de la policía es significativa, pero no para el coeficiente de Gini , para los delitos de homicidio y no para hurto. Los efectos fijos regionales muestran que las características específicas de las regiones de Colombia no explican las diferencias en las tasas de criminalidad.

Palabras Claves: Economía del crimen, hurto, homicidio, Densidad poblacional

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* * Article resulting from the investigation entitled "Crime in Colombia: bases for an alternative model of explanation of criminal conduct as the basis of a public criminal policy."

Resumen

A partir dos dados-painel para as Regiões da Colômbia no período de 1993-2013, estimou-se a taxa de criminalidade (homicídio e roubo) utilizando o método dos mínimos quadrados ordinários, baseados no modelo desenvolvido por Ehrlich (1973). Deste modo, foi possível minimizar os problemas econométricos, tais como a endonegeidade das variáveis explicativas e os erros de medição pela omissão das taxas reais de delitos. As regressões permitem concluir que o grau de pobreza, medido em termos do NBI geram um efeito negativo na taxa de criminalidade; a densidade populacional tem efeitos positivos para os delitos de homicídio e roubo; de igual modo, a taxa de escolaridade incide positivamente no roubo comum; a taxa de eficiência da polícia é significativa, mas não para o coeficiente de Gini, para os crimes de homicídio e não para o roubo. Os efeitos fixos regionais mostram que as características específicas das regiões da Colômbia não explicam as diferenças nas taxas de criminalidade.

Palavras-chave: Economia do crime, roubo, homicídio, Densidade populacional.

Profile

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Introducción

There are two fundamental theoretical perspectives for explaining the factors that affect criminal conduct. The first is based on criminologists, psychologists, and social scientists in general, and argues that there is a predisposition of individuals to crime, the product of their psychic structure, as well as the influences of their economic and social environment. An alternative perspective was postulated by Gary Becker (1968), known as the "crime economy," who posited the essentially maximizing nature of the offender, subject to a cost-benefit analysis of his conduct, where incentives play a leading role.

This investigation is part of the economic model of crime that treats illegal or criminal activities as individuals' choices over legal activities, and that the opportunity cost of choosing one alternative or another has to do strongly with moral hazard. An important limitation of this theoretical approach is that its explanatory power of criminal conduct has only shown effectiveness in crimes that it has a basic economic component.

The main objective is to determine through an econometric panel data model the economic and sociological factors or determinants of crime in the different regions of Colombia. In short, it is necessary to give empirical evidence to the theoretical explanation of the criminal economy. The five regions of Colombia are taken as an analysis unit, and crime is searched in 1993-2013.

I.Theoretical model

The theoretical model of neoclassical economic literature that studies crime and its causes, in particular, begins with Becker's initial work (1968) and contrasted empirically by Ehrlich (1973), so it is known as the Becker-Ehrlich model. The fundamental hypothesis of the model holds that a risk-neutral agent will choose to commit a crime if the expected usefulness of criminal activity exceeds the expected usefulness of legal activity. Individuals, therefore, commit crimes because they choose between legal and illegal activities in a reasonable way.

According to Eide (1973), an individual's decision to commit a crime depends on their feelings, desires, and context, and beliefs about expected outcomes. One individual commits one crime and another does not, it is because their assessment of the costs and benefits of illegal activities are different, but not their basic motivations.

Criminal activities cause harm to society, and its members have a sense of insecurity (Roemer, 2001). Social loss from criminal conduct is represented by the cost of arresting and pro- ceasing the criminal, prison expenses, destruction of economic property, and moral injury of individuals. In his investigation, Becker (1968), noticed that the most effective criminal policy is the one that minimizes social loss related to crime, not the arrest of the largest number of criminals.

The Becker-Ehrlich model is based on the fact that an individual can participate in two market activities: illegal activity (i) and legal activity (L). The individual must choose their optimal participation in these activities at the beginning of a given period. There are no supposed to be any training costs, no training costs, no activi-

ty change. The gains in both activities are increasing from the time spent on them. To simplify it is assumed that (L) is true in the sense that net returns are given with certainty based on the WL (TL) function where TL is the time spent on the legal activity. On the other hand (i) it is risky in that their net returns are conditional to two states of the world: a) capture and punishment at the end of the period, with subjective probability Pi and b) escaping the law with probability 1-Pi. If the offender succeeds with probability 1-Pi gets a net profit, either monetary or psychological, equal to Wi(ti), being analogous to tL for illegal activities. If instead the individual is captured and punished, their returns are reduced by a Fi(ti) amount: the discounted value of the penalty for their illegal activity and other related losses (including possible loss of loot). The probability of capture is assumed to be independent of the time spent on i and L and that this time relates proportionally to any direct input used in the production of market returns (Núñez, 2003).

Fajnzylber (2000), for his part, proposes a basic equation model of criminal explanation, based on the rationality of the individual, and the valuation of costs and benefits that he makes of his criminal action.

II. An overview of crime studies in Colombia

Studies on crime economics in Colombia are scarce. The first crime economics investigation was in 1994. Posada and Montenegro (1994), analyzed the economic and social determinants of crime for Colombian departments, using the method of ordinary least squares. The explanatory variables used were poverty, income, and judicial deterrence variables.

Posada (1994), publishes "Economic Models of Crime and the Possibility of a ProlongedDay", where he deals with the theoretical foundation of the criminal economy. The different explanatory versions of criminal conduct are based on this work if it has economic "motivations". The first two versions state that the individual benefit of breaking the law is exogenous, and on the other hand, it is determined by society's per capita income. A third version has to do with the social cost of crime, i.e. society's need to allocate material resources to control crime.

Mauricio Rubio (1999; 2003), publishes "Crime and Impunity", which is a contribution to the economic and social understanding of the violent actions of criminal gangs, common crime, guerrillas, and paramilitaries. A propositional result is that the best way to combat criminal violence in its various manifestations in Colombia is by strengthening justice, and democratic institutions.

Astrid Martínez (2001), makes the most complete synthesis about the different theoretical economic approaches that are generally or can be used, in investigations into the causes of criminal violence in Colombia. The economic theory of crime has evolved, from the mainstream (neoclassical theory), which regards economic agents as maximizing subjects to restrict whose legitimacy it does not question. This approach has been introduced with analyses of the role of institutions, the examination of restrictions, and the solutions to the systems in which those decisions are made.

Sánchez y Núñez (2001), study the crime

rate for the seven big cities, and 711 municipalities using an econometric panel data model. On the other hand, Pablo Querubín (2003) explores in an investigation the relationship between departmental economic growth and criminal violence and reaches a fundamental conclusion: the different manifestations of criminal violence (narcotraffic, common crime, and armed conflict), significantly slowdown, departmental economic growth. Another important investigation is that of Sánchez, Díaz, and Formisiano (2003), which explores through the technique of spatial econometrics the determinants of the different crimes: murder, theft, kidnapping, and terrestrial piracy.

Ortiz (2010) conducts exploratory research that uses qualitative approaches and tries to explain the spatial distribution of homicides in the city of Cali. It proposes an explanatory hypothesis that homicides are not evenly distributed on the perimeter of the city. The distribution of homicides in Cali is determined by factors associated with the economy, sociology, and the same spatial dynamics of the city.

Cortés, Vargas, Hincapié, and Franco (2012), this research discusses the democratic security policy of Alvaro Uribe's government: Democratic Security. In particular, they assess the intensity of the gun conflict in municipalities with little or no state presence before 2002. The results show that guerrillas and paramilitaries increase their criminal activity in reverse relation to the presence of the state's armed forces and police.

Grautoff, Chavarro, and Arce (2011) investigate, using time series regression models, the criminal phenomenon for the city of Bogota. Research shows that there is no significant correlation between crime explanatory variables in Bogota. Devia (2012) in this investigation proposes a model simulation of criminal interaction between agents: citizen, police, and criminal. The crime, the investigation concludes, could be determined by the spatial confluence of the agents, if the appropriate context circumstances occur.

III. Econometric model

The determination of the econometric data model panel is derived from the BeckerEhrlich crime model. This functional relationship associates the crime rate with economic and sociological variables, and with deterrence variables, and legal and illegal entry opportunities. The model presented is as follows:

$$Y_{it} = \beta o + \sum_{k=1} \beta_k X_{kit} + U_{it}$$

Where endogenous variable Yit (criminal rate) is a linear function of X exogenous variables (Police Efficiency Rate, Legal income, poverty, unemployment rate, population density), i expresses the cross-cutting unit of research, t is time, 0 is the vector interception, βk is the vector of parameters of explanatory variables and Uit is the error and represents the non-observable fixed effects that differ between units of analysis that are constant over time.

A regressive model with panel data with fixed effects is used for this study to evaluate the effect on variables that change over time. Each individual has its characteristics that can influence the estimated effect. Fixed effects assume that these unique characteristics of each individual (it is assumed that there is no correlation of the variable between individuals) can snout the effects found so it must be

corrected. In this sense, the fixed effects allow to obtain unsewn estimators since the unseen effect, being fixed over time, is eliminated by the transformation of each unit, consequently, the fixed effect of the term error is eliminated and the correlation between error and explanatory variables is avoided (Wooldridge, 2009).

Response and explanatory variables

Response variables.

The response variables for this investigation are the homicide rate (number of homicides per 100000 inhabitants), and the rate of theft (number of thefts reported-two per 100000 inhabitants).

Explanatory variables.

The economic and sociological variables used in the model are the following:

Population Density: Population density is a measure of the population distribution of a country or region, which is equivalent to the number of inhabitants divided by the area where they live. It indicates the number of people living in each surface unit, and is normally expressed in inhabitants per km2. According to the theoretical model, the concentration of the population in geographic spaces increases the probability of people to associate to commit crimes, and a direct relationship with the potential victims, a positive sign is expected in the empirical results.

School Coverage: The gross coverage rate is the relationship between the population that is enrolled in basic education, compared to the population located in the normative age range (5-17 years). Higher education must imply a priori lower crime rate, a negative sign is expected, or it may also happen that higher education is associated with higher crime

Unsatisfied Basic Needs: This indicator is expressed as the number (%) of people with UBN in each Region. Basically. This indicator associates poverty with the economic dependence of households, school dropouts, lack of essential public services, critical overcrowding, and the state of housing.

Unemployment Rate: The unemployment rate is defined as the ratio of the unemployed population and the economically active population. According to the specified theoretical model, high unemployment rates increase the incentives to engage in criminal activities, therefore, a positive sign is expected in the empirical results.

Police Efficiency Rate: This indicator is defined as the ratio of the number of arrests and the number of complaints in the same period. For the design of this indicator, the statistics of the National Police were used. According to the Becker-Ehrlich model, the police efficiency rate acts as a deterrent variable, increasing the probability of capture and punishment, therefore, it is expected that in the estimated model it appears with a negative sign.

Gini coefficient. This indicator measures the degree of income concentration. A positive sign is expected, since theoretically, greater inequality is associated with greater criminal behavior.

IV. Regression, estimation, and results

Results for homicides:

Murder is an appalling crime, for when life is mowed, all rights to economic and sociological perpetrators of crime in Colombia deny the victim. On the other hand, murder is a crime of great social impact (Roemer, 2001), and generates scouring and fear in the general population. The murder itself is a complex phenomenon that requires to be explained, without any of the theoretical approaches that have been proposed since the different social sciences.

The World Homicide Study (2013) points to at least the most recent characteristics of this crime. The homicide rate in Latin America is the highest on the planet, far from even countries that are immersed in conflict or war. More than half of the killings fall on the young population, and 95% of the dead are men, and firearms are involved in more than 50% of the deaths. Something important is that organized crime activities, especially drug trafficking, determine 30% of all deaths in Latin America.

According to the econometric model for the homicide rate, it is found that all economic and social variables are significant in the explanation of the phenomenon of homicide, except for the Gini coefficient, as shown by the summary generated by the statistical package.

As for the education variable (CCOL), it is significant and positive, which is quite consistent with the theoretical approximations of crime association and years of schooling. Greater schooling is associated with either less criminality or greater criminality, i.e. the effect of one counteracts the other. In this sense, the positive sign indicates that the greater the number of homicide offenses, and that they have been carried out by people who have improved their living conditions.

Gini's coefficient proved not significant for the crime of homicide in the regions, however, the positive sign that it has been found in most empirical studies (Fajnzylber, 2000). The unemployment rate is positive, and significant, indicating that there has been higher unemployment in the regions with the highest number of homicides. Some empirical studies show this association (Winter, 1998).

Poverty (NBI) proved significant and positive, which is the expected sign in this type of research (Cerro & Meloni, 1999), indicating that there is a greater propensity for murder by people in poverty.

The coefficient for the efficiency rate of

Dependent Variable: LOG(TH?)
Method: Pooled Least Squares
Date: 02/23/16 Time: 07:14
Sample: 1993 2013
Included observations: 20
Number of cross-sections used: 5
Total, panel (balanced) observations: 105

Tabla. 1.
Resultado de Estimaciones para Tasa de Homicidio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DP?)	0.438744	0.410442	1.068955	0.0070
LOG(NBI?)	0.572408	0.164134	3.487443	0.0007
LOG(CCOL?)	0.722314	0.395335	1.827094	0.0009
LOG(TD?)	-0.190999	0.105115	1.817056	0.0025
LOG(GINI?)	-1.137230	0.382070	2.976500	0.3241
LOG(TEP?)	-0.063257	0.057181	-1.106269	0.0015
Fixed Effects				
_AND--C	-0.0762000			
_CAR--C	-0.0544005			
_PAC--C	-0.0607443			
_ORI--C	-0.0068733			
_AMA--C	-0.0005759			

R-squared	0.798263	Mean dependent var	3.582497
Adjusted R-squared	0.771949	S.D. dependent var	0.482331
S.E. of regression	0.230335	Sum squared resid	4.881007
Log likelihood	12.11342	F-statistic	20.44759
Durbin-Watson stat	1.242413	Prob(F-statistic)	0.000000

Fuente: *Revista Criminalidad*

the police resulted in the negative sign expected, which corroborates studies (Freeman, 1999), which indicate that a greater number of catches have a deterrent effect on criminal conduct in general, and committing homicide, in particular. Increasing the rate of capture and conviction, which would be a sign of the effectiveness of the justice system, increases the cost of committing a crime, drastically reducing the expected usefulness (Earlich, 1973).

Results for theft

Theft and theft seem endemic to modern societies, but it is also well documented in preprivate societies. The theft rate, not theft, is the variable that is required to be explained. According to the summary of the statistical package, the explanatory variables are significant (except for Gini), and with the appropriate signs. Each variable is explained.

Dependent Variable: LOG(THU?)
Method: Pooled Least Squares
Date: 02/23/16 Time: 06:51
Sample: 1993 2013
Included observations: 20
Number of cross-sections used: 5
Total panel (balanced) observations: 105

Tabla 2.
Resultado de Estimación para Hurtos

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DP?)	0.427930	0.167201	2.559384	0.0021
LOG(NBI?)	0.003415	0.101297	-0.033708	0.0002
LOG(CSCO?)	-0.081902	0.122853	0.666667	0.0017
LOG(TD?)	0.090536	0.099674	0.908321	0.0001
LOG(GINI?)	-0.618352	0.860540	0.718563	0.1242
LOG(TEP?)	-0.000812	0.097855	1.586515	0.0000
Fixed Effects				
_AND--C	-0.062682			
_CAR--C	-0.005144			
_PAC--C	-0.072320			
_ORI--C	-0.020302			
_AMA--C	-0.007572			

R-squared	0.811218	Mean dependent var	6.128690
Adjusted R-squared	0.799351	S.D. dependent var	0.912138
S.E. of regression	0.645397	Sum squared resid	38.32148
Log likelihood	-96.07118	F-statistic	8.753199
Durbin-Watson stat	1.498618	Prob(F-statistic)	0.000000

Fuente: *Revista Criminalidad*

The efficiency rate of the police shows, as a result, a negative sign for the theft rate, which is consistent with the assumptions of the theoretical model adopted. However, theft is insensitive to the police's efficiency rate. Results for these types of crimes have been found in empirical studies from other countries (Kessler & Molinari, 1997). One possible explanation for this fact is that theft is rarely reported by individuals, since the effectiveness of the judicial system is lower for this crime, therefore, the odds of compensating the victim are low. Population density has a positive coefficient and is significant that it consists of empirical studies (Glaeser, 1996), which show that has higher urban concentration is the crime rate. The unemployment rate, and the poverty rate, measured in NBI, positive and significant, which corroborates the empirical findings of other studies (Winter, 1998), which found a significant and positive association between unemployment and theft. The school coverage rate has a negative, and significant coefficient, which shows that education increases opportunities for legal admission, and therefore acts as a phenomenon of riskadversity for the one who committed a crime.

Conclusions

This research was carried out to find the economic and sociological factors that have an impact on the criminality of the regions of Colombia in a period (1993-2013). The crimes studied were homicide and theft, which have a high component of economic motivation, which allows corroborating the assumptions of the economic model of the crime in which the study was focused.

An econometric model of fixed-effect pa-

nel da- ts was estimated for the country's five regions (Andean, Caribbean, Pacífica, Amazonia, and Orinoquía). The model was estimated with explanatory, economic, and sociological variables, which according to theoretical models are empirically associated with crime. Statistical information comes from the Dane for economic and sociological variables and the Criminality magazine of the National Police regarding the number of different types of crimes.

In many countries, research has been carried out using the Becker model (1968) and the empirical contrast of Ehrlich (1973), and other studies, such as Entorf and Spengler (2000). This allowed us to compare the results given with those of those studies, and in this way validate the research. The investigation notes that:

The efficiency rate of the police has a deterrent effect on crimes of murder and theft, causing the propensity to commit these crimes to fall significantly.

Inequality, as measured in this investigation by the Gini coefficient, was not statistically significant as an explanatory variable for homicide and theft offenses, but variables that relate to poverty such as unemployment rate, and schooling. The investigation of this variable, and its insensitivity, must be deepened to explain the crime. Population density proved as expected for similar studies, as increased urban concentration is associated with more crimes, in particular theft, but also other crimes such as homicide.

In general, the construction of a criminal public policy that has as its main purpose to reduce the temporal trajectory of criminal variables must be informed of empirical studies solidly based on a theoretical criminal model, which does not reject all explanations of the complex and multicausal criminal phenomenon.

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