The Socioeconomic Determinants of Crime:

the Case of Texas

Kristin Ross Balthazar

Dissertation submitted in partial fulfillment of the requirements for the degree of MSc in Economics, at the Universidade Católica Portuguesa

October 2012

ABSTRACT.

Title: The Socioeconomic Determinants of Crime: the Case of Texas

Author: Kristin Ross Balthazar

This paper investigates the relationship between various socioeconomic factors and crime, especially income inequality and poverty. As crime rates have steadily increased over time, ecological theories of crime have been developed to explain the behavior of both property crime and violent crime. Identifying possible predictors of crime is one step into developing social policies that will help lower the vast social costs of criminal activity. The first part of this paper discusses the three major ecological theories thought to best explain crime (strain theory, social disorganization theory, and economic theory). The second part uses county-level data from the state of Texas to explore the links between likely socioeconomic factors and crime rates. Our analysis provides evidence that inequality is unlikely to be a constantly significant factor in determining property crime rates but does have a significant impact on violent crime. Family instability is the most consistently significant determinant of both types of crime.

Table of Contents

Acknowledgements

First and foremost, I would like to thank my supervisor, Professor Miguel Gouveia, for his help and guidance throughout the development of this thesis. Without him, this paper would still be nothing more than a small spark of an idea in my mind.

I am thankful for the help and input of Católica's faculty and staff throughout my time as a student at the University. They have made it possible for me to realize my goal of earning a degree in Economics.

A very special thanks to my friends, most especially Serap Ünlü and Elsa Natália Hilário Camuamba, who have shared the good times with me and supported me through the bad; their friendship has made my experience at Católica more than just "going to school."

Last, but definitely not least, a thanks to my family over across the Pond, my parents and grandparents, who have let me run thousands of miles away to pursue a dream and have been behind me every step of the way. Thank you, Momma and Dad, for your faith in me and for always being there for me.

And—thanks to my sister, who, no matter how far I buried myself into my schoolwork, made sure to drag me out of my papers now and then, make me laugh, and boost my spirits—and made sure I was always updated on what was *really* going on in American football.

1. Introduction.

Crime has enormous negative implications for society. Not only does it affect society in terms of money—spent in order to apprehend and punish criminals or to help repair damage done from criminal activity—but also in terms of personal safety and happiness. Since part of a government's job is to protect its citizens, crafting efficient social policies to help minimize the effects of crime is a common objective of governing bodies. Identifying the determinants of crime is an important step to achieving this end.

Although criminal intent was once thought to be largely a personal problem—brought on by weak morals or insanity—more recent theories focus on ecological causes. These theories suggest that people are driven to crime through environmental stimuli rather than internal urges, and therefore, by controlling these outside influences, crime can be reduced. The three most prominent ecological theories are strain theory, social disorganization theory, and the economic theory of crime. These theories consider both economic and social variables, income inequality included.

This paper looks at the relationship of many socioeconomic variables to crime: income inequality, population density, unemployment, race, poverty levels, family instability, residential stability, police expenditures, female-male ratios, education, gun ownership, and religious participation. We will look at data for all Texas counties to investigate the links between these variables and crime. Limiting the sample to one state helps lower the impact of demographic (and associated characteristics) and legislative differences found across US states.

The paper is organized as follows. Section 2 presents basic demographic and legislative information on the state of Texas that might affect crime rates. Section 3 presents a brief synopsis of Becker's (1968) economic theory of crime, and Section 4 continues with a literature review of theoretical and empirical contributions to the study of crime. Section 5 introduces our data, and Section 6 describes our data in more detail. Section 7 presents our methodology and regressions and discusses their results, and Section 8 concludes.

2. Welcome to Texas.

In this paper, we analyze data for 254 Texas counties, which in total cover a land area of 261,797.12 square miles (678,051.43 square kilometers) and have a total population of 20,851,820 persons.

The data sample has been restricted to one state in order to help minimize the effects that cultural variations, differing demographics, and state-specific laws have on crime. While it is true that the areas of Texas are hardly homogeneous (for instance, compare northern Williamson County's 74% white non-Hispanic population and 5% poverty rate with Webb County, located in south Texas near the Mexican border, whose population is 94% Hispanic and has a poverty rate of 31%), these counties are much more likely to be similar to each other—especially in terms of legislation—than are counties chosen far and wide across the United States as they are in other empirical studies (Sjoquist (1973) or Kelly (2000), for example).

Texas' demographics differ greatly from that of the United States. Its Hispanic population is far greater than that of the country taken as a whole, which presents different cultural elements as well as different issues among races than are present elsewhere. In 2000, the US population measured 69.1% white non-Hispanic, 12.5% Hispanic, and 12.3% black. Texas, however, is 52.4% white non-Hispanic, 32% Hispanic, and 11.5% black. Other demographic differences include age—the US 15-24 age bracket stood at 13.9% in 2000, compared to Texas' 15.2%—and the percentage of the population in female-headed households. In 2000, 7.9% of family households were female-headed with minor children, while in Texas the percentage was 4.5.

Texas' legislation may also have an impact on its crime rate. Criminal punishments are regulated to some degree at the state level, and may vary with other states. Gun laws also vary widely across the US. Owning a gun has always been legal in Texas, and in 1995 the state legislature approved concealed carry laws, which allows those who obtain a Concealed Handgun License (CHL) to carry a firearm on their person in public. Other states have various limits on weapons: for instance, Illinois is a complete no-carry state, while Vermont requires no permit to carry and other states fall somewhere in between. Texas also has a Castle Doctrine in place which allows individuals to use lethal force to defend their person and property, which is well-known by residents. There is no definitive data to determine whether these laws raise or lower crime rates, but it is likely these laws do affect an individual's choice of whether or not to participate in criminal activity.

3. The Economic Theory of Crime.

Although Fleisher (1966) was the first economist to attempt to look at crime from an economic perspective and supposed that if the possibility of getting caught was relatively low and gains from legal market activity were not high enough, then some people would engage in criminal activity, it is Becker's 1968 paper "Crime and Punishment: An Economic Approach" that is considered the beginning of the economic theory of crime. He developed a model that took into account both the individual's incentives to commit crime as well as deterrents and also the costs of crime to society.

Becker describes an individual's choice to commit crime with the function

$$O_j = O_j(p_j, f_j, u_j,)$$

where O is the number of offenses an individual would commit, p is the probability of his conviction, f is the punishment if he is convicted, and u is a variable representing all other factors that influences the decision to commit crime (for instance, income available through legal ventures and income available through criminal activities).

Because the individual's choice is made under uncertainty, the expected utility of criminal activity can be described as

$$EU_j = p_jU_j(Y_j - f_j) + (1 - p_j)Uj(Yj)$$

where Y_j is the individual's income from committing a crime. As is evident in the equation, not only is the expected utility dependent upon income gained from crime, but also the probabilities of conviction p_j versus success $(1 - p_j)$ and punishment f_j.

Crime does not only affect the perpetrators. Crime also affects society, and Becker defines the social loss function as

$$L = D(O) + C(p, O) + bfpO$$

where D is the damage from crime, C is the cost of apprehension and conviction of criminals, and $bfpO$ is the total social loss from punishments. b is the coefficient that reflects the cost to society that takes into account not only monetary costs, but also societal values—fines would show b close to zero, while imprisonment and most other punishments would show $b > 1$.

The main aim of social policy is to protect citizens, and that includes protecting citizens from crime. In this function of social loss, social policy variables are represented by *p* and *f*. By minimizing this equation with respect to *p* and *f* and solving the model, we can determine how to minimize the impact of crime on society by raising or lowering the risks involved with committing crimes.

However, another way of accomplishing this could be by changing the variables that affect an individual's choice to commit crime (represented by *u* in Becker's model). For instance, increasing the opportunities available to him through legal market activity may make the opportunity cost of criminal activity high enough to make illegal activities too costly to pursue.

Ehrlich (1973) continues that analysis and investigates how income levels and distributions may affect crime. He argues that income inequality can be an indicator of possible payoffs between legal and illegal activity, and that income levels can indicate the number of opportunities to commit crime (compared to those available through legitimate activity). By extension, then, controlling income levels (for instance, by helping those on the low end of the income distribution increase their income) or controlling inequality might also be effective ways of combating crime.

4. Literature Review.

Theoretical Studies.

The study of crime is not limited to only one field, and the links between crime and various socioeconomic variables have been studied from many different points of view. As a result, several different theories have been developed to explain these relationships. Merton's (1938) strain theory, Shaw and McKay's (1942) social disorganization theory, and Becker's (1968) economic theory of crime are three influential ecological theories of crime, all of which use the incentives, deterrents, and other influences found in an individual's environment to give possible explanations for varying crime rates. Inequality figures heavily into each of these theories, especially strain theory and economic theory.

Strain theory suggests that individuals feel more frustration when placed near others who are more successful; as inequality increases, those on the lower end of the income distribution are more likely to channel their anger and resentment into crime.

Social disorganization theory argues that as the communities become less able to regulate its members, crime increases. Factors that contribute to this community weakening include poverty, racial heterogeneity, less residential stability, and family instability (the former three determinants are noted by Shaw and McKay (1942), while family instability was first noted as a possible factor by Kornhauser (1978)). Inequality is considered to have an impact here because of its link to poverty.

The economic theory of crime is the most recently developed, and Becker's paper has had a significant impact on the way criminal behavior is viewed. Rather than considering criminal behaviors as the result of mental or moral deficiencies, they are now considered as a possible result of a utility maximization problem: the individual considers crime by comparing his possible returns from criminal activity (taking into account the possibility of being apprehended and the resulting punishment) against the returns he would receive from participating in legal market activity.

The economic theory of crime considers inequality important because areas with high income inequality mean individuals with low returns from legal market activity are closer to those who have higher returns and thus have goods worth taking. This situation increases the possible returns on time and effort placed in criminal activity. Therefore, lowering crime rates can be achieved by reducing the relative benefits of criminal behavior: by either reducing the gains from crime, raising the probability of being caught and increasing the

severity of punishment, or by making the opportunities of legal market activity more attractive and more widely available.

Other authors have continued the development of Becker's theory. Ehrlich (1973), Sjoquist (1973), and Block and Heineke (1975) were all early followers of Becker's economic theory of crime. Ehrlich considered the effects of income levels and income distribution might have on crime rates, and found that higher median family incomes were associated with higher levels of violent crime, and the percentage of families with incomes below one-half of the median income was also associated with higher crime rates. He also found that unemployment rates were less important than other factors. Sjoquist's model showed individuals choosing how to allocate their fixed amount of time to either legal or criminal market activities, and considered arrest, conviction, and punishment to be the costs of criminal activities. As Becker's model suggested, Sjoquist's empirical testing of his model demonstrated that an increase in the number of arrests compared to the number of crimes led to lower crime rates.

In all of the previously mentioned models that are concentrated on the economic theory of crime, inequality is considered to be a very important determinant of crime. Chiu and Madden (1998) develop a model that details the link between the number of burglaries and income distributions; as inequality increases, burglaries also increase. İmrohoroğlu, Merlo, and Rupert (2004) present a dynamic equilibrium model and then analyze property crime rates in the United States. They hoped to identify the factors that led to the drastic decrease in crime. They concluded that higher probability of being caught, a stronger economy, and the aging of the population are important factors, while unemployment is not significant. Inequality, however, is a very important determinant of crime; if everything else had remained constant, the increase in income inequality would have caused a sharp increase in crime levels.

Empirical Studies.

Several empirical studies corroborate the claim that inequality is an important determinant of crime. Morgan Kelly (2000) examines the link between inequality and crime in metropolitan counties in the US in 1991. He considers violent crime and property crime separately, and controls for other factors that may also have an impact on crimes: police activity, poverty, unemployment, family structure, race, residential mobility, age, and education. In his first model, he assumes that police expenditures are exogenous and uses a

logistic regression to estimate the model. In a second regression, he assumes that police expenditures may be endogenous, and then uses a two-stage GMM regression. Both regressions give similar results. While violent crime is heavily influenced by inequality and less so by police activity, property crime is more strongly determined by poverty (positively) and is more reactive towards police expenditures (negatively).

Other empirical studies build upon these findings. Demombynes and Özler (2002) use a similar approach to investigate the case of South Africa. They use cross-sectional data and a negative binomial regression to estimate various factors of property crime and violent crime. The data is unique in that it is grouped by police jurisdictions, which are smaller areas than states or counties. The study also considers inequality within and between racial groups, and considers each district's relative wealth compared to those around it in order to account for the possibility that criminals might venture into other areas to commit crimes if those areas offered better opportunities. They found that inequality has a significant impact unless police expenditure and unemployment are controlled for; violent crime cannot be explained by these same variables, revealing inequality to still be an important determinant of violent crime.

Nilsson (2004) examines the relationship of inequality and crime in Swedish counties, using individual-level data across 27 years (1973-2000). She uses an OLS regression and accounts for county and year fixed effects. When investigating property crime, she finds that poverty has a significant impact, along with the proportion of divorcees (her results show that a 1% increase in the proportion of divorcees leads to a 20% increase in property crime). The proportion of the population that is made up of foreign citizens also shows a positive relationship with crime levels. Youth and inequality are not significant. When considering violent crime, the only significant variable is the proportion of the population that is male, aged 15-24 years.

Scorzafave and Soares (2009) add new possibilities to their examination of the link between income inequality and pecuniary crime. They use data from municipalities of São Paulo State, Brazil, taking the average of information from the years 2002, 2003, and 2004. Their criminal data is unique in that it also includes crimes related to drug trafficking. They look not only at economic factors, but also moral factors: for instance, they include the percentage of the population that professes to believe in a religion as a possible factor in determining crime rates. They find that income inequality has a positive significant impact, along with median income levels, unemployment, and urbanization. When considering moral costs, the percentage of the population aged 15-17, population with adolescent mothers, the

percentage of the population that professes no religion, and migration all have a positive impact on pecuniary crime rates.

Fajnzylber, Lederman and Loayza (2002) take a cross-country sample to explore the relationship between inequality and crime across countries. They use a lagged-variable GMM regression for panel data in their study, and find that while violent crime is stagnant over time, inequality does have a positive significant impact on crime. GDP growth has a significant negative effect on crime. While these results follow what would be expected given previous studies, Neumayer (2005) contests the certainty of the claim that inequality has a significant impact on crime. His empirical tests show that, no matter how inequality is measured, it is insignificant in fixed effects and dynamic models. It is only significant in random-effects models, or when the number of countries is sufficiently limited (such as in the previously discussed Fajnzylber, Lederman, and Loayza study). However, Neumayer does admit that some of this insignificance may spring from a poor estimator of inequality over time.

Table 1 presents detailed information on selected empirical studies of crime.

Table 1. Literature Review: A Sampling of Empirical Studies

PAPER	DEPENDENT VARIABLE	EXPLANATORY VARIABLES	FINDINGS	REGRESSIONS
Fleisher; The Effect of Income on Delinquency (1966)	Four variables considered: 1) number of court appearances by male youth in census tract communities of Chicago; 2) number of court appearances by male youth for 45 suburbs of Chicago with populations over 10,000; 3) number of arrests of males under 25 for property crimes in 101 US cities; 4) number of arrests of males under 25 for violent crimes in 101 US cities. All measured in rates per 1000 population.	Two income variables: 1) Mean family income for the second lowest quartile of families, to represent the economic level of the community; 2) Mean family income of the highest quartile of families, to represent payoff of certain crimes. Also considers male civilian unemployment rate; the proportion of females 14 years or older that are separated or divorced; percent of population living somewhere else five years ago; percent of the population that is nonwhite; a dummy variable to distinguish northern vs. southern cities.	Fleischer states that there is a lack of evidence suggesting that the model is well-specified. He suspects that the phenomena behind the effects of income are also behind the effects of family instability on crime, although he notices that income makes a higher impact on those groups he shows to have a higher "taste" for crime.	Each dependent variable was estimated using OLS, and the two largest samples (101 cities and Chicago communities) were divided into three subgroups according to the family stability value and evaluated separately as well. The R^2 were generally around .40, and always lower when the family stability variable was left out. R^2 was highest for dependent variable 1), using all independent variables at .85.
Ehrlich; Participation in Illegitimate Activities: A Theoretical and Empirical Investigation (1973)	Index Crimes: separated into categories (property and violent, and their subcategories)	1-year lagged crime rate, probability of apprehension, average punishment, median family income, % families below one-half median income, % nonwhites, % males 14-24 years of age, unemployment of urban male youth, labor force participation rate of young males, mean years of schooling for those over 25, % living in metropolitan areas, police expenditures, % male population, northern vs. southern state	Found that unemployment rates were not steady across regressions. Some showing that education and age are significant. Inequality was also shown to be significant for determining property crime, and was consistent with other theoretical models.	Used weighted OLS regressions; for property crime, R^2 .75, for crimes against persons R^2 .88. Also used two-stage least squares and obtained similar results. Also regressed individual crime categories on the selected independent variables.
Sjoquist; Property Crime and Economic Behavior (1973)	Property crime rates; robbery, burglary, larceny	Rate of arrests, rate of convictions as a fraction of crimes, rate of convictions of a fraction of arrests, yearly income, yearly sales of retail outlets, average sentence for thieves, percent nonwhite population, mean years of schooling, population density, unemployment, percent population earning less than $3000	Found tentative evidence of Becker's theory. Greater possibility of arrest did have an effect to lower crime, as did higher sentences.	Used OLS; regressed crime rates on various arrest and conviction variables. First did not use unemployment or population earning less than 3000; however, the coefficient of income was negative and these two variables corrected for it. R^2 for crimes regressed on rate of arrests is .638.
Morgan Kelly; Inequality and Crime (2000)	Crime rate, both totals and broken down into various subcategories--violent and property crimes	population, population density, income Gini, (also used education Gini in some regressions), female headed households, nonwhite population, unemployment rate, poverty rate, residential mobility, percentage of youth, college education, police expenditure	Possible endogeneity of police activity does not highly impact estimated coefficients. Violent crime is little affected by police activity or poverty, but strongly affected by inequality (income or education)--following strain theory. Property crime is not as affected by inequality, but is spurred on by poverty and somewhat deterred by police expenditure.	Assuming exogeneity: Poisson regression, log linear. Assuming endogeneity of police activity: 2-step GMM estimator using % democrat voters, per capita income, and share of non-police expenditure by local government as instruments. When considering exogeneity, the residual deviance term for violent crime is 8.102, for property 22.493; using GMM, the H statistic shows there is little difference in the previous results.

PAPER	DEPENDENT VARIABLE	EXPLANATORY VARIABLES	FINDINGS	REGRESSIONS
Daly, Wilson, Vasdev; Income Inequality and homicide rates in Canada and the United States (2001)	Looks specifically at homicide rates, rather than overall crime.	Income Gini, median household income	Shows a high correlation between income inequality and homicides. The paper suggests this may be a result of "competitiveness." Also in comparing US and Canada, with other variables held constant, Canada's more generous benefit systems seem to have negative impact on crime (through lessening inequality).	Correlations only
Fajnzylber, Lederman, Loayza; Inequality and Violent Crime (2002)	Homicide, robbery. This looked at country-level data. Between and within countries, pooled cross country, and as time series data.	Gini index, GNP per capita (level of development), avg. years of education of adult population, level of urbanization, GDP growth rate (proxy for employment and general opportunities), lagged variable--crime from the previous period	Found that violent crime has a high level of inertia over time. Income inequality has a positive significant effect, while GDP growth has a significant negative effect on crime levels. GNP, urbanization, and education levels all show no significant impact on crime.	First assessed by OLS, but the model is not considered well-specified. When using GMM for dynamic (lagged-variable) models for panel data, the Sargan test indicates .651 for homicides and .531 for robbery levels.
Gabriel Demombynes and Berk Özler; Crime and Local Inequality in South Africa (2002)	Crime levels, divided into categories of violent and property crimes (including subcategories of burglary, vehicle theft, robbery, rape, murder, serious assault)	Mean expenditure in own jurisdiction, unemployment rate, a dummy to represent a jurisdiction as the richest in the area, inequality measures within and between racial groups, population density, female headed households, youth, and race	Shows high correlation between property crimes and inequality until police expenditure and unemployment are controlled for; high correlation between violent crime and inequality is not accounted for by the same variables. Most inequality is accounted for by inequality within racial groups, not between them. Sociological theories better explain violent crime rather than economic theories. Looked at possibility of criminals moving between areas in order to do their crimes in other jurisdictions before returning home with their loot.	Negative binomial regression models, with various regressions selecting different independent variables. Most R^2 registered at .38. Used probit to test for misreported crime data. Cross-section data.
Stephen Machin and Costas Meghir; Crime and Economic Incentives (2004)	Property crime rates	Wage distribution; conviction rates for property crimes, share of population aged 15-24, sentence length, measure for returns on crime	Found that the data supported the expectations of the model: that crime rates were higher at the lower end of the wage distribution, and that this relationship was more important than that of crime and unemployment. Deterrence measures have a large and significant impact on lowering crime rates, as does raising wages at the lower end of the wage distribution.	Used OLS, OLS with a lagged dependent variable, and IV estimators and accounted for area and year fixed effects. R^2 for all regressions were .93 or above

PAPER	DEPENDENT VARIABLE	EXPLANATORY VARIABLES	FINDINGS	REGRESSIONS
Anna Nilsson; Income Inequality and Crime: the Case of Sweden (2004)	Crime rates, both overall and broken down into property and violent categories	Unemployment rate, proportion of population that is male aged 15-24, percent of the population that is made up o foreign citizens, percent population divorced, number of police officers, various measures of income inequality: 10/90; Gini; also considered 10 percentile and 90 percentile separately	Property crime: the percentage of relatively poor has the greatest impact. As the proportion rises, so do crime rates, although the rate of change slows as the proportion grows. The proportion of divorcees has a huge impact--a 1% increase shows a 20% increase in crimes. Foreign citizens are also positively correlated, and youth and inequality show little effect. Violent crime: the only statistically important variable is the proportion of the population that is male aged 15-24.	OLS, accounting for county and year fixed effects. She uses individual level data for all Swedish counties. When changing her dependent variable, her regressions yield R^2 of .968 (total crime), .927 (burglary), .939 (auto theft), and .967 (robbery).
Eric Neumayer; Inequality and Violent Crime: Evidence from Data on Robbery and Violent Theft (2005)	Number of robberies/violent thefts per 1 million inhabitants	Measure of inequality (Gini or top-to-bottom income ratio), GDP per capita, GDP growth rate, unemployment rate, urbanization rate, female labor force participation rate, males 15-64, Polity measure of democracy, human rights violation measure (PPTS)	No matter how inequality is measured, it is insignificant in fixed effects and dynamic models. It is significant only in a random-effects model, unless the number of countries used is restricted to those used in by Fajnzylber, Lederman, and Loayza (2002) . Neumayer admits that part of this insignificance could come from a poor estimator of true inequality over time	GMM lagged variable; fixed effects models; random effects models. For fixed effects models, R2 range from .21 to .62 (depending on which independent variables are included). For random effects, the R2 are .50 using Gini and .66 using top-to-bottom income ratio
Lena Edlund, Hongbin Li, Junjian Yi, Junsen Zhang; Sex Ratios and Crime: Evidence from China's One-Child Policy (2007)	Total crime rates (breakdowns of categories not available for Chinese provinces)	Sex ratio, per capita income, unemployment rate, secondary school enrollment, income inequality (urban over rural), urbanization, age structure, welfare expenditures, police expenditures, share of population that are immigrants (from other provinces)	Urbanization and the sex ratio have significant impacts on crime. In fact, as much as one-seventh of the increase in crime can be attributed to the overabundance of males in China.	Performed panel data regressions for both OLS and IV estimators. Results were similar. When including all independent variables for OLS, the R^2 is .81.
A.H. Baharom, Muzafar Shah Habibulla; Crime and Income Inequality: The Case of Malaysia (2009)	Total crime; burglary; violent crime; property crime; theft	Gross household income inequality, computed from a regression relationship between Deininger and Squire inequality measures and UTIP-UNIDO pay inequality measures	Found that neither variable responded to any sort of shock to the other. For the case of Malaysia, there is no meaningful relationship between any of the crimes studied and income inequality.	Bounds testing (as in Pesaran et al.), with an autoregressive distributed lag framework. Estimated a conditional ARDL unrestricted error-correction model.
Luis Guilherme Scorzafave and Milena Karla Soares; Income Inequality and Pecuniary Crimes (2009)	Average pecuniary crime rate per 100,000 inhabitants, including drug trafficking offenses	Income Gini, median income, unemployment, risk, school attendance, adolescent mother, people without religion, percentage aged 15-17 years, migration, urbanization, metropolitan area.	Income inequality has a positive, significant impact. Other economic factors--median income and unemployment—are also significant. Urbanization has a positive effect. Of the "moral costs," proportion of population aged 15-17, school attendance, no religion, adolescent mothers, and migration all show positive impacts.	OLS with lagged variables, then, to control for spatial issues, also spatial autoregressive and spatial error models. Using OLS with uncorrected crime data shows and R^2 of .491; using corrected data shows .526.

5. The Data: Sources and Definitions.

A. The dependent variable

Crime

All crime data are taken from the 2000 FBI uniform crime reports. Our crime is separated into two broad categories, as defined by the FBI: violent crime, which includes murder, forcible rape, robbery, and aggravated assault; and property crime, which consists of burglary, larceny, and auto theft. We will investigate property crime and violent crime independently. We assess crime as the rate of crime per 1,000 persons.

B. The independent variables:

Inequality

In order to measure income inequality, we use a Gini index constructed from the publicly available income distribution published by the US Census Bureau (Burkey, 2006). The distribution is based on household income with a bottom segment of less than $10000 yearly and each interval increasing by $5000. The top bracket consists of households earning $200,000 or more. The income Gini here are not computed for individual level data because that data is not publicly available, which may mean these are not the true Gini indices. However, they are still a good representative of income inequality for these counties.

We also include other factors, both economic and social, that should be considered as having an effect on crime. All data are taken from the US Census Bureau's 2000 Census, except where noted. These variables include:

Total Population

We measure total population as the total count of all residents of a given county in absolute terms.

Population Density

Population density is the number of inhabitants per square mile of land area. As population density rises, it provides those with criminal intent with both more potential

targets and a higher degree of anonymity, which can lower the perpetrator's chances of being caught (Glaeser and Sacerdote, 1999).

Unemployment

We measure unemployment as the percentage of civilian labor force unemployed. In an economic theory of crime, unemployment lessens the opportunity cost for committing crime, thereby making pecuniary crimes more attractive for the unemployed. However, more recent studies suggest that this relationship between unemployment and crime may be insignificant (İmrohoroğlu, Merlo, and Rupert, 2004, among others).

Race

While the race of a person has little to do with potential criminality in and of itself, the racial situation might influence circumstances enough to make race factor into the decision of whether to commit crime or not. Grogger (1998) discusses the lower levels of economic success attained by black males, for instance. Texas also has a large group of Hispanics and Latinos, many of whom do not speak English well and find their educational and employment opportunities limited (27% speak predominately Spanish; 7% speak English "not well" or "not at all"). Here we measure race as the percentage of the population who are non-white (including Latinos).

Poverty

Poverty is measured as the percentage of the population below the poverty line. Those with lower returns from legitimate market activity would find that crime has a higher expected payoff and would therefore be more likely to engage in criminal activity (Becker 1968, Ehrlich 1973, and others).

Family Instability

Family instability is represented by the percentage of family households with minor children headed by a single female. Several theories link this instability to crime. One is that family breakups can lead to emotional damage in children, who then channel that into crime as they grow older; others dictate that this weak family structure leads to less structured lifestyles which can encourage unruly behavior in children and crime in the adults they become. There is also an increased risk of poverty in female-headed households.

Residential Stability

Residential stability is measured by the percentage of the population who were living in the same home five years previously. A stable location gives inhabitants more possibility of building a strong community in which others would be willing to step in on behalf of a neighbor if they were to witness a crime, and a strong community also lowers anonymity (which, as discussed above, can increase criminal activity).

Police Expenditure

We use police expenditure to represent the forces present in communities in order to discourage criminal activity. Here, we have a question of endogeneity; higher levels of spending might indicate the preventative action keeping crime levels in their current state, or higher spending could be a reaction to increasing crime levels. We measure police expenditure as the number of dollars spent on the county police force.

Aged 15-24

We use the percentage of the population aged 15-24 to represent the age bracket most likely to commit crime.

Female to Male Ratio

We represent the female to male ratio as the percent of the population younger than 40 years that is female. A recent study suggests that as demographics change and men begin to outnumber women, the decrease in the number of married men amounts to the loss of a stabilizing societal force (Edlund, Li, Yi, and Zhang, 2007). Without this stabilization, reckless behavior becomes more common and can cause crime levels to rise.

Educational Attainment

Higher levels of education can indicate both more socialization and more economic opportunities, both of which can reduce crime levels. We measure educational attainment as the percentage of the population that has graduated high school or earned a GED.

Gun Ownership

Gun ownership is represented by the proportion of the adult population that has been issued Concealed Handgun Licenses (a citizen must be 21 years of age in order to apply, except in very extenuating circumstances). The data was taken from the Texas Department

of Public Safety. Gun ownership is thought to have one of two effects on crime: either it makes it easier for criminals to obtain weapons, thereby increasing crime rates; or, it serves as a deterrent to crime because arming potential victims means the cost of crime may not only include the possibility of arrest and punishment, but also personal injury to the criminal. This particular variable is also subject to possible endogeneity—it is not clear if more people apply for licenses as crime rises and they feel the need to protect themselves, or the increasing number of persons with CHL licenses impacts the number of people willing to commit crime.

Religious Participation

Religious participation is represented by the percentage of the population that is affiliated with a church or other religious congregation. This affiliation can build community ties and reduce the anonymity of a population, even in large populations. It can also indicate, as in Scorzafave and Soares (2009), a moral deterrent against crime. Data were taken from *Congregations and Membership in the United States 2000* (Jones, 2002), published by the Glenmary Research Center, which notes that traditional black Protestants are underrepresented in this study.

6. The Data: Descriptive Statistics.

Summary Statistics.

Summary statistics for property crime and violent crime rates and explanatory variables are given in Table 2.

The correlation matrix is given in Appendix A. A few variables are very highly correlated: the percentage of non-white residents and the percentage of the population over 25 that are high school graduates have a high negative correlation (-.7588), family instability is highly correlated with poverty (.7735), and the percentage of high school graduates is also strongly correlated with poverty (-.8245).

Race is also correlated with poverty (.7274) and family instability (.6609). The percentage of high school graduates is negatively correlated with both family instability (-.6504) and unemployment (-.6223), and unemployment and poverty show a correlation coefficient of .6622.

Inequality is not highly correlated with violent crime or property crime.

Table 2. Summary Statistics for Crime Rates and Explanatory Variables

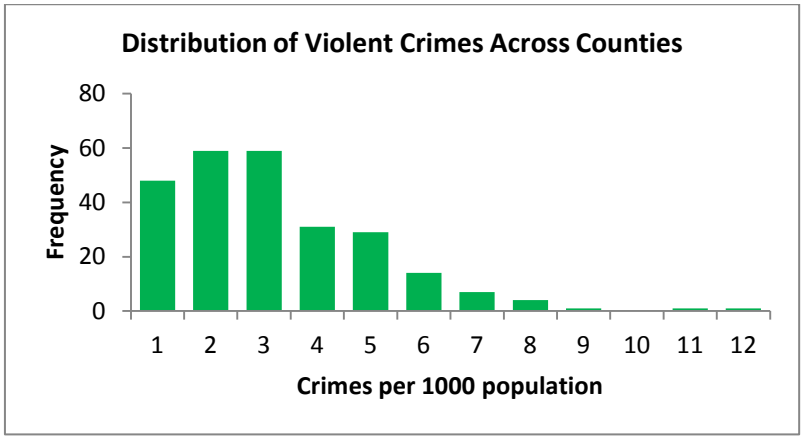
	Mean	Median	Minimum	Maximum	Std. Dev.	C.V.	Skewness	Ex. kurtosis
Property Crime Rate	23.40	19.80	0	66.06	14.61	0.62	0.90	0.24
Violent Crime Rate	2.69	2.36	0	11.98	1.91	0.71	1.22	2.53
Income Gini	0.4566	0.4585	0.3571	0.5660	0.0319	0.0697	-0.08	0.97
Total Pop.	82094	17425	67	3400600	294540	3.59	8.05	75.60
Pop. Density	86.17	20.55	0.10	2521.50	254.51	2.95	6.55	49.80
Unemployment	4.79	4.30	2.50	16.80	1.83	0.38	3.52	17.86
Race	35.95	32.10	4.20	98.00	20.929	0.58	1.02	0.63
Poverty	17.28	16.48	0	50.89	6.6511	0.38	1.33	3.61
Family Instability	4.44	4.25	0	13.38	2.0681	0.47	0.78	1.34
Residential Stability	57.37	58.00	32.10	72.80	7.1545	0.12	-0.46	0.39
Police Ex. Per Capita	97.10	80.91	0	2328.40	146.8	1.51	13.92	208.82
Aged 15 - 24	13.85	13.73	5.97	35.75	3.02	0.21	2.27	12.03
Female-Male Ratio	48.22	49.23	28.10	55.17	3.4528	0.07	-2.78	9.21
High School Grad.	71.31	72.10	34.70	91.80	8.9099	0.12	-0.89	1.66
Gun Owners	2.50	2.38	0.40	7.52	1.1649	0.47	0.87	1.36
Religious Participation	65.51	62.87	8.96	100	17.215	0.26	0.18	-0.28

Descriptions of all variables and instruments are presented in Appendix B.

Distributions of Selected Variables.

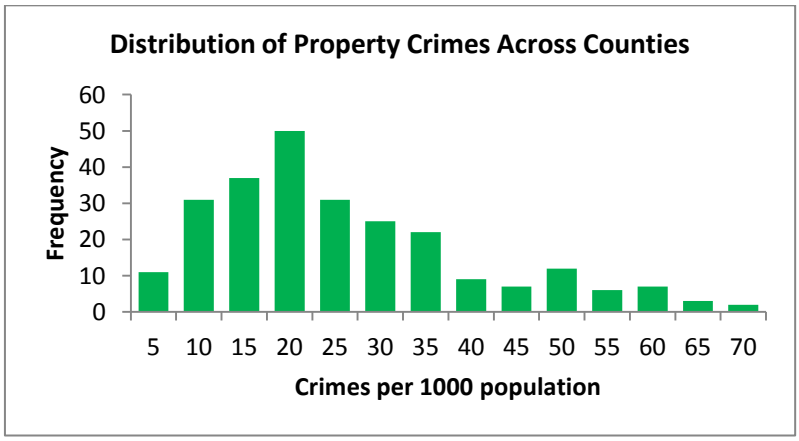
Here we can see the distribution of our dependent variables (violent crimes and property crimes) and two independent variables: poverty and inequality. Poverty is thought to be one of the most important predictors of crime, as higher levels of poverty represent more people for whom crime present lowered opportunity costs of illegal activity. Inequality is considered important because it can be representative of the possible payoffs of that illegal activity.

Histogram 1.



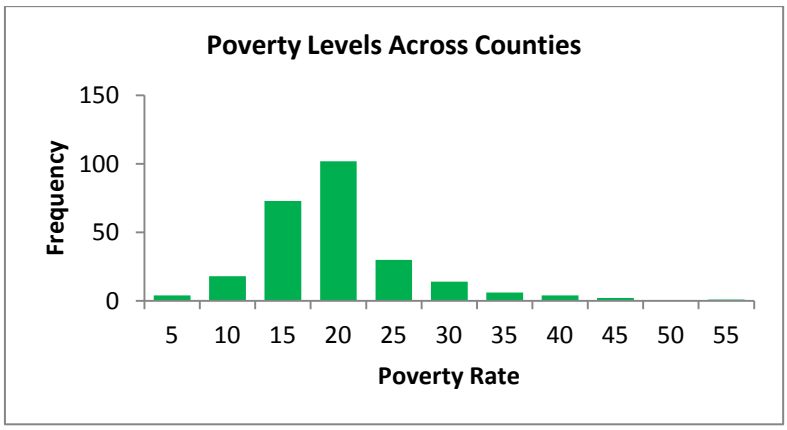
In Histogram 1, we can see that the majority of counties have violent crime rates of 3 or less violent crimes per 1000 population, and only 28 counties have violent crime rates of over 5 crimes per 1000 population. Only two counties have violent crime rates exceeding 10 crimes per 1000 population.

Histogram 2.



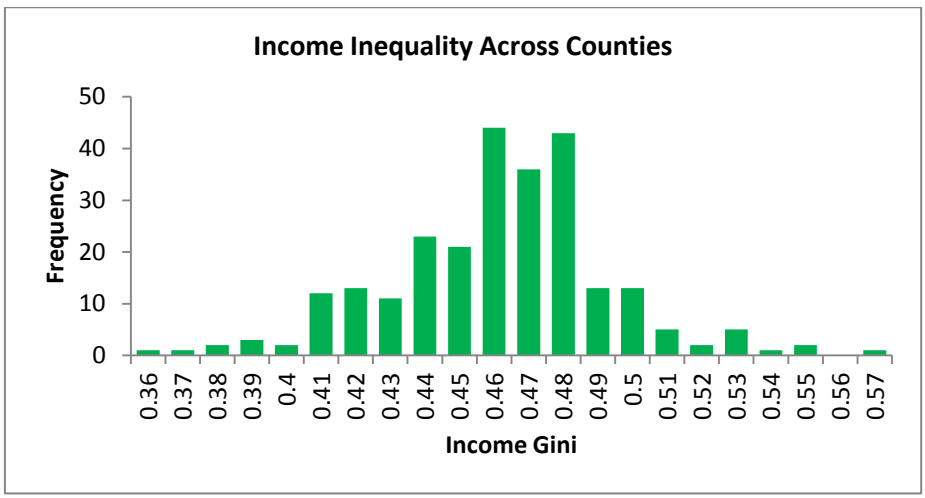
Histogram 2 shows that property crimes are far more numerous than violent crimes. About half of all Texas counties have property crime rates of 20 per 1000 population or less. Only two counties have property crime rates of above 65 crimes per 1000 persons.

Histogram 3.



Histogram 3 shows the frequency of poverty levels in Texas counties. Most counties have poverty rates below 20% of their population; over three-quarters of counties (197 counties) are in this range. Only one county has a poverty rate of above 50%: Starr County, near the Texas-Mexico border.

Histogram 4.



Histogram 4 shows the distribution of income inequality across counties. Loving County, with a population of 67 persons, has the lowest inequality (it also has the lowest Gini index in the nation) while the highest level of inequality in Texas is found in Kenedy County.

7. Methodology and Results.

Our model will take the form

$$Crime\ Rate_i = \beta_0 + \beta_1 I_i + \beta_2 v_i + \beta_3 X_i + \beta_4 p_i + \varepsilon_i$$

where *Crime Rate* represents the rate of crime per 1000 population, *I* is inequality, *v* is the poverty level, *p* is police expenditures per capita, and X denotes all other factors. We expect β_4 to carry a negative sign.

Model 1.

In our first model, we will assume that police expenditures and gun ownership rates are established independently of crime rates, as are all other variables. Therefore, we will use OLS to perform our regressions. The results from the OLS regressions are shown in Table 3.

Table 3. Ordinary Least Squares

Property Crime Rates per 1000 population

	Coefficient	Std. Error	p-value
Constant	-39.8443	22.7873	0.0817
Income Gini	34.4412	25.4518	0.1773
Pop. Density	**0.0115**	**0.0030**	**0.0002**
Unemployment	0.9309	0.5300	0.0803
Race	0.1282	0.0613	0.0376
Poverty	**-0.7640**	**0.2388**	**0.0016**
Family Instability	**2.9587**	**0.5354**	**0.0000**
Residential Stability	**-0.6424**	**0.1454**	**0.0000**
Police Ex. Per Capita	**0.0195**	**0.0048**	**0.0001**
Aged 15 - 24	**0.7770**	**0.2886**	**0.0076**
Female-Male Ratio	**0.9848**	**0.2113**	**0.0000**
High School Grad	0.2382	0.1735	0.1710
Gun Owners	0.2223	0.6852	0.7459
Religious Participation	-0.0506	0.0446	0.2580

R^2 =.5327

Violent Crime Rates per 1000 population

	Coefficient	Std. Error	p-value
Constant	-2.6526	3.3854	0.4341
Income Gini	2.9073	3.7812	0.4427
Pop. Density	**0.0021**	**0.0004**	**0.0000**
Unemployment	0.0789	0.0787	0.3177
Race	0.0091	0.0091	0.3167
Poverty	**-0.1094**	**0.0355**	**0.0023**
Family Instability	**0.4406**	**0.0795**	**0.0000**
Residential Stability	-0.0553	0.0216	0.0111
Police Ex. Per Capita	-0.0003	0.0007	0.6439
Aged 15 - 24	0.1044	0.0429	0.0156
Female-Male Ratio	**0.1082**	**0.0314**	**0.0007**
High School Grad	-0.0077	0.0258	0.7659
Gun Owners	0.0855	0.1018	0.4017
Religious Participation	-0.0009	0.0066	0.8912

R^2 =.3993

From these results we can see that property crimes and violent crimes are affected by some of the same significant factors: population density, poverty, family instability, and the male to female ratio, although with sometimes very different coefficients. All of these

determinants of crime have the same sign for both property and violent crime, but the sizes of the coefficients are quite different in some cases—for instance, family instability.

We can also see that age, residential stability, and police expenditures have a significant impact on property crimes while they are not significant factors for violent crimes. In fact, our results show different signs for police expenditures: they are shown to have a positive significant impact on property crimes, but they have a negative insignificant impact on violent crimes.

Several of our coefficients seem to move in the opposite direction previously seen in the literature: poverty has a negative coefficient, while the percentage of females has a positive coefficient. Inequality is not significant for either type of crime.

Model 2.

However, not all variables may be exogenous. Police expenditures and gun ownership may be endogenous and dependent upon crime rates. In order to assess this situation, we will use instruments to account for possible endogeneity and explain our endogenous variables. We will consider four possible instruments. First, we will look at total local area government revenue per capita; wealthier area governments are more likely to allocate higher amounts of money to police forces independently of crime. Secondly, we will look non-police expenditure as a share of total revenue, because counties spending at higher levels will likely spend more on their police departments as well. Third, we will look at per capita income, because richer residents can afford more independent crime protection, both by security personnel and by taking the necessary classes and tests to earn a concealed handgun license (and possibly purchase a firearm). The fourth instrument is ratio of firearm instructors to citizens eligible for weapons licenses, as this indicates how convenient it is to obtain a license.

In order to use these instruments, we must first make sure they are suitable instrumental variables. Including these four variables in property crime and violent crimes regressions show them to be insignificant as explanatory variables (including per capita income). Regressing police expenditures on our possible instruments shows two to be significant (total revenues per capita and share of non-police expenditures) to be significant and have an R^2 of .68. We can show, then, that these are reasonable instruments for police expenditure per capita.

However, when considering the same four instruments for the percentage of the adult population that has obtained weapons licenses, the instruments' explanatory power does not

seem quite as strong. The ratio of applicants to instructors is significant, as is per capita income and share of non-police expenditures; however, when regressing the percentage of the population with CHL licenses on our instrumental variables, the R^2 is .39.

We will use the Hausman and Sargan statistics and their corresponding p-values to confirm the use of instrumental variable regressions and the instruments' suitability. The Hausman statistic will appear significant if the OLS is indeed consistent and, therefore, the most efficient and preferred regression method. The Sargan statistic will be significant if there is an issue with an instrument and the instrumental variable is not suitable.

Results from the two-stage instrumental variable estimation are shown in Table 4.

Table 4. Two-stage Least Squares

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-56.2043	27.2306	0.0390
Income Gini	58.9529	32.6026	0.0706
Pop. Density	**0.0107**	**0.0035**	**0.0020**
Unemployment	0.8516	0.6258	0.1736
Race	0.0452	0.0859	0.5987
Poverty	-0.6893	0.2836	0.0151
Family Instability	**2.4285**	**0.6797**	**0.0004**
Residential Stability	**-0.4990**	**0.1784**	**0.0051**
Police Ex. Per Capita	0.0076	0.0076	0.3193
Aged 15 - 24	0.4746	0.3662	0.1949
Female-Male Ratio	**1.1823**	**0.2605**	**0.0000**
High School Grad	0.4507	0.2239	0.0442
Gun Owners	-5.6162	3.2143	0.0806
Religious Participation	-0.1010	0.0564	0.0736

R^2 =.4120
Hausman p-value: .019
Sargan p-value: .346

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-4.5205	3.9075	0.2473
Income Gini	6.3048	4.6783	0.1778
Pop. Density	**0.0020**	**0.0005**	**0.0001**
Unemployment	0.0546	0.0898	0.5434
Race	-0.0024	0.0123	0.8464
Poverty	-0.0948	0.0407	0.0199
Family Instability	**0.3710**	**0.0975**	**0.0001**
Residential Stability	-0.0402	0.0256	0.1161
Police Ex. Per Capita	-0.0012	0.0011	0.2606
Aged 15 - 24	0.0666	0.0525	0.2053
Female-Male Ratio	**0.1315**	**0.0374**	**0.0004**
High School Grad	0.0173	0.0321	0.5906
Gun Owners	-0.6608	0.4612	0.1519
Religious Participation	-0.0067	0.0081	0.4075

R^2 =.2929
Hausman p-value: .154
Sargan p-value: .421

From these results, we can see that, like our OLS regressions, population density, family stability, and the percentage of females are significant for both property and violent crimes. Residential stability is significant only for property crimes. Other factors are not significant, including both poverty and inequality.

Model 3.

In our previous regressions, gun ownership has been insignificant. Exogeneity is questionable, and our available instruments with do not seem to have high explanatory

power. If we remove this troublesome variable from our two-stage estimations, we find the results presented in Table 5.

Table 5. Two-stage Least Squares (gun ownership omitted)

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-42.8809	22.8292	0.0603
Income Gini	32.5242	25.3572	0.1996
Pop. Density	**0.0115**	**0.0030**	**0.0001**
Unemployment	1.0805	0.5373	0.0443
Race	0.1350	0.0607	0.0262
Poverty	**-0.8158**	**0.2408**	**0.0007**
Family Instability	**2.9577**	**0.5330**	**0.0000**
Residencial Mobility	**-0.6021**	**0.1466**	**0.0000**
Police Ex. Per Capita	0.0124	0.0061	0.0422
Aged 15 - 24	**0.7566**	**0.2873**	**0.0085**
Female-Male Ratio	**1.0136**	**0.2112**	**0.0000**
High School Grad	0.2700	0.1730	0.1187
Religious Participation	-0.0594	0.0446	0.1826

R^2 =.5285
Hausman p-value: .052
Sargan p-value: .681

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-2.9456	3.3818	0.3837
Income Gini	3.2033	3.7563	0.3938
Pop. Density	**0.0021**	**0.0004**	**0.0000**
Unemployment	0.0811	0.0796	0.3085
Race	0.0081	0.0090	0.3652
Poverty	**-0.1095**	**0.0357**	**0.0021**
Family Instability	**0.4332**	**0.0790**	**0.0000**
Residencial Mobility	-0.0524	0.0217	0.0157
Police Ex. Per Capita	-0.0007	0.0009	0.4684
Aged 15 - 24	0.0998	0.0426	0.0191
Female-Male Ratio	**0.1115**	**0.0313**	**0.0004**
High School Grad	-0.0040	0.0256	0.8746
Religious Participation	-0.0018	0.0066	0.7853

R^2 =.3972
Hausman p-value: .630
Sargan p-value: .314

When we compare these results to those of our other models, we see that they are much more similar to the results of our OLS regressions. The only significance change is in police expenditures, which appear significant in our OLS regressions for property crime but are not in our two-stage regressions for property crime. Coefficients for each variable are similar. Inequality is not considered significant for either category of crime. Poverty is significant but carries a negative coefficient for both property and violent crime.

Model 4.

In our first three sets of regressions, we did not weight our observations. All variables were presented as rates, and therefore the size of each county was accounted for. In this model, we will add the population dimension by weighting our regression on total county population.

The results are presented in Table 6.

Table 6. Weighted Ordinary Least Squares

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-76.0639	29.2390	0.0099
Income Gini	-10.8012	40.9013	0.7919
Pop. Density	**0.0042**	**0.0013**	**0.0015**
Unemployment	-1.1988	0.7422	0.1076
Race	**0.1894**	**0.0721**	**0.0092**
Poverty	0.3248	0.4546	0.4756
Family Instability	**4.3448**	**0.8084**	**0.0000**
Residencial Mobility	**-0.6416**	**0.1956**	**0.0012**
Police Ex. Per Capita	0.0447	0.0260	0.0869
Aged 15 - 24	0.1001	0.3053	0.7433
Female-Male Ratio	**1.4645**	**0.3363**	**0.0000**
High School Grad	0.4920	0.2253	0.0299
Gun Owners	0.2574	1.2250	0.8338
Religious Participation	0.1542	0.0682	0.0246

R^2 =.6774

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-12.6306	4.1816	0.0028
Income Gini	**20.8438**	**5.8494**	**0.0004**
Pop. Density	**0.0012**	**0.0002**	**0.0000**
Unemployment	0.0196	0.1061	0.8533
Race	0.0196	0.0103	0.0584
Poverty	**-0.2211**	**0.0650**	**0.0008**
Family Instability	**0.6342**	**0.1156**	**0.0000**
Residencial Mobility	-0.0171	0.0280	0.5423
Police Ex. Per Capita	0.0067	0.0037	0.0745
Aged 15 - 24	0.0997	0.0437	0.0233
Female-Male Ratio	**0.1560**	**0.0481**	**0.0013**
High School Grad	-0.0310	0.0322	0.3366
Gun Owners	0.0639	0.1752	0.7156
Religious Participation	0.0016	0.0097	0.8709

R^2 =.7570

In these results, several of the factors shown to be significant in our other regressions also appear here: population density, family instability, and the percentage of females have been determined significant in every regression. We also see that race and residential stability are also significant for property crimes, although poverty and inequality are not.

For violent crime, however, we find that both poverty and inequality are significant. Of note, however, is the fact that poverty carries a negative sign.

Model 5.

Once again considering the endogeneity of police expenditures and gun ownership—especially for property crime, we will use instrumental variables to account for that possibility. We will use the same instruments as in Model 2. The results for our weighted two-stage regression are presented in Table 7.

Table 7. Weighted Two-Stage Least Squares

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-98.7204	31.0610	0.0017
Income Gini	9.9136	51.0319	0.8461
Pop. Density	**0.0084**	**0.0017**	**0.0000**
Unemployment	0.0321	0.7663	0.9667
Race	**-0.5024**	**0.1859**	**0.0074**
Poverty	-0.2608	0.5779	0.6522
Family Instability	**4.8565**	**1.0282**	**0.0000**
Residential Stability	0.4500	0.3195	0.1602
Police Ex. Per Capita	0.0865	0.0667	0.1961
Aged 15 - 24	0.1568	0.3053	0.6081
Female-Male Ratio	**1.9596**	**0.3595**	**0.0000**
High School Grad	**0.6133**	**0.2267**	**0.0073**
Gun Owners	**-18.4007**	**4.3826**	**0.0000**
Religious Participation	-0.0398	0.0869	0.6469

R^2 =.6960
Hausman p-value: .269
Sargan p-value: 1.000*

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-13.6250	4.5357	0.0029
Income Gini	**19.8272**	**7.4519**	**0.0083**
Pop. Density	**0.0015**	**0.0002**	**0.0000**
Unemployment	0.1314	0.1119	0.2415
Race	-0.0515	0.0271	0.0590
Poverty	**-0.2422**	**0.0844**	**0.0045**
Family Instability	**0.6208**	**0.1501**	**0.0000**
Residential Stability	0.0923	0.0467	0.0490
Police Ex. Per Capita	0.0160	0.0097	0.1010
Aged 15 - 24	0.0983	0.0446	0.0285
Female-Male Ratio	**0.1912**	**0.0525**	**0.0003**
High School Grad	-0.0151	0.0331	0.6495
Gun Owners	**-1.7653**	**0.6400**	**0.0063**
Religious Participation	-0.0196	0.0127	0.1245

R^2 =.7612
Hausman p-value: .641
Sargan p-value: 1.000*

*The statistic is less than one; it appears as 1.000 due to rounding.

Here we can see that, once again, population density, family instability, and the female-male ratio are all significant for both types of crime. The percentage of the population owning a gun is also a significant negative factor for both types of crime, although it has a much larger impact on property crime than it does on violent crime. Race and the percentage of the population that are high school graduates are also significant factors for property crime.

For violent crime, we see a different set of significant factors aside from those mentioned above: poverty and inequality are additional significant variables. In fact, the income inequality coefficient is quite large.

Additional Considerations: Measure of Poverty

In our regressions we have been using the total poverty rate. However, Kelly (2000) suggests that this measure includes people who are generally unsuited for criminal activity, as many people in poverty are young children or elderly, and excluding these age groups from the poverty statistic would be a more precise measure of poverty's impact on crime. We have run our weighted two-stage least squares regressions using this reduced poverty rate to investigate the impact of this observation. We compare the results in Table 8.

Table 8. Comparison of Reduced Poverty Rates and Total Poverty Rates.

Property Crime Rates				**Total Poverty Only**				**Violent Crime Rates**
	Coefficient	Std. Error	p-value		Coefficient	Std. Error	p-value	
Total Poverty	-0.2608	0.5779	0.6522	**Total Poverty**	**-0.2422**	**0.0844**	**0.0045**	

Total Poverty and Reduced Poverty								
	Coefficient	Std. Error	p-value		Coefficient	Std. Error	p-value	
Total Poverty	-0.76279	1.0388	0.4635	**Total Poverty**	**-0.46445**	**0.150808**	**0.0023**	
Reduced Poverty	0.863224	1.48338	0.5612	Reduced Poverty	0.3821	0.21535	0.0773	

Reduced Poverty Only								
	Coefficient	Std. Error	p-value		Coefficient	Std. Error	p-value	
Reduced Poverty	-0.04133	0.825609	0.9601	Reduced Poverty	-0.16866	0.122076	0.1684	

From our comparison, we can see that the reduced poverty rate is not significant. However, even when regressed alongside the reduced poverty rate, total poverty is significant for violent crime. Interestingly, when regressed together, the two poverty measures show different signs.

Data for the complete regressions including the reduced poverty rate are presented in Appendix C.

Additional Considerations: The Classification of Crime

We have been using the FBI's criminal classifications throughout this paper. By these standards, robbery is considered a violent crime. While robbery is indeed a violent crime, it is also arguably property crime, and it is reasonable to think that a person committing such an act might be driven by pecuniary interests. This argument is not strong for the other categories of violent crimes (murder, forcible rape, and aggravated assault). Changing this classification to consider robbery a property crime rather than a violent crime might better highlight the factors contributing to strictly pecuniary crimes and those with little to no monetary payoff. The results of these regressions can be seen in Table 9.

Table 9. Weighted Two Stage Least Squares (adjusted crime classifications)

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	101.1130	31.2232	0.0014
Income Gini	17.4120	51.2983	0.7346
Pop. Density	**0.0094**	**0.0017**	**0.0000**
Unemployment	0.1262	0.7703	0.8700
Race	**-0.5047**	**0.1869**	**0.0074**
Poverty	-0.3265	0.5809	0.5746
Family Instability	**4.9559**	**1.0335**	**0.0000**
Residential Stability	0.4501	0.3211	0.1623
Police Ex. Per Capita	0.0901	0.0671	0.1806
Aged 15 - 24	0.1686	0.3069	0.5832
Female-Male Ratio	**1.9657**	**0.3614**	**0.0000**
High School Grad	**0.6057**	**0.2279**	**0.0084**
Gun Owners	**-18.5165**	**4.4054**	**0.0000**
Religious Participation	-0.0452	0.0873	0.6050

R^2 =.7203

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-11.2319	4.0794	0.0063
Income Gini	12.3288	6.7022	0.0671
Pop. Density	**0.0006**	**0.0002**	**0.0086**
Unemployment	0.0373	0.1006	0.7114
Race	-0.0493	0.0244	0.0448
Poverty	-0.1765	0.0759	0.0209
Family Instability	**0.5215**	**0.1350**	**0.0001**
Residential Stability	0.0922	0.0420	0.0289
Police Ex. Per Capita	0.0125	0.0088	0.1564
Aged 15 - 24	0.0864	0.0401	0.0321
Female-Male Ratio	**0.1851**	**0.0472**	**0.0001**
High School Grad	-0.0075	0.0298	0.8004
Gun Owners	**-1.6494**	**0.5756**	**0.0045**
Religious Participation	-0.0142	0.0114	0.2155

R^2 =.5461

Here we can see that the determinants of property crime do not appear to differ greatly. The same factors are significant, and the coefficients are close. For violent crime, however, income inequality and poverty are no longer significant, and there is more variation in the coefficients.

8. Conclusions.

After conducting regressions in various specifications, it can be seen for this data set that inequality is not necessarily a good predictor of total crime. It did not appear as a significant factor for property crime, although, as seen in previous studies (such as Kelly (2000) and Demombynes and Özler (2002)), it is large and significant in the case of violent crime. This seems to fall in line with strain theory, rather than an economic theory, although some violent crimes may be conducted with pecuniary intent (as with the case of robbery).

Poverty was not a consistently significant factor, which was somewhat unexpected. Also of interest is that in almost every case, poverty has a negative coefficient, including those regressions in which it is significant. It is possible that this is explained by the gap between those people who are making enough money to support themselves and those who are poor enough to qualify for various welfare programs. As more people fall below the income limit for state programs and are able to obtain goods through these avenues, crime may no longer look like an attractive option.

The three factors that appear significant throughout all regressions are population density (as expected), family instability (as expected), and the female-to male ratio. The fact that family instability has a large significant impact on both types of crime seems to validate social disorganization theory. The importance of this particular variable is well known and has been for some time; Fleisher (1966) also used it as one of his independent variables. The recurring importance of the percentage of residents staying in the same home for five years or more also hints at the importance of a strong community as a crime deterrent.

The significance of the female-to-male ratio is not altogether unexpected but for the fact that the sign is always positive, the opposite of what would seem likely. In fact, it is in direct opposition to Edlund, Li, Yi, and Zhang (2007), who found that the increase in males can account for as much as one-seventh of the crime increase in China under the government's one-child policy.

From these data, it appears that controlling economic circumstances would not have the strong impact on crime that policymakers might hope. While poverty and inequality might be considered ills of society for other reasons, based on these data they have less impact on crime than social factors. Rather, focusing on social issues (though probably more difficult) seems to be the key to reducing crime. Even poverty, which is appears to be significant in some specifications, is highly correlated to family instability, though this paper does not prove any causal links.

In order to test these results, longitudinal tests would be beneficial. Also, obtaining individual-level data might produce more precise measures of poverty and especially inequality. Considering the percentage of individuals earning just above the income limit for social welfare programs as a possible factor of crime might also yield some insight into the determinants of crime.

9. Appendices

Appendix A. Correlation Matrix for All Variables.

	Total Pop.	Income Gini	Pop. Density	Unemployment	Race	Poverty	Family Instability	Residential Stability	Police Ex. Per Capita	Aged 15-24	Female-to-Male Ratio	High School Grad	Gun Owners	Religious Participation
Total Pop.	1	-0.0146	**0.9381**	-0.0413	0.1554	-0.0799	0.0073	-0.3035	0.0410	0.1274	0.0547	0.1296	-0.0950	-0.1630
Income Gini	-0.0146	1	-0.0437	0.2988	0.3446	0.5432	0.4679	0.2840	-0.1740	0.1005	-0.1152	-0.4440	-0.0990	0.1874
Pop. Density	**0.9381**	-0.0437	1	-0.0612	0.1254	-0.1282	-0.0139	-0.3713	0.0409	0.1471	0.0633	0.1953	-0.0724	-0.1914
Unemployment	-0.0413	0.2988	-0.0612	1	0.5423	0.6622	0.5782	0.2866	0.0941	0.1147	-0.0100	-0.6223	-0.3292	-0.0777
Race	0.1554	0.3446	0.1254	0.5423	1	0.7274	0.6609	0.2454	-0.0269	0.3893	-0.0628	**-0.7588**	-0.5146	0.0345
Poverty	-0.0799	0.5432	-0.1282	0.6622	0.7274	1	**0.7735**	0.4174	-0.1469	0.2584	0.0251	**-0.8245**	-0.3709	0.1919
Family Instability	0.0073	0.4679	-0.0139	0.5782	0.6609	**0.7735**	1	0.2222	-0.1004	0.3273	-0.1147	-0.6504	-0.4248	0.1248
Residential Stability	-0.3035	0.2840	-0.3713	0.2866	0.2454	0.4174	0.2222	1	0.0717	-0.3813	0.1915	-0.5399	-0.0300	0.4051

	Religious Participation	Gun Owners	High School Grad	Female-to-Male Ratio	Aged 15-24	Police Ex. Per Capita
Total Pop.	-0.1630	-0.0950	0.1296	0.0547	0.1274	0.0410
Income Gini	0.1874	-0.0990	-0.4440	-0.1152	0.1005	-0.1740
Pop. Density	-0.1914	-0.0724	0.1953	0.0633	0.1471	0.0409
Unemployment	-0.0777	-0.3292	-0.6223	-0.0100	0.1147	0.0941
Race	0.0345	-0.5146	**-0.7588**	-0.0628	0.3893	-0.0269
Poverty	0.1919	-0.3709	**-0.8245**	0.0251	0.2584	-0.1469
Family Instability	0.1248	-0.4248	-0.6504	-0.1147	0.3273	-0.1004
Residential Stability	0.4051	-0.0300	-0.5399	0.1915	-0.3813	0.0717
Police Ex. Per Capita	-0.1565	-0.0425	0.1004	0.1156	-0.1235	1
Aged 15-24	-0.1814	-0.3264	-0.1449	-0.2057	1	-0.1235
Female-to-Male Ratio	0.1048	0.1592	0.0860	1	-0.2057	0.1156
High School Grad	-0.2364	0.4245	1	0.0860	-0.1449	0.1004
Gun Owners	-0.0435	1	0.4245	0.1592	-0.3264	-0.0425
Religious Participation	1	-0.0435	-0.2364	0.1048	-0.1814	-0.1565

Appendix B. Variables and Instruments.

Variable	Description
	Dependent Variables
Property Crime Rate	Number of property crimes per 1000 population, 2000
Violent Crime Rate	Number of violent crimes per 1000 population, 2000
	Independent Variables
Income Gini	Gini Index for household incomes, 2000
Total Population	County population, total, 2000
Population Density	Number of persons per square mile, 2000
Unemployment	Unemployment rate, 2000
Race	Percentage non-white (including Latino) population, 2000
Poverty	Percentage population living below the poverty line, 2000
Family Instability	Percentage of households with minor children headed by a single female, 2000
Residential Stability	Percentage of population living in the same house as five years previous, 2000
Police Ex. Per Capita	Dollars spent per person on police force, 1997
Aged 15 -24	Percentage of population aged 15 -24 years, 2000
Female to Male Ratio	Percentage of population 40 years or younger that is female, 2000
High School Grad.	Percentage of 25 year olds and older that graduated high school, 2000
Gun Owners	Percentage of citizens eligible to obtain CHL that are licensed, 2000
Religious Participation	Percentage of the population actively affiliated with a religious congregation, 2000
	Instruments
Per Capita Income	Income per capita, 1999
Total Revenues Per Capita	Local area government revenues per capita, 1997
Share Non-Police Expenditure	Local area government expenditures excluding police as a share of total revenue, 1997
Ratio Firearm Instructors	Ratio of eligible citizens for CHL to licensed CHL instructors, 2000

Appendix C.

Weighted Two-Stage Least Squares (including poverty and reduced poverty rates)

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-84.2257	39.8479	0.0356
Income Gini	1.5472	53.0862	0.9768
Pop. Density	0.0083	0.0017	0.0000
Unemployment	0.0717	0.7704	0.9259
Race	-0.5006	0.1862	0.0077
Poverty	-0.7628	1.0388	0.4635
Reduced Poverty	0.8632	1.4834	0.5612
Family Instability	5.0799	1.0988	0.0000
Residential Stability	0.4599	0.3204	0.1524
Police Ex. Per Capita	0.0836	0.0670	0.2137
Aged 15 - 24	0.0091	0.3973	0.9817
Female-Male Ratio	1.8559	0.4017	0.0000
High School Grad	0.5623	0.2433	0.0217
Gun Owners	-18.6751	4.4139	0.0000
Religious Participation	-0.0323	0.0879	0.7136

R^2 =.6964

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-7.2091	5.7849	0.2139
Income Gini	16.1238	7.7068	0.0375
Pop. Density	0.0015	0.0002	0.0000
Unemployment	0.1489	0.1118	0.1842
Race	-0.0507	0.0270	0.0619
Poverty	-0.4644	0.1508	0.0023
Reduced Poverty	0.3821	0.2154	0.0773
Family Instability	0.7197	0.1595	0.0000
Residential Stability	0.0967	0.0465	0.0387
Police Ex. Per Capita	0.0147	0.0097	0.1311
Aged 15 - 24	0.0329	0.0577	0.5689
Female-Male Ratio	0.1452	0.0583	0.0134
High School Grad	-0.0376	0.0353	0.2880
Gun Owners	-1.8867	0.6408	0.0036
Religious Participation	-0.0162	0.0128	0.2051

R^2 =.7643

Weighted Two-State Least Squares (reduced poverty rates only)

Property Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-95.8276	36.5465	0.0093
Income Gini	-5.3508	52.1983	0.9184
Pop. Density	0.0083	0.0017	0.0000
Unemployment	-0.0816	0.7408	0.9124
Race	-0.5169	0.1847	0.0056
Reduced Poverty	-0.0413	0.8256	0.9601
Family Instability	4.5586	0.8380	0.0000
Residential Stability	0.4683	0.3199	0.1445
Police Ex. Per Capita	0.1041	0.0608	0.0883
Aged 15 - 24	0.1074	0.3737	0.7741
Female-Male Ratio	1.8872	0.3991	0.0000
High School Grad	0.6735	0.1903	0.0005
Gun Owners	-18.3701	4.3901	0.0000
Religious Participation	-0.0449	0.0862	0.6030

R^2 =.6958

Violent Crime Rates per 1000 population

	Coefficient	Std. error	p-value
Constant	-14.2732	5.4038	0.0088
Income Gini	11.9238	7.7181	0.1237
Pop. Density	0.0015	0.0003	0.0000
Unemployment	0.0556	0.1095	0.6123
Race	-0.0606	0.0273	0.0274
Reduced Poverty	-0.1687	0.1221	0.1684
Family Instability	0.4024	0.1239	0.0013
Residential Stability	0.1018	0.0473	0.0323
Police Ex. Per Capita	0.0273	0.0090	0.0027
Aged 15 - 24	0.0927	0.0553	0.0946
Female-Male Ratio	0.1643	0.0590	0.0058
High School Grad	0.0301	0.0281	0.2860
Gun Owners	-1.7010	0.6491	0.0093
Religious Participation	-0.0239	0.0127	0.0622

R^2 =.7550

10. Bibliography

Baharom, A.H., and Muzafar Shah Habibullah (2009), "Crime and Income Inequality: the Case of Malaysia", *Journal of Politics and Law*, 2(1): 55-70.

Becker, Gary S. (1968), "Crime and Punishment: An Economic Approach", *Journal of Political Economy*, 76(2): 169-217.

Block, M.K. and J.M. Henieke (1975), "A Labor Theoretic Analysis of Criminal Choice", *American Economic Review*, 65(3): 314-325.

Burkey, Mark L. (2006), "Gini Coefficients for the 2000 Census", available at <http://main.burkeyacademy.com/home/gini-coefficients>. Retrieved 10/4/2012.

Chiu, W.H. and P. Madden (1998), "Burglary and Income Inequality", *Journal of Public Economics*, 69(1): 123-141.

Daly, Martin, Margo Wilson, and Shawn Vasdev (2001), "Income Inequality and Homicide Rates in Canada and the United States", *Canadian Journal of Criminology*, 219-236.

Demombynes, Gabriel, and Berk Özler (2002), "Crime and Local Inequality in South Africa", Policy Research Working Paper no. 2925.

Edlund, Lena, Hongbin Li, Junjian Yi, and Junsen Zhang (2007), "Sex Ratios and Crime: Evidence from China's One-Child Policy", IZA Discussion Paper no. 3214.

Ehrlich, Isaac (1973), "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation", *Journal of Political Economy*, 81(3): 521-565.

Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza (2002), "Inequality and Violent Crime", *Journal of Law and Economics*, 45(1): 1-39.

Fleisher, Belton (1966), "The Effect of Income on Delinquency", *American Economic Review*, 56(1/2): 118-137.

Glaeser, Edward, and Bruce Sacerdote (1999), "Why Is There More Crime in Cities?", *Journal of Political Economy,* 107(S6): S225-S258.

Grogger, Jeffery (1998), "Market Wages and Youth Crime", *Journal of Labor Economics*, 16: 756-791.

İmrohoroğlu, Ayse, Antonio Merlo, and Peter Rupert (2004), "What Accounts for the Decline in Crime?", *International Economic Review*, 45(3): 707-729.

Jones, Dale E. et al. (2002). *Congregations and Membership in the United States 2000,* Glenmary Research Center, Nashville, TN.

Kelly, Morgan (2000), "Inequality and Crime", *The Review of Economics and Statistics*, 82(4): 530-539.

Kornhauser, Ruth Rosner, (1978), *Social Sources of Delinquency: An Appraisal of Analytic Models,* University of Chicago Press, Chicago, IL.

Machin, Stephen, and Costas Meghir (2004), "Crime and Economic Incentives", *The Journal of Human Resources*, 39(4): 958-979.

Merton, Robert (1938), "Social Structure and Anomie", *American Sociological Review,* 3: 672-682.

Neumayer, Eric (2003), "Good Policy Can Lower Violent Crime: Evidence from a Cross-National Panel of Homicide Rates, 1980-97", *Journal of Peace Research,* 40(6): 619-640.

Neumayer, Eric (2005), "Inequality and Violent Crime: Evidence from Data on Robbery and Violent Theft", *Journal of Peace Research,* 42(1): 101-112.

Nilsson, Anna (2004), "Income Inequality and Crime: The Case of Sweden", IFAU Working Paper no. 2004:6.

Scorzafave, Luis Guilherme, and Milena Karla Soares (2009), "Income Inequality and Pecuniary Crimes", *Economic Letters,* 104: 40-42.

Shaw, Clifford, and Henry McKay (1942), *Juvenile Delinquency and Urban Areas,* University of Chicago Press, Chicago, IL.

Sjoquist, David (1973), "Property Crime and Economic Behavior: Some Empirical Results", *American Economic Review,* 63(3): 439-446.