

CRIME AND VICTIMIZATION

An Economic Perspective

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May 8, 2000

Abstract

The recent upward trend in crime rates of developing countries has spurred widespread public concern about personal and proprietary insecurity. In some countries, the questions of crime, violence, and victimization are attracting more attention from academics and policy makers than traditional economic problems. The objective of this paper is to examine the main issues related to crime and victimization from an economic perspective. For this purpose the paper combines a review of the main results established in the literature with original research on the causes of crime and the risk factors of victimization. The first section provides a review of the estimates of the costs of crime, the main theoretical and empirical research on its causes, and the relative advantages of official and survey data on crime. The second section presents original work on the main causes of violent crime from a cross-country perspective. The empirical work starts with a basic model of the economic determinants of homicide and robbery rates. In turn, this empirical model is extended along five dimensions: 1) deterrence factors, 2) illegal drug-related activities, 3) demographic issues, 4) income and ethnic polarization, and 5) social capital. The third section reviews recent case studies of Latin American cities that rely on survey data to assess the empirical determinants of the probability of victimization. These studies focus on three types of risk factors: 1) individual characteristics, 2) household characteristics, and 3) community characteristics. The main conclusions from the previous sections are summarized in section four.

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INTRODUCTION

The incidence of crime and violence varies widely across nations and regions of the world. Within specific countries, there is also substantial variation in the risks of victimization faced by individuals living in different areas and belonging to diverse social and demographic groups. Notwithstanding the enormous heterogeneity in the *levels* of crime and victimization rates, there are signs that during the past decades the problems of crime and violence have worsened considerably around the world. Crime rates in industrialized countries have increased by rates of the order of 300-400% since the late 1960s.² For example, rates of violent crime, such as intentional homicide rates, have also risen in many countries. From the early 1980s to the mid 1990s, the rate of intentional homicides increased by 50% in Latin America and Sub-Saharan Africa and by more than 100% in Eastern Europe and Central Asia.³

The recent upward trend in crime rates has spurred widespread public concern about issues related to crime and insecurity, which in many countries now attract more attention than traditional economic issues such as unemployment, inflation, and taxes. In the United States, public opinion polls conducted during the mid-1990s reported violent crime as the nation's "most serious problem".⁴ In England and the Netherlands more than half of the public see crime as the number one problem facing their country, while in France 39% place it at the top of citizens' concerns.⁵ Similar conclusions can be derived from polls conducted in 17 Latin American countries in 1996, where violence was described as "the region's main social and economic problem."⁶

The objective of this paper is to examine the main issues concerning crime and victimization from an economic perspective. For this purpose we combine a review of the main results established in the literature with original research on the causes of crime and the risk factors of victimization. The first section provides a review of the costs, causes, and data on

² International Centre for the Prevention of Crime (1998), chapter 3, p. 5.

³ Fajnzylber, Lederman and Loayza (1998), pp. 11-15.

⁴ New York Times and CBS poll quoted in Blumstein (1995), p. 10.

⁵ International Centre for the Prevention of Crime (1998), chapter 3, p. 2.

⁶ Polls conducted by LatinoBarómetro, quoted in Londoño and Guerrero (1999), p. 6.

crime. We present the main methodological approaches to the measurement of the costs of crime, together with some estimates for selected developed and developing countries. For the review of the causes of crime, we provide a brief literature survey extending from Becker's original contribution to the recent developments that emphasize social interactions. The survey covers both theoretical results and empirical evidence, emphasizing how the interaction between the two has stimulated their development. Lastly, the section on crime data describes the main sources of information regarding the incidence of various types of crime and the characteristics of victims and offenders. We discuss the relative advantages of crime statistics derived from official sources and from victim and offender surveys.

The second section presents original work on the main causes of violent crime from a cross-country perspective. The objective of this section is to analyze the social and economic determinants of homicide and robbery rates (at a national level) in a worldwide sample of countries. We start with an empirical model in which the main determinants of violent crime rates are economic variables. This basic model includes as explanatory variables the average and distribution of national income, the growth rate of output, and the average educational attainment of the adult population. In turn, we extend the basic model along five dimensions: 1) deterrence factors, 2) illegal drug-related activities, 3) demographic issues, 4) income and ethnic polarization, and 5) social capital. Section III reviews the empirical evidence from recent Latin American case studies that rely on household or individual victimization surveys conducted in major urban centers in the late 1990s. Finally section four, summarizes the main conclusions from the previous sections.

I. A REVIEW OF THE COSTS, CAUSES, AND DATA ON CRIME

A. THE COSTS OF CRIME

The concern with crime is well justified given its pernicious effects on economic activity and, more generally, on the quality of life of people who must cope with a reduced sense of personal and proprietary security. There are several approaches to the measurement of the social costs of crime and estimates vary considerably depending on the adopted methodologies and assumptions.

The simplest way of estimating the economic costs of crime is to adopt an accounting perspective and add up all the direct and indirect losses from crime. Lack of appropriate data and disagreements on the specific assumptions about the opportunity costs of the resources lost because of crime constitute the main limitations to this type of calculation. The most common categories considered in the accounting of the costs from crime include the amounts spent on policing, courts and prisons, private security expenditures, the value of potential years of life lost due to murder or crime-related disabilities, and the health-care costs associated with traumas caused by violence (when they do not result in death or disability). There are other indirect costs from crime that are more difficult to quantify. Indeed, complete estimates should include the discounted value of stolen properties (see below), the under-investment that crime causes in the legal sector, the reduced productivity of businesses, reductions in the rates of human and social capital accumulation, the lowering of labor force participation rates, and the intergenerational transmission of violent behaviors.⁷

Since many stolen goods are not lost to society as a whole but are instead transferred from victims to criminals, it is not obvious that the total value of those goods should be accounted as a social cost. For instance, since the value of stolen properties is potentially smaller for the criminals than for the victims, one could argue that only the difference between these two valuations should be taken into consideration as a welfare loss. However, as emphasized by Glaeser (1999), given that the time spent by criminals in illegal rather than legal activities is in fact a social loss and since the value of goods taken should in equilibrium be equal to the opportunity cost of the criminals' time, it can be argued that all property losses should be considered social losses.⁸

Estimates performed in industrialized countries indicate that the costs of shattered lives account for the largest share of all measured crime costs: in France, Australia, England and the United States the value of lost lives represents more than 40% of those costs.⁹ In the specific case of women, according to the 1993 *World Development Report*, 9 million years of healthy lives are lost annually in the world as a result of rape and domestic violence. This loss is larger than the

⁷ See Buvinic and Morrison (1999), Technical Note 4.

⁸ Glaeser (1999), p. 19.

⁹ International Centre for the Prevention of Crime (1998), chapter 2, p. 3.

corresponding one due to all types of cancer in women and twice as large as the loss due to motor-vehicle accidents suffered by women.¹⁰

In the United States, a study using 1992 data estimated that crime caused a loss of \$170 billion dollars in the form of potential years of life lost and suffering, while public expenditures on the criminal justice system and private security costs amounted to \$90 and \$65 billion dollars, respectively.¹¹ Adding these figures to the value of lost jobs due to urban decay (\$50 billion), property losses (\$45 billion) and treatment of crime victims (\$5 billion), this study estimated the total cost of crime to be \$425 billion per year. This represents more than 5% of the U.S. Gross Domestic Product, a figure that is similar to those obtained by analogous procedures in Australia, Canada and the Netherlands.¹²

In Latin America, a recent study conducted at the Inter-American Development Bank estimates that the social costs of crime, including the value of stolen properties, amount to \$168 billion dollars, or 14.2% of the region's GDP.¹³ The largest cost category in this study is that of "intangibles" which accounts for half of the estimated costs of crime. It includes the effects of crime on investment and productivity (estimated on the basis of unspecified time-series or cross-country econometric models) and the impact on labor and consumption (as measured in unspecified surveys by the citizens' willingness to pay to avoid violence). One could argue that the very high intangible costs from crime found in Latin America are the result of the region's higher *levels* of crime, possibly coupled to a non-linearity in the relationship between crime and its impact on citizens' welfare. That is, the pernicious effects on the quality of life may in fact accelerate when crime rates cross some threshold level. However, it is also theoretically plausible that crime produces diminishing welfare effects as its incidence rises. Alternatively, one could attribute the higher Latin American estimates of "intangible" costs to methodological differences and/or to the sensibility of the results to the quality of the available data.¹⁴

¹⁰ Buvinic and Morrison (1999), Technical Note 4.

¹¹ Mandel et. al. (1993).

¹² International Centre for the Prevention of Crime (1998), chapter 2, p. 3.

¹³ Londoño and Guerrero (1999), p. 27.

¹⁴ An approach that has not been applied to date in Latin America is that of using housing price hedonics to measure the economic costs of crime. In the United States, results from studies of this type indicate that a doubling of crime rates could lead to a reduction of 8 to 12.5% in real estate costs (Buvinic and Morrison, 1999). As argued by Glaeser (1999), p. 20, one advantage of these studies is that they generate estimates of the value of *marginal reductions* in the level of crime, as opposed to accounting estimates of the *total costs* of crime. Indeed, the former may be most useful from a practical point of view, since most policy measures will not lead to a complete eradication but rather to marginal reductions of the level of crime.

If one excludes “intangibles” and the value of stolen goods (about \$25 billion dollars), the remaining social costs of crime still amount to 4.9% of Latin America’s GDP, with the largest category being the cost of potential lives lost and other health-related costs (1.9% of the region’s GDP), followed by the expenditures in police and the criminal justice system (1.6% of GDP), and the cost of private security (1.4% of GDP).¹⁵ Worthy of note is the fact that there are considerable differences across countries in the estimates obtained by the IDB. Thus, while Mexico stands close to the region’s average, with crime costs (excluding intangibles and transfers) of 4.9% of GDP, crime in El Salvador and Colombia lead to losses of, respectively, 9.2 and 11.4% of GDP. At the other end of the spectrum, crime-related costs in Peru and Brazil amount to, respectively, 2.9 and 3.3% of GDP.¹⁶

The very high social and economic costs of crime and violence indicate that these problems have become serious obstacles to sustainable social and economic development in many countries around the world. Moreover, the recent worrisome trends in crime rates have created a sense of urgency and have attracted the attention of governments and international organizations, which now face the formidable challenge of designing and implementing policies to prevent and reduce crime and violence. A necessary first step to undertake this challenge is to develop a better knowledge of the causes of crime and violence.

B. THE CAUSES OF CRIME

At least since the pioneering work of Becker (1968), economists have analyzed the determinants of crime from the perspective of the offender’s rational decision to participate in illegal activities, on the basis of a cost-benefit analysis. In his Nobel lecture, Becker emphasized that the economic way of looking at human behavior is a “*method* of analysis, not an assumption about particular motivations, ... [which] assumes that individuals maximize welfare *as they conceive it...*”¹⁷ Regarding issues of crime and punishment, Becker writes that this “[r]ationality imp[li]e[s] that some individuals become criminals because of the financial and other rewards from crime compared to legal work, taking account of the likelihood of apprehension and conviction, and the severity of punishment.”¹⁸

¹⁵ Londoño and Guerrero (1999), p. 22.

¹⁶ Londoño and Guerrero (1999), p. 26.

¹⁷ Becker (1993), pp. 385-386.

¹⁸ Becker (1993), pp. 390.

One of the main insights from Becker's approach is that criminal behavior responds to changes in expected punishment. This assertion has received considerable empirical support dating back at least to the 1970s. This evidence has been based on econometric analysis of the effects of expected punishment on crime, using cross-sectional and time-series data at the level of states, cities and neighborhoods, while controlling for a number of other factors. Examples of early studies of this sort are Ehrlich (1973) and Mathieson and Passell (1976), who generated estimates of the elasticity of crime with respect to the expected size of punishment of -0.5 and -0.3 respectively. Moreover, using data on capital punishment provisions across the United States, Ehrlich (1975a) found a major impact from the death penalty on crime rates.

Analysts often make a subtle distinction between the "deterrent" effects of policing and convictions and the incapacitation or "preventive" effects of locking-up (or killing, in the case of capital punishment) criminals who have a tendency to rejoin the crime industry once they are released. Indeed, as stated by Ehrlich (1981), "deterrence essentially aims at modifying the 'price of crime' for all offenders while incapacitation – and for that matter, rehabilitation – acts through the removal of a subset of convicted offenders from the market for offenses...."¹⁹ The empirical evidence, at least for the United States, has favored the idea that imprisonment reduces crime rates mostly through deterrence rather than incapacitation.²⁰

A related consideration for assessing the effectiveness of deterrence is the individual's attitude towards risk, which affects her expected utility from illegal income. In principle, if individuals are risk-neutral, increases in the probability of arrest and conviction and increases in the size of the penalty, conditional upon conviction, should have the same effect on crime. For risk-averse individuals, however, raising the probability of conviction may have greater deterrent effects than raising the severity of punishment.²¹ The empirical evidence for the United States indicates that criminals may indeed be risk-averse, as they respond more readily to increases in the probability of arrest than to increases in the time spent in prison.²²

One serious econometric problem that afflicts most of the early empirical estimates of the crime and punishment relationship is that crime-reducing efforts through increased deterrence

¹⁹ Ehrlich (1981), p. 311.

²⁰ Ehrlich (1975a, 1981), Levitt (1998).

²¹ Becker (1968), p. 178, and Ehrlich (1973), p. 528. The standard assumption in theoretical models is to consider individuals who are risk averse, but who exhibit decreasing risk aversion with increasing income. Schmidt and Witte (1984), p. 161.

are usually not exogenous with respect to crime levels. High crime rates may induce governments to increase the number of police or the severity of the punishment. Thus, ordinary least squares regressions of crime rates on deterrence variables may underestimate the crime reducing effect of the latter, and even lead to spurious positive correlations between crime and deterrence. The work of Steven Levitt (1996, 1997, 1998) has greatly contributed to overcome this problem by making use of econometric techniques aimed at isolating exogenous sources of variation in the level of deterrence. By constructing variables that capture exogenous variations in the size of the prison population, the number of police per capita, and conviction rates, Levitt has found robust evidence that all these measures of deterrence have significant effects on crime, as predicted by Becker's economic model.²³

The literature focusing on the payoffs and opportunity costs of crime is also rich. Fleisher (1966) and Ehrlich (1973) were pioneers in studying the effects of income levels and income disparities on the incidence of crime. As argued by Fleisher, the theoretical effect on crime of higher levels of average income is *a priori* ambiguous, because both the opportunity cost and the expected payoff from crime are correlated with income. Though Fleisher's and Ehrlich's empirical findings about the effects of income levels are mutually contradictory,²⁴ both authors found a significant crime-inducing impact of income inequality.²⁵ Ehrlich's (1973) interpretation of this result is that, for a given median income, larger income inequality is an indication of a larger absolute differential between the payoffs from legal and illegal activities.²⁶

There are also a number of studies that have focused on the relationship between crime and labor market outcomes, such as employment and wages. Both Fleisher (1966) and Ehrlich

²² Grogger (1991). This result is also supportive of the prevalence of the deterrent vis-à-vis the incapacitation effects of imprisonment.

²³ Levitt (1996) studies the effect on crime rates of releasing criminals due to prison overcrowding. Levitt (1997) uses the changes in the number of police per capita that are brought about by electoral cycles to elicit the "pure" effect of policing on crime rates across cities. Levitt (1998) estimates the effect of conviction rates for a specific type of offense on the rates of other crimes and compares estimates obtained from short and long differences of the data. He uses the results to infer the relative importance of deterrence, incapacitation, and measurement error in the explanation of the negative relationship between crime and conviction rates.

²⁴ Fleisher (1966) found a negative effect from city average family income on young males arrest rates, while Ehrlich (1973) found that higher state median family incomes were associated with larger rates of violent and property crimes.

²⁵ Fleisher (1966) measured income inequality as the difference between the average income of the second lowest quartile and the highest quartile of households. The income inequality variable used by Ehrlich (1973) is the percentage of families below one-half of the median income.

²⁶ Ehrlich (1973) assumes that median state income is a good proxy for the payoffs from crime – the "opportunities provided by potential victims of crime" – while legitimate opportunities available to potential offenders may be approximated by the mean income level of those below the state's median income.

(1973) considered the effect on crime of the unemployment rate, viewing the latter as a complementary indicator of income opportunities available in the formal labor market.²⁷ In their empirical studies, however, both authors found that unemployment rates are less important than income levels and distribution. As reviewed by Freeman (1994), time series studies have failed to uncover a robust, positive and significant relationship between unemployment and crime, but most studies based on cross-sectional and individual data do point in that direction.²⁸ A recent study based on individual data that uncovered a negative relationship between the fraction of time working and arrest rates is Tauchen, Witte and Griesinger (1994), which follows the Philadelphia birth cohort of 1945.²⁹ In another recent study with individual data, Grogger (1997) provided convincing evidence that relates market wages to youth crime participation rates. The author uses data from the U.S. National Longitudinal Survey of Youth (NLSY) to estimate a time-allocation model where individuals choose how much time to allocate to legal and illegal work. His econometric results indicate that the fall in youth wages observed in the United States since the mid-1970's may explain as much as three quarters of the rise in youth crime over the same period.³⁰

Another important factor related to the effect of economic conditions on crime is the level of education of the population, which can determine the expected rewards from both legal and criminal activities. As shown by Freeman (1991), criminals tend to be less educated and from poorer backgrounds than others: in 1986, over two thirds of all 18-24 year old imprisoned men and three fourths of the 18-24 year old black prisoners had fewer than 12 years of schooling. For the corresponding cohorts of non-imprisoned men, the fractions with that level of educational attainment were 25 and 30%, respectively.³¹ Thus, one could expect that areas with higher average educational levels should have a lower incidence of crime. Ehrlich (1975b), however, found that property crime rates in the United States were positively and significantly related to the average years of schooling of the population aged 25 and over, even after controlling for income inequality and median income. Several explanations of this puzzling empirical finding

²⁷ In the words of Fleisher (1966), "in attempting to estimate the effect of income on delinquency, it is important to consider the effects of both normal family incomes and deviations from normal due to unemployment" (p. 121).

²⁸ Two notable exceptions are Witte (1980) and Trumbull (1989). Trumbull's (1989) analysis is based on county level data from North Carolina, while Witte (1980) follows a sample of North Carolina men released from prison.

²⁹ Tauchen, Witte and Griesinger (1994), p. 410.

³⁰ Grogger (1997), p. 32. The author's econometric results on the youth wage-crime relationship also help explain racial differences in rates of crime participation and the age distribution of crime.

³¹ Freeman (1991), p. 6.

were provided by this author: education may raise productivity in illegal activities to a greater extent than in legal ones; higher average levels of education may be associated with less underreporting of crimes and with wealthier potential victims, and finally, higher average levels of education may go hand-in-hand with more pronounced educational inequities.³²

In contrast, the evidence from studies based on individual data does support a negative effect of education on crime, although not necessarily derived from the greater legitimate income potentially associated with education, but rather from the participation in legitimate activities per se. Witte and Tauchen (1994), for example, found that for a sample of young men, the act of going to school and/or work reduces the probability of committing criminal acts, even if a high school degree does not have a significant effect on that probability.³³

In somewhat of a departure from Becker's paradigm, an increasing body of evidence has turned to sociological aspects that affect the incidence of crime. As argued by DiIulio (1996), it is possible that the prevalence of high crime rates in U.S. cities was related to the depletion of what social scientists have called "social capital."³⁴ As defined by Putnam (1993), the term "social capital" refers to "features of social organization, such as trust, norms, and networks, which can improve the efficiency of society in facilitating coordinated actions."³⁵ As supportive evidence for the role of social capital, Freeman (1986) finds a strong relationship between church attendance and a lower probability of arrest for youth surveyed in the NLSY. Similarly, Glaeser and Sacerdote (1999) found that the most important observable characteristic of urban residents in the explanation of city crime rates in the U.S. is the percentage of female-headed households, which is responsible for almost 30% of the city-crime effect.³⁶

In the same vein, some contributions to the economics of crime have emphasized that individual perceptions of the benefits and costs associated with criminal activity are determined by their "vicinity." Using a survey of Boston disadvantaged youths, Case and Katz (1991) found that an individual's propensity to commit a crime rises when his peers are also engaged in

³² Ehrlich (1973), pp. 319-335.

³³ The same finding is reported in Tauchen, Witte and Griesinger (1994), p. 410, who find a negative relationship between crime and variables for the fractions of time at work and at school, but no significant effect from educational attainment on arrest rates. Moreover, the coefficients on the time spent at work and at school are not significantly different from one another. This finding is also present in Farrington et al. (1986), Gottfredson (1985), and Viscusi (1986).

³⁴ DiIulio (1996), pp.20-21.

³⁵ Putnam (1993), p. 173.

³⁶ Glaeser and Sacerdote (1999), p. S253.

criminal activities. This empirical finding has been modeled by Glaeser, Sacerdote, and Scheinkman (1996), who emphasize the role of social interactions in explaining the significant variance of crime rates across U.S. cities. As argued by these authors, both the cost of crime and the taste for it are determined by local social interactions between criminals, their peers and family members.³⁷ An important implication of this approach is that crime rates across different cities need not converge.

Sah (1991) emphasized the role of another type of social interaction, this time operating at the macro or systemic level. This author argued that individuals living in areas with high crime participation rates can perceive a lower probability of apprehension than those living in areas with low crime participation rates because the resources spent in apprehending each criminal tend to be low in high crime areas. An important implication of this analysis is that “past crime breeds future crime.”³⁸ Thus, as it is the case with the social interactions modeled by Glaeser et al. (1996), systemic social interactions may cause cities and countries to experience criminal inertia over time.

As we have tried to illustrate, the economics literature on the causes of crime has transited from an emphasis on deterrence effects and economic conditions to more recent considerations of social factors that may help explain how crime is propagated over time and within communities. This evolution has been spurred by the continuous interaction between theoretical and empirical contributions. The development of the latter, in particular, is highly dependent on the availability of appropriate sources of data, to which we now turn.

C. THE DATA ON CRIME

Empirical studies on the economic determinants of crime can take several forms and aim at different objectives, depending on the type of data that they use. The data on crime can be classified according to its source, level of aggregation and availability of longitudinal observations.

The most frequently used source of crime data is the criminal justice system. Official crime statistics can be tabulated at different levels of aggregation – e.g. counties, cities, states or countries – and allow for analysis based on time series, cross sectional or even panel data. The

³⁷ Glaeser, Sacerdote and Scheinkman (1996), p. 512.

³⁸ Sah (1991), p. 1282.

main limitation of this source of data is that only a fraction of all offenses ever make their way into official statistics, which are commonly thought to underestimate the actual incidence of crime. This happens because victims frequently do not report crimes to the police, especially when minor offenses are involved, when victims do not have confidence in the local authorities, and when victims view the event as a “private matter.” The latter is most often the case in crimes of interpersonal violence (e.g., rape) and when offenders are known to the victims (e.g., domestic violence).³⁹

Official crime data also suffers from deficiencies in the recording procedures of the police and justice systems, which in many cases do not compute their statistics from the complete set of law enforcement agencies existing in each country. Moreover, there is a well justified concern that the quality of official crime statistics is jeopardized by the selectivity with which crimes may be recorded by the criminal justice system: crime statistics could be measuring “the behavior of officials and not of crime.”⁴⁰ For example, in El Salvador the Fiscalia General de la Republica (the office of the country’s chief prosecutor) only records crimes for which there is an indicted suspect.⁴¹

A second type of crime data involves homicide and intentional injury statistics collected from hospitals and morticians. This data is usually collected and tabulated by the countries’ health authorities and serves as an alternative, or complement, to the violent crime statistics collected through law enforcement agencies. Tabulations are available at several levels of aggregation, and usually in the form of time series.

Homicide data is of special interest because this crime is usually thought to suffer the least from the problems of underreporting and underrecording that afflict official crime statistics. Especially in cross-national studies, the use of homicide data is also justified by the fact that it is less sensitive to changing definitions of crimes across legal systems. Even in the United States, experts have frequently focused on homicides as a proxy for crime, not only because “it is a fairly reliable barometer of all violent crime” but also because “at a national level, no other crime is measured as accurately and precisely.”⁴²

³⁹ Gottfredson (1986), p. 257.

⁴⁰ Gottfredson (1986), p. 256.

⁴¹ Cruz et al. (2000), p. 14.

⁴² Fox and Zawitz (2000), p. 1.

Victimization surveys constitute the third source of crime data and, as stated by Glaeser (1999), they are “the primary workhorse” for measuring crime.⁴³ These surveys are collected from city- or country-representative samples of households. They provide information about non-fatal crimes and have the main advantage of including incidents not reported to the police, as well as detailed information about victims, offenders and criminal offenses. To be useful for analysis, victimization surveys must have geographic identifiers which enable the researcher to link the individual to the community in which she lives and/or was victimized. Then the researcher also needs to know attributes of that community, which may be drawn from broader national surveys or national census. Victimization surveys are a relatively new source of crime data. In the United States, they have been regularly performed since 1973 by the Bureau of Justice Statistics in conjunction with the Census Bureau. Other countries that pioneered this type of research are the United Kingdom, the Netherlands, and Canada. Since 1989, the United Nations Interregional Crime and Justice Research Institute (UNICRI) has been promoting the application of methodologically consistent city victimization surveys around the world. To date, these International Crime Victim Surveys (ICVS) have been performed in 55 countries.⁴⁴

A final data source is the offender survey. This type of survey can both be taken through traditional survey methods where respondents are asked if they have been arrested (or less reliably if they have committed a crime). Alternatively, these surveys can be done at the point of arrest, or through surveys of prison population. For that type of survey to be effective it must be assumed that the police arrest a relatively random sample of the population of criminals. When this type of data set is merged with data on the population at large, then it is possible to identify how criminals differ from average citizens. This was the approach adopted by Glueck and Glueck (1950, 1968), who are known as the pioneers of the empirical research on crime in the United States. These authors followed two matched samples of offenders and non-offenders over many years and laid the foundations for most of the subsequent cross-sectional and longitudinal research in criminology.⁴⁵

All in all, it can be said that cross sectional and panel data studies have been the most common, while the studies using exclusively time series data have been the less abundant. This

⁴³ Glaeser (1999), p. 26.

⁴⁴ Newman (1999), p. 25.

⁴⁵ Gottfredson and Hirschi (1990), p. 221. Cruz et al. (2000) use prison survey data to study the factors that make some criminals more violent than others.

is largely attributable to the fact that time series of crime data are usually not available for long periods. However, it is worth noting that time-series studies and those based on panel data share some important advantages. Unlike cross-sectional studies, they allow researchers to establish cause and effect, “by showing that changes in one factor are followed by changes in another.”⁴⁶ Moreover, the exploitation of the temporal variation in the data allows for the consideration of the effects of the business cycle on crime, as well as for the testing of the hypothesis of criminal inertia. For this reason, studies of the relationship between crime and the labor market have frequently used time series or panel data sets.⁴⁷

II. CROSS-COUNTRY EVIDENCE⁴⁸

A. EMPIRICAL APPROACH

1. Objective

The objective of this section is to analyze the social and economic causes of violent crime rates in a worldwide sample of countries. The dependent variable of the empirical model, that is the variable whose cross-country and over-time variance we attempt to explain, is the incidence of violent crime at a national level. For reasons explained in the following section, the incidence of violent crime in a country is proxied by its rates of intentional homicides and robberies. In most empirical applications considered below, the data set consists of an unbalanced panel of about 45 countries for homicides and 34 countries for robberies, covering the period 1970-94.

We start with an empirical model in which the main determinants of violent crime rates are economic variables. This basic model includes as explanatory variables the output growth rate, the average income of the population, the level of income inequality, the average educational attainment of the adult population, and the lagged crime rate. Then, we extend the basic model along five dimensions. First, we consider deterrence factors by estimating, alternatively, the effects of police presence in the country and the existence of capital punishment. Given the importance of deterrence in the crime literature, we would have wanted

⁴⁶ Farrington (1986), p. 212. Panel data studies also provide the researcher with means of controlling for reverse causality and other sources of endogeneity in the explanatory variables.

⁴⁷ Freeman (1994), p. 10. These studies have often found that crime rates are negatively related to the contemporaneous unemployment rate but positively related to the first lag of this variable, a finding that has been interpreted by arguing that those different signs reflect, respectively, the effects of reduced criminal opportunities and reduced opportunity costs of crime.

⁴⁸ This section draws freely from Fajnzylber, Lederman, and Loayza (1999, 2000), and Lederman, Loayza, and Menéndez (1999).

to include these variables in the core model. We decided against it because we only have limited cross-sectional data for these variables. The second extension deals with the effects of illegal drugs in two aspects, namely, the production of drugs in the country and the rate of drug possession.

The third extension considers demographic issues. In particular, we study whether the degree of urbanization and the age composition of the population, respectively, have an effect on the incidence of violent crime. Fourth, we explore more deeply the relationship between inequality and violent crime by considering the effects of other variables closely linked with income inequality. They are the level of educational inequality, the degree of income polarization, and the extent of ethnic and linguistic fractionalization of the population. The last extension deals with the relationship between social capital and violent crime. For this purpose we analyze the crime-reducing effect of measures of trust among community members and participation in voluntary secular and religious organizations.

2. Crime Data⁴⁹

One of the reasons cross-country crime studies are uncommon is that it is difficult to compare crime rates across countries. The issues of mismeasurement associated with aggregate variables are quite severe for most types of crime data. Underreporting is widespread in countries with low quality police and judicial systems and with poorly educated populations. In fact, Soares (1999) finds that the extent of underreporting is negatively correlated with the level of development. Underreporting is most pronounced for low-value property crime (e.g., common theft) and for crimes carrying a social stigma for the victim (e.g., rape).

In this paper we attempt to reduce the biases caused by measurement errors by, first, choosing the types of crime that are least likely to be affected by mismeasurement and, second, employing an econometric methodology that deals with systematic measurement error. The types of crime we work with are intentional homicides and robberies. Robberies are more likely to be reported than other property crimes given that robberies include a violent component, thus giving victims an additional reason to report the crime. Of all types of crime, intentional homicide statistics suffer the least from underreporting, underrecording and non-uniformity of definitions. Furthermore, the incidence of homicide appears to be a good proxy for other types of common

⁴⁹ For details on definitions and sources of crime data and other variables, see Appendix Table 1.

crime. According to Donohue (1998: 1425), “while homicide data may not be perfectly reflective of the time trend in all crimes, it does seem to follow the pattern of most other street crimes fairly well during the recent periods when more accurate data is available for these other crimes... while murder may not be a perfect proxy for crime, it is simply the best we have.” To the extent that intentional homicide and robbery are good proxies for overall crime, our conclusions apply to criminal activities broadly understood. However, if these types of crime proxy mostly for violent crime, our results apply more narrowly.

We work with two sources of international official crime statistics. The first is the United Nations World Crime Surveys (UN), which collect crime statistics from national justice ministries. From this source, we obtain statistics on the number of intentional homicides and robberies as reported by the police. The data set consists of an unbalanced panel of non-overlapping five-year averages covering the period 1970-94 for about 45 countries for homicides and 34 countries for robberies. The data set included in the regressions was selected according to the quality of the available crime data and by the availability of at least three consecutive observations.⁵⁰ The regression samples based on UN data feature some balance between observations from developed and developing countries. In fact, 16 of the 45 countries in the homicide regressions and 14 out of 34 in the robbery regressions belong to industrialized countries. However, these regression samples exclude countries from Sub-Saharan Africa, due to the lack of data for three consecutive 5-year periods.

Our second source of crime statistics is the mortality data from the World Health Organization (WHO), which in turn collects this information from national public health records. From this source, we obtain a second measure for the incidence of homicides in a country. In the WHO data set, a homicide is defined as a death purposefully inflicted by another person, as determined by an accredited public health official. The regression sample based on WHO data consists of an unbalanced panel of non-overlapping five-year averages for the period 1965-95 and covering about 45 developed and developing countries. Despite the similarity in the total number of countries, the composition of the WHO and UN homicide data sets are somewhat

⁵⁰ To control for quality we excluded countries that had 10-fold or greater increases in the reported number of crimes from one year to another. The presumption underlying this criterion is that such large jumps in the series could only be due to changes in definitions or reporting standards. For more detailed information on the how the data was "cleaned", please refer to the Appendix in Fajnzylber et al. (1998).

different. In the WHO data set, industrialized and Latin American countries are over represented.⁵¹

In most empirical exercises discussed below we use the information provided by the UN source. The reason for this is that regressions based on UN data allow the comparison between homicide and robbery results. We use the WHO data set both to test the robustness of the results concerning the basic economic model and to examine in greater depth the relationship between inequality and violent crime. In the latter case, the larger time coverage of the WHO data set is an important advantage given that, for the purpose of this exercise, we must consider a polarization index that has rather limited coverage.

3. Econometric Methodology

For most of the empirical analysis of this section, we use a generalized method of moments (GMM) estimator applied to dynamic models of panel data. This estimator was developed by Chamberlain (1984), Holtz-Eakin, Newey and Rosen (1988), and, particularly, Arellano and Bond (1991) and Arellano and Bover (1995). With this methodology we can use panel data to control for the joint endogeneity of crime determinants and the presence of unobserved country-specific effects, such as systematic measurement error in crime statistics.⁵²

Working with panel data and a corresponding GMM dynamic estimator allows us to overcome some of the estimation problems that have troubled empirical studies on the causes of crime. Combining the time-series with the cross-country dimensions of the data can add important information, permitting both a richer model specification and ways to control for joint endogeneity and unobserved country-specific effects. Regarding the model specification, first we would like to consider the variables that drive the differences in crime rates across countries. These are variables that vary slowly over time but significantly from one country to the rest. Examples of them are national income inequality and the geographic conditions favorable to illegal drug production. Second, we would like to consider the information provided by variables that vary significantly over time. This is the case of GDP growth, whose time-series variance can allow us to test business-cycle effects on the incidence of crime. Using panel data,

⁵¹ In the basic WHO regression sample there are 20 countries from the OECD, 10 countries from Latin America, 5 from the Caribbean, 4 from East Asia, 3 from Eastern Europe and Central Asia, and 3 from Africa and the Middle East.

we can also consider the effect of variables that vary notably both over time and across countries. This is the case of indicators of overall development, such as per capita GNP, educational attainment, police presence, urbanization, and the age composition of the population. Third, by considering the patterns of crime rates for a given country over time, we can test whether there is inertia in crime rates. In the regression models, we test for inertia by including the lagged crime rate as an explanatory variable.

Regarding the correction of estimation biases, we first would like to control for the joint endogeneity of some of the explanatory variables. It is likely that the incidence of crime is not only driven by but also affects a number of economic and social variables. For instance, if crime occurs mostly among the poor, more crime may result in higher income inequality. Likewise, higher crime rates may scare away domestic investment and, thus, hurt economic growth. In extreme cases, the incidence of crime and violence may even alter the urban structure of the country and even its age composition. Controlling for joint endogeneity is essential to obtain consistent estimates of the effect of various economic and social variables on crime rates. Our GMM estimator uses the panel structure of our data set to identify instruments for the explanatory variables. These are the lagged values of the explanatory variables themselves. They are appropriate instruments under the assumption that the error term is not serially correlated. As explained below, the validity of this assumption can be tested statistically.

Finally, the GMM dynamic panel-data estimator allows us to control for the effect of unobserved variables that vary little over time and can, thus, be considered as country-specific effects. One very important motivation for taking into account the existence of unobserved heterogeneity across countries is the possibility that countries differ in the degree to which their citizens underreport crimes. Likewise, the use of different definitions and criteria for recording crime statistics could also lead to country-specific measurement errors. Provided that the factors that determine the underreporting – or underrecording – of crime rates are relatively stable over time, their impact can be modeled by the inclusion of a time-invariant country-specific component in the error term. In addition, this term could capture other non-observable crime determinants related to each society's tolerance and taste for violent or illegal activities, provided that these characteristics are relatively stable over time. GMM panel estimators control for the

⁵² For a more complete exposition of the GMM dynamic panel methodology, see Fajnzylber, Lederman, and Loayza (2000).

presence of unobserved country-specific effects by either differencing the regression equation (in which case proper instruments are the lagged *levels* of the explanatory variables) or using lagged *differences* of the explanatory variables as instruments (in which case the regression equation is specified in levels). The particular version of the GMM methodology we use is called the GMM *system* estimator, which uses both ways of controlling for unobserved specific effects. That is, the regression in levels and differences (each properly instrumented) are estimated jointly in a “system.”

The consistency of the GMM estimator depends on whether lagged values of the explanatory variables are valid instruments in the crime-rate regression. We address this issue by considering two specification tests suggested by Arellano and Bond (1991). The first is a Sargan test of over-identifying restrictions, which tests the null hypothesis of overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. Failure to reject this null hypothesis gives support to the model. The second test examines the hypothesis that the error term is not serially correlated. We test whether the *differenced* error term (that is, the residual of the regression in differences) is first- and second-order serially correlated. First-order serial correlation of the differenced error term is expected even if the original error term (in levels) is uncorrelated, unless the latter follows a random walk. Second-order serial correlation of the differenced residual indicates that the original error term is serially correlated and the instruments are misspecified. On the other hand, if the test fails to reject the null hypothesis of no second-order serial correlation, we conclude that the original error term is serially uncorrelated and the moment conditions are well specified.

B. RESULTS

1. Basic Economic Determinants

Based on previous micro- and macro-level literature, we consider the following variables as the basic economic determinants of violent crime rates: 1) GNP per capita (in logs) as both a measure of average national income and a proxy for overall development. 2) The average number of schooling years of the adult population as a measure of average educational attainment. 3) The GDP growth rate to proxy for employment and economic opportunities in general. 4) The Gini coefficient to measure the inequality of income distribution. And 5) the

lagged homicide rate (in logs) to consider inertial effects of violent crime. All these variables are considered endogenous in the empirical analysis.

Table 1 presents the results on the basic economic model for homicide and robbery rates. To check the robustness of the results, we use two alternative sources for homicide statistics, namely, the United Nations World Crime Surveys (UN) and the World Health Organization Mortality Statistics (WHO). First, note that the Sargan and serial-correlation specification tests are supportive of the GMM *system* estimator and its assumptions. This is the case not only for the three regressions reported in Table 1 but also for all results based on this GMM methodology (Tables 2-5). The homicide and robbery regressions of the basic economic model indicate that the GDP growth rate, the degree of income inequality as measured by the Gini index, and the respective lagged crime rate are significant and robust determinants of national crime rates.

The coefficients on per capita GNP change sign and significance in each of the three regressions, while educational attainment is not statistically significant in either of them. Thus, the level of economic development, as measured by these two variables, does not appear to have an effect on the incidence of violent crimes. The fact that per capita income does not have a clear effect on violent crime rates when holding income inequality constant can be interpreted as evidence that the *level* of poverty does not induce criminal behavior. However, when we combine the crime-inducing impact of higher inequality with that of lower GDP growth, we can conclude that the *rate* of poverty alleviation is a significant determinant of violent crime rates. The lack of significance of educational attainment in our violent crime regressions confirms the “education puzzle” first noticed by Ehrlich (1975b).

Let’s examine in more detail the variables that significantly determine crime rates. The negative impact of GDP growth on violent crime rates indicates that the incidence of crime is counter-cyclical and that stagnant economic activity induces heightened criminal activity. By increasing the availability of job opportunities and rising wages in the legal vis-à-vis the criminal labor market, economic growth has a crime-reducing effect. The fact that this result holds not only for robbery but also homicide rates may indicate that an important fraction of homicides results from economically motivated crimes that became violent.⁵³

⁵³ An alternative explanation is that economic conditions may have a cognitive impact on individuals by affecting their moral values or tolerance for crime.

The positive effect of income inequality on the homicide and robbery rates can be interpreted as the impact of the difference between the returns to crime (as measured by the income of the victims) and its opportunity cost (as measured by the legal income of the most disfavored citizens). This argument, initially made by Ehrlich (1973, pp. 538-540), is based on the assumption that crime victims are relatively richer than their aggressors and may not apply to crimes where victims and perpetrators share common social and economic characteristics. An alternative interpretation of the positive link between inequality and crime is that in countries with higher income inequality, individuals have lower expectations of lifetime improvement of their social and economic status through legal economic activities, which would decrease the opportunity cost of participating in illegal endeavors. Moreover, pessimistic perceptions of economic improvement through legal activities could also lead to a lessening of the moral loss associated with breaking the law.

There may be other factors explaining the positive link between inequality and crime. Bourguignon (1998, p. 2) argues that "...the significance of inequality as a determinant of crime in a cross-section of countries may be due to unobserved factors affecting simultaneously inequality and crime rather than to some causal relationship between these two variables." One such factor that could lead to a spurious correlation between income inequality and crime rates is the limited amount and the unequal distribution of crime prevention efforts that could be present in more unequal countries. We explore this possibility below when we include proxies of deterrence in our empirical model. Other factors that could affect both income inequality and crime are the existence of educational inequality, and the degree of income and ethnic polarization. We examine these factors in subsection 5. From the additional analysis, we conclude that income inequality has a significant and independent impact on intentional homicide and robbery rates. This is consistent with the observation in Neapolitan (1997) and LaFree (1999) to the effect that the most robust finding in cross-national crime research has been the positive relationship between income inequality and homicides. This conclusion is not only derived from studies based on official crime statistics but is also present in those based on victimization rates from household surveys. Using the International Crime Victim Surveys developed by the United Nations Interregional Crime and Justice Research Institute (UNICRI), Soares (1999) finds a significant crime-inducing effect of income inequality.

The past incidence of crime is another significant determinant of violent crime rates, giving evidence in favor of the existence of crime waves. We can mention a couple of channels through which past crime can breed future crime. First, the costs of performing criminal activities decline over time given that, as in any other activity, criminals learn by doing (see Glaeser, Sacerdote, and Scheinkman 1996). Furthermore, the moral loss of breaking the law can also be reduced by social interactions with other criminals, and the job opportunities in the legal labor market are likely to be reduced by the stigma associated with past criminal records (see Leung 1995). A second channel that explains the observed criminal inertia is that the police and judicial systems fail to respond to jumps in the incidence of criminal behavior, which encourages further crime by reducing the perceived probabilities of apprehension and conviction of criminals (see Sah 1991 and Posada 1994). It is noteworthy that the lagged crime rate, the GDP growth rate, and the Gini index, are always significantly linked to the incidence of homicides and robberies in all the extensions to the basic economic model that we consider below.

2. The Role of Deterrence

The role of deterrence factors in the incidence of crime is one of the most important issues in the economics literature on crime. However, because of lack of comparable data across countries, our analysis of deterrence factors is rather limited. We use two variables to proxy for the probability of being caught and for the corresponding severity of the punishments. They are the number of police personnel per 100,000 inhabitants and the presence of the death penalty in the country. The assumption underlying the use of the latter variable is that the use of the capital punishment in a given country is an indicator of the overall severity of its legislation regarding the punishment of offenders. Their limited data availability (police) and over-time variability (death penalty) prevents us from treating them as endogenous variables in the GMM *system* estimator. However, in order to diminish their within-country endogeneity (i.e., the fact that they respond to changes in the country's crime rate), we include them in the crime regressions as averages for the whole 1970-94 period or the sub-period for which they are available.⁵⁴

The results on deterrence are presented in Table 2. Although the use of period averages diminishes the within-country endogeneity of deterrence variables, they still suffer from cross-

⁵⁴ Some countries changed their stance towards the death penalty between 1970 and 1994; therefore, the death-penalty indicator used in the regressions ranges between 0 and 1.

country endogeneity (i.e., the fact that countries with higher incidence of homicides tend to have larger police force and tougher criminal legislation). Reverse causality should lead to a positive bias in the estimation of both variables' coefficients. Therefore, finding a significantly negative coefficient on a deterrence proxy means that its crime-reducing impact is large enough to overcome the positive bias due to reverse causality. This is what we find in the case of homicide regressions, where the estimated coefficients for both police presence and death penalty are significantly negative. On the other hand, the deterrence results for the robbery rate are not clearcut. First, the number of police, relative to the size of the population, carries a positive and significant coefficient, which is likely to reflect causality running from robbery rates to police personnel. Second, the death penalty indicator has no significant relationship with the robbery rate. This may indicate either that the death penalty is not necessarily associated with across-the-board harsher punishment or that in the case of robbery the bias due to reverse causality is stronger than for homicides.

3. Drug-Related Activities

An important incentive to commit crimes is the existence of profitable criminal “industries.” In this subsection we focus on one such industry, namely, the illegal drug trade. This is a potentially important determinant of crime not only because the drug trade is highly profitable but also because it uses a very “violence-intensive” technology. We use two variables as indicators of the size of the illegal drug industry in a country. The first is the number of drug possession offenses per 100,000 population. We should note that this variable does not measure exactly the extent of actual drug consumption in a given country but only the fraction of that figure that is considered illegal in the country’s legislation and that has been detected by law enforcement agencies. Thus, the variable in question reflects not only the size of the drug-consuming population but also the degree of tolerance for drug consumption in the corresponding society. We introduce this variable as the average for all years for which it is available and treat it as an exogenous variable. As in the case of deterrence factors, data availability prevents us from controlling for the endogeneity of the drug possession crime rate. The second indicator on the drug trade is a “dummy” variable that takes the value one when a country is listed as a significant producer of any illegal drug in any of the issues of the U.S. Department of State’s *International Narcotics Control Strategy Report* (published annually since

1986). Since this variable does not vary over time either, we consider it to be exogenous in the corresponding regressions.

The results on crime effects from drug-related activities are presented in Table 3. In this case, the results in the homicide and robbery regressions differ sharply. In the case of homicides, both drug production and drug possession crime rate have a significantly positive effect. This is consistent with the notion that the illegal drug trade is usually accompanied by violent disputes for market shares among different networks of producers and distributors. As a note of caution, it is important to highlight that the crime inducing effect of the drug possession crime rate cannot be interpreted as reflecting the effects on homicides of drug consumption per se. The reason for this is that a high rate of (detected) drug possession can also be the result of tough legislation regarding illegal drug consumption.

In contrast, however, both the dummy for drug production and the drug possession crime rate carry a surprisingly negative and significant coefficient in the regressions for the robbery rate. One explanation for this result is that drug activities are substitutes of economically motivated crimes. Whereas homicides can be considered a byproduct of illegal drug activities (which explains their positive association), robberies may compete for resources with those activities (resulting in a negative coefficient). On the other hand, this explanation contradicts the view that the existence of networks of producers and distributors of illegal drugs generates an externality that favors the growth of other criminal activities.

4. Demographic Factors

According to the literature, some demographic factors can contribute to the intensity of violent criminal activity. Specifically, it is argued that a large degree of urbanization can facilitate the development of social interactions between criminals and would-be criminals, thus decreasing the costs of committing crimes and leading to a higher incidence of them (see Glaeser, Sacerdote, and Scheinkman 1996, and Glaeser and Sacerdote 1999). Also, recent papers have argued that some trends in criminal rates can be explained by the age-composition of the population, particularly the proportion of young males who are purported to be prone to violence (see, for example, Blumstein and Rosenfeld 1998).

Table 4 reports the estimation results when we include, alternatively, the country's rate of urbanization and its share of young males (ages 15-29) in the total population. These two

explanatory variables are introduced in their five-year averages and are considered endogenous in the homicide and robbery rate regressions (analogously to the basic economic variables). After controlling for basic economic conditions, larger fractions of the population living in urban areas are not associated with higher homicide rates. In contrast, however, an increase in the degree of urbanization does lead to a rise in the robbery rate, confirming the view that this type of property crime is more an urban phenomenon than homicide. On the age-composition of the population, despite the fact that *in the U.S* most victims and perpetrators of homicides are young males, we find no evidence that an increase in the relative share of young males results in a rise of either type of violent crime in our cross-country analysis.

5. Inequality and Polarization

In this subsection, we study in greater depth the connection between violent crime rates and various measures and concepts related to inequality. Our objective is twofold. First, we want to examine the crime-inducing effects of educational inequality, income polarization, and ethnic division. These three variables are closely linked with income inequality. Second, we wish to test whether the significant and robust relationship between income inequality and the incidence of violent crime can be explained by their correlation with the measures of educational inequality and polarization.

Beyond clarifying the role of income inequality, considering educational inequality in crime regressions can also help solve the “education’s puzzle,” derived from the finding that the average level of educational attainment is uncorrelated or even positively related to the incidence of crime. To measure educational inequality we use the dispersion of educational attainment of the adult population derived from data on enrollment and attainment rates per educational grade (De Gregorio and Lee 1998).

It has been argued that society’s degree of polarization may be the cause of rebellions, civil wars, social tension, and, by extension, violent crime (Esteban and Ray 1994, and Collier and Hoeffler 1998.) We consider the effects of two types of polarization in society, namely, income polarization and ethnic division. The concept of income polarization was formally introduced by Esteban and Ray (1994). Though related to income inequality, income polarization emphasizes the separation between large and internally homogenous income groups. Income polarization is increasing in both the income difference between groups and the degree

of “identification” within each group, where identification depends positively on the size of the group and negatively on its internal income dispersion. Some researchers report that it is not uncommon for countries or regions to experience opposing movements in measures of income inequality and polarization (Contreras 1997). However, they mostly move together, especially since synthetic measures of income distribution, like the Gini Index, are mechanically related to measures of polarization. Following Esteban and Ray’s principles for appropriate measures of polarization, we construct a polarization index from data on national income shares by quintiles.⁵⁵

In addition, we study the effect of another type of polarization, namely, the polarization in society due to ethnic divisions. As a measure of ethnic division, we use an index of ethno-linguistic fractionalization. This index has been used by Mauro (1995) and Easterly and Levine (1997) in their cross-country growth studies, and its role in civil conflicts and wars has been documented by Collier and Hoeffler (1998). This index measures ethnic polarization up to a country-specific threshold level. Beyond that level, the index represents ethnic dispersion more than polarization. Therefore, allowing for non-linear effects is called for in analyzing the effect of ethno-linguistic fractionalization on violent crime rates.

As explained in the crime-data section, for the analysis of inequality, polarization, and violent crime we switch the source of crime data. That is, in this subsection we use the homicide statistics provided by the World Health Organization (WHO). We do this to take advantage of the larger time coverage of the WHO data set. Expanded time coverage in crime data is necessary to obtain a regression sample large enough to undertake our GMM *system* estimator given that the data on income shares by quintiles (used to construct the polarization index) is scarce. Regarding the endogeneity of these additional explanatory variables, we control for the endogeneity of both educational inequality and income polarization. Given the pre-determined and time-invariant nature of ethno-linguistic fractionalization, we constrain it to be fully exogenous.

Table 2.5 presents the main results. Regarding educational inequality, when we introduce its measure instead of the Gini index (not shown in the table), the estimated coefficient of this variable acquires the sign and significance of the Gini index in the basic regression -- it is positive and significant at the 5% level. However, when we include the Gini coefficient and the

⁵⁵ See Fajnzylber, Lederman, and Loayza (1999) for details about the construction of the polarization index.

measure of education inequality at the same time (column 1), the results change. While the Gini maintains its positive sign and statistical significance, the estimated coefficient of education inequality becomes negative and significant. In other words, once income inequality is controlled for, violent crime rises as educational attainment becomes more equally distributed. This result would imply that if income opportunities do not follow the egalitarian patterns of educational attainment, violent crime might rise, possibly due to people's greater awareness of income disparities. On the other hand, when educational inequality is included in the regression (instead of or in addition to the Gini index), the average level of educational attainment acquires a negative and significant sign in the homicide regression. This result may offer a solution to the "education's puzzle" to the extent that the effect of a rise in average education is estimated to be crime reducing once the dispersion in education is controlled for. This is a new finding and merits further investigation.

Regarding income polarization (column 2), we find that it has a positive and significant effect on homicide rates, even after controlling for basic economic determinants of violent crime. In an additional exercise (not shown in the table), we examine whether this relationship is non-linear. We find that the square term of polarization has a negative and statistically significant coefficient, while the linear term keeps its significant positive sign. This implies that the crime-inducing effect of polarization tends to decrease at higher levels of the index. However, at least in the sample under consideration, its total effect on violent crime rates is never negative. It is important to note that, notwithstanding the significant effect of polarization and its relatively high correlation with the Gini coefficient (0.71), income inequality does not lose its significance as a determinant of violent crime.

Finally, we find that the ethno-linguistic fractionalization has a significant crime-inducing effect (column 3). However, in contrast with income polarization, there is no evidence of the non-linear effects that we expected (the coefficient on its square term is not significantly different from zero). This may reflect the fact that in the countries included in the sample, ethnic fractionalization varies mostly in the range for which an increase in the index represents ethnic polarization rather than ethnic dispersion. Lastly, we note that the Gini index does not lose its sign, size, and significance with the inclusion of ethnic division as a crime determinant.

6. Social Capital

The last extension to the basic model that we consider deals with the relationship between social capital and violent crime. The economics literature on crime has mostly expanded following Becker's original paradigm, which is based on individual cost-benefit analysis. Only recently the effect of social interactions on criminal behavior has been the focus of some economics studies, most of them theoretical (see Glaeser, Sacerdote, and Scheinkman 1996). DiIulio (1996) argues that one of the areas that have so far received little attention from economists is the potential link between "social capital" and violent crime.

There are two basic arguments for social capital to reduce violent crimes. The first is that social capital decreases the costs of social transactions. This allows for peaceful resolution of conflicts, both interpersonal (in the home, neighborhood, and workplace) and societal (such as a perceived unfair distribution of economic opportunities). This argument is in the spirit of Fukuyama's assertion that "trust can dramatically reduce what economists call transaction costs – costs of negotiations, enforcement and the like -- and makes possible certain efficient forms of economic organization" (1995, 90). The second argument in favor of the crime-reducing impact of social capital is that communities with stronger ties among its members are better equipped to organize themselves to overcome the free-rider problems of collective action. This decreases the potential for individual opportunistic behavior, thus lessening the potential for social contention and conflict. Glaeser and Sacerdote (1999) point out that opportunistic behavior is one of the problems of big cities, where individuals are less likely to be long-term residents and urban anonymity protects criminals from the social stigma.

On the other hand, there are also reasons to think that social capital may lead to more violent crime. In certain contexts, stronger social interactions allow individuals involved in criminal activities to more easily exchange information and know-how that diminish the costs of crime. Furthermore, deep ties among community members may facilitate the influence of "successful" criminals, enacting them as role models and inducing stronger tastes and propensity for crime and violence in the community. According to Glaeser, Sacerdote and Scheinkman (1996), these perverse social interactions may be the fundamental cause of the observed inertia of crime rates in cities in the United States. Rubio (1997) analyzes the role of drug cartels, guerrilla groups, and gangs in generating a perverse social capital in Colombia. He argues that these groups corrupt whole communities by providing youths with role models and by training them in the use of arms and violence.

The seemingly opposite effects of social capital on crime may create some confusion. One way to reconcile these two antagonistic effects is to consider that social capital has the potential for inducing more crime and violence when it is specific to particular groups (such as gangs, ethnic clans, and closed neighborhoods) rather than dispersed throughout society.

This section explores empirically the effect of different measures of social capital, such as the prevalence of trust on members in the community and the membership and participation in voluntary secular and religious organizations, on the incidence of homicide. These measures were obtained from comparable household surveys in several countries around the world. They come from the World Value Survey (WVS) and were complemented with data from Muller and Seligson (1994), who incorporated countries from Central America.

The data scarcity that we face in the case of cross-country empirical work on crime is even more pronounced when analyzing the effect of social capital. When we cross the sample on social capital indicators with that on homicide rates (from WHO), we are left with a maximum sample of 39 countries (none of them from Africa) with one observation for each of them, corresponding to the average for the period 1980-94. Therefore, our empirical strategy in the analysis of the effect of social capital must be different from that presented above. We replace our panel estimator with a cross-sectional instrumental-variable estimator. Furthermore, we limit our set of explanatory variables to the GDP growth rate and the Gini index of income inequality, in addition to the measures of social capital.

Endogeneity issues are also an important concern in the analysis of crime effects of social capital. In fact, the incidence of crime and violence may in turn affect social capital. For example, in societies where crime is rampant, the prevalence of community trust will tend to be low. Furthermore, the overall effect of violent crime on some measures of social capital may be ambiguous. For example, the participation in voluntary communal organizations may rise as result of higher crime, precisely as a reaction to organize the community to fight crime. On the other hand, voluntary participation may be reduced if violent crime leads to fears of leaving the house or the neighborhood. Thus, to be able to conclude that social capital leads to more or less violence and crime, we need to isolate the component of social-capital measures that is exogenous to violent crime rates. We deal with the joint endogeneity problem through the use of instrumental variables, which are assumed to affect violent crime solely through social capital (more precisely, we employ the generalized method of moments applied to cross-sectional

regressions). As instruments for social capital we use, first, regional dummy variables indicating groups of countries according to geographic location or stage of development (with the idea that countries in a region share certain cultural traits that in turn affect their social capital). The second instrumental variable is the numbers of *telephones per capita* in the country (as argued by Collier 1998, means of communication such as telephones diminish the costs of social interactions).

The results on social capital are presented in Table 2.6.⁵⁶ In this table, we present the results using the maximum sample available for each social capital indicator. We have conducted some additional exercises (not presented here) in which we either estimate the regressions using a common sample for all indicators or change the set of instrumental variables. Our main conclusion is that, controlling for omitted variables and joint endogeneity, the prevalence of *trust* on community members seems to have a significant and robust effect of reducing the incidence of violent crimes. The effect of other social capital indicators on violent crime is not clear. In the case of the religion-related variables, namely, *religiosity* (the self-proclaimed importance of religion in the individual's daily life) and *church attendance*, the differing results obtained with various samples indicate that their effect on violent crime may be specific to either particular countries or particular types of religion.

In the case of the social capital variables denoting involvement in communal organizations, namely *membership* and *participation in voluntary social organizations*, their unclear effect on violent crime may be due to a combination of two factors. The first is our inability to fully isolate their exogenous component and, thus, estimate correctly its effect on violent crime. The second, and probably most important, factor behind their ambiguous effect on violent crime rates is that *membership* and *participation in voluntary social organizations* reflect both group-specific and society-wide social capital. As argued above, while the latter type of social capital would reduce violent crime, the former may increase it. Finally, and confirming our previous results, we find that even controlling for social capital, income inequality (measured by the Gini coefficient), and per capita GDP growth rate are robust determinants of the incidence of violent crime rates. After having identified these robust

⁵⁶ As with crime rates, we express the social capital indicators in natural logarithms. Since these indicators are given in different units, it is necessary to express them in logs to be able both to compare their coefficients and to interpret them as the effect on crime rates of (approximately) a percentage change in each indicator.

explanatory variables from analyses that rely on aggregate crime statistics, the following section looks at evidence based on micro data.

III. MICRO EVIDENCE

As mentioned in section I, micro evidence collected through household surveys and/or surveys of individuals is the traditional workhorse of empirical analyses of the determinants of crime and violence. On the one hand, an important disadvantage of micro data is that it does not include information about extreme forms of crime and violence, such as homicides, for an obvious reason: the victims of such crimes cannot participate in the surveys. Also, it is not practical to use these data for estimating the effect of certain community wide characteristics, such as income inequality, on the individual's probability of being victimized. The reason is that neighborhood or district borders are more imaginary than real, and potential aggressors can easily move across these borders to perpetrate crimes. To examine the effect of inequality using survey data would require collecting social and economic information about both the victims and the aggressors, which is virtually impossible to collect. This type of limitation will be considered below when we discuss the results from case studies of Latin American cities that use survey data. On the other hand, the main advantage of micro data is that information collected through surveys tends to be more accurate than official statistics, which may suffer from a combination of reporting and recording errors. Recent victimization surveys, which asked respondents whether they or another member of their family had been the victim of a crime within a given period of time (usually 6 or 12 months), actually show that the reporting rates tend to be quite low in Latin American metropolitan areas. For example, recent short surveys (or mini surveys) financed by the World Bank and other surveys show that reporting rates in several Latin American cities range between 17 and 46 percent. That is, less than half of the total number of victimization episodes is actually reported to the local authorities.

The causes of under-reporting across countries seem to be related to the level of development (Soares 1999), and since the quality of public institutions is correlated with the level of development (Kaufmann et al. 1999), one can only infer that the quality of public institutions affects the extent of under-reporting of crimes. In other words, as citizens' confidence in public institutions rises, so will the extent of crime reporting by private citizens. Nevertheless, it is likely that other factors also play a role in determining the extent of under-reporting. For

example, cities or countries may have different incidences of violent aggressions against persons in terms of their share of total victimization episodes. And since the gravity of the aggression is likely to be associated with the incentives to report the crime, some of the cross-country differences in reporting rates may reflect different structures of crime or victimization patterns. In any case, the determinants of the reporting rates across countries and cities remains an interesting avenue for future research.

In the rest of this section, we review existing empirical evidence about the factors that determine the probability that an individual will be the victim of a crime, be it a physical aggression against the person, an economically motivated crime against property, or any type of victimization. The dependent variable in these analyses of victimization is dichotomous, and econometric models attempt to determine the factors that affect the probability or odds of being a victim, either using probit or logit models.⁵⁷ Based on the results of recent econometric studies in four Latin American cities (Mexico City, Rio de Janeiro, San Salvador, and Sao Paulo), subsection A looks at the evidence by comparing the results across cities, beginning with victimization of any type. In turn, in sub-section B we compare the results across types of crimes (violent and economic crimes) within and across six cities (the four mentioned above plus Cali and Lima). The six cities were chosen because this small sample represents significant diversity in terms of the level and presumed causes of crime and violence. For example, the city homicide rates range from over 80 homicides per 100,000 in Cali and San Salvador to over 20 in Lima and Mexico City.⁵⁸ Regarding some important case-specific causes of crime and violence, Cali is known to have been afflicted by the influence of drug trafficking groups, San Salvador by the presence of youth gangs (or *maras* in Spanish) and the abundance of firearms produced by the decade long civil war that ended in 1994, Mexico City by the economic crisis of 1995, and Rio de Janeiro by police violence. Nevertheless, the main objective here is to derive general conclusions from the city case studies based on the econometric analysis of the probability of being victimized in these six Latin American cities.

A. DETERMINANTS OF VICTIMIZATION IN LATIN AMERICAN CITIES

⁵⁷ The problems of inference associated with linear probability models are well known.

⁵⁸ See the case studies financed by the World Bank: Cruz et al. (2000), Funsalud (2000), Instituto Apoyo (2000), Piquet (2000), and Velez et al. (2000). Some of the homicide rates cited here are disputed by alternative sources of

The case studies examined the relationship between the probability of being a victim and three types of explanatory variables, which were introduced sequentially. The first type is composed of variables that characterize the individual: gender, age, years of education, employment status, alcohol consumption, and firearm ownership.⁵⁹ The last two variables, depending on the exact wording of the question asked in the survey, are arguably exceptions in the sense that they can be endogenous. Victims of crimes may resort to alcohol use and firearm acquisition as a response to the traumatic experience. In general, however, most variables in the probit or logit models are exogenous.

The second category of explanatory variables is composed of social and economic characteristics of the household. The number of members in the household is expected to affect individual victimization probabilities because family members tend to look after each other -- the household can be considered to be a network of protection. Single parent families reflect a form of social dysfunction. The dependents in the family, especially the young members of the household, are likely to be affected by the reduced availability of parental guidance and protection. As a consequence, such young people may fall into the "wrong" social networks, exposing them to higher risks of victimization and perhaps reducing their moral objection to criminal behavior. Finally, the income of the household may also attract delinquents.

The third category of explanatory variables characterizes the communities where the household resides. The rates of unemployment, the number of police per capita (the police rate), the average income levels per capita, the distribution of income, the average level of educational attainment of the population, and the presence of drug and alcohol distribution centers can all be expected to influence the probability of being victimized. Of course, ideally the community characteristics should correspond to the place where the aggressions actually took place, but this information is rarely available from the household surveys. Also, as mentioned earlier, the borders of the communities within cities are non-binding and therefore the results about these variables should be interpreted with caution. Therefore, an implicit assumption in these studies is that the place of residence has an effect on the individual's probability of being a victim. Furthermore, it is likely that people are victimized in their homes while they are present or

information that are available in each city, and the studies cited contain detailed discussions about the alternative sources.

⁵⁹ The case studies of Cali, San Salvador, Rio de Janeiro and Sao Paulo also control for the ethnic origin of the individual.

during their absence, or nearby when they are in transit to and from their places of work, study and leisure. In any case, this is an empirical question that can be answered by the statistical significance of the community-level variables.

Table 3.1 presents the stylized results from probit or logit models that use data from four surveys conducted in Mexico City in 1999 (Funsalud 2000), Rio de Janeiro in 1996 (Piquet 2000), San Salvador in 1996 (Cruz et al. 2000), and Sao Paulo in 1999 (Piquet 2000). The number of observations included in each regression ranges from 1,057 for San Salvador to 2,605 for Mexico City. All surveys used probabilistic sampling techniques to ensure that the samples are representative of each city's population. There are some important differences concerning the information collected. For example, in San Salvador and Rio de Janeiro the questionnaires focused on the interviewed individual, while the those used in Mexico City and Sao Paulo asked the respondent to provide social and economic information only about the members of the household who had been the victim of crime. In the case of Mexico City, the researchers were able to gather social and economic data about non-victims by cross-referencing some basic household location and descriptive statistics with existing household surveys. For Sao Paulo no information was provided about individuals in households without any victims. Therefore, in this case the data is composed of all individuals that belong to households with at least one victim.

The dependent variable in the four cases that appear in Table 3.1 is 1 if the individual was the victim of any type of crime and zero otherwise. The plus signs reflect variables that had a positive and significant probit coefficient or a significant odds ratio greater than one; the negative signs reflect variables that had a negative and significant probit coefficient or a significant odds ratio below one. Blank cells mean that the variable was included in the analysis but was not significant, and the n.a.'s mean that data was not available to include the corresponding variable in the analysis.

There are two individual characteristics that are significant in all four cases presented in Table 3.1 -- being a male and being unemployed. The former tends to increase the likelihood of being a victim, while the latter reduces it. Age was not a significant variable in the case of Mexico City, and older people tend to have a lower probability of being a victim in San Salvador and Sao Paulo. In Rio de Janeiro the results presented in Piquet (2000) are not easily summarized by one sign, because the odds ratio in this logit model is greater than one and significant for two age groups: those aged 18-24 and 35-44. In the other cases, it was the youngest group that had a

significant odds ratio greater than one or positive and significant probit coefficient (in the case of San Salvador).

None of the household or community characteristics are significant in all four cases. Of the household characteristics, the condition of being headed by a single parent has a positive and significant effect in the cases of Rio de Janeiro and San Salvador, while in the other two it was not significant. Among the community characteristics, only the average level of educational attainment of the population appears significant in more than one case, and its sign is negative in both Brazilian metropolitan areas. It is noteworthy that in only one case that used data on police presence it appeared significant and with the expected negative sign, which indicates the existence of a deterrent effect in San Salvador, in spite of the limitations mentioned earlier about the non-binding characteristics of the community-wide variables. However, the lack of significance of most of the community characteristics may be due to this limitation of this type of data.

More generally, the four cases seem to indicate that gender plays a central role in crime and violence in Latin American cities, as do economic motivations. The latter conclusion comes from the fact that unemployed individuals in the four cities examined here tend to have a lower probability of being victimized than employed individuals.⁶⁰ We now turn to the comparison of the determinants of victimization for violent and economic crimes.

B. Comparing Violent and Economic Victimization across Latin American Cities

Table 3.2 shows the corresponding stylized results for 6 pairs of regressions applied to survey data from: Cali, Colombia in 1996 (Velez et al. 2000); Lima, Peru in 1998 (Instituto Apoyo 2000); Mexico City in 1999 (Funsalud 2000); Rio de Janeiro in 1996 (Piquet 2000); San Salvador in 1996 (Cruz et al. 2000); and Sao Paulo in 1999 (Piquet 2000). The surveys for Cali and Lima had the same characteristics as those from Rio de Janeiro and San Salvador, which were discussed above. The Lima survey covered over 8,000 individuals, while the one for Cali covered 2,900 individuals. For each city, the table shows the signs of the significant odds ratios or probit coefficients, using the same notation used in the previous table. The model for violent offenses appears in the left side of each city, followed by the model for the economically

⁶⁰ An alternative sociological explanation of this result is that employed individuals spend more time in public areas during their commute to and from the workplace than unemployed individuals -- see Piquet (2000).

motivated crimes. In some cases, there is some overlap of crimes across these two categories, as indicated in the note at the bottom of the table. Crimes against the person in Cali include threats, wounds caused by firearms and other weapons; and, crimes against property include armed robbery, and extortion by other individuals and by public officials. For Lima we focus on physical aggressions against the person and on muggings. For Mexico City, Rio de Janeiro and Sao Paulo, violent crimes refer to robbery with the threat of violence, assaults and other crimes against the person, including violence against women. In these cases economic crimes include robbery with the threat of violence plus thefts and burglaries. Violent crimes in San Salvador include armed robbery, threats, assaults, wounds caused by firearms and other weapons and kidnappings. Economic crimes without violence in San Salvador include only extortions by public officials or private citizens.

Beginning with the two significant individual characteristics discussed above, gender and the employment status of the individual also appear significant and with the same sign as before in most cases, without showing a contrasting pattern between violent and economic crimes. The "male" gender dummy variable is negative and significant in only one case -- muggings in Lima. The "unemployed" variable is negative and significant in six of the twelve models. The only city in which the state of being unemployed is not relevant neither for violent (against persons) nor for economic (against property) crimes is Cali. The results about the age variable are also broadly consistent with those discussed in the previous section, except, again, for the case of muggings in Lima where older people seem to be have a higher risk of victimization. Keeping in mind our concern about the potential endogeneity of the alcohol and weapon variables, it is interesting that in many instances these are not significant. In any case, we can conclude that among the individual characteristics, gender, employment status and age seem to be significant risk factors, but it is not at all clear that these have differential effects on violent versus economic crimes. For example, age can raise the probability of being a victim of both types of crime in Cali and Rio de Janeiro. Also, unemployment reduces the probability of being a victim of violent crimes in Rio de Janeiro and San Salvador, but it also has the same effect for economic crimes in Lima, Mexico City, Rio de Janeiro and Sao Paulo.

Of the household characteristics, the variable of belonging to a household with a single parent appears significant and with the expected positive sign in only three cases: muggings in Lima, violent crimes in Rio de Janeiro, and economic crimes without violence in San Salvador.

Again, there is no systematic evidence here supporting the presumption that the determinants of the probability of being a victim of violent and economic crimes are different.

Regarding the community characteristics, the police rate, the average level of educational attainment of the population, and the existence of a drug distribution center appear consistently with the corresponding expected signs whenever they are significant. High rates of police per capita seem to reduce the probability of being a victim of muggings in Lima and economic crimes in San Salvador. The absence of more cases with a significant sign for this variable could reflect the low quality of police services throughout the Latin American region, but it is also possible that the allocation of police resources to specific areas within cities is meaningless in practice. Higher levels of education seem to reduce the probability of being a victim of physical aggressions in Lima, and of violent and economic crimes alike in Rio de Janeiro. The poverty rate seems to be associated with lower probabilities of victimization by economic crimes in Rio de Janeiro and Sao Paulo, which is consistent with the findings that the average income of the population raises the probability of victimization by muggings in Lima and violent crimes in Rio de Janeiro. Again, this evidence seems to indicate that the poor are actually protected from economic crimes. Finally, the existence of drug distribution centers increases the risk of victimization by physical aggressions in Lima, and, again, of violent and economic crimes alike in Rio de Janeiro. Hence it seems that only indicators of poverty at the community level seem to have differential effects on the probability of victimization by violent versus economic crimes, even though in San Salvador the average income of the community has a negative sign for economic crimes without violence. In this case, this result may reflect that "rich" neighborhoods enjoy higher levels of privately financed security services. In the following section we summarize the conclusions from this and the previous sections.

IV. CONCLUSIONS

The results from cross-country analyses provide strong evidence in favor of the economic model of criminal behavior when augmented to allow for inertial effects. Both economic growth and income inequality are robust determinants of violent crime rates. Furthermore, even controlling for country-specific effects (including systematic measurement error), there is clear evidence that violent crime is self-perpetuating. These variables -- economic growth, inequality, and past crime rates -- worked well for homicides and remarkably well for robbery rates. Their

sign and statistical significance survived the addition of other explanatory variables, including measures of crime deterrence, demographic characteristics, social capital, and variables conceptually related to income inequality such as educational inequality, income polarization, and ethnic fractionalization. In contrast, the level of education of the adult population and the average income of the population were not robust explanatory variables for either type of crime.

Two variables related to the probability of being caught and the severity of the punishment -- namely, the number of police per capita and the existence of the death penalty -- also seem to have significant deterrent effects for the crime of homicide. It is notable that these results show up in the homicide regressions in spite of the fact that we cannot control for the endogeneity of these deterrence variables. Indeed, endogeneity goes against finding a crime-reducing effect of deterrence given that reverse causation produces a positive bias in the estimated coefficient. On the other hand, it seems that in the case of robberies the deterrent effect of police presence and death penalty cannot overcome the positive bias due to unresolved endogeneity issues.

The drug-related variables had different effects on the two types of crime examined in this paper. Drug production and drug possession rates tend to increase national homicide rates, but they seem to have the opposite effect on robberies. The results concerning homicides can be explained by the fact that drug-related industries are intensive in the use of violence. In the case of robberies, we hypothesize that the illicit drug trade is a substitute for other economically motivated crimes like robberies, which are less violence-intensive.

Another explanatory variable that had differential effects on homicides and robberies was the rate of urbanization, which only had a significant positive effect on robbery rates. The issue of why urban centers tend to induce higher rates of crimes against property has already produced some interesting research (e.g., Glaeser and Sacerdote 1999, Gaviria and Pagés 1999).

Both income polarization and ethnic division have a worsening effect on violent crime rates, just as they do on the incidence of large-scale civil conflicts. However, the influence of income or ethnic polarization appears to be independent from the crime effect of income inequality. When educational inequality is included in homicide regressions, the level of average educational attainment appears to have a violent crime-reducing effect, thus presenting a way to solve the “education puzzle.” Another puzzle arises, however, as educational inequality appears to have a negative effect on the homicide rate, when income inequality is controlled for. This

result would imply that if income opportunities do not follow the egalitarian patterns of educational attainment, violent crime might rise possibly due to people's greater awareness of income disparities.

Finally, one measure of social capital, namely, *trust on community members*, appears to have the effect of reducing the incidence of violent crimes. The results regarding other measures of social capital (membership and participation in secular and religious organizations) are rather unclear. This may be due to a combination of limited samples, inability to fully control for reverse causation, and most likely, the contrasting effects of group-specific and society-wide social capital.

Turning to the empirical results based on survey data, the low rates of crime reporting in several Latin American cities showed that the extent of under-reporting in developing countries can be quite severe. Indeed, other existing evidence shows that the Latin American region has some of the lowest reporting rates in the world.⁶¹ An interesting avenue for future research would be to analyze further the determinants of the extent of under-reporting. In particular, it would be nice to know if the quality of public institutions and the structure of crime affect the reporting rate across countries or cities.

The brief review of recent empirical case studies based on micro data highlights the need to undertake further efforts using survey data. The main reason is that the case study evidence shows that it is very difficult to generalize about the causes of victimization. Nevertheless, for the Latin American cases discussed here, it seems that gender, unemployment, family structure, police presence, and drug distribution are important factors. The risk factors for violent crimes sometimes are the same as for economic crimes across countries, and only indicators of poverty levels at the community level seem to have a differential effect whereby residents of poor areas are "protected" from economic crimes. Indeed, the most robust explanatory variables are important for both types of crimes.

Finally, the evidence indicates that gender and age may be important risk factors. Notably lacking in the literature, however, are studies examining the vulnerabilities and risks for specific populations and subgroups that are impacted by different types of property and violent crimes. Fruitful research efforts in the future are likely to come from analyses that examine the determinants of victimization from homicide or other lesser crimes against demographically-

⁶¹ Newman (1999), p. 36.

defined subgroups of the population. This approach may lead to deeper understandings of why young men are more at risk than other individuals and of why the relative risks of victimization of men and women differ across countries. Moreover, it is important to improve our understanding of the causes of specific forms of violence, such as domestic violence and sexual offenses, which remain grossly understudied by the economics profession.

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**Table A-1: Descriptions and Sources of the Variables
Used in the Cross-country Analysis**

Variable	Description	Source
Intentional Homicide Rate (UN)	Death purposely inflicted by another person, per 100,000 population.	Constructed from the United Nations World Crime Surveys of Crime Trends and Operations of Criminal Justice Systems, various issues, except for Argentina, Brazil, Colombia, Mexico, and Venezuela. The data is available on the internet at http://www.ifs.univie.ac.at/~uncjin/wcs.html#wcs123 . The data on population was taken from the World Bank's International Economic Department database. For the five Latin American countries listed above, the source for the number of homicides was the Health Situation Analysis Program of the Division of Health and Human Development, Pan-American Health Organization, from the PAHO Technical Information System. This source provided us with data on the annual number of deaths attributed to homicides, which come from national vital statistics systems. Another exception is the United States for the 1990-94 period, for which "intentional" homicide data is not available. In this case we used the ratio of "intentional" homicides to total homicides in 1975-76 (72%) to deduce a proxy for the intentional homicides during 1990-94 based on the total number of homicides.
Robbery Rate	Total number of Robberies recorded by the police, per 100,000 population. Robbery refers to the taking away of property from a person, overcoming resistance by force or threat of force.	Same as above. No exceptions.
Intentional Homicide Rate (WHO)	Number of deaths purposely inflicted by another person, per 100,000 population.	Constructed from mortality data from the World Health Organization (WHO). Most of this data is available by FTP from the WHO server (WHO-HQ-STATS01.WHO.CH) in the directory '\FTP\MORTALIT'. Additional data was extracted from the WHO publication "World Health Statistics Annual." The data on population was taken from the World Bank's International Economic Department data base.
Police	Number of police personnel per 100,000 population.	Constructed from the United Nations World Crime Surveys of Crime Trends and Operations of Criminal Justice Systems, various issues.
Drug Possession Crime Rate	Number of drug possession offenses per 100,000 population.	Same as above.

Variable	Description	Source
Drug Producers Dummy	Dummy that takes the value one for the countries which are considered significant producers of illicit drugs.	International Narcotics Control Strategy Report, U.S. Department of State, Bureau for International Narcotics and Law Enforcement Affairs, various issues.
Gini Index	Gini Coefficient, after adding 6.6 to the expenditure-based data to make it comparable to the income-based data.	Constructed from Deininger and Squire (1996). The dataset is available on the internet from the World Bank's Server, at http://www.worldbank.org/html/prdmg/grthweb/datasets.htm .
Average years of Schooling	Average years of Schooling of the Population over 15.	Barro and Lee (1996). The dataset is available on the internet from the World Bank's Server, at http://www.worldbank.org/html/prdmg/grthweb/datasets.htm .
Standard Deviation of Educational Attainment	Standard deviation of the distribution of education for the total population over age 15. The population is distributed in seven categories: no formal education, incomplete primary, complete primary, first cycle of secondary, second cycle of secondary, incomplete higher, and complete higher. Each person is assumed to have an educational attainment of $\log(1+\text{years of schooling})$.	De Gregorio and Lee (1998).
Ethno-Linguistic Fractionalization	Measure that two randomly selected people from a given country will not belong to the same ethno-linguistic group (1960).	Easterly and Levine (1997). The data-set is available on the internet from the World Bank's Server, at http://www.worldbank.org/html/prdmg/grthweb/datasets.htm .
Income Polarization	Measure of polarization derived from national income distribution data (income by population quintiles) following the principles outlined in Esteban and Ray (1994).	Fajnzylber, Lederman, and Loayza (1999).
GNP per capita	Gross National Product expressed in U.S. dollars prices, based on an average of each country's real exchange rate.	Loayza et al. (1998).
Growth of GDP	Growth in the Gross Domestic Product expressed in constant 1987 local currency prices.	The dataset is available on the internet from the World Bank's Server, at http://www.worldbank.org/html/prdmg/grthweb/datasets.htm .
Urbanization Rate	Percentage of the total population living in urban agglomerations.	Same as above.
Death Penalty	Dummy for countries whose laws do (1) or do not (0) allow the death	Amnesty International. List of Abolitionist and Retentionist Countries at

Variable	Description	Source
	penalty. Some countries experienced changes, either abolishing or imposing the death penalty during 1970-94. Hence period averages range between 0 and 1.	http://www.amnesty.org/ailib/intcam/dp/abrelist.htm#7
Ratio of Males Aged 15 to 34 to Total Population	Ratio of number of males aged 15 to 34 to total population.	Pre-formatted projection tables in the World Development Indicators database of the World Bank.
Variables for Social Capital:	Survey Question:	Description:
TRUST	Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?	The indicator for trust is the average mean of trust for the surveys of 1981 and 1990. This indicator is the percentage of respondents in each country who said that "most people can be trusted", after deleting the "don't know" responses.
MEMBER	Please look at the following list of voluntary organizations and activities and say which, if any, do you belong to?	The measure of the density of member activity is the average number of groups cited per respondent in each country.
MEMBER SECULAR	Same as above	The same responses are used but now the measure is of membership to secular organizations only. Thus membership to religious organizations are excluded in this measure.
PARTICIPATION	Please look at the following list of voluntary organizations and activities and say which, if any, are you currently doing voluntary work for?	The measure of the density of voluntary work is the average number of groups cited per respondent in each country for whom they are doing any form of voluntary work.
RELIGIOSITY	Please say how important is religion in your life. 1 – Very Important 2 – Quite Important 3 – Not Very Important 4 – Not At All Important.	The numbers were averaged across the respondent in each country to obtain an indicator of the degree of religiosity in the country. In order for an increase of this variable to represent an increase in social capital, we use the inverse of the original value.
CHURCH ATTENDANCE	Apart from weddings, funerals and christenings, about how often do you attend religious services these days?	Measured on an 8-point scale from 1 (more than once a week) to 8 (never), the responses were averaged to obtain an indicator of participation in religious services. In order for an increase of this variable to represent an increase in social capital, we use the inverse of the original value.

Table 2.1: Basic Economic Model*Estimation Technique: GMM System Estimator**(t-statistics are presented below their corresponding coefficients)*

Dependent Variable (in logs):	Homicide Rate	Homicide Rate	Robbery Rate
Data Source:	WHO	UN	UN
	[1]	[2]	[3]
Constant	0,8171 12,13937	-0,3886 -0,52762	-0,4965 -0,86584
Lagged Dependent Variable	0,8376 12,1394	0,7263 12,2731	0,7673 23,4132
Growth Rate (% Annual Change in Real GDP)	-0,0115 -6,4619	-0,0239 -2,9616	-0,1468 -10,3282
Average Income (Log of GNP per capita in US \$)	-0,0805 -7,4297	0,0090 0,0783	0,1280 2,4637
Income Inequality (Gini Coefficient)	0,0035 5,9282	0,0146 2,2671	0,0258 3,7501
Educational Attainment (Avg. Yrs. of Educ., Adults)	-0,0013 -0,2347	0,0354 0,6907	-0,0016 -1,3333
No. Countries	48	45	34
No. Observations	193	136	102
SPECIFICATION TESTS (P-Values):			
(a) Sargan Test	0,532	0,226	0,446
(b) Serial Correlation :			
First-Order	0,008	0,068	0,043
Second-Order	0,592	0,284	0,803

* For details on definitions and sources of variables, see Appendix Table 1.

Table 2.2: Deterrence*Crime Data Source: United Nations World Crime Surveys (UN)**Estimation Technique: GMM System Estimator**(t-statistics are presented below their corresponding coefficients)*

Dependent Variable (in logs):	Police Personnel		Death Penalty	
	Homicide Rate	Robbery Rate	Homicide Rate	Robbery Rate
	[1]	[2]	[3]	[4]
Constant	-3,5098	-0,1555	0,4234	-0,1231
	-4,6884	-7,3205	0,4549	-8,8430
Lagged Dependent Variable	0,4820	0,8026	0,7267	0,9286
	5,2070	26,9728	12,0864	23,6425
Growth Rate	-0,0395	-0,1555	-0,0037	-0,1231
(% Annual Change in Real GDP)	-2,6655	-7,3205	-0,4563	-8,8430
Average Income	0,4227	0,0798	-0,1185	-0,0211
(Log of GNP per capita in US \$)	2,8993	2,2198	-0,9845	-0,2752
Income Inequality	0,0377	0,0270	0,0178	0,0257
(Gini Coefficient)	4,3166	5,4259	2,1770	2,4630
Educational Attainment	-0,0554	0,0002	0,0762	-0,0014
(Avg. Yrs. Of Educ., Adults)	-0,7109	0,1739	1,6568	-0,6016
Police	-0,0009	0,0008		
(Per 100,000 Pop.)	-1,8348	2,8878		
Death Penalty			-0,3457	0,0354
(Dummy)			-2,5133	0,2709
No. Countries	41	33	43	33
No. Obs.	124	99	131	98
SPECIFICATION TESTS (P-Values):				
(a) Sargan Test	0,306	0,452	0,421	0,433
(b) Serial Correlation :				
First-Order	0,171	0,034	0,135	0,033
Second-Order	0,636	0,766	0,318	0,821

* For details on definitions and sources of variables, see Appendix Table 1.

Table 2.3: Drug-Related Activities

Crime Data Source: United Nations World Crime Surveys (UN)

Estimation Technique: GMM System Estimator

(t-statistics are presented below their corresponding coefficients)

Dependent Variable (in logs):	Drug Production		Drug Possession	
	Homicide Rate [1]	Robbery Rate [2]	Homicide Rate [3]	Robbery Rate [4]
Constant	-1,0537 -1,5102	-0,1288 -7,8744	-1,3046 -1,7084	-1,3643 0,3510
Lagged Dependent Variable	0,6007 9,3867	0,7862 22,4419	0,6230 9,6495	0,8194 28,2520
Growth Rate (% Annual Change in Real GDP)	-0,0316 -3,7848	-0,1288 -7,8744	-0,0259 -2,0995	-0,1268 -5,8804
Average Income (Log of GNP per capita in US \$)	0,0776 0,7032	0,0227 0,4330	0,1076 0,7627	0,1907 4,6464
Income Inequality (Gini Coefficient)	0,0165 2,5928	0,0204 4,1203	0,0306 5,4550	0,0292 5,7035
Educational Attainment (Avg. Yrs. Of Educ., Adults)	0,0492 1,0932	0,0005 0,3770	-0,0433 -0,6194	-0,0010 -1,1286
Drug Production (Dummy for Drug Producers)	0,6341 4,1709	-0,4025 -4,1033		
Drug Possession (Drug Possession Crime Rate)			0,0020 2,2395	-0,0007 -1,8220
No. Countries	45	34	42	33
No. Obs.	136	102	127	99
SPECIFICATION TESTS (P-Values):				
(a) Sargan Test	0,34	0,682	0,434	0,398
(b) Serial Correlation :				
First-Order	0,07	0,041	0,086	0,047
Second-Order	0,306	0,625	0,340	0,842

* For details on definitions and sources of variables, see Appendix Table 1.

Table 2.4: Demographic Factors*Crime Data Source: United Nations World Crime Surveys (UN)**Estimation Technique: GMM System Estimator**(t-statistics are presented below their corresponding coefficients)*

Dependent Variable (in logs):	Urbanization		Young Males	
	Homicide Rate [1]	Robbery Rate [2]	Homicide Rate [3]	Robbery Rate [4]
Constant	-0,0542	0,4696	0,4549	0,6048
	-0,0932	1,1148	0,7298	1,3929
Lagged Dependent Variable	0,8294	0,7605	0,8413	0,8826
	17,0926	18,8387	19,9425	37,23451
Growth Rate	-0,0244	-0,1082	-0,0101	-0,1226
(% Annual Change in Real GDP)	-3,5502	-7,7679	-1,1405	-10,71827
Average Income	-0,0194	-0,0757	-0,1090	0,0206
(Log of GNP per capita in US \$)	-0,2162	-1,1543	-1,3164	0,74065
Income Inequality	0,0152	0,0142	0,0194	0,0225
(Gini Coefficient)	2,4394	2,7925	2,4155	4,56247
Educational Attainment	0,0538	0,0010	0,0820	-0,0004
(Avg. Yrs. Of Educ., Adults)	1,2832	0,5875	1,5793	-0,63664
Urbanization	-0,0060	0,0135		
(% of Pop. In Urban Centers)	-1,4096	3,6364		
Young Males			-0,0352	-0,0360
(% Males of Ages 15-34 in Pop.)			-1,3575	-1,23783
No. Countries	45	34	44	34
No. Obs.	136	102	133	102
SPECIFICATION TESTS (P-Values):				
(a) Sargan Test	0,439	0,722	0,323	0,591
(b) Serial Correlation :				
First-Order	0,042	0,046	0,105	0,047
Second-Order	0,184	0,548	0,213	0,375

* For details on definitions and sources of variables, see Appendix Table 1.

Table 2.5: Inequality and Polarization*Crime Data Source: World Health Organization Mortality Statistics (WHO)**Estimation Technique: GMM System Estimator**(t-statistics are presented below their corresponding coefficients)*

Dependent Variable (in logs):	Homicide Rate		
	Educational Inequality	Income Polarization	Ethnic Division
	[1]	[2]	[3]
Lagged Dependent Variable	0,8162	0,6929	0,8636
	40,8387	17,7960	65,9342
Growth Rate	-0,0246	-0,0156	-0,0080
(% Annual Change in Real GDP)	-16,4105	-2,5366	-3,3321
Average Income	0,0152	-0,1511	-0,0062
(Log of GNP per capita in US \$)	1,6251	-3,6827	-0,6837
Income Inequality	0,0124	0,0105	0,0048
(Gini Coefficient)	7,1283	6,0819	4,6939
Educational Attainment	-0,0224	0,0345	-0,0045
(Avg. Yrs. Of Educ., Adults)	-3,0433	2,0011	-0,5621
Drug Production	0,2533	0,3226	0,2458
(Dummy for Drug Producers)	19,1909	3,1641	8,5840
Educational Inequality	-0,0218		
(Standard Deviation of Schooling Years)	-2,2003		
Income Polarization		0,0930	
(Log of Income Polarization Index)		3,3494	
Ethnic Division			0,3287
(Index of Ethno-linguistic Fractionalization)			8,9749
No. Countries	44	38	42
No. Obs.	190	141	182
SPECIFICATION TESTS (P-Values):			
(a) Sargan Test	0,717	0,949	0,513
(b) Serial Correlation :			
First-Order	0,013	0,013	0,013
Second-Order	0,447	0,528	0,559

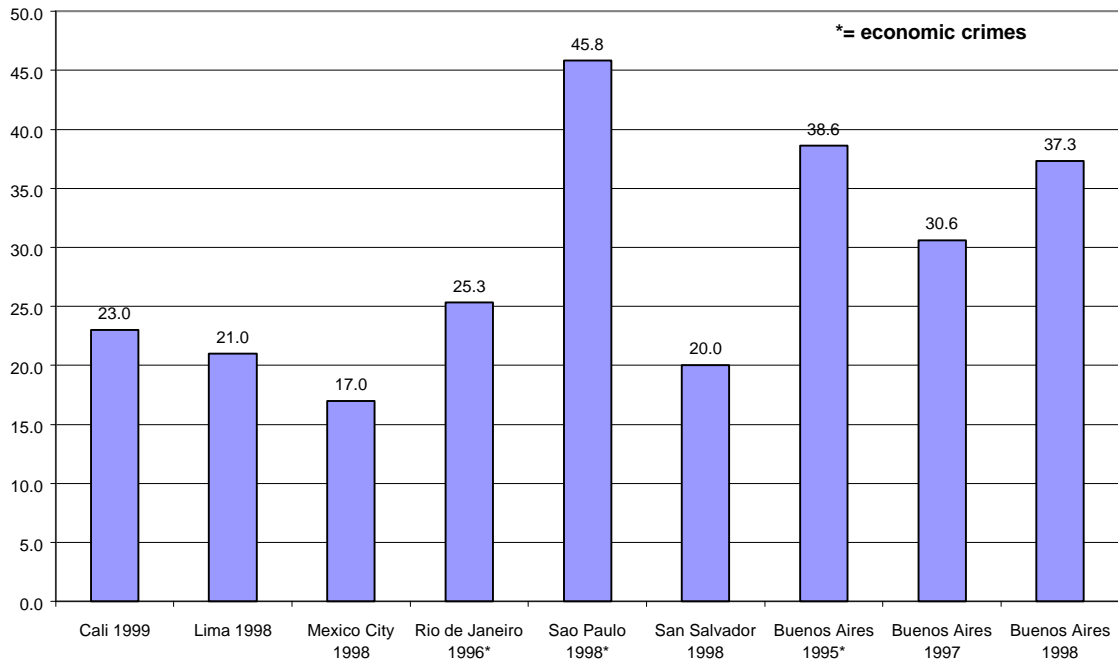
* For details on definitions and sources of variables, see Appendix Table 1.

Table 2.6: Social Capital*Crime Data Source: World Health Organization Mortality Statistics (WHO)**Estimation Technique: Cross-sectional GMM Estimator**Instrumental Variables: Regional dummies and phones per capita**(t-statistics are presented below their corresponding coefficients)*

Dependent Variable (in logs):	Homicide Rate					
	[1]	[2]	[3]	[4]	[5]	[6]
Constant	-1,82	-0,70	-1,03	-0,58	-0,90	-4,54
	-2,35	-1,96	-2,22	-0,81	-2,18	-1,21
Growth Rate (% Annual Change in Real GDP)	-0,21	-0,36	-0,32	-0,37	-0,37	-0,38
	-4,08	-6,77	-6,40	-7,66	-4,39	-6,39
Income Inequality (Gini Coefficient)	0,05	0,06	0,05	0,07	0,06	0,08
	3,50	4,51	4,86	8,86	8,89	3,57
Trust	-1,21					
	-1,78					
Membership		-0,41				
		-0,46				
Secular Membership			-0,66			
			-0,85			
Participation				0,38		
				0,59		
Religiosity					0,56	
					0,49	
Church attendance						-1,90
						-1,00
No. Countries	39	30	30	28	31	30
SPECIFICATION TESTS (P-Values):						
Hansen Test	0,51	0,12	0,18	0,22	0,53	0,35

* For details on definitions and sources of variables, see Appendix Table 1.

Figure 3.1. Victimization Reporting Rates in Metropolitan Areas



Sources: World Bank financed "mini victimization surveys"; PAHO-Activa survey for Rio de Janeiro; Criminal Policy Division, Ministry of Justice for Greater Buenos Aires, 1995, 1997 and 1998.

Table 3.1. Significant Determinants of the Probability of Being a Victim of Any Type: Empirical Results from Victimization Surveys in Latin American Cities

Explanatory Variables	Mexico City 1999	Rio de Janeiro 1996	San Salvador 1996	Sao Paulo 1999
I. Individual Characteristics				
Gender (male)	+	+	+	+
Age		?	-	-
Education	+			
Unemployed	-	-	-	-
Weapon	n.a.	n.a.		n.a.
Alcohol	n.a.	+		n.a.
II. Household Characteristics				
# of Members				
Household Income				
Single Parent		+	+	
III. Community Characteristics				
Unemployment Rate	+		-	
Police Rate		n.a.	-	n.a.
Education		-		-
Income		+		
Income Inequality		n.a.		n.a.
Poverty Rate	n.a.			
Number of Household Members	n.a.	-	n.a.	
Drugs	n.a.		n.a.	
Alcohol	n.a.	n.a.	n.a.	n.a.

**Table 3.2. Significant Determinants of the Probability of Being a Victim of Violent and Economic Crimes:
Empirical Results from Victimization Surveys in Latin American Cities**

Explanatory Variables	Cali 1996 (Vs person)	Cali 1996 (Vs pprty)	Lima 1998 (Aggres-sions)	Lima 1998 (Mug-gings)	Mexico City 1999 (Viol.)	Mexico City 1999 (Econ.)	Rio de Janeiro 1996 (Violent)	Rio de Janeiro 1996 (Econ.)	San Salvador 1996 (Viol.)	San Salvador 1996 (Econ. W/o viol.)	Sao Paulo 1999 (Violent)	Sao Paulo 1999 (Econ.)
I. Individual Characteristics												
Gender (male)	+	+	+	-	+		+	+	+			+
Age	-	-		+			?		-	-	-	?
Education				+	+	-		+				
Unemployed				-		-	-	-	-			-
Weapon			+		n.a.	n.a.	n.a.	n.a.			n.a.	n.a.
Alcohol	+	+			n.a.	n.a.	+	+				
II. Household Characteristics	n.a.	n.a.										
# of Members					+		-*	-*		-		
Household Income												
Single Parent				+			+			+		
III. Community Characteristics	n.a.	n.a.										
Unemployment					+	+			-			
Police Rate				-						-		
Education			-				-	-				-
Income				+			+			-		
Income Ineq.			+				n.a.	n.a.	-	+		
Poverty Rate								-				-
Drugs			+		n.a.	n.a.	+	+	n.a.	n.a.		
Alcohol					n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Notes: Unless noted otherwise, violent crimes refer to aggressions against the person with or without economic motivation, and economic crimes refer to crimes against property with or without violence. * Average number of household members for the community (municipalities). n.a. = not available. W/o = without. Pprty = property.