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## Crime and Victimization: An Economic Perspective

**W**hy is there more crime and violence in some countries than in others? And why is violent crime rising so rapidly around the world? What groups of people are most at risk from various types of crime? What evidence do we have that “crime waves” exist? Does poverty lead to high rates of violent crime? Or is it income inequality? Should crime alleviation be added to the list of benefits from economic reforms that generate sustained growth? Is the pro-cyclical nature of public expenditures in most developing countries exacerbating crime waves? Is education the key to solving the crime problem? How effective is police presence in fighting crime? Do people trust the police and judiciary? Are cultural and sociological factors overriding determinants of crime rates? Or are they secondary to economic forces? In particular, what makes Latin America one of the most crime-prone regions in the world? These questions are of vital importance to policy makers. Although we can not provide definite answers to all these issues, this paper should contribute to understanding them better and approaching their solutions.

The incidence of crime and violence varies widely across nations and regions of the world. Notwithstanding the enormous heterogeneity in the levels of crime and victimization rates, there are signs that over the past decades the problems of crime and violence have worsened considerably

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throughout the world. Crime rates in industrialized countries have increased by 300 to 400 percent since the late 1960s.<sup>1</sup> From the early 1980s to the mid 1990s, the rate of intentional homicides increased by 50 percent in Latin America and sub-Saharan Africa and by more than 100 percent in eastern Europe and central Asia.<sup>2</sup>

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 in the mid-1990s reported violent crime as the nation's "most serious problem."<sup>3</sup> 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 percent place it at the top of citizens' concerns.<sup>4</sup> Similar conclusions can be derived from polls conducted in seventeen Latin American countries in 1996, which describe violence as "the region's main social and economic problem."<sup>5</sup>

This paper examines the main issues concerning crime and victimization from an economic perspective, combining 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 following section provides an overview of the costs and causes of crime, together with a brief look at the type of data available for analyzing crime. We start by presenting the main methodological approaches for measuring the costs of crime and present estimates for selected developed and developing countries. We then survey the literature on the causes of crime, which extends 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. Finally, the section on crime data describes the main sources of information regarding crimes, victims, and offenders, and it discusses the relative advantages of crime statistics derived from official sources and from victim and offender surveys.

1. International Centre for the Prevention of Crime (1998, chap. 3, p. 5).

2. Fajnzylber, Lederman, and Loayza (1998, pp. 11–15).

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

4. International Centre for the Prevention of Crime (1998, chap. 3, p. 2).

5. Polls conducted by Latino Barómetro, quoted in Londoño and Guerrero (1999, p. 6).

The next 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, the average educational attainment of the adult population, and the lagged crime rate (to allow for inertial effects). In turn, we extend the basic model along five dimensions: (1) deterrence factors, (2) activities related to illegal drugs, (3) demographic issues, (4) income and ethnic polarization, and (5) social capital.

The paper then 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. In the final section we phrase our main results in terms of policy implications. Thus we attempt to show how the conclusions of the paper can form the basis for specific policy recommendations.

## **A Review of the Costs, Causes, and Data Sources on Crime**

This section provides an overview of some conceptual issues regarding the costs of crime, together with available estimates; theoretical and empirical research on the causes of crime and violence; and the relative advantages of official crime statistics versus victimization surveys.

### *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. Several approaches have been used to measure the social costs of crime, and estimates vary considerably depending on the adopted methodologies and assumptions.

The simplest way 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 lost resources 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). Crime also leads to other indirect costs that are more difficult to quantify. Complete estimates should include the discounted value of stolen property (see below), the underinvestment 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.<sup>6</sup>

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. Since the value of stolen property 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 Glaeser emphasizes, 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, all property losses should be considered social losses.<sup>7</sup>

Estimates performed in industrialized countries indicate that the costs of shattered lives account for the largest share of all measured crime costs: in Australia, England, France, and the United States, the value of lost lives represents more than 40 percent of those costs.<sup>8</sup> In the specific case of women, every year 9 million years of healthy lives are lost worldwide as a result of rape and domestic violence.<sup>9</sup> This loss is larger than the corresponding loss due to all types of cancer in women and twice as large as the loss due to motor-vehicle accidents suffered by women.<sup>10</sup>

In the United States, a study using 1992 data estimated that crime caused a loss of \$170 billion in the form of suffering and potential years of life lost, while public expenditures on the criminal justice system and pri-

6. See Buvinic and Morrison (1999, technical note 4).

7. Glaeser (1999, p. 19).

8. International Centre for the Prevention of Crime (1998, chap. 2, p. 3).

9. World Bank (1993).

10. Buvinic and Morrison (1999, technical note 4).

vate security costs amounted to \$90 billion and \$65 billion, respectively.<sup>11</sup> 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 percent of the U.S. gross domestic product (GDP). Similar figures were obtained using analogous procedures in Australia, Canada, and the Netherlands.<sup>12</sup>

In Latin America, a recent study conducted at the Inter-American Development Bank (IDB) estimates that the social costs of crime, including the value of stolen properties, amount to \$168 billion, or 14.2 percent of the region's GDP.<sup>13</sup> The largest cost category in this study is that of intangibles, which accounts for half of the estimated costs of crime. This category 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 relation 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.<sup>14</sup> It is also theoretically plausible that crime produces diminishing welfare effects as its incidence rises. Alternatively, the higher Latin American estimates of so-called intangible costs may stem from methodological differences or from the sensitivity of the results to the quality of the available data.<sup>15</sup>

11. Mandel and others. (1993).

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

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

14. Alternatively, in explaining the intangible costs of crime, the cumulative effect of relatively high levels of crime over a long period of time may be more important than the levels of crime at a given point in time. Thus the costs of crime could grow even in the context of stable or declining crime rates.

15. An approach that has not been applied to date in Latin America is that of using so-called hedonic estimates of housing prices 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 percent in real estate costs (Buvinic and Morrison, 1999). 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 (Glaeser, 1999, p. 20). 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 percent of Latin America's GDP, with the largest category being the cost of potential lives lost and other health-related costs (1.9 percent of the region's GDP), followed by expenditures on police and the criminal justice system (1.6 percent of GDP) and the cost of private security (1.4 percent of GDP).<sup>16</sup> The IDB estimates demonstrate considerable differences across countries. While Mexico stands close to the region's average, with crime costs (excluding intangibles and transfers) of 4.9 percent of GDP, crime in El Salvador and Colombia lead to losses of 9.2 and 11.4 percent of GDP, respectively. At the other end of the spectrum, crime-related costs in Peru and Brazil amount to 2.9 and 3.3 percent of GDP, respectively.<sup>17</sup>

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. Governments and international organizations now face the formidable challenge of designing and implementing policies to prevent and reduce crime and violence. A necessary first step is to develop a better knowledge of the causes of crime and violence.

### *The Causes of Crime*

At least since the pioneering work of Becker, 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.<sup>18</sup> 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 . . .*"<sup>19</sup> Regarding issues of crime and punishment, Becker writes that this rationality implies 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."<sup>20</sup> Below, we

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

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

18. Becker (1968).

19. Becker (1993, pp. 385–86, emphasis in original).

20. Becker (1993, p. 390).

review some of the main contributions to the economics literature on the determinants of crime, which has developed considerably in recent years, particularly in the United States.

One of Becker's main insights 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. In early studies of this sort, Ehrlich estimates the elasticity of crime with respect to the expected size of punishment to be  $-0.5$ , while Mathieson and Passell calculate it at  $-0.3$ .<sup>21</sup> Using data on capital punishment provisions across the United States, Ehrlich finds that the death penalty has a major impact on crime rates.<sup>22</sup>

Analysts often make a subtle distinction between deterrent effects, which are associated with policing and convictions, and incapacitation or preventive effects, which result from locking up (or killing, in the case of capital punishment) criminals who have a tendency to rejoin the crime industry once they are released. As Ehrlich states, "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."<sup>23</sup> The empirical evidence, at least for the United States, has favored the idea that imprisonment reduces crime rates mostly through deterrence rather than through incapacitation.<sup>24</sup>

An assessment of the effectiveness of deterrence must also incorporate individual attitudes toward risk, which affect the 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.<sup>25</sup> The

21. Ehrlich (1973); Mathieson and Passell (1976).

22. Ehrlich (1975a).

23. Ehrlich (1981, p. 311).

24. Ehrlich (1975a, 1981); Levitt (1998a).

25. Becker (1968, p. 178); 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).



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.<sup>26</sup>

One serious econometric problem that afflicts most of the early empirical estimates of the relation between crime and punishment is that crime-reducing efforts through increased deterrence 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 (OLS) regressions of crime rates on deterrence variables may underestimate the crime-reducing effect of the latter, and they may even lead to spurious positive correlations between crime and deterrence.

Levitt greatly contributes to overcoming this problem by using econometric techniques aimed at isolating exogenous sources of variation in the level of deterrence.<sup>27</sup> By constructing variables that capture exogenous variations in the size of the prison population, the number of police per capita, and arrest rates, Levitt finds robust evidence that all these measures of deterrence have significant effects on crime, as predicted by Becker's economic model. In estimating the effect of prison populations on crime, Levitt corrects for the simultaneity bias arising from the fact that for a given probability and severity of punishment, the prison population should increase with the overall crime rate.<sup>28</sup> To this end, he uses the status of litigation on state prison overcrowding as an instrumental variable for the rate of change of incarceration rates.<sup>29</sup> Levitt's estimates of the elasticity of crime with respect to prisoners are almost four times higher when the endogeneity of prison populations is controlled for. After taking into account a number of economic and demographic crime determinants, Levitt finds that a 100 percent increase in the number of prisoners per capita causes a 40 percent reduction in violent crime rates and a 29 percent reduction in property crime rates.

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

27. Levitt (1996, 1997, 1998a).

28. Levitt (1996).

29. Prison overcrowding lawsuits have been filed in the United States since 1965 on the grounds of unconstitutional conditions in prisons. Levitt shows that the filing of prison overcrowding litigation leads to the lowering of prison population growth rates, even before the courts reach any decision. Moreover, the status of prison overcrowding litigation is shown to be unrelated to previous crime rates.

Following a similar approach, Levitt correlates changes in the number of police per capita with electoral cycles and then uses the variable to elicit the pure effect of policing on crime rates across cities.<sup>30</sup> Levitt shows that police forces in large U.S. cities grow disproportionately faster in mayoral and gubernatorial election years, while crime rates do not appear to be significantly related to electoral cycles, at least after controlling for other types of social spending and for economic conditions. Election-year indicator variables are thus used as instruments for the number of police officers. For six out of seven crime categories, this procedure leads to negative and significant estimates of the elasticity of crime with respect to the size of the police force. Additional controls are included to account for unobserved heterogeneity in levels and rates of change of crime rates, which could also positively bias the above elasticities. Results indicate that each additional police officer reduces the number of reported crimes by approximately eight per year. Using available estimates of the social costs of crime and the total costs of hiring additional police officers, Levitt concludes that police staffing in large American cities is below its optimal level.

Finally, Levitt turns to the negative relation between crime and arrest rates that is often found in empirical tests of the deterrence hypothesis, in order to determine whether this result supports this hypothesis or can instead be attributed to an endogeneity bias.<sup>31</sup> A bias could arise because the underreporting of crime leads to a measurement error in the number of reported crimes, which appear both in the numerator of crime rates and in the denominator of arrest rates. Levitt estimates the arrest-crime elasticity using first through fourth differences of both variables, expecting to find lower absolute values for the longer differences, given the fact that they should be less affected by measurement-error bias. The various estimates are not, however, significantly different from each other, which suggests that the bias resulting from measurement error is not substantial. The negative correlation between arrests and crimes is not spurious, but reflects either deterrence or incapacitation. To distinguish between these two effects Levitt estimates the effect of arrest rates for a specific type of offense on the rates of other crimes. Assuming that property and violent crimes are not substitutes for one another (that is, criminals would not

30. Levitt (1997).

31. Levitt (1998a).

switch from one to the other in response to changes in relative arrest rates), he interprets the corresponding cross-elasticity as reflecting exclusively an incapacitation effect. Using these estimates, in conjunction with published information on the time served per arrest and on the likelihood of re-arrest for each type of crime, Levitt estimates the deterrence and incapacitation components of the reduction in a given crime associated with increases in own-crime arrests. He concludes, as does Ehrlich, that deterrence is empirically more important than incapacitation. This is particularly true for assault and property crimes, for which deterrence explains a minimum of 75 percent of the overall effect. Still, incapacitation effects are not negligible: Levitt estimates that each additional person-year of incapacitation leads to a reduction of 5.1 to 8.2 index crimes.

A recent line of research questions the motives of officials in the police and judiciary. Law enforcement has traditionally been assumed to serve the needs of the people or to maximize some social welfare function, but researchers increasingly recognize that law enforcement officials respond to their own incentives, which are not always consistent with society's welfare. This literature is still mostly limited to the United States. In a pioneering article, Posner attempts to understand what it is that judges maximize.<sup>32</sup> Glaeser and Sacerdote examine the factors that are associated with higher levels of punishment for murderers in the United States.<sup>33</sup> They find that people who kill African-Americans get shorter sentences, while murderers of women are more severely punished. These behavioral patterns presumably illustrate the attitudes of the judges who make most of these sentencing decisions. Glaeser, Kessler, and Piehl show that federal prosecutors act decisively against criminals with more income and higher level of human capital.<sup>34</sup> They argue that this relates to the career ambitions of the prosecutors, who want to distinguish themselves by prosecuting high-profile criminals. If the issue of police and judiciary incentives is relevant in the United States, it is much more so in developing countries, where corruption and lack of accountability are endemic problems in the public administration.

The literature on the payoffs and opportunity costs of crime is also rich. Fleisher and Ehrlich were pioneers in studying the effects of income levels and

32. Posner (1995).

33. Glaeser and Sacerdote (1999b).

34. Glaeser, Kessler, and Piehl (1998).

income disparities on the incidence of crime.<sup>35</sup> Fleisher argues that 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. Fleisher's and Ehrlich's empirical findings about the effects of income levels are mutually contradictory.<sup>36</sup> However, both authors find a significant crime-inducing impact of income inequality.<sup>37</sup> Ehrlich's 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.<sup>38</sup>

A number of studies focus on the relation between crime and labor market outcomes, such as employment and wages. Both Fleisher and Ehrlich examine the effect on crime of the unemployment rate, viewing the latter as a complementary indicator of income opportunities available in the formal labor market.<sup>39</sup> In their empirical studies, however, both authors find that unemployment rates are less important than income levels and distribution. Time-series studies have failed to uncover a robust, positive, and significant relation between unemployment and crime, but most studies based on cross-sectional and individual data do point in that direction.<sup>40</sup> A recent study by Tauchen, Witte, and Griesinger uncovers a negative relation between the amount of time spent working and arrest rates, using individual data on the Philadelphia birth cohort of 1945.<sup>41</sup> In another recent study with individual data, Grogger provides convincing evidence relating

35. Fleisher (1966); Ehrlich (1973).

36. Fleisher (1966) finds that a city's average family income has a negative effect on the arrest rates of young males, while Ehrlich (1973) finds that states with higher median family incomes have higher rates of violent and property crimes.

37. Fleisher (1966) measures income inequality as the difference between the average income of the second lowest quartile and the highest quartile of households, whereas Ehrlich (1973) uses the percentage of families below one-half of the median income.

38. Ehrlich (1973) assumes that the median income for the state 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.

39. Fleisher (1966); Ehrlich (1973). In the words of Fleisher, “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” (1966, p. 121).

40. See the literature review in Freeman (1994). Two notable exceptions are Witte (1980) and Trumbull (1989). Trumbull's analysis is based on county-level data from North Carolina, while Witte follows a sample of North Carolina men released from prison.

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

market wages to youth crime participation rates.<sup>42</sup> The author uses data from the U.S. National Longitudinal Survey of Youth (NLSY) to estimate a time-allocation model in which individuals choose how much time to allocate to legal and illegal work. His econometric results indicate that the drop in youth wages observed in the United States since the mid-1970s may explain as much as three-quarters of the rise in youth crime over the same period.<sup>43</sup>

Another important factor related to the effect of economic conditions on crime is the educational level of the population, which can determine the expected rewards from both legal and criminal activities. Criminals tend to be less educated and from poorer backgrounds than noncriminals: in 1986, over two-thirds of all eighteen- to twenty-four-year-old male prisoners and three-fourths of the eighteen- to twenty-four-year-old black male prisoners had fewer than twelve years of schooling. For the corresponding cohorts of nonimprisoned men, only 25 and 30 percent, respectively, had attained that educational level.<sup>44</sup> Thus one could expect that areas characterized by higher average educational levels should have a lower incidence of crime. Ehrlich reports, however, that property crime rates in the United States are positively and significantly related to the average years of schooling of the population aged twenty-five and over, even after controlling for income inequality and median income.<sup>45</sup> The author provides several explanations for this puzzling empirical finding: 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 higher average levels of education may go hand in hand with more pronounced educational inequities.<sup>46</sup>

In contrast, the evidence from studies based on individual data supports a negative effect of education on crime. This effect is not necessarily derived from the greater legitimate income that is potentially associated with education, however, but rather from participation in legitimate activ-

42. Grogger (1997).

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

44. Freeman (1991, p. 6).

45. Ehrlich (1975b).

46. Ehrlich (1975b, pp. 319–35).

ities per se. Witte and Tauchen, for example, find that for a sample of young men, the act of going to school or work reduces the probability of committing criminal acts, even if a high school degree does not have a significant effect on that probability.<sup>47</sup>

In somewhat of a departure from Becker's paradigm, an increasing number of studies turns to the sociological aspects of the incidence of crime. Dilulio argues that the prevalence of high crime rates in U.S. cities is related to the depletion of what social scientists call social capital.<sup>48</sup> Putnam defines social capital as the "features of social organization, such as trust, norms, and networks, which can improve the efficiency of society in facilitating coordinated actions."<sup>49</sup> Thus Freeman finds a strong relation between church attendance and a lower probability of arrest for youth surveyed in the NLSY.<sup>50</sup> Glaeser and Sacerdote find that the most important explanation of urban crime rates in the United States is the percentage of female-headed households, which is responsible for almost 30 percent of the city-crime effect.<sup>51</sup>

Similarly, individual perceptions of the benefits and costs of criminal activity are determined by their environment. Using a survey of disadvantaged youths in Boston, Case and Katz find that an individual's propensity to commit a crime rises when peers are also engaged in criminal activities.<sup>52</sup> This empirical finding has been modeled by Glaeser, Sacerdote, and Scheinkman, who emphasize the role of social interactions in explaining the significant variance of crime rates across U.S. cities. They argue that both the cost of crime and the propensity for it are determined by local social interactions among criminals, their peers, and their family members.<sup>53</sup> An important implication is that crime rates across different cities need not converge.

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

48. Dilulio (1996, pp. 20–21).

49. Putnam (1993, p. 173).

50. Freeman (1986).

51. Glaeser and Sacerdote (1999a, p. S253).

52. Case and Katz (1991).

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

Sah emphasizes the role of another type of social interaction, this time operating at the macroeconomic or systemic level. Individuals living in areas with high crime participation rates may 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 is that "past crime breeds future crime."<sup>54</sup> Thus, as in the case of the social interactions modeled by Glaeser, Sacerdote, and Scheinkman, systemic social interactions may cause cities and countries to experience criminal inertia over time.

Two issues that have recently received special attention from economists and other social scientists are the relation between crime and drugs and the explanation of youth crime participation. For instance, Blumstein shows that the homicide rate among youth aged eighteen and under, the number of homicides committed by juveniles with guns, and the arrest rate on drug charges among nonwhite juveniles all more than doubled between the mid-1980s and the early 1990s.<sup>55</sup> The same period saw no growth in the homicide rate among adults aged twenty-four and older and no growth in either the drug-related arrest rate for white juveniles or the number of juvenile homicides not involving guns. Blumstein attributes these worrisome trends to changes in the illegal drug market that were brought about by the introduction of crack cocaine. Because of its low price, crack cocaine attracted a larger number of buyers and led to an increase in the number of transactions. This, in turn, led to a considerable increase in the number of drug sellers, who are usually recruited among inner-city juveniles because of their lower opportunity costs and because of the relatively lenient punishments they face when caught. Because most drug dealers carry guns for self-protection and because dispute resolution in the illegal drug market is often violent, the growth of the crack cocaine market was accompanied by an increased diffusion of guns among juveniles. This, Blumstein argues, led to a greater incidence of both drug- and non-drug-related lethal violence among youth.

Grogger and Willis provide statistical tests of the hypothesis that the introduction of crack cocaine led to significant increases in crime in twenty-seven U.S. metropolitan areas.<sup>56</sup> Given the fact that crack markets

54. Sah (1991, p. 1282).

55. Blumstein (1995).

56. Grogger and Willis (1998).

are mostly concentrated in inner cities, Grogger and Willis assume that crack cocaine had no effect on suburban crime rates. They then compare crime rates in inner cities and suburbs, as well as before and after the introduction of crack in each metropolitan area. Results suggest that most index crimes experienced significant increases after crack was introduced; the only nonsignificant increases are for burglary and rape. Grogger and Willis also report econometric estimates of the effects of the introduction of crack cocaine, after controlling both for economywide period effects that influence crime rates differently in inner cities and suburbs and for area- and year-specific unobservable factors that may influence the introduction of crack. These results also favor the existence of sizeable positive, significant effects from crack introduction on violent crimes and robbery but not on other property crimes.

Grogger and Willis suggest that crack cocaine can be seen as a technological innovation that reduces the unit cost of cocaine intoxication. It thus leads to an outward shift in the supply curve for this product, and consequently the number of drug transactions increases, as does the incidence of violence, which is viewed as the main tool for enforcing agreements in the presence of incomplete property rights. As for the finding that crack cocaine had almost no effect on the rates of property crimes, Grogger and Willis hypothesize that these crimes are related to the demand side of the market, as they provide users with the income they need to purchase the drug. If the elasticity of the demand for drugs is relatively low, as can be expected for habit-forming goods, the outward shift in the supply curve may lead to a reduction in the total expenditures in cocaine intoxication, which would explain the absence of effects on property crimes.

The decline in violent crime rates in the United States after 1991 has also been linked to the crack cocaine epidemic, which began to abate in the early 1990s.<sup>57</sup> Other factors have certainly contributed to that decline as well, such as the long period of economic expansion in the United States and the increase in incarceration since the mid-1980s. In any case, the recent swings in the homicide rates of the younger age groups have

57. Blumstein and Rosenfeld, (1998); Grogger (1999). Grogger (1999) argues that the costs of entry in the market for illegal drugs increased with the escalation of violence that accompanied the introduction of crack cocaine. This would have shifted the supply curve for illegal drugs upward, which would explain the reversal in drug-related violence.



certainly contributed to spurring interest in juvenile crime, especially in the extent to which young offenders are responsive to economic incentives. The available evidence suggests that this is indeed the case, both for positive and negative incentives.<sup>58</sup>

The economics literature on the causes of crime has thus moved 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.

### *Data Sources 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 they use. The data on crime can be classified according to their 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 (for example, counties, cities, states, or countries) and allow for analysis based on time-series, cross-sectional, or even panel data. The 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 when crimes involve interpersonal violence (such as rape) and when offenders are known to the victims (as in domestic violence).<sup>59</sup>

Official crime data also suffer from deficiencies in the recording procedures of the police and justice systems, which in many cases do not

58. Levitt (1998b) shows that juvenile crime is at least as responsive to criminal sanctions as is adult crime; Grogger (1997) shows that when deciding to participate in crime, youth do take into account the level of legitimate wages; and Mocan and Rees (1999) find that juvenile crime responds to arrest rates and to local economic conditions.

59. Gottfredson (1986, p. 257).

compute their statistics from the complete set of law enforcement agencies existing in each country. Moreover, the quality of official crime statistics may be jeopardized by the selectivity with which crimes are recorded by the criminal justice system: crime statistics could be measuring “the behavior of officials and not of crime.”<sup>60</sup> For example, in El Salvador the Fiscalía General de la República (the office of the country’s chief prosecutor) only records crimes for which there is an indicted suspect.<sup>61</sup>

A second type of crime data involves homicide and intentional injury statistics collected from hospitals and morticians. These data are usually collected and tabulated by the countries’ health authorities and serve 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 are of special interest because these crimes are usually thought to be the least affected by the problems of underreporting and underrecording that afflict official crime statistics. In cross-country studies, the use of homicide data is further justified by the fact that they are 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.”<sup>62</sup>

Victimization surveys, which are the third source of crime data, are “the primary workhorse” for measuring crime.<sup>63</sup> These surveys are collected from city- or country-representative samples of households. They provide information about nonfatal 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 that enable the researcher to link the individuals to the community in which they live or were victimized. The researcher also needs a description of that community, which may be drawn from broader national surveys or national censuses. Victimization surveys are a relatively new source of crime data. In

60. Gottfredson (1986, p. 256).

61. Cruz, Trigueros Argüello, and González (2000, p. 14).

62. Fox and Zawitz (2000, p. 1).

63. Glaeser (1999, p. 26).

the United States, the Bureau of Justice Statistics, in conjunction with the Census Bureau, has regularly performed such surveys since 1973. Other countries that pioneered this type of research are Canada, the Netherlands, and the United Kingdom. Since 1989, the United Nations Interregional Crime and Justice Research Institute (UNICRI) has been promoting the application of methodologically consistent city-level victimization surveys around the world. By 1998, these International Crime Victim Surveys (ICVS) had been performed in 55 countries.<sup>64</sup>

A final data source is the offender survey. This type of survey can be taken through traditional survey methods in which 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 populations, in which case 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, it is then possible to identify how criminals differ from average citizens. This was the approach adopted by Glueck and Glueck, who are known as the pioneers of empirical research on crime in the United States.<sup>65</sup> These authors followed two matched samples of offenders and nonoffenders over many years and laid the foundations for most of the subsequent cross-sectional and longitudinal research in criminology.<sup>66</sup>

All in all, studies based on cross-sectional and panel data have been the most common, while studies exclusively using time-series data have been the less abundant. This is largely because time series of crime data are usually not available for long periods. However, time-series studies and studies 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."<sup>67</sup> Moreover, the temporal variation in the data allows the researcher to consider the effects of the business cycle on crime, as well

64. Newman (1999, p. 25).

65. Glueck and Glueck (1950, 1968).

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

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

as to test the hypothesis of criminal inertia. For this reason, studies of the relation between crime and the labor market have frequently used time-series or panel data sets.<sup>68</sup>

### **Cross-Country Evidence: An Empirical Approach**

This section analyzes the social and economic causes of violent crime rates in a worldwide sample of countries.<sup>69</sup> 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, a country's rates of intentional homicides and robberies serve as a proxy for the incidence of violent crime. Most of the empirical applications considered below employ a data set consisting 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 wanted to include these variables in the core model, but we decided against it because the cross-sectional data for these variables are limited. The second extension deals with the effects of two aspects of illegal drugs, namely, the production of drugs in the country and the drug possession crime rate.

The third extension considers demographic issues. In particular, we study whether the degree of urbanization and the age composition of the population have an effect on the incidence of violent crime. Fourth,

68. 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, which has been interpreted as reflecting, respectively, the effects of reduced criminal opportunities and reduced opportunity costs of crime.

69. This section draws heavily on Fajnzylber, Lederman, and Loayza (1999, 2000), and Lederman, Loayza, and Menéndez (2000).

we explore more deeply the relation between inequality and violent crime by considering the effects of other variables closely linked with income inequality. These variables are the level of educational inequality, the degree of income polarization, and the extent of ethnic and linguistic fractionalization of the population. The fifth extension deals with the relation 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.

### *Crime Data*

One of the reasons cross-country crime studies are uncommon is that it is difficult to compare crime rates across countries.<sup>70</sup> 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 poorly educated populations. In fact, Soares finds that the extent of underreporting is negatively correlated with the level of development.<sup>71</sup> Underreporting is most pronounced for low-value property crime (such as common theft) and for crimes carrying a social stigma for the victim (such as rape).

To reduce the biases caused by measurement errors, this paper focuses on the types of crimes that are least likely to be affected by mismeasurement and also employs an econometric methodology that deals with systematic measurement error. The types of crime featured in the analysis are intentional homicides and robberies. Robberies are more likely to be reported than are other property crimes because they include a violent component, which gives victims an additional reason to report the crime. Of all types of crime, intentional homicide statistics suffer the least from underreporting, underrecording, and nonuniformity of definitions, and the incidence of homicide appears to be a good proxy for other types of common crime. According to Donohue, “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. . . . [W]hile murder may not be a perfect proxy for crime, it is simply the best

70. For details on definitions and sources of crime data and other variables, see table A1 in the appendix.

71. Soares (1999).

we have.”<sup>72</sup> 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 crimes are a good proxy mostly for violent crime, our results apply more narrowly.

An important question, therefore, is whether our measures of homicides, which were obtained from the United Nations (UN) and the World Health Organization (WHO), are correlated with each other and with lesser crimes, which are represented in the analysis through measures of robberies from the UN and victimization survey data. (See below for additional information on data definitions and coverage of the UN and WHO databases.) To provide a preliminary answer to this question, we examine the bivariate correlations between our homicide rates, robbery rates, and victimization rates for a small sample of developed and developing countries. The victimization rates used are those reported by Newman; these rates are the percentage of survey respondents who were the victim of any type of crime during a five-year period between 1989 and 1996.<sup>73</sup> To obtain some degree of comparability, we use the average national homicide and robbery rates from the UN and WHO for a comparable period, namely, 1990–94. The correlation analysis was conducted with the natural logarithms of the aforementioned variables in order to eliminate the influence of the units of measurement. For each correlation, we use the largest possible sample of countries, which in the best case consists of twenty-one countries, including twelve industrialized and nine developing countries.

Table 1 shows the pairwise correlations, their p-values, and the number of countries included in each subsample. All the correlations are positive, indicating that homicide rates, robbery rates, and victimization rates are correlated across countries. Moreover, only the correlations between UN intentional homicide rates and UN robbery rates and between UN robbery rates and victimization rates are not statistically significant. The highest correlation is between the UN homicide rate and the victimization rates (0.77, p-value of 0.00), closely followed by the correlation between UN homicides and WHO homicides (0.73, p-value of 0.00). The correlation between the WHO homicides and UN robberies is also quite high (0.61) and is statistically significant at 1 percent. The WHO homicide rates are also highly correlated with the victimization rates (0.52), and this

72. Donohue (1998, p. 1425).

73. Newman (1999), statistical appendix.

**TABLE 1. Pairwise Correlations among Homicide, Robbery, and Victimization Rates<sup>a</sup>**

	<i>Homicides (WHO)</i>	<i>Homicides (UN)</i>	<i>Robberies (UN)</i>	<i>Victimization rates</i>
Homicides (WHO)	1.00			
Homicides (UN)	0.73 (0.00) <i>N</i> = 21	1.00		
Robberies (UN)	0.61 (0.01) <i>N</i> = 16	0.42 (0.11) <i>N</i> = 15	1.00	
Victimization rates	0.52 (0.04) <i>N</i> = 15	0.77 (0.00) <i>N</i> = 14	0.42 (0.18) <i>N</i> = 12	1.00

Source: Authors' calculations based on World Health Organization (WHO) mortality statistics; United Nations (UN) world crime surveys (various issues); Newman (1999).

a. *N* is the number of country observations; *p* values are in parentheses. All variables are expressed in natural logarithms.

correlation is significant at 5 percent. Although this evidence is not definitive, it does suggest that homicides are highly correlated with victimization rates across countries. On the other hand, the low and insignificant correlation between robbery rates and victimization rates is probably the result of measurement errors in the robbery data (that is, underreporting and underrecording). This preliminary evidence suggests that homicide rates are likely to be good proxies for crime in general, especially because they seem to be highly correlated with victimization rates across countries.

As mentioned above, we work with two international sources of official crime statistics. The first is the United Nations (UN) world crime surveys, which collect crime statistics from national justice ministries. This source provides statistics on the number of intentional homicides and robberies as reported by the police. The data set consists of an unbalanced panel of nonoverlapping five-year averages covering the period 1970–94 for about forty-five countries for homicides and thirty-four countries for robberies. The data set included in the regressions was selected on the basis of the quality of the available crime data and the availability of at least three consecutive observations.<sup>74</sup> The regression samples based on

74. To control for quality we excluded countries that had tenfold 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 how the data was cleaned up, see the appendix in Fajnzylber, Lederman, and Loayza (1998).

UN data feature some balance between observations from developed and developing countries: sixteen of the forty-five countries in the homicide regressions and fourteen out of thirty-four in the robbery regressions are industrialized countries. However, these regression samples exclude countries from sub-Saharan Africa, because of the lack of data for three consecutive five-year periods.

Our second source of crime statistics is mortality data from the World Health Organization (WHO), which collects this information from national public health records. This source provides a second measure for a country's incidence of homicides. 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 nonoverlapping five-year averages for the period 1965–95 which covers about forty-five 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 different. In the WHO data set, industrialized and Latin American countries are overrepresented.<sup>75</sup>

Most of the empirical exercises discussed below are based on the UN data set, because it allows the comparison between homicide and robbery results. We use the WHO data set to test the robustness of the results concerning the basic economic model and to examine in greater depth the relation 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.

### *Econometric Methodology*

Most of the empirical analysis of this section employs a generalized method of moments (GMM) estimator applied to dynamic models of panel data.<sup>76</sup> This methodology allows us to use panel data to control for the joint endogeneity of crime determinants and the presence of unobserved

75. The basic WHO regression sample comprises twenty OECD countries, ten Latin American countries, five Caribbean countries, four East Asian countries, three eastern European and central Asian countries, and three African and Middle Eastern countries.

76. The GMM estimator was developed by Chamberlain (1984); Holtz-Eakin, Newey, and Rosen (1988); Arellano and Bond (1991); Arellano and Bover (1995).



country-specific effects, such as systematic measurement errors in crime statistics.<sup>77</sup>

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 consider the variables that cause the differences in crime rates among countries. These are variables that change slowly over time but vary significantly from one country to the next. Examples include national income inequality and the geographic conditions favorable to illegal drug production. Second, we consider the information provided by variables that differ significantly over time. This is the case of GDP growth, whose time-series variance allows us to test business-cycle effects on the incidence of crime. Panel data also highlight 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 gross national product (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. The regression models test for inertia by including the lagged crime rate as an explanatory variable.

Regarding the correction of estimation biases, we first 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 alter the urban structure of the country and its age composition. Controlling for joint endogeneity is essential for obtaining 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

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

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. Countries may differ in the degree to which their citizens underreport crimes, for instance, and they may use different definitions and criteria for recording crime statistics. Provided that the factors that determine the underreporting—or under-recording—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 nonobservable 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 presence of unobserved country-specific effects either by differencing the regression equation (in which case the proper instruments are the lagged *levels* of the explanatory variables) or by 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 methods of controlling for unobserved specific effects. That is, the regressions 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 using two specification tests suggested by Arellano and Bond.<sup>78</sup> The first is a Sargan test of overidentifying 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

78. Arellano and Bond (1991).

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.

### *Results*

Based on previous micro- and macroeconomic literature, we consider the following variables as the basic economic determinants of violent crime rates: per capita GNP (in logs), both as a measure of average national income and as a proxy for overall development; the average number of years of schooling of the adult population, as a measure of average educational attainment; the GDP growth rate, as a proxy for employment and economic opportunities in general; the Gini coefficient, as a measure of the inequality of income distribution; and the lagged homicide rate (in logs), as a measure of the inertial effects of violent crime. All these variables are considered endogenous in the empirical analysis. As already mentioned, we proceed, first, by estimating a model in which crime rates are explained only by these basic economic determinants. We then extend this basic model by including, as potential crime determinants, deterrence factors, drug-related variables, demographic characteristics of the population, alternative indicators of inequality, and measures of social capital.

**BASIC ECONOMIC DETERMINANTS.** Table 2 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 (UN) world crime surveys and the World Health Organization (WHO) mortality statistics. 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 2 but also for all results based on this GMM system methodology (tables 3–6). 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 rates are significant and robust determinants of national crime rates.

TABLE 2. Basic Economic Model<sup>a</sup>

<i>Explanatory variables</i>	<i>Homicide rate (WHO data) (1)</i>	<i>Homicide rate (UN data) (2)</i>	<i>Robbery rate (UN data) (3)</i>
Constant	0.8171 (12.13937)	-0.3886 (-0.52762)	-0.4965 (-0.8658)
Lagged dependent variable	0.8376 (12.1394)	0.7263 (12.2731)	0.7673 (23.4132)
Growth rate <sup>b</sup>	-0.0115 (-6.4619)	-0.0239 (-2.9616)	-0.1468 (-10.3282)
Average income <sup>c</sup>	-0.0805 (-7.4297)	0.0090 (0.0783)	0.1280 (2.4637)
Income inequality <sup>d</sup>	0.0035 (5.9282)	0.0146 (2.2671)	0.0258 (3.7501)
Educational attainment <sup>e</sup>	-0.0013 (-0.2347)	0.0354 (0.6907)	-0.0016 (-1.3333)
Number of countries	48	45	34
Number of observations	193	136	102
<i>Specification tests (p value)</i>			
Sargan test	0.532	0.226	0.446
Serial correlation			
First order	0.008	0.068	0.043
Second order	0.592	0.284	0.803

Source: Authors' calculations based on WHO mortality statistics; UN world crime surveys (various issues) for crime data. For other variables, see the sources listed in the appendix.

a. Dependent variables are expressed in logs. Estimation technique is the generalized method of moments (GMM) system estimator; *t* statistics are in parentheses. For details of definitions and sources of variables, see appendix.

b. Percent annual change in real GDP.

c. Log of per capita GNP in dollars.

d. Gini coefficient.

e. Average number of years of education, for adults.

The coefficients on per capita GNP change sign and significance in each of the three regressions, while educational attainment is not statistically significant in any 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 income inequality is held 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.<sup>79</sup>

The past incidence of crime is another significant determinant of violent crime rates, which represents evidence in favor of the existence of crime waves. Past crime can breed future crime through a couple of channels. First, the costs of performing criminal activities decline over time given that, as in any other activity, criminals learn by doing.<sup>80</sup> The moral loss from breaking the law may also be reduced by social interactions with other criminals, and job opportunities in the legal labor market are likely to be reduced by the stigma associated with past criminal records.<sup>81</sup> 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.<sup>82</sup>

Criminal inertia implies that the long-run effect of a sustained change in one of the variables that affect crime rates is a multiple of its short-run effect (which is given by the corresponding coefficient as reported in the tables). In the case of homicides, long-run effects are 3.7 times larger than the short-run effects; and in the case of robberies, 4.3 times. In the case of transitory shocks, criminal inertia implies that the effect of a shock lasts longer than the shock itself. According to the estimated persistence coefficients, the half-life of a one-period shock to the homicide rate is 2.2 periods, and the corresponding half-life for the robbery rate is 2.6 periods.

The negative impact of GDP growth on violent crime rates indicates that the incidence of crime is countercyclical and that stagnant economic activity induces heightened criminal activity. By increasing the availability of job opportunities and raising 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 for homicide rates may indicate that an important fraction of homicides results from economically motivated crimes that become violent.<sup>83</sup>

79. Ehrlich (1975b).

80. See Glaeser, Sacerdote, and Scheinkman (1996).

81. See Leung (1995).

82. See Sah (1991); Posada (1994).

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

The estimated coefficients for the growth rate are not only statistically significant, but they are also economically important in magnitude. For homicides, the estimated growth coefficient implies that a one percentage point increase in the GDP growth rate is associated with a 2.4 percent decline in the homicide rate in the short run. In the case of robberies, a similar increase in the GDP growth rate leads to a short-run fall of 13.7 percent in the robbery rate, that is, more than five times higher than for the homicide rate. Thus economic activity, using the GDP growth rate as a proxy, has a larger impact on typically economic crimes, such as robberies, than on more violent crimes, such as homicides.

The positive effect of income inequality on the homicide and robbery rates can be interpreted as the impact of the difference between the returns on 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, is based on the assumption that crime victims are relatively richer than their aggressors; it may not apply to crimes where victims and perpetrators share common social and economic characteristics.<sup>84</sup> An alternative interpretation of the positive link between inequality and crime is that in countries with higher income inequality, individuals have lower expectations of improving their social and economic status through legal economic activities, which would decrease the opportunity cost of participating in illegal endeavors. Pessimistic perceptions of economic improvement through legal activities could also lead to a lessening of the moral dilemma associated with breaking the law.

Other factors may explain the positive link between inequality and crime. Bourguignon 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.”<sup>85</sup> One such factor that could lead to a spurious correlation between income inequality and crime rates is the limited amount and 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

84. Ehrlich (1973, pp. 538–40).

85. Bourguignon (1998, p. 2).

ethnic polarization, which we also discuss below. Additional analysis indicates that income inequality has a significant and independent impact on intentional homicide and robbery rates. This is consistent with the observation by Neapolitan and LaFree to the effect that the most robust finding in cross-national crime research has been the positive relation between income inequality and homicides.<sup>86</sup> 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 International Crime and Justice Research Institute (UNICRI), Soares finds a significant crime-inducing effect of income inequality.<sup>87</sup>

As in the case of economic growth, the effect of inequality appears to be important. According to our point estimates, a 1 percentage point increase in the Gini coefficient is associated with a 1.5 percent increase in the homicide rate and a 2.6 percent rise in the robbery rate. These are the impact effects. If the increase in the Gini index represents a permanent worsening of income inequality, the permanent effects are 3.7 and 4.3 times larger for homicide and robbery rates, respectively.

The main results of the basic model are very robust. 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. Furthermore, the crime-related effect of these variables is robust to the inclusion of regional dummy variables, which are thought to capture specific features of the regions that resist direct measurement (namely, cultural, sociological, and historical factors). In particular, the Latin America dummy showed no statistical significance when the proposed economic determinants of crime rates were included in the econometric analysis.<sup>88</sup>

**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 the subject. Our analysis of deterrence factors is rather limited,

86. Neapolitan (1997); LaFree (1999).

87. Soares (1999).

88. See Fajnzylber, Loayza, and Lederman (2000). Although the sign and significance of the estimated coefficients for the key crime determinants are robust, their magnitude is not very stable in different regressions. This is hardly surprising given that, first, the samples across regressions are not the same and, second, we estimate the coefficients using an instrumental-variable approach.

however, because of lack of comparable data across countries. We use two variables as proxies for the probability of being caught and for the corresponding severity of the punishments: the number of police personnel per 100,000 inhabitants and the presence of the death penalty in the country. The use of capital punishment in a given country is assumed to be an indicator of the overall severity of its legislation regarding the punishment of offenders. Limited data availability (police) and over-time variability (death penalty) prevents us from treating the two variables as endogenous variables in the GMM system estimator. However, to diminish their within-country endogeneity (that is, 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 subperiod for which they are available.<sup>89</sup>

The results on deterrence are presented in table 3. Although the use of period averages diminishes the within-country endogeneity of deterrence variables, they still suffer from cross-country endogeneity (that is, the fact that countries with a higher incidence of homicides tend to have a larger police force and tougher criminal legislation). Reverse causality should lead to a positive bias in the estimation of both variables' coefficients. Finding a significantly negative coefficient on a deterrence proxy means that its crime-reducing impact is large enough to overcome the positive bias caused by reverse causality. This is the case for homicide regressions: the estimated coefficients for both police presence and the death penalty are significantly negative. In contrast, the deterrence results for the robbery rate are not clear-cut. 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.

**DRUG-RELATED ACTIVITIES.** The existence of profitable criminal industries provides an important incentive to commit crimes. This subsection focuses on one such industry, namely, the illegal drug trade. This is

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



TABLE 3. Deterrence<sup>a</sup>

<i>Explanatory variables</i>	<i>Homicide rate</i> (1)	<i>Robbery rate</i> (2)	<i>Homicide rate</i> (3)	<i>Robbery rate</i> (4)
Constant	-3.5098 (-4.6884)	-0.5720 (-1.7125)	0.4234 (0.4549)	0.1357 (0.1710)
Lagged dependent variable	0.4820 (5.2070)	0.8026 (26.9728)	0.7267 (12.0864)	0.9286 (23.6425)
Growth rate <sup>b</sup>	-0.0395 (-2.6655)	-0.1555 (-7.3205)	-0.0037 (-0.45639)	-0.1231 (-8.8430)
Average income <sup>b</sup>	0.4227 (2.8993)	0.0798 (2.2198)	-0.1185 (-0.9845)	-0.0211 (-0.2752)
Income inequality <sup>b</sup>	0.0377 (4.3166)	0.0270 (5.4259)	0.0178 (2.1770)	0.0257 (2.4630)
Educational attainment <sup>b</sup>	-0.0554 (-0.7109)	0.0002 (0.1739)	0.0762 (1.6568)	-0.0014 (-0.6016)
Police rate <sup>c</sup>	-0.0009 (-1.8348)	0.0008 (2.8878)		
Death penalty <sup>d</sup>			-0.3457 (-2.5133)	0.0354 (0.2709)
Number of countries	41	33	43	33
Number of observations	124	99	131	98
<i>Specification tests (p value)</i>				
Sargan test	0.306	0.452	0.421	0.433
Serial correlation				
First order	0.171	0.034	0.135	0.033
Second order	0.636	0.766	0.318	0.821

Source: Authors' calculations based on UN world crime surveys (various issues) for crime data. For other variables, see the sources listed in the appendix.

a. Dependent variables are expressed in logs. Estimation technique is the GMM system estimator; *t* statistics are in parentheses. See appendix for details.

b. See notes to table 2 for details.

c. Number per 100,000 population, average for 1970-94.

d. Fraction of years in the period 1970-94 for which the death penalty was present in the country.

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 a country's illegal drug industry. The first is the number of drug possession offenses per 100,000 people. This variable does not measure the extent of actual drug consumption in a given country, but only the fraction that is considered illegal in the country's legislation and that has been detected by law enforcement agencies. Thus the variable reflects not only the size of the drug-consuming population, but also the society's degree of tolerance for

drug consumption. 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. State Department's *International Narcotics Control Strategy Report* (published annually since 1986). Since this variable does not vary over time, we consider it to be exogenous in the corresponding regressions.<sup>90</sup>

The results on crime effects from drug-related activities are presented in table 4. 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 share among different networks of producers and distributors. However, the crime-inducing effect of the drug possession crime rate cannot be interpreted as reflecting the effects on homicides of drug consumption per se, because a high rate of (detected) drug possession could also stem from tough legislation on illegal drug consumption.

In contrast, 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 for 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

90. Lack of data prevents us from controlling directly for the joint endogeneity of the drug-related variables, as we do in the case of our core economic variables. We use them as country averages (that is, without time variation) to minimize their within-country endogeneity with crime rates. In the case of the dummy for drug-producing countries, the production of illegal drugs responds mostly to climatic characteristics (such as abundant rain in the forests of Colombia and Bolivia) and geographic location (such as the proximity of Mexico to the United States, with its high demand for drugs). Thus this variable is not driven by prevalent crime rates in the country. At any rate, we recognize that we do not control for potential between-country endogeneity of the drug-producers dummy or the drug-possession crimes rate.

TABLE 4. Drug-Related Activities<sup>a</sup>

<i>Explanatory variables</i>	<i>Homicide rate</i> (1)	<i>Robbery rate</i> (2)	<i>Homicide rate</i> (3)	<i>Robbery rate</i> (4)
Constant	-1.0537 (-1.5102)	-0.3626 (0.7206)	-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 <sup>b</sup>	-0.0316 (-3.7848)	-0.1288 (-7.8744)	-0.0259 (-2.0995)	-0.1268 (-5.8804)
Average income <sup>b</sup>	0.0776 (0.7032)	0.0227 (0.4330)	0.1076 (0.7627)	0.1907 (4.6464)
Income inequality <sup>b</sup>	0.0165 (2.5928)	0.0204 (4.1203)	0.0306 (5.4550)	0.0292 (5.7035)
Educational attainment <sup>b</sup>	0.0492 (1.0932)	0.0005 (0.3770)	-0.0433 (-0.6194)	-0.0010 (-1.1286)
Drug production <sup>c</sup>	0.6341 (4.1709)	-0.4025 (-4.1033)		
Drug possession <sup>d</sup>			0.0020 (2.2395)	-0.0007 (-1.8220)
Number of countries	45	34	42	33
Number of observations	136	102	127	99
<i>Specification tests (p value)</i>				
Sargan test	0.34	0.682	0.434	0.398
Serial correlation				
First order	0.07	0.041	0.086	0.047
Second order	0.306	0.625	0.340	0.842

Source: Authors' calculations based on UN world crime surveys (various issues) for crime data. For other variables, see the sources listed in the appendix.

a. Dependent variables are expressed in logs. Estimation technique is the GMM system estimator; *t* statistics are in parentheses. See appendix for details.

b. See notes to table 2 for details.

c. Dummy for drug producers.

d. Drug possession crime rate, average for 1970-94.

of producers and distributors of illegal drugs generates an externality that favors the growth of other criminal activities.

**DEMOGRAPHIC FACTORS.** According to the literature, demographic factors can contribute to the intensity of violent criminal activity. Specifically, 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.<sup>91</sup> Recent papers have also argued that some trends in crim-

91. See Glaeser, Sacerdote, and Scheinkman (1996); Glaeser and Sacerdote (1999a).

**TABLE 5. Demographic Factors<sup>a</sup>**

<i>Explanatory variables</i>	<i>Homicide rate</i> (1)	<i>Robbery rate</i> (2)	<i>Homicide rate</i> (3)	<i>Robbery rate</i> (4)
Constant	-0.0542 (-0.0932)	0.4696 (1.1148)	0.4549 (0.7298)	0.6048 (1.3929)
Lagged dependent variable	0.8294 (17.0926)	0.7605 (18.8387)	0.8413 (19.9425)	0.8826 (37.2345)
Growth rate <sup>b</sup>	-0.0244 (-3.5502)	-0.1082 (-7.7679)	-0.0101 (-1.1405)	-0.1226 (-10.7183)
Average income <sup>b</sup>	-0.0194 (-0.2162)	-0.0757 (-1.1543)	-0.1090 (-1.3164)	0.0206 (0.7406)
Income inequality <sup>b</sup>	0.0152 (2.4394)	0.0142 (2.7925)	0.0194 (2.4155)	0.0225 (4.5625)
Educational attainment <sup>b</sup>	0.0538 (1.2832)	0.0010 (0.5875)	0.0820 (1.5793)	-0.0004 (-0.6366)
Urbanization <sup>c</sup>	-0.0060 (-1.4096)	0.0135 (3.6364)		
Young males <sup>d</sup>			-0.0352 (-1.3575)	-0.0360 (-1.2378)
Number of countries	45	34	44	34
Number of observations	136	102	133	102
<i>Specification tests (p value)</i>				
Sargan test	0.439	0.722	0.323	0.591
Serial correlation				
First order	0.042	0.046	0.105	0.047
Second order	0.184	0.548	0.213	0.375

Source: Authors' calculations based on UN world crime surveys (various issues) for crime data. For other variables, see the sources listed in the appendix.

a. Dependent variables are expressed in logs. Estimation technique is the GMM system estimator; *t* statistics are in parentheses. See appendix for details.

b. See notes to table 2 for details.

c. Percentage of population in urban areas.

d. Percentage of males aged fifteen to thirty-four in population.

inal 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.<sup>92</sup>

Table 5 reports the estimation results when we include, alternatively, the country's rate of urbanization and its share of young males (aged fifteen to twenty-nine) 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

92. See, for example, Blumstein and Rosenfeld (1998).

basic economic variables). After controlling for basic economic conditions, a higher degree of urbanization is not associated with higher homicide rates. In contrast, an increase in the degree of urbanization does lead to a rise in the robbery rate, which confirms the view that this type of property crime is more an urban phenomenon than is homicide. On the age composition of the population, despite the fact that in the United States most victims and perpetrators of homicides are young males, we find no evidence that an increase in the relative share of the young male population results in a rise of either type of violent crime in our cross-country analysis.

**INEQUALITY AND POLARIZATION.** This subsection examines in greater depth the connection between violent crime rates and various measures and concepts related to inequality. Our objective is twofold. First, we analyze the crime-inducing effects of educational inequality, income polarization, and ethnic division. These three variables are closely linked with income inequality. Second, we test whether the significant and robust relation 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 help solve the education 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.<sup>93</sup>

Society's degree of polarization may be the cause of rebellions, civil wars, social tension, and, by extension, violent crime.<sup>94</sup> 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.<sup>95</sup> Though related to income inequality, income polarization emphasizes the separation between large, internally homogeneous income groups. Income polarization is increasing with regard to 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. It

93. De Gregorio and Lee (1998).

94. Esteban and Ray (1994); Collier and Hoeffler (1998).

95. Esteban and Ray (1994).

is not uncommon for countries or regions to experience opposing movements in measures of income inequality and polarization.<sup>96</sup> They mostly move together, however, 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.<sup>97</sup>

Ethnic divisions are another source of societal polarization. As a measure of ethnic division, we use an index of ethnolinguistic fractionalization. Mauro and also Easterly and Levine use this index in their cross-country growth studies, and Collier and Hoeffler document its role in civil conflicts and wars.<sup>98</sup> The index measures ethnic polarization up to a country-specific threshold. Beyond that level, the index represents ethnic dispersion more than polarization. An analysis of the effect of ethnolinguistic fractionalization on violent crime rates must therefore allow for nonlinear effects.

As explained in the discussion on crime data, our analysis of inequality, polarization, and violent crime is based on WHO homicide statistics to take advantage of the larger time coverage of the WHO data set over the UN data. Expanded time coverage in crime data is necessary for obtaining a regression sample large enough to undertake our GMM system estimator, given that data are scarce with regard to income shares by quintiles (which are used to construct the polarization index). Regarding the endogeneity of these additional explanatory variables, we control for the endogeneity of both educational inequality and income polarization. Given the predetermined and time-invariant nature of ethnolinguistic fractionalization, we constrain it to be fully exogenous.

Table 6 presents the main results. When we introduce the measure of educational inequality 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 5 percent. When we include the Gini coefficient and the measure of educational inequality at the same time (column 1), the results change. The Gini maintains its positive sign and statistical significance, but the esti-

96. See Contreras (1997).

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

98. Mauro (1995); Easterly and Levine (1997); Collier and Hoeffler (1998).

TABLE 6. Inequality and Polarization<sup>a</sup>

Explanatory variables	Homicide rate		
	(1)	(2)	(3)
Lagged dependent variable	0.8162 (40.8387)	0.6929 (17.7960)	0.8636 (65.9342)
Growth rate <sup>b</sup>	-0.0246 (-16.4105)	-0.0156 (-2.5366)	-0.0080 (-3.3321)
Average income <sup>b</sup>	0.0152 (1.6251)	-0.1511 (-3.6827)	-0.0062 (-0.6837)
Income inequality <sup>b</sup>	0.0124 (7.1283)	0.0105 (6.0819)	0.0048 (4.6939)
Educational attainment <sup>b</sup>	-0.0224 (-3.0433)	0.0345 (2.0011)	-0.0045 (-0.5621)
Drug production <sup>c</sup>	0.2533 (19.1909)	0.3226 (3.1641)	0.2458 (8.5840)
Educational inequality <sup>d</sup>	-0.0218 (-2.2003)		
Income polarization <sup>e</sup>		0.0930 (3.3494)	
Ethnic division <sup>f</sup>			0.3287 (8.9749)
Number of countries	44	38	42
Number of observations	190	141	182
<i>Specification tests (p value)</i>			
Sargan test	0.717	0.949	0.513
Serial correlation			
First order	0.013	0.013	0.013
Second order	0.447	0.528	0.559

Source: Authors' calculations based on WHO mortality statistics for crime data. For other variables, see the sources listed in the appendix.

a. Dependent variable is expressed in logs. Estimation technique is the GMM system estimator; *t* statistics are in parentheses. See appendix for details.

b. See notes to table 2 for details.

c. Dummy for drug producers.

d. Standard deviation of years of schooling.

e. Log of income polarization index.

f. Index of ethnolinguistic fractionalization.

mated coefficient of educational inequality becomes negative and significant. In other words, when we control for income inequality, violent crime rises as educational attainment becomes more equally distributed. This result implies that if income opportunities do not follow the egalitarian patterns of educational attainment, violent crime rises, possibly due to people's greater awareness of income disparities. Moreover, 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 neg-

ative and significant sign in the homicide regression. This result may offer a solution to the education puzzle to the extent that a rise in average education reduces crime when we control for the dispersion in education. This is a new finding and merits further investigation.

In contrast to educational inequality, income polarization (column 2) has a positive and significant effect on homicide rates even after controlling for the basic economic determinants of violent crime. In an additional exercise to determine whether the relation is nonlinear (not shown in the table), we find that the square term of polarization has a negative, 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. Its total effect on violent crime rates is never negative, however, at least in the sample under consideration. 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, the ethnolinguistic fractionalization has a significant crime-inducing effect (column 3). Unlike income polarization, however, ethnolinguistic fractionalization did not demonstrate the expected nonlinear effects (that is, 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 is well under the threshold, such that an increase in the index represents continued ethnic polarization rather than ethnic dispersion. Lastly, we note that the Gini index does not lose its sign, size, or significance with the inclusion of ethnic division as a crime determinant.<sup>99</sup>

**SOCIAL CAPITAL.** The final extension to the basic model deals with the relation between social capital and violent crime. The economics literature on crime mostly follows Becker's original paradigm, which is based on individual cost-benefit analysis. Only recently has the effect of social interactions on criminal behavior become the focus of economics studies, most

99. Although the inequality result is maintained even after controlling for income polarization and ethnic division, we acknowledge that social mobility is another potentially important variable, one that is omitted here. We thank Alejandro Gaviria for pointing this out. Unfortunately, as far as we know, there is no internationally comparable data set with indicators of social mobility.



of which are theoretical.<sup>100</sup> Dilulio argues that one of the areas that has received little attention from economists is the potential link between social capital and violent crime.<sup>101</sup>

There are two basic arguments for the role of social capital in reducing 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). The second argument in favor of the crime-reducing impact of social capital is that communities with stronger ties among their members are better equipped to organize themselves to overcome the free-rider problems of collective action. This decreases the potential for individual opportunistic behavior, which lessens the potential for social contention and conflict. Glaeser and Sacerdote point out that opportunistic behavior is one of the problems in big cities, where individuals are less likely to be long-term residents and urban anonymity protects criminals from social stigma.<sup>102</sup>

At the same time, other aspects of 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. Deep ties among community members may also facilitate the influence of successful criminals, who may become role models and thus strengthen the propensity for crime and violence in the community. Rubio analyzes the role of drug cartels, guerrilla groups, and gangs in generating a perverse social capital in Colombia.<sup>103</sup> 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 disseminated throughout society.

100. See Glaeser, Sacerdote, and Scheinkman (1996).

101. Dilulio (1996).

102. Glaeser and Sacerdote (1999a).

103. Rubio (1997).

This section explores empirically how the incidence of homicide is affected by different measures of social capital, such as the prevalence of trust within the community and membership and participation in voluntary secular and religious organizations. These measures are based on comparable household surveys in several countries around the world, as described in the World Values Survey (WVS).<sup>104</sup> They were complemented with data from Muller and Seligson, who incorporated countries from Central America.<sup>105</sup>

The data scarcity encountered in cross-country empirical work on crime is even more pronounced in the case of social capital. When we cross the sample for social capital indicators with that for homicide rates (from WHO), we are left with a maximum sample of 39 countries (none of them from Africa) with one observation for each country, corresponding to the average for the period 1980–94. Consequently, our empirical strategy for analyzing the effect of social capital must be different from the one presented above. We replace the panel estimator with a cross-sectional, instrumental-variable estimator, and we limit the 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 is another important concern for the analysis of how social capital affects crime. In fact, the incidence of crime and violence may affect social capital. In societies where crime is rampant, for example, the prevalence of community trust tends to be low. Furthermore, the overall effect of violent crime on some measures of social capital may be ambiguous. For example, participation in voluntary communal organizations may rise as a result of higher crime, as community members organize to fight crime, or it 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 in measures of social capital 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.) Our instruments for

104. The World Values Survey is coordinated by the Institute for Social Research, University of Michigan.

105. Muller and Seligson (1994).

social capital include regional dummy variables indicating groups of countries according to geographic location or stage of development, on the basis that countries in a region share certain cultural traits that in turn affect their social capital. The second instrumental variable is the number of telephones per capita in the country, on the basis that means of communication such as telephones diminish the costs of social interactions.<sup>106</sup>

Table 7 presents the results on social capital using the maximum sample available for each social capital indicator.<sup>107</sup> Additional exercises (not presented here) estimate the regressions using a common sample for all indicators or change the set of instrumental variables. Controlling for omitted variables and joint endogeneity, the prevalence of trust among community members seems to have a significant and robust effect in reducing the incidence of violent crimes.<sup>108</sup> The effect of other social capital indicators on violent crime is not clear. In the case of religiosity (that is, the importance of religion in daily life, as claimed by the individual) and church attendance, the differing results obtained with various samples indicate that their effect on violent crime may be specific to particular countries or religions.

The effect of membership and participation in voluntary social organizations is unclear, which may be due to a combination of two factors. The first is our inability to fully isolate their exogenous component and, thus, correctly estimate their effect on violent crime. The second, and probably more important, factor behind their ambiguous effect on violent crime rates is that membership and participation in voluntary social organiza-

106. See Collier (1998).

107. 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 to compare their coefficients and interpret them as the effect on crime rates of (approximately) a percentage change in each indicator.

108. Glaeser and others (1999, p. 5) point out that their results, which are based on an experiment conducted on a sample of Harvard undergraduates, show that “while trust survey questions [such as the one from the WVS] are bad at predicting the levels of trust, they may be good at predicting the overall level of trustworthiness in a society.” If these results were applicable to our sample of countries, then our results would need to consider the conceptual difference between trust (defined by Glaeser and others as “the commitment of resources to an activity where the outcome depends on cooperative behavior”) and trustworthiness (defined as “behavior that increases the returns to people who trust you”). At the national level, however, it is virtually impossible to distinguish between these two concepts, because having a large number of people with trust must be highly correlated with the level of trustworthiness.

**TABLE 7. Social Capital<sup>a</sup>**

<i>Explanatory variables</i>	<i>Homicide rate</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-1.82 (-2.35)	-0.70 (-1.96)	-1.03 (-2.22)	-0.58 (-0.81)	-0.90 (-2.18)	-4.54 (-1.21)
Growth rate <sup>b</sup>	-0.21 (-4.08)	-0.36 (-6.77)	-0.32 (-6.40)	-0.37 (-7.66)	-0.37 (-4.39)	-0.38 (-6.39)
Income inequality <sup>b</sup>	0.05 (3.50)	0.06 (4.51)	0.05 (4.86)	0.07 (8.86)	0.06 (8.89)	0.08 (3.57)
Trust <sup>c</sup>	-1.21 (-1.78)					
Membership <sup>c</sup>		-0.41 (-0.46)				
Secular membership <sup>c</sup>			-0.66 (-0.85)			
Participation <sup>c</sup>				0.38 (0.59)		
Religiosity <sup>c</sup>					0.56 (0.49)	
Church attendance <sup>c</sup>						-1.90 (-1.00)
Number of countries	39	30	30	28	31	30
<i>Specification tests (p value)</i>						
Hansen test	0.51	0.12	0.18	0.22	0.53	0.35

Source: Authors' calculations based on WHO mortality statistics for crime data and World Values Survey for social capital data. For other variables, see the sources listed in the appendix.

a. Dependent variable is expressed in logs. Estimation technique is the cross-sectional GMM estimator; *t* statistics are in parentheses. See appendix for details.

b. See notes to table 2 for details.

c. See definitions in appendix table A2.

tions reflect both group-specific and societywide social capital. As argued above, while the latter type of social capital would reduce violent crime, the former may increase it. Finally, 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, which confirms our previous results.

## Microeconomic Evidence

Microeconomic evidence collected through household or individual surveys is the traditional workhorse of empirical analyses of the determinants

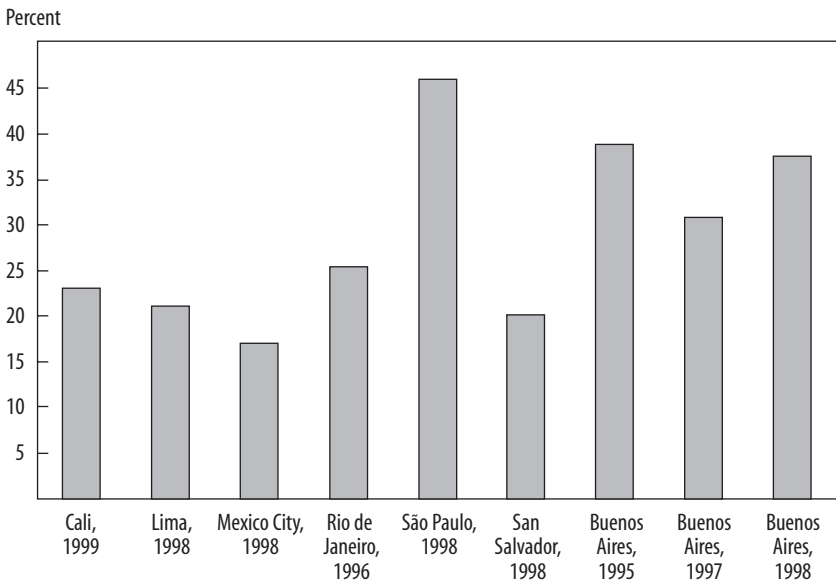
of crime and violence. An important disadvantage of microeconomic data is that they do not include information about extreme forms of crime and violence, such as homicides, for an obvious reason: the victims of such crimes cannot participate in the surveys. Also, it is not practical to use these data for estimating the effect of certain communitywide characteristics, such as income inequality, on the individual's probability of being victimized. Neighborhood or district borders are more imaginary than real, and potential aggressors can easily move across these borders to perpetrate crimes. Using survey data to examine the effect of inequality would require collecting social and economic information about both the victims and the aggressors, so that the economic distance between these individuals could be accurately measured. This type of information is, unfortunately, virtually impossible to collect.

The main advantage of microeconomic data is that information collected through surveys tends to be more accurate than official statistics, which, as mentioned above, may suffer from a combination of reporting and recording errors. Recent victimization surveys, which asked respondents whether they or a member of their family were the victim of a crime within a given period of time (usually six or twelve 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 show that reporting rates in several Latin American cities range between 17 and 46 percent (see figure 1). That is, fewer than half of the total number of victimization episodes are actually reported to the local authorities.

The causes of underreporting across countries seem to be related to the level of development.<sup>109</sup> The level of development, in turn, is correlated with the quality of public institutions.<sup>110</sup> The quality of public institutions, then, appears to affect the extent of underreporting of crimes. In other words, as citizens' confidence in public institutions rises, so does the extent of crime reporting by private citizens. Other factors probably also play a role in determining the extent of underreporting. For example, cities or countries may vary in the incidences of violent aggressions 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,

109. Soares (1999).

110. Kaufmann, Kray, and Zoido-Lobaton (1999).

**FIGURE 1 . Victimization Reporting Rates in Metropolitan Areas<sup>a</sup>**

Sources: Victimization surveys financed by the World Bank, as reported in Cruz, Argüello, and González (2000); Instituto Apoyo (2000); Piquet (2000); Velez and others (2000). For Rio de Janeiro, Pan-American Health Organization (PAHO), Activa survey. For Greater Buenos Aires, data from Ministry of Justice, Criminal Policy Division.

a. Data for Rio de Janeiro, São Paulo, and Buenos Aires (1995) represent economic crimes.

some of the cross-country differences in reporting rates may reflect different structures of crime or victimization patterns. The determinants of the reporting rates across countries and cities remain an interesting avenue for future research.

In the rest of this section, we first discuss the main objectives of victimization studies and what we can expect from them. We then review existing empirical evidence regarding 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, using either probit or logit models. We begin with a review of recent econometric studies on the determinants of victimization for any type of

crime conducted in four Latin American cities (Mexico City, Rio de Janeiro, San Salvador, and São Paulo). We then compare the results across types of crimes (that is, violent versus economic crimes) within and across six Latin American 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 eighty homicides per 100,000 in Cali and San Salvador to over twenty in Lima and Mexico City.<sup>111</sup> 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.

### *Victimization Studies: Questions and Potential Answers*

Data collected through victimization surveys have been used to examine the impact of city size and population growth on the probability of being victimized in the United States and in Latin American cities.<sup>112</sup> Studies on the empirical determinants of victimization tend to focus on the social and economic characteristics of the victims as explanatory variables, thus providing a map for identifying the individuals with the highest risk. Hence victimization studies help answer questions about the individual, family, and community characteristics that make some individuals more vulnerable to crime than others.

The answers derived from such studies usually take the general form of “the victims tend to be young males, from single-parent households, who are employed.” However, an interesting question to ask prior to undertaking (or in this case, reviewing) victimization studies is what theories of crime tell us about the results to be expected. From an economic perspective, theory tends to emphasize the role of an individual’s earnings:

111. See the case studies financed by the World Bank: Cruz, Trigueros Argüello, and González (2000); Funsalud (2000); Instituto Apoyo (2000); Piquet (2000); Vélez and others (2000). Some of the homicide rates cited here are disputed by alternative sources of information that are available in each city, and the studies cited contain detailed discussions about the alternative sources.

112. See Glaeser and Sacerdote (1999a); Gaviria and Pagés (1999).

a steady flow of earnings is expected to attract criminals, and the probability of being a victim is therefore expected to be a positive function of indicators that are related to the individual's earnings.<sup>113</sup> Such indicators include income, level of education, and employment status. Very few economists would completely ignore noneconomic risk factors such as family structure, age, and gender, such that a solid economic approach to analyzing the empirical determinants of the probability of being a victim would control for these noneconomic factors, as well. In other words, the real question to be answered by empirical economists is the following: after controlling for noneconomic factors, do the economic characteristics of the individual, household, or community affect the probability of victimization? The studies reviewed below follow this multivariate approach.

### *Determinants of Victimization in Latin American Cities*

The studies of Latin American cities reviewed here examine the relation between the probability of being a victim and three types of explanatory variables, which are 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.<sup>114</sup> The last two variables are arguably exceptions in the sense that they can be endogenous, depending on the exact wording of the question asked in the survey. Crime victims may resort to alcohol use and firearm acquisition in 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 the social and economic characteristics of the household. The number of household members is expected to affect individual victimization probabilities because family members tend to look after each other—the household can be considered 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

113. For simple but formal theoretical models of the incentives to commit crimes, see Fajnzylber, Lederman, and Loayza (1998) and the appendix in Lederman, Loayza, and Menéndez (2000).

114. The case studies of Cali, San Salvador, Rio de Janeiro, and São Paulo also control for the individual's ethnic origin.



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 household income may also attract delinquents.

The third category of explanatory variables characterizes the communities where the household resides. The unemployment rates, 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. Ideally, the community characteristics correspond to the place where the aggressions actually took place, but this information is rarely available from household surveys. Also, as mentioned earlier, the borders of the communities within cities are nonbinding, and the results about these variables should be interpreted with caution. An implicit assumption in these studies is that the place of residence affects the individual's probability of being a victim and that people are likely to be victimized in their homes, whether they are present or absent, or nearby when they are in transit to and from their places of work, study, and leisure. This is an empirical question that can be answered by the statistical significance of the community-level variables.

Table 8 presents the stylized results from probit or logit models using data from four surveys conducted in Mexico City in 1999, Rio de Janeiro in 1996, San Salvador in 1996, and São Paulo in 1999.<sup>115</sup> The number of observations included in each regression ranges from 1,057 for San Salvador to 2,605 for Mexico City. All four surveys used probabilistic sampling techniques to ensure that the samples are representative of each city's population. The information collected displays some important differences. In San Salvador and Rio de Janeiro, the questionnaires focused on the interviewed individual, while those used in Mexico City and São Paulo asked the respondent to provide social and economic information only about the household member who had been the victim of crime. In the case of Mexico City, the researchers were able to gather social and economic data about nonvictims by cross-referencing some basic household location and descriptive statistics with existing household surveys. For São Paulo, no information was provided about individuals in households without any

115. For Mexico City, see Funsalud (2000); for Rio de Janeiro and São Paulo, see Piquet (2000); for San Salvador, see Cruz, Trigueros Argüello, and González (2000).

**TABLE 8. Significant Determinants of Victimization in Latin American Cities**

<i>Explanatory variables<sup>a</sup></i>	<i>Mexico City (1999)</i>	<i>Rio de Janeiro (1996)</i>	<i>San Salvador (1996)</i>	<i>São Paulo (1999)</i>
<i>Individual characteristics</i>				
Gender (male)	+	+	+	+
Age		?	–	–
Education	+			
Unemployed	–	–	–	–
Weapon	n.a.	n.a.		n.a.
Alcohol	n.a.	+		n.a.
<i>Household characteristics</i>				
Number of members				
Household income				
Single parent		+	+	
<i>Community characteristics</i>				
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.

Source: Authors' calculations based on victimization surveys, as reported in Cruz, Trigueros Argüello, and González (2000); FUNSALUD (2000); Piquet (2000).

a. The dependent variable in each case is 1 if the individual was the victim of any type of crime and 0 otherwise. Plus signs reflect variables with a positive and significant probit coefficient or a significant odds ratio greater than one; negative signs reflect variables with a negative and significant probit coefficient or a significant odds ratio below one; blank cells indicate that the variable was included in the analysis but was not significant; the question mark indicates that it was not possible to sign the corresponding variable; n.a. means not available.

victims, such that the data are composed of all individuals belonging to households with at least one victim.

There are two individual characteristics that are significant in all four cases presented in table 8, namely, 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 have a lower probability of being a victim in San Salvador and São Paulo. In Rio de Janeiro, the survey results 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, namely, those aged eighteen to twenty-four and those aged thirty-five to forty-four. In the

three other cities, only the youngest group had a significant odds ratio greater than one or a 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. The variable representing the household's level of income is not significant in any of the cases. Since the unemployment variable for the individual is significant (as discussed above) and consistent with economic theories of crime, the lack of a significant result for household income is noteworthy. One plausible conceptual explanation is that what matters is the existence of steady income, rather than the size of the family's income, while a statistical explanation might focus on the unreliability of household incomes reported to the surveyors. Our preferred explanation, which is both conceptual and statistical, is that when the size of the family's income stream is considered, what matters for the individual's probability of being victimized is the employment status. After all, it is the individual being victimized and not the household as a whole.

Among the community characteristics, only the average level of educational attainment of the population appears significant in more than one case, and it is negative in both Brazilian metropolitan areas. In only one case that used data on police presence was this variable significant and, as expected, negative, which indicates the existence of a deterrent effect in San Salvador, despite the limitations mentioned above regarding the nonbinding characteristics of the communitywide variables. The lack of significance of most of the community characteristics may be due to this limitation.

The four cases 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 have a lower probability of being victimized than do employed individuals.<sup>116</sup> We now turn to the comparison of the determinants of victimization for violent and economic crimes.

116. 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 do unemployed individuals (see Piquet, 2000).

*Comparing Violent and Economic Victimization across Latin American Cities*

Table 9 shows the corresponding stylized results for six pairs of regressions applied to survey data from Cali, Colombia, in 1996; Lima, Peru, in 1998; Mexico City in 1999; Rio de Janeiro in 1996; San Salvador in 1996; and São Paulo in 1999.<sup>117</sup> The surveys for Cali and Lima had the same characteristics as those from Rio de Janeiro and San Salvador, discussed above. The Lima survey covered over 8,000 individuals, while the Cali survey covered 2,900 individuals. Crimes against the person in Cali include wounds caused by firearms and other weapons and threats, while crimes against property include armed robbery and extortion both by private citizens and by public officials. For Lima we focus on physical aggressions against the person and muggings. For Mexico City, Rio de Janeiro, and São Paulo, violent crimes refer to robbery with the threat of violence, assault, and other crimes against the person, including violence against women; economic crimes include robbery with the threat of violence plus theft and burglary. Violent crimes in San Salvador include armed robbery, threats, assault, wounds caused by firearms and other weapons, and kidnappings, while nonviolent economic crimes include only extortions by public officials or private citizens.

Beginning with the two significant individual characteristics discussed above, namely, gender and employment status, both appear significant and with the same sign as before in most cases, with no 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. Cali is the only city in which the state of being unemployed is not relevant either for violent crimes (against persons) or for economic crimes (against property). The results for the age variable are also broadly consistent with those discussed in the previous section, except, again, for the case of muggings in Lima, in which older people seem to have a higher risk of victimization. With regard to the potential endogeneity of the alcohol and weapon variables, it is interesting that in many instances these are not significant. We conclude that among the individual characteristics, gender,

117. For Cali, see Vélez and others (2000); for Lima, see Instituto Apoyo (2000); for Mexico City, see Funsalud (2000); for Rio de Janeiro and São Paulo, see Piquet (2000); for San Salvador, see Cruz, Trigueros Argüello, and González (2000).

**TABLE 9. Significant Determinants of Victimization in Latin American Cities: Violent and Economic Crimes<sup>a</sup>**

Explanatory variables	Cali (1996)		Lima (1998)		Mexico City (1999)		Rio de Janeiro (1996)		San Salvador (1996)		Sao Paulo (1999)	
	Crimes against persons	Crimes against property	Aggressions	Muggings	Violent crimes	Economic crimes	Violent crimes	Economic crimes	Violent crimes	Economic crimes, no violence	Violent crimes	Economic crimes
<i>Individual characteristics</i>												
Gender (male)	+	+	+	-	+	+	+	+	+	+	+	+
Age	-	-	+	+	+	+	?	+	-	-	-	?
Education												
Unemployed				-								
Weapon					n.a.	n.a.						
Alcohol	+	+	+		n.a.	n.a.	n.a.	n.a.			n.a.	n.a.
<i>Household characteristics</i>												
Number of household members	n.a.	n.a.			n.a.	n.a.	+	+	+	+	+	+
Household income												
Single parent							+	+		+		
<i>Community characteristics</i>												
Community characteristics	n.a.	n.a.			n.a.	n.a.						
Unemployment rate							+	+				
Police rate												
Education												
Income												
Income inequality												
Poverty rate												
Drugs												
Alcohol												

Source: Authors' calculations based on victimization surveys, as reported in Cruz, Trigueros Arguello, and González (2000); FUNSALUD (2000); Instituto Apoyo (2000); Piquet (2000); Velez and others (2000).  
 a. Unless otherwise noted, violent crimes refer to aggressions against the persons with or without economic motivation, and economic crimes refer to crimes against property with or without violence (see text for further detail). \* Indicates average number of household members for the community (municipalities); plus signs reflect variables with a positive and significant probit coefficient or a significant odds ratio greater than one; negative signs reflect variables with a negative and significant probit coefficient or a significant odds ratio below one; blank cells indicate that the variable was included in the analysis but was not significant; the question mark indicates that it was not possible to sign the corresponding variable; n.a. means not available.

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 reduce the probability of being a victim of both types of crimes in Cali and San Salvador. 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 São Paulo.

Of the household characteristics, the variable of belonging to a single-parent household appears significant and with the expected positive sign in only three cases: muggings in Lima, violent crimes in Rio de Janeiro, and nonviolent economic crimes 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 consistently appear with the 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 or of violent and economic crimes alike in Rio de Janeiro. The poverty rate seems to be associated with lower probabilities of being a victim of economic crimes in Rio de Janeiro and São Paulo, which is consistent with the finding that a higher average income raises the probability of victimization from 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 from physical aggressions in Lima and of both violent and economic crimes in Rio de Janeiro. Hence at the community level, only the indicators of poverty seem to have differential effects on the probability of victimization from violent versus economic crimes. Although in San Salvador the average income of the community is negative for nonviolent economic crimes, this may reflect higher levels of privately financed security services in rich neighborhoods.

Besides highlighting the role of economic variables, the evidence reviewed here 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 affected by different types of property and violent crimes. Future research efforts should examine the determinants of victimization from homicide and lesser crimes within demographically defined subgroups of the population. This approach may lead to a deeper understanding of why young men are more at risk than other individuals and why the relative victimization risks 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.

### **Policy Implications**

This final section of the paper highlights our main results. However, rather than merely restating or summarizing the previous two sections, we phrase our conclusions in terms of policy implications. Because our research on crime, particularly as it applies to developing countries, is still incipient, the policy recommendations we offer must be taken as preliminary.

Our first conclusion is that crime is self-perpetuating. Once crime rates increase, bringing them down takes more than just eliminating their original causes. Crime waves are a reality that policymakers must deal with. The main policy implication of this result is that crime-fighting actions are most effective when the incidence of crime is low. Often, however, public authorities realize that crime has increased only after its incidence is already quite high. Early warning indicators in the case of crime are at least as necessary as they are in preventing balance-of-payments crises or environmental damage. These early warning indicators should be based not only on publicly available official data, but also on surveys.<sup>118</sup> While high-quality official data are clearly important, periodic victimization surveys, such as those studied in this paper, are the best tool that policymakers have for both detecting early crime trends and identifying the groups

118. For a discussion on how the public disclosure of information on crime and victimization can be used as a tool for fighting crime, see Lederman (1999).

that are most at risk. Furthermore, victimization surveys can help public authorities improve the quality of the police and judiciary because surveys can measure their effectiveness and trustworthiness, as well as the reasons behind people's perceptions. Victimization surveys in several Latin American cities reveal that the extent of underreporting is quite severe. This is a sad reality, but understanding the reasons behind it is the beginning of a solution.

Our second conclusion is that economic growth can be an effective way to fight crime. Much merit has been ascribed to growth, from reducing poverty to promoting democracy. It appears that crime alleviation should be added to the list of benefits from economic reforms that lead to sustained growth. Additional research is needed for understanding the mechanisms through which poor economic activity increases crime, but we have some preliminary ideas. In Latin America, as well as in most other developing regions, public expenditures are strongly procyclical, contrary to what economic theory on macroeconomic stabilization would recommend. Specifically, in times of recession, governments tend to cut expenditures for police personnel and equipment as well as for social programs that benefit the disadvantaged. These expenditure cuts are mistakes: weaker police activity appears to stimulate crime (particularly the violent type), and income differences widen during recessions, together with the potential benefits from crime. A policy recommendation from this analysis, then, is that public expenditure on police enforcement and social programs should have a strong countercyclical bias.

Our third conclusion is that income inequality and, more generally, an unequal distribution of economic opportunities and police protection strongly promote crime. We already hinted at the role of income inequality when we advocated increased spending on social programs during recessions, but we should be more precise as to why targeted social programs are important. We have no evidence that the level of poverty itself leads to a higher incidence of crime. However, when we combine the beneficial effect of economic growth with the crime-inducing consequence of inequality, we conclude that a faster rate of poverty alleviation reduces crime in a significant way. For crime prevention, a greater policy concern should be placed on inequality and impoverishment than on poverty itself.

A related conclusion has to do with the role of education in preventing crime. Our results indicate that if better education reduces the incidence of crime, it must be through education's effect on improved economic growth



or reduced inequality. More clearly, education by itself is no panacea for preventing crime. In fact, we question whether providing educational opportunities to the entire population is the key to solving the problem of crime, as some people seem to believe. Sadly enough, reducing educational inequality can actually have a crime-increasing effect if income opportunities do not follow the egalitarian patterns of educational attainment. Why does this occur? We conjecture that education for all people not only brings about a civilizing effect, but also an awareness of income disparities that can lead to crime and violence. The policy implication from this result is not that educational efforts should be de-emphasized, but that educational reforms should seek that employment and income opportunities accompany educational achievement.

Latin America is one of the most crime-prone regions in the world. The endemic income inequality in Latin American countries, which dates back to colonial times, holds part of the explanation. Recurrent economic crises and the poor growth performance of the lost decade of the 1980s have surely contributed to the proliferation of crime and violence in the region. However, for some countries with exceedingly high crime rates in Latin America (for example, Brazil, Colombia, and Mexico), we need to look for additional answers. Our results point to the strong crime-inducing effect of activities related to illegal drugs. Countries that produce drugs and countries with higher rates of drug possession have a larger incidence of homicides. The policy implications of this result are the hardest to derive and implement, and we leave definitive answers to the experts. However, we would like to propose some examples of potential solutions.

Violence is a fundamental ingredient in the illegal drug trade; it is used to enforce contracts and secure and enlarge market shares in a highly profitable, illegal activity. The criminal and violent elements of drug trafficking can be drastically reduced only if it ceases to be so profitable and so illegal. This has two potential policy implications. The first consists of imposing penalties and punishments large enough to curtail the demand for illegal drugs. These policies should be implemented primarily in drug-consuming regions, such as the United States and Europe. It appears, however, that these countries prefer to fight the drug wars far from their borders. The second policy implication consists of legalizing and regulating the drug trade. This is a very controversial implication, but one that merits analysis and discussion. After pondering its benefits and costs, the feasibility of legalizing drugs depends on whether the same conclusions can

be reached for drug-producing and drug-consuming countries. This is unlikely. For drug-producing countries, such as many in Latin America, the benefits of legalizing drugs appear to outweigh its costs, while the opposite seems to be the case for countries that only consume drugs. That said, we recommend that the imposition of stiffer punishments for drug consumers and the legalization of the drug trade, as examples of substantial policy actions, should be openly analyzed and discussed.

Other factors also influence the incidence of crime. Some of them are cultural, such as social capital in the form of trust among society members; others are sociological, such as the extent of urbanization or the degree of ethnolinguistic fractionalization. However, explaining the high crime rates in the region turns out to be fairly simple: in the econometric analysis, the dummy variable for Latin America loses all statistical significance when the variables emphasized in these concluding remarks are included. In other words, once we account for economic growth, income inequality, and drug-related activities, Latin America's crime rate is no longer a puzzle.

## **Appendix**

Table A1 contains detailed definitions for all the variables that are used in the section on cross-country evidence, together with a description of the data sources. Table A2 presents the variables for social capital, which are derived from the World Values Surveys sponsored by the University of Michigan. For each variable, the table lists the survey question used to capture the variable and the calculation method.

**TABLE A1. Description of Variables Used in the Cross-Country Analysis**

<i>Variable</i>	<i>Description</i>	<i>Source</i>
Intentional homicide rate (UN)	Death purposely inflicted by another person, per 100,000 population.	<p>Constructed from the United Nations <i>World Crime Surveys of Crime Trends and Operations of Criminal Justice Systems</i>, various issues, except for Argentina, Brazil, Colombia, Mexico, and Venezuela. The data are available on the Internet at <a href="http://www.ifs.univie.ac.at/uncjin2/mosaic/wcs.htm">www.ifs.univie.ac.at/uncjin2/mosaic/wcs.htm</a>.</p> <p>The data on population were taken from the World Bank's International Economics Department database.</p> <p>For Argentina, Brazil, Colombia, Mexico, and Venezuela, 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 (PAHO), 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.</p> <p>Another exception is the United States for the 1990–94 period, for which intentional homicide data are not available. In this case we used the ratio of intentional homicides to total homicides in 1975–76 (72 percent) to deduce a proxy for the intentional homicides during 1990–94 based on the total number of homicides.</p>
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.	<p>Constructed from mortality data from the World Health Organization (WHO). Most of these data are available by FTP from the WHO server (WHO-HQ-STATS01.WHO.CH) in the directory \FTP\MORTALIT. Additional data were extracted from the WHO publication "World Health Statistics Annual."</p> <p>The data on population were taken from the World Bank's International Economics Department database.</p>

TABLE A1. Continued

<i>Variable</i>	<i>Description</i>	<i>Source</i>
Police	Number of police personnel per 100,000 population.	Constructed from the United Nations <i>World Crime Surveys of Crime Trends and Operations of Criminal Justice Systems</i> , various issues.
Drug possession crime rate	Number of drug possession offenses per 100,000 population.	Same as above.
Drug producers dummy	Dummy that takes the value one for the countries which are considered significant producers of illicit drugs.	<i>International Narcotics Control Strategy Report</i> , 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 them comparable to the income-based data.	Constructed from Deininger and Squire (1996). The data set is available on the Internet at <a href="http://www.worldbank.org/html/prdmg/grthweb/datasets.htm">www.worldbank.org/html/prdmg/grthweb/datasets.htm</a> .
Average years of schooling	Average years of schooling of the population over 15 years of age.	Barro and Lee (1996). The data set is available on the Internet at <a href="http://www.worldbank.org/html/prdmg/grthweb/datasets.htm">www.worldbank.org/html/prdmg/grthweb/datasets.htm</a> .
Standard deviation of educational attainment	Standard deviation of the distribution of education for the total population over 15 years of age. 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).
Ethnolinguistic fractionalization	Measure that the two randomly selected people from a given country will not belong to the same ethnolinguistic group (1960).	Easterly and Levine (1997). The data set is available on the Internet at <a href="http://www.worldbank.org/html/prdmg/grthweb/datasets.htm">www.worldbank.org/html/prdmg/grthweb/datasets.htm</a> .
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, based on an average of each country's real exchange rate.	Loayza and others (1998).
Growth of GDP	Growth in the gross domestic product expressed in constant 1987 local currency prices.	The data set is available on the Internet at <a href="http://www.worldbank.org/html/prdmg/grthweb/datasets.htm">www.worldbank.org/html/prdmg/grthweb/datasets.htm</a> .
Urbanization rate	Percentage of the total population living in urban areas.	Same as above.

*(continued)*

TABLE A1. Continued

<i>Variable</i>	<i>Description</i>	<i>Source</i>
Death penalty	Dummy for countries whose laws do (1) or do not (0) allow the death penalty. Some countries experienced changes, either abolishing or imposing the death penalty during 1970–94. Hence period averages range between 0 and 1.	Amnesty International. List of Abolitionist and Retentionist Countries at <a href="http://www.amnesty.org/cilib/intcam/dp/abrelist.htm#7">www.amnesty.org/cilib/intcam/dp/abrelist.htm#7</a>
Ratio of males aged 15–34 to total population	Ratio of number of males aged 15–34 to total population.	Preformatted projection tables in the World Development Indicators database of the World Bank.

TABLE A2. Description of Variables for Social Capital Used in the Cross-Country Analysis

<i>Variables for social capital</i>	<i>Survey question</i>	<i>Description</i>
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.
Membership	Please look at the following list of voluntary organizations and activities and say which, if any, you belong to.	The measure of the density of membership activity is the average number of groups cited per respondent in each country.
Secular membership	Same as above	The same responses are used but now the measure is of membership to secular organizations only, excluding religious organizations.
Participation	Please look at the following list of voluntary organizations and activities and say which, if any, you are 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 religion is in your life. 1. Very important 2. Quite important 3. Not very important 4. Not at all important.	The numbers were averaged across the respondents 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.

## Comments

**Peter Reuter and John Roman:** The extraordinary economic growth that has occurred in much of the world over the last twenty years has been accompanied by a surge in measured crime in many of the more rapidly growing countries.<sup>1</sup> Rising wealth, even improved education, appear not to have suppressed crime. This has generated a certain amount of pop sociology, such as references to cities as breeding grounds for crime and the growth of anomie in industrial and post-industrial societies, but only a modest amount of systematic research. The connection between the multi-dimensional development process and crime is one of considerable scientific and policy interest.

The original contribution of the paper by Fajnzylber, Lederman, and Loayza has two components. First, they attempt to validate the basic economic model of crime by showing that it can account for the variation in aggregate crime rates across countries and over time in a parsimonious fashion. Second, they use the results of their empirical work to develop policy conclusions. Their results generate a number of interesting observations, most notably that there are long crime waves, such that changes in economic factors may take decades to fully play out.

We argue that the analysis produces a number of implausible results, however, in large part because of the approach chosen rather than any detail of its execution. The problems of data quality and construct validity that bedevil cross-national studies of such poorly measured social phenomena as crime may be insoluble. On the policy side, the finding that economic growth rates and inequality explain violent crime is of limited utility: it is a priori difficult to envision a nation not seeking growth and income equality regardless of their effect on crime. Furthermore, the authors' conclusions with regard to drug policy do not follow from the paper's findings.

1. Shawn Bushway provided helpful comments for the discussion below.

*The Analysis*

Fajnzylber, Lederman, and Loayza present a wide array of analyses on the relation between crime and economic conditions, but their core contribution is easily described. They estimate a single equation in which the dependent variable is either homicide or robbery (both proxies for violent crimes generally) and the explanatory variables, in addition to the lagged dependent variable, are primarily economic: average income, income growth, average education, and income inequality. These are described as “the basic economic determinants of violent crime rates.” The data consist of five-year averages over a twenty-five-year period for between thirty-five and forty-five nations (depending on the specification). The authors then sequentially introduce a series of other independent variables: two deterrence measures, an indicator of illicit drug production, an indicator of drug use, two demographic factors, and more refined measures of inequality. Finally, they add six social capital measures to a stripped-down version of the basic model.

The only variables with consistently significant coefficients in these equations are GDP change, the Gini coefficient, and lagged crime (homicide or robbery). For every other variable the coefficient is either non-significant, has the wrong sign, or changes signs in different specifications. The estimation technique, namely, the generalized method of moments (GMM), does not allow any measure of goodness of fit.

The coefficient estimates suggest that changes in growth rates and income inequality have surprisingly large effects on robbery. Controlling for inertial effects, in the short run a 1 percentage point increase in the GDP growth rate would yield a 13.7 percent decline in robbery. Therefore, an increase in the growth rate from 2 percent to 6 percent would halve robberies sustained over a five-year period (the time unit of observation in the paper), and a similar decrease in growth would increase robberies by more than half. For the Gini coefficient, which ranges from 35 to 55 in the authors’ data set, the long-term effect of an increase of one point is about 11 percent; quite modest reductions in income inequality would appear to have very substantial effects on the crime rate.

Omitted variables or other specification errors may explain these seemingly incongruous results. The consistency of signs for income growth and inequality hides apparently large variations in size. Again consider the GDP growth coefficient in table 2 for homicide. With the WHO data, that

coefficient is  $-0.0115$ ; using the UN homicide data, the coefficient is almost twice as large in the same specification, at  $-0.0239$ . The inequality coefficient quadruples when the two versions are compared, though they both claim to be essentially the same measure

Other variables with a strong theoretical base are all rejected because they do not consistently have significant coefficients with the predicted sign. Yet there is abundant evidence that in cross-state or individual-level analyses they have substantial effects. For example, in a number of studies, the fraction of young males in the population turns out to have a substantial, statistically significant effect on various measures of crime.<sup>2</sup>

### *Interpreting the Findings*

The decision to commit crime involves weighing the returns to legitimate and illegitimate work. Rising wages should reduce crime, but of course wages also affect other relevant variables, including the return to criminal activity since rising wages will generate more wealth and thus more attractive targets. Testing at the microeconomic level has required careful development of proxies for these other effects.

At the aggregate level of this paper, we are left with explanatory variables that have many possible interpretations. Criminologists have developed a number of competing theories, in which income growth and inequality may play roles but through quite different mechanisms. For example, control theory claims that employment exerts social control over an individual: an individual's lack of employment leads to a breakdown of positive social bonds for that individual, which in turn is hypothesized to induce the individual to increase his criminal activity, both violent and income related.<sup>3</sup> William Julius Wilson expands this theory to cover not just individuals but areas in his analysis of inner-city problems.<sup>4</sup> Using a series of carefully constructed studies of poverty areas in Chicago, he claims that "many of today's problems in the inner-city ghetto neighborhoods—crime, family dissolution, welfare, low levels of social organization and so on—are fundamentally a consequence of a disappearance of work."<sup>5</sup> Employment is seen as the main builder of

2. For example, see Levitt (forthcoming).

3. Gottfredson and Hirschi (1990).

4. Wilson (1995).

5. Wilson (1996: xiii).



pro-social bonds and institutions in a community, and its absence results in large-scale disorder. Anomie, another aggregate-level theory, suggests that frustration from income inequality and other aggregate-level problems causes individuals to resort to crime.<sup>6</sup>

The results presented by Fajnzylber, Lederman, and Loayza simply do not allow one to distinguish among these different interpretations. For generalized predictive purposes this may not be important; all one needs to know is what is likely to happen to the crime rate as inequality diminishes or the growth rate increases. However differentiating among these interpretations is essential for both scientific and policy purposes.

### *Data Quality*

Statistics on crime are notoriously weak for reasons that are obvious and well explored. For a half century, the United States has invested in improving the reporting of crime, most notably through the development of large-scale victimization surveys. The data system is now strong enough that for violent and property crimes, a fairly good description of the numbers and characteristics of offenders and offenses can be provided on an annual basis. Only a few other countries have developed comparably strong systems.<sup>7</sup> Many countries in the authors' sample (for example, India and Nepal) have very weak systems. The authors note that "one of the reasons cross-country crime studies are uncommon is that it is difficult to compare crime rates across countries. . . . Underreporting is widespread in countries with low-quality police and judicial systems and poorly educated populations."

Fajnzylber, Lederman, and Loayza use two sources of crime data for homicide. One is from the World Health Organization and is generated by reports from medical examiners or coroners. The other is from the United Nations, and it serves as a focal point for various criminal justice data. The UN data are derived from annual reports by national agencies, such as the FBI or the Japanese National Police Agency. The UN attempts to impose consistency across nations with respect to offense definitions, but given differences in legal systems, this can be very difficult, if not impossible. The authors are certainly correct that homicide is the vio-

6. Uggen (1994).

7. Lynch (1995).

lent crime most likely to be recorded in any society, but the definitional issues remain potentially severe. For example, the UN states that “comparisons of homicide are confounded by how deaths from drunken driving are recorded.”<sup>8</sup> Japan apparently includes a broad class of vehicular deaths, which may account for its surprisingly high level relative to other Asian nations.<sup>9</sup>

The consequences can be very serious, as shown in the summary statistics presented for the dependent variables. The most striking anomaly is that for Dutch homicide rates. Whereas the U.S. rate is about 8 per 100,000 over the period 1970–95, it is approximately 11 per 100,000 in the Netherlands, according to the UN data. This hardly accords with popular impression. In fact, a review of other reports based on the annual Ministry of Justice data show a homicide rate between 1 and 2 per 100,000, which is low by western European standards.<sup>10</sup> This discrepancy in the figures arises because the Dutch include attempted homicide (and perhaps euthanasia) in their reports to the United Nations.

Other anomalies are also apparent, though less dramatic. In the United Nations data, Sweden has twice the homicide rate of Great Britain over the twenty-five-year period, while reports from other sources show Sweden with slightly lower rates. Inspection of the figures for the five individual years in which the homicide data are reported in the UN’s *Surveys of Crime Trends* suggests that this is probably the result of definitional changes in Sweden. Whereas the three surveys for 1974, 1978, and 1984 show rates of 1.53, 1.50, and 1.39, for 1988 and 1993 the figures are 7.22 and 9.53.<sup>11</sup> This is approximately the level of the United States, and it is far above the western European mean found in other sources. This apparent wave of homicides since the mid-1980s (annual increases of 50 percent in each of four successive years) is inconsistent not only with impressions, but also with agency statistics on Swedish homicides. For example, the national statistical agency reports only 121 homicides in 1990, a rate of 1.5 per hundred thousand.<sup>12</sup>

8. UN (1999, p.43).

9. James Lynch (personal communication).

10. The 1995 figure was 1.8 (*Registered Murders in the Netherlands, Press Release*, CBS Voorburg-Statistics Netherlands, 14 July 1998, cited by [www.csdp.org/factbook/thenethe.htm](http://www.csdp.org/factbook/thenethe.htm)).

11. UN (1999).

12. Statistics Sweden (2000).

None of these anomalies should be surprising. In a careful review of four sources of cross-national homicide data, Bennett and Lynch described quality control for three of them with a single word: none. For the fourth source, namely, the WHO data, they used four damning words: minimal post facto edits.<sup>13</sup> These homicide figures constitute a set of numbers with a common label; whether they are in fact consistently collected data on a uniformly defined phenomenon is a fact to be established, not an assumption to be made.

One response might be that, with a robust estimating technique such as GMM, it only matters that the recording error be consistent. "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." However, the error may not be of the systematic kind the authors assert can be handled by GMM. For example, the reporting probability for robbery is likely related to income. Field, commenting on the United Kingdom, notes that "increased wealth . . . by providing the telephones and cars . . . make[s] crime reporting easier."<sup>14</sup> For countries moving rapidly from poverty to high income (for example, Korea), the effect may be very substantial. Given the significance of GDP growth rate in these models, this effect may be enhanced.

The macroeconomic data used to predict changes in violent crime may be as poor an indicator as the crime rate measures they seek to explain. For instance, it is well known that a substantial portion of GDP may be missed in official accounts. These omissions may take the form of unrecorded income, as in the case of agricultural production in India or micro-enterprise in Latin America; irregular income, such as the under-the-table payments common in southern Europe; or income that is difficult to measure, including the well-known countercyclical substitution of home production for market production.<sup>15</sup> Given that unrecorded and irregular economic activity may be substantial (up to 75 percent of GDP in less developed countries) and that the series in this paper is long enough to capture major internal economic changes, GDP changes may be capturing a shift from unrecorded to recorded income. Thus, it may not

13. Bennett and Lynch (1990, p.155).

14. Field (1999, p.11).

15. Schneider and Enste (2000); Tanzi (1999); Becker (1965).

be simply a nation's overall economic health that explains changes in violent crime, but also changes in the coverage of data collected.

### *Construct Validity*

Given the definitional inconsistencies and data gaps in cross-national data systems, the authors are forced to resort to inadequate proxies for some constructs. We focus here on just two: deterrence, because of its centrality to an understanding of crime, and the drug trade, because it features so prominently in the paper's conclusions.

The proxies for deterrence are the number of police per 100,000 population and a capital punishment statute. With regard to the use of the latter variable, the authors state that "the use of capital punishment in a given country is assumed to be an indicator of the overall severity of its legislation regarding the punishment of offenders." Yet in the developed world, capital punishment has become a historical oddity, with the frightening exception of the United States. Using this proxy, all western European nations (which constitute about a quarter of the sample countries) are treated as having the same sentence severity since 1981, though the average time served varies substantially. For example, whereas homicide convictions in the United Kingdom led to prison sentences averaging a hundred months, for Switzerland the figure was only fifty months.<sup>16</sup>

For the drug industry, the authors count a country as a drug producer if the U.S. State Department lists it as such in any year since 1986. Apart from the fact that the United States itself is a major producer (though net importer) and is not recorded as such by the State Department, the list is also selective in that it only covers nations that produce for the U.S. market. For example, the Netherlands is a major exporter of marijuana within western Europe, but it is not included in the list because it does not export to the United States.

Nor is the listing a plausible indicator of the possible contribution of drug production to violence. Contrast Bolivia and Colombia, two of the mainstays of the cocaine industry. Bolivia's involvement is almost exclusively in the coca-growing sector, exporting early-stage refined product. Most earnings accrue to small, rural producers with little incentive for

16. UN (1999).

either contractual or competitive violence. Colombia dominates the trafficking sector; earnings go primarily to a small number of organizations whose core competence involves command of violence.<sup>17</sup> The Colombian traffickers have challenged the power of the state over a period of decades, as well as engaging in numerous competitive killings. This exercise needs a proxy that captures more of the heterogeneity of the industry, for example, by distinguishing among sectors (production versus distribution) or drugs (cannabis versus cocaine).

### *Policy Implications*

Fajnzylber, Lederman, and Loayza are generally cautious in drawing policy implications. That caution is appropriate because the results themselves have little policy meaning: findings about the crime consequences of economic growth, inequality, and education are unlikely to affect views about the desirability of wealth, egalitarian income distribution, or more accessible and better quality education. The one area in which they choose to make comments directly relevant to crime policy is with respect to drugs.

The authors conclude that “our results point to the strong crime-inducing effect of activities related to illegal drugs.” After noting that they “leave definitive answers to the experts,” they go on to make two suggestions: first, reducing drug consumption requires “imposing penalties and punishments large enough to curtail the demand for illegal drugs,” and second, “the feasibility of legalizing drugs depends on whether the same conclusions can be reached for drug-producing and drug-consuming countries.” Given Latin America’s centrality in the drug trade, this issue of particular importance to *Economía*.

Few analysts of U.S. drug policy would agree that the nation with the Western world’s largest drug problem has failed to impose severe penalties on cocaine and heroin users. The United States devotes perhaps 100,000 prison and jail cells to those convicted of simple possession. Admittedly this is a modest 5 percent of all U.S. correctional capacity, but on a per capita basis it is almost as much as some Western European nations use for all criminal offenses. Perhaps the United States could do

17. Thoumi (1995). Since the mid-1990s it appears that the major drug trafficking enterprises, associated with Cali and Medellín, have been replaced by a larger number of smaller enterprises, numbering perhaps in the hundreds. However, this comes after the period covered by Fajnzylber, Lederman, and Loayza.

more; MacCoun and Reuter estimate the annual probability of a cocaine user being arrested for that offense as only about 6 percent.<sup>18</sup> But when one takes into account arrests of impoverished cocaine and heroin users for crime, including dealing, to support the costs of their own consumption, the annual probabilities may be closer to one quarter and the share of time spent incarcerated even higher.

Nor is it the case that the “United States and Europe . . . prefer to fight the drug wars far from their borders.” The share of the massive U.S. drug budget going to international programs is consistently less than 5 percent.<sup>19</sup> Most of the money goes to domestic law enforcement, precisely as the authors suggest be done. Western European nations dedicate an even smaller share to international control programs.

As to legalization, the authors correctly observe that producer countries, such as Colombia and Mexico, would benefit substantially in terms of reduced violence and corruption, while consumer countries would probably not benefit. However, this decision can be made solely by the consumer countries. If the United States decided to legalize the production of cocaine, for example, the production might well be located in the Mid-west, with new, higher-yield varieties grown in a much smaller area; whether or not the producer countries also legalized would hardly affect the price of cocaine or heroin. The dominance of the Andean countries arises primarily from the toughly enforced prohibitions in the United States.

The drug policy comments are interesting conjectures, but again, they hardly flow from the authors’ results. Colombia and Mexico have many reasons for wanting to eliminate drug production; using cross-national data to demonstrate that their violent crime rates would be lower and robbery rates higher hardly affects this. [The assertion about the need for a consistency of interests among consumer and producer countries also does not relate to the findings of this study.]

### *Conclusions*

The paper’s weaknesses are mostly inherent in the approach used rather than in lack of diligence or skill on the part of the authors. National criminal justice and public health systems employ a variety of definitions and

18. MacCoun and Reuter (forthcoming).

19. Office of National Drug Control Policy (various issues).

measurement methods, which generate data of poor quality. This weakens cross-national comparisons with aggregate data. The international agencies that provide these data are underfunded and not very expert; they can do little to improve accuracy and consistency. For researchers to learn enough about these differences to make sensible adjustments requires investing a great deal of time to develop a class of knowledge.

There is also a very limited set of available proxies for explanatory variables because less wealthy countries have limited administrative data systems. Even the choice of dependent variable is driven by the limits of availability. Homicide is not the crime one would pick to test the Becker/Ehrlich model, which is clearly more relevant to income-generating crime than to violent crime. However, it is the crime for which cross-national data have at least some plausibility. The limits of the data also limit the power of policy conclusions that can be drawn.

Finally, given the paucity of available data, it is not clear what conclusions can be drawn from them. The consequences of economic development for crime rates across countries is an interesting issue, quite independently of any claim to test a broader model of the determinants of crime. The challenge is to find an approach that is not so vulnerable to the limitations of cross-national data and can yield meaningful policy conclusions.

**Alejandro Gaviria:** This paper presents a comprehensive survey of the main empirical findings about the determinants of crime and violence. First, the paper reviews the economic literature in this area, showing that in recent years the emphasis has shifted from economic considerations to social interactions and other social aspects. The paper then surveys the cross-national evidence on the determinants of violent crime—an area in which the authors have made groundbreaking contributions. Finally, the paper surveys various studies that use victimization data to determine who are the most likely victims of crime in Latin American cities.

In these comments I focus on the last two sections of the paper, beginning with some methodological issues concerning the cross-country results. I then address the authors' interpretation of two key results: the positive connection between inequality and violent crime and the negative connection between social trust and violent crime. Finally, I comment briefly on the victimization studies presented in the last section of the paper.

*A Methodological Point: The Simpler, The Better*

The paper analyzes the main correlates of violent crime in a cross-country setting. The dependent variable is either the homicide rate or the robbery rate, and the independent variables include inequality, growth, and development indicators. The data set consists of an unbalanced panel of about forty-five countries and five periods of five years each. The authors use a dynamic specification in which the crime rate depends not only on country attributes, but also on the crime rate of the preceding period. This specification is consistent with various theoretical and empirical studies that suggest inertia is a prominent characteristic of the evolution of crime over time.

Table 10 contains descriptive statistics of the main variables used in the paper. The table shows, in particular, that both the main dependent variable (the log of the homicide rate) and the three core explanatory variables (the Gini coefficient, the GDP growth rate, and the GDP per head) vary much more across countries than over time within countries. According to this result, any estimation method that ignores the cross-sectional dimension of the data will entail substantial losses of efficiency. Knowing this, the authors use a generalized method of moments (GMM) estimation method that considers not only the longitudinal dimension of the data, but the cross-sectional dimension as well.<sup>1</sup> This method allows for the presence of joint-endogeneity, and it yields consistent estimators of the coefficient on the lagged dependent variable.

**TABLE 10. Descriptive Statistics of Main Variables**

Variable	Mean	Standard deviation		Minimum	Maximum
		Between	Within		
Gini coefficient	38.54	8.88	1.56	22.8	58.0
GDP growth	3.89	2.37	1.21	-2.9	11.5
GDP per capita (dollars)	6,552	4,572	804	684	17,845
Log homicide rate	1.45	0.93	0.28	-0.7	4.4
Growth of homicide rate (percent)	11.0	30.8	29.0	-219.3	133.4

Source: Author's calculations based on data from the United Nations and the World Bank.

1. This method was first proposed by Arellano and Bover (1995).



The GMM estimation method used in the paper also has several shortcomings, however, none of which is discussed by the authors. First, this method does not completely eliminate the possibility of biases stemming from omitted country attributes that are correlated with the explanatory variables. Second, the small-sample properties of the estimators are unknown. And third, the standard errors are likely to be severely underestimated.<sup>2</sup>

The authors of the paper overlooked a simpler (and, in my opinion, better) estimation method: ordinary least squares (OLS). The available Monte Carlo evidence dealing with dynamic panel estimation unambiguously shows that when the dependent variable exhibits high levels of inertia (as it does in this case), OLS is by far the best estimation method.<sup>3</sup> When I tried to replicate the main results of the paper using OLS, I found similar coefficients but much higher standard errors, which casts serious doubts on the significance of the results reported in the paper.

### *Inequality and Violent Crime: The Latin American Effect*

The positive connection between inequality (measured by the Gini coefficient) and violent crime (measured by either the homicide rate or the robbery rate) is perhaps the main empirical result of this paper. This connection is not only statistically significant, but also quite substantial: an increase in the Gini coefficient of 10 points (approximately the difference between Costa Rica and Mexico) will increase the homicide rate by more than 50 percent. This result, however, appears to be rather sensitive to the inclusion of regional dummies.

Table 11 reproduces the core results of the paper using OLS. The connection between inequality and the homicide rate is significant and substantial, but this connection weakens considerably and loses its significance completely when we introduce a dummy for Latin America, thus casting serious doubts on the causal link between inequality and violence postulated in the paper.<sup>4</sup> If the empirical association between the Gini and

2. See, for example, the Monte Carlo evidence presented by Judson and Owen (1999).

3. See the Monte Carlo evidence presented by Kiviet (1995) and Judson and Owen (1999). Kiviet states, "We find that OLS has an impressingly small standard deviation, and therefore, when bias is moderate (which it is when the coefficient on the dependent variable is high), it has an attractive mean squared error" (1995, p. 70).

4. The same point is made by Bourguignon, who states that the coefficient on the Gini "becomes insignificant when a dummy variable is introduced for Latin America in the homicide regression" (1999, p. 22).

**TABLE 11. Determinants of Homicide Rates: Panel Information, 1970–94<sup>a</sup>**

<i>Independent variable</i>	(1)	(2)
Lagged homicide rate (logs)	0.844 (21.94)	0.832 (20.809)
Gini coefficient	0.012 (2.59)	0.008 (1.385)
GDP growth	-0.059 (-4.417)	-0.052 (-3.302)
GDP (logs)	-0.009 (-0.211)	-0.010 (-0.24)
Dummy for Latin America and the Caribbean		0.132 (1.107)
Number of observations	153	153
Number of countries	56	56

Source: Homicide rates are from the UN data set; other variables are from World Bank, *World Development Indicators*.

a. Dependent variable is the log of the homicide rate. Standard errors are in parentheses.

the homicide rate is mainly driven by the differences between Latin America and the rest of the world, the causal link between these two variables becomes very difficult to defend, as one can think of many circumstances surrounding the history and institutions of Latin America that can explain both its high inequality and its high crime rates. The authors explore some of these circumstances but many others remain to be studied.

The connection between violent crime and inequality thus appears more fragile than the paper indicates. And the possibility that this connection is driven by unobserved regional (or country) characteristics cannot be completely ruled out.

### *Inequality versus Mobility*

The paper contains a lengthy discussion about the interpretation of the positive connection between inequality and violent crime. The authors explore several alternatives, rule out various hypotheses, and conclude that a simple economic argument may be at the heart of this connection. In their view, inequality increases violence by depressing the economic prospects of the poor. Their argument is simple: in more unequal societies, the poor earn less and are more numerous, which increases the number of people

willing to commit crimes, which in turn raises crime and ultimately violence.<sup>5</sup>

Although theoretically plausible, this mechanism is at odds with the available ethnographic evidence (not to mention most popular accounts of the origins of crime and violence).<sup>6</sup> What appears as the main driving force of crime in most ethnographic studies is not so much the absence of reasonable economic opportunities as the absence of social mobility (that is, the frustration that comes with knowing that one's prospects of mobility are very limited and that most opportunities of advancement are irremediably closed). If this is the case, social justice and violence are still connected, but the connection is, by its very nature, deeper and less dependent on a short-term worsening of the income distribution. Therefore, changes in equality would affect violence only if they entail a change in the way opportunities are distributed in society.

Although the validity of the latter hypothesis is difficult to examine using cross-country data, figure 2 offers some suggestive evidence. The top panel of the figure shows the association between the Gini coefficient and the log of the homicide rate for fourteen Latin American countries.<sup>7</sup> Only a slight connection is found between these two variables, which should not be surprising in light of the results of table 12. The bottom panel of the figure shows the association between an index of social rigidity and the homicide rate for the same sample of countries.<sup>8</sup> These two variables demonstrate a strong connection, which lends some support to the hypothesis presented above. This evidence is consistent with the view that violence will flourish when the prospects of mobility are low, and it contradicts the alternative view that inequality is a direct cause of violence. Of course, more research is needed to confirm these trends and to elucidate the main mechanisms through which the absence of mobility affects violent crime.

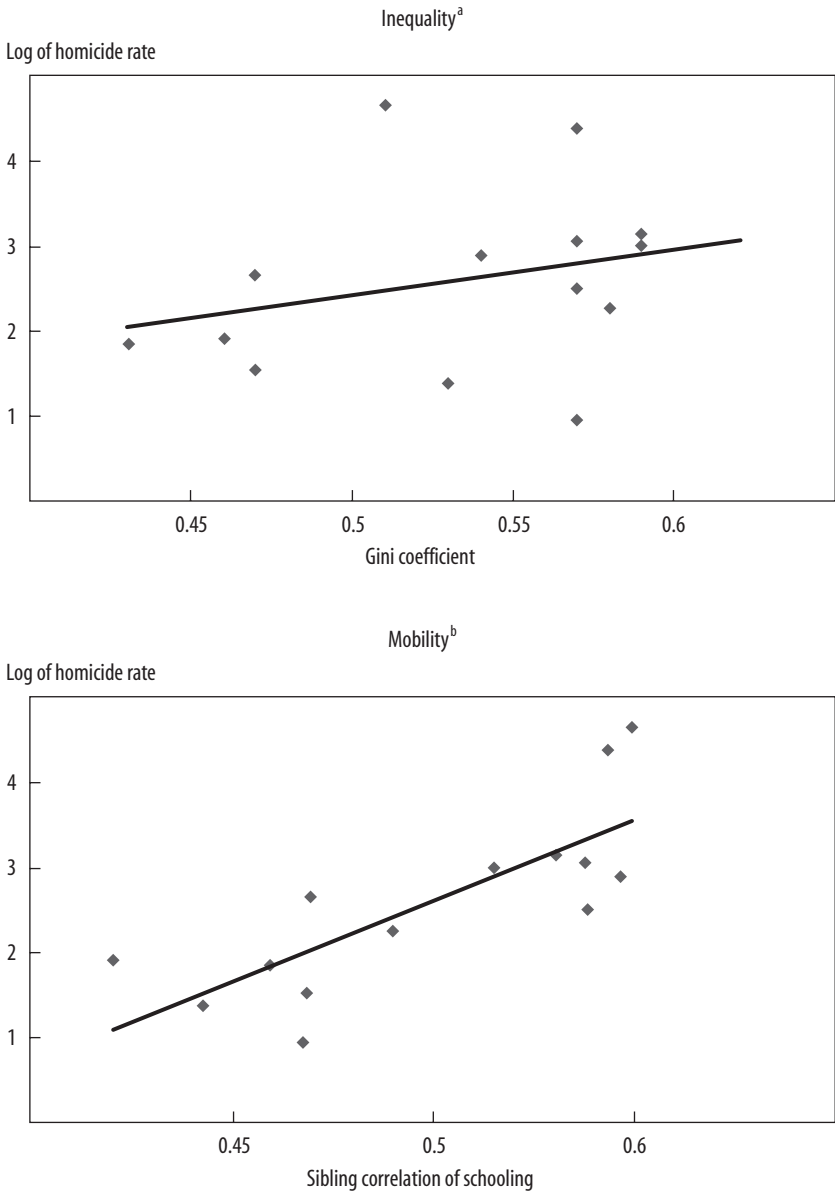
5. See Bourguignon (1999) for a formal model of this idea.

6. See, for example, Wilson (1987, 1996) on inner city violence in the United States; Levitt and Venkatesh (1998) on gang violence.

7. The countries included in the graph are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Mexico, Nicaragua, Panama, Peru, Uruguay, and Venezuela.

8. This index, which was developed in a recent paper by Dahan and Gaviria (2000), is based on the correlation of schooling among teenage siblings: the higher this correlation, the lower the prospects of mobility.

**FIGURE 2 . Inequality versus Mobility**



Source: Dahan and Gaviria (2000) and United Nations data set.

a. Correlation = 0.27.

b. Correlation = 0.78.

*Social Trust and Violent Crime: The Need to Go beyond the Cross-Country Evidence*

The authors report a negative association between social trust (measured as the percentage of people who self-report trusting others in social exchanges) and the homicide rate. They also present some evidence that a decline of trust will cause an increase in the homicide rate.

Many doubts remain as to the true meaning of the association between social trust and violent crime. Too many possibilities are consistent with the evidence presented in the paper. This evidence may indicate, for example, that the members of more trusting societies are better able to organize themselves to fight crime. At the same time, the members of more trusting societies are also more trustworthy and more likely to abide by the law as a matter of principle.<sup>9</sup> Trust, then, may be just a proxy for the presence of a strong collective preference for law and order. Alternatively, trust may be a proxy for good institutions of conflict resolution. If people know that any potential dispute will be resolved in an expedient manner by an objective third party, they will be less likely to think twice before bestowing trust on their fellow citizens. In the same way that good fences make good neighbors, good courts can make trusting partners.

Unfortunately, the cross-country evidence presented in the paper gives no clues as to which of the mechanisms mentioned above is most important. Without a clear understanding of the mechanisms at work, the empirical association between social trust and violent crime has no policy relevance. In my opinion, if we are to understand the complex relation between crime and social capital, we need to undertake more detailed case studies. The cross-country evidence clearly does not provide enough resolution to understand what is going on here.

*Victimization Studies: The Need to Go beyond Description*

The paper presents the results of various studies that use victimization data to identify the main risk factors associated with crime victimization in various Latin American cities. Most of these studies lack an analytical framework and put too great an emphasis on description. Most of the studies show, for example, that individuals who hold regular jobs are more likely

9. Glaeser and others (1999) present experimental evidence showing that the available measures of social trust are indeed measures of trustworthiness.

to be victims of crime. In my opinion, this result says little to either the social scientist who is interested in the root causes of crime (there are numerous, equally plausible hypotheses that are consistent with this result), or to the practitioner who is interested in designing policies for crime control and prevention (it would be almost impossible to design an anti-crime policy specifically targeting such a heterogeneous group).

One should approach victimization data not with the open mind of the epidemiologist who wants to find out more about risk factors, but with the probing mind of the economist who wants to test whether a theory is consistent with the evidence at hand. Victimization data, when used imaginatively, can provide alternative ways to test some of the most controversial theories about the causes of crime. To give just one example, some of the same theories that predict that inequality causes crime also predict that wealthier individuals are more likely to be victimized. In sum, victimization studies can greatly advance our knowledge about the root causes of crime, but an informed approach to the evidence is paramount in this case.

This paper gives the reader a good sense about some of the reasons why some countries are more violent than others. The authors use a variety of approaches, and although one often would like to see a more obvious common thread, the paper makes up in breadth what it lacks in unity.

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