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## Welfare Costs of Crime and Common Violence: A Critical Review

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TEXTO PARA DISCUSSÃO

No. 581

Welfare Costs of Crime and Common  
Violence: A Critical Review

Rodrigo R. Soares



# Welfare Costs of Crime and Common Violence: A Critical Review<sup>\*</sup>

Rodrigo R. Soares<sup>†</sup>

## Abstract

This paper critically reviews a vast array of literature on the costs of crime and common violence. Using a simple economic model of crime as a theoretical benchmark, we conceptually discuss the estimates available and their potential use as inputs for public policy. We present current methodologies, explore their main results, discuss their limitations, and suggest directions for further research.

*Keywords:* crime, violence, welfare, costs, contingent valuation, willingness to pay

*JEL codes:* K42, O17, O57

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## 1. Introduction

Crime and violence have many potential welfare implications. They pose straightforward consequences to the quantity and quality of life, such as reductions in lifespan, widespread feelings of insecurity, and behavior changes intended to avoid crime. There is also the social waste from the value of goods lost and destroyed, the public and private money spent on prevention, and the costs of criminal justice and prison systems. In addition, and far less straightforward, crime has potentially deleterious consequences on growth, through reduced productivity and shortened planning horizons for investments in physical and human capital. This paper critically reviews a vast array of literature that tries to estimate different dimensions of the costs of crime and common violence. Using a simple economic model of crime as a theoretical benchmark, we conceptually discuss these estimates and whether they may be used as inputs for public policy. We present current methodologies, explore their main results, discuss their limitations, and suggest directions for further research.

Tables 1.1 and 1.2 present crime rates (International Crime Victimization Survey—ICVS) and mortality due to violence (World Health Organization—WHO) for various regions of the world.<sup>1</sup> Crime rates vary widely across regions and types of crime, from 17 percent per year for thefts in Africa and Latin America to 3.6 percent for burglaries in Asia. But the most striking differences appear in the worst byproduct of crime: violent deaths. Mortality rate due to violence varies greatly, from 21.8 per 100,000 inhabitants in Latin America and the Caribbean to 4.0 in Western Europe. Latin America and the Caribbean, together with the Former Communist block, have violence-related mortality rates far above those observed in any other region portrayed (Africa is not included due to a lack of data). For example, deaths due to violence are 200 percent more common in Latin America than in North America and the Western Pacific, and 450 percent more common than in Western Europe.

High crime, coupled with violence, burdens many dimensions of society. Measuring the magnitude of this burden in a consistent and unified way, however, is a difficult task. Material

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<sup>1</sup> Mortality due to violence is defined as the number of deaths caused by homicides and injuries purposely inflicted by other persons, plus other violent deaths, according to the International Classification of Diseases (ICD). The data refer to 55 countries in the ICVS dataset and 73 countries in the WHO dataset. There are no mortality data by cause of death for Africa in the WHO dataset for the 1990s.

costs of crime and violence, including both direct costs and expenditures on criminal justice and crime prevention, have been estimated to comprise a significant fraction of production across different regions of the world. This number is estimated at approximately 2.1 percent of the GDP per year for the United States, and 3.6 percent for Latin America and the Caribbean.<sup>2</sup> Considering monetary costs related to property crime, some have suggested that the number rises to 2.6 percent for the United States and 5.1 percent for Latin America (Bourguignon 1999). In South Africa, public spending on criminal justice alone accounts for 3.1 percent of GDP (Altbeker 2005).

On top of material costs, high injury and mortality rates are among the most important direct consequences of crime. Economists have recently developed tools to estimate how much reductions in life expectancy cost society, and results indicate these can be quite significant. Recent estimates indicate that increases in mortality represent a quantitatively significant welfare loss. This loss is either the direct result of a shorter life span or the indirect effect of a shorter planning horizon on investments in physical and human capital.<sup>3</sup> In the case of violence, increased mortality represents a substantial welfare loss estimated to be of the same order of magnitude of direct material costs of crime (Soares 2006). Current evidence suggests that one year of life expectancy lost to violence is associated on average with a yearly social cost of 3.8 percent of GDP. This estimate still ignores costs due to injuries and reduced health, for which there are no trustworthy economic-based estimates available.

The nonmonetary dimension of the costs of crime also carries indirect economic consequences. These effects include changes in behavior from reductions in productive life length (such as decreased investments in human capital and health), reduced savings and investments in physical capital, and, therefore, reduced long-run growth. Shorter life horizons reduce an individual's incentive to take actions that generate long-term benefits and short-term costs, such as investing in education and saving for the future (Lorentzen, McMillan, and Wacziarg 2007). In countries with high HIV prevalence, for example, individuals tend to invest less in human capital (Kalemli-Ozcan 2006). This connection leads to a negative correlation

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<sup>2</sup> See for example Bourguignon (1999), Londoño and Guerrero (1999), and World Bank (2003).

<sup>3</sup> See for example Murphy and Topel (2003) and Lorentzen, McMillan, and Wacziarg (2007).

between adult mortality and investments in human and physical capital, and can be a source of poverty traps.

Finally, there are various intangible costs related to labor markets, business climates, personal traumas, and changes in daily behavior. According to Londoño and Guerrero (1999), intangible costs of crime—deterioration of productivity, consumption, and labor force—constitute the major part of Latin Americans' estimated cost of violence, corresponding to 7.1 percent of the region's GDP. In Colombia, Gaviria and Vélez (2002) document that crime reduces investment and employment in poor urban communities. In Brazil, 52 percent of managers rank crime as a major business constraint (World Bank 2003a). In Jamaica, violence is estimated to result in an average loss of three work days per firm, directly affecting 19 percent of firms (World Bank 2003b). Typically, though, these dimensions are much harder to measure in a systematic and comparable way, and there is only limited evidence available.

Therefore, crime's negative effects encompass several different dimensions. As a result, there is no existing methodology capable of dealing simultaneously with all the relevant issues. As a rule, different methodologies have been developed to address different issues, and each estimate is highly dependent on its specific methodology and on the type of data available. For similar reasons, more encompassing studies inevitably lose detail and rigor in their analysis. In any case, some have suggested that overall costs of crime in particularly violent regions, such as Latin America, may reach as much as 10 percent of yearly GDP (Londoño and Guerrero 1999).

In this review, we concentrate our attention on economically motivated crimes and their byproducts, and on the issues that have been the main focus of recent research. Our main concern relates to crimes against personal safety and property (for example, theft, assault, robbery, homicide), and we do not explicitly address crimes derived from the prohibition of certain activities and practices (such as prostitution and drug trafficking and consumption). The very prohibition and illegality of these activities engenders much crime, corruption, and violence, which naturally raises the question of the social costs and benefits of defining certain activities as crimes (Keefer et al. 2008). We avoid this question altogether by thinking exclusively in terms of crimes associated with illegal involuntary property transfer (thefts,

robberies, and burglaries) and physical violence.<sup>4</sup> Therefore, we also do not deal explicitly with some other relevant issues, which are nevertheless outside the main scope of the literature on costs of crime, such as corruption, white-collar crime, and domestic violence.<sup>5</sup>

This survey tries to rationalize in economic terms the estimates from the existing methodologies, highlight some of their limitations, and point out potential directions for future research. To do so, we start in Section 2 by establishing a very simple theoretical model that presents in clear terms the various different dimensions of costs of crime. This theoretical referential is used as a benchmark to give economic meaning to the different concepts discussed in the literature. It also guides our discussion of the various methodologies. In Section 3 we present the methodologies used to estimate particular aspects of the costs of crime and discuss some issues they fail to contemplate. Section 4 considers some difficult-to-measure dimensions of crime costs that are not included in standard methodologies. In Section 5, we present in a systematic and roughly comparable way the main empirical results currently available in the literature. Section 6 concludes with general remarks and a discussion of potentially fruitful directions for future research.

## 2. Theoretical Benchmark

In order to understand the various dimensions of the costs of crime estimated in the literature, we develop a very simple economic model of crime. This model follows the tradition of Becker (1968), Stigler (1970), and Ehrlich (1973), and is intended only to guide our discussion and shed light on limitations of current literature.

First, consider a rational agent that derives utility from two goods,  $c$  and  $y$ , according to the utility function

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<sup>4</sup> Still, various costs of crime discussed here will be contaminated by these dimensions, either because a large part of the criminal justice system is allocated to prevent and punish crimes related to drug consumption and trade, for example, or because drug trafficking indirectly engenders organized crime and violence.

<sup>5</sup> Lederman et al. (2005) show that corruption seems to be driven by very different factors than common crime. Crime rates for common crimes are highly correlated with each other, but bear almost no correlation at all with perceived corruption. In relation to domestic violence, Waters et al. (2005) review some of the scant literature available. The numbers presented by the authors suggest costs of child abuse in the United States vary between \$2,000 and \$40,000 per child, with total costs above \$14 billion. Costs of intimate partner violence vary between \$1,000 and \$4,000 per victim (Waters et al. 2005).

$$V_n(c, y) = \alpha \cdot \ln c + y, \quad (1)$$

where  $\alpha$  is constant. The subscript  $n$  in the utility function indicates the “no-crime” scenario. This individual maximizes (1) subject to the budget constraint  $p \cdot c + y = m$ , where  $p$  is the price of good  $c$ ,  $m$  is income, and the price of  $y$  is normalized to 1. In this setting,  $y$  can be interpreted as income spent in all other goods apart from  $c$ , or as the utility related to the money left after  $c$  is consumed. Given the quasi-linear specification proposed, there is no income effect in the demand for  $c$ , so any loss of income or expenditure is immediately reflected on reduced demand for  $y$ .

The optimal choice of this consumer implies consumption of the two goods corresponding to a “no-crime” scenario  $c_n = \alpha/p$  and  $y_n = m - \alpha$ . This is the “no-crime scenario” against which one may compare a situation with positive incidence of crime. As we shall see, this is precisely what some of the strategies employed in the literature try to do. To understand what the methodologies actually measure, let us now consider, in turn, the problems of a potential victim and a criminal.

*Victims.* Assume that good  $c$  may be stolen, while  $y$  cannot. Suppose that  $c$  is a good targeted by criminals, so the probability of being victim of a crime,  $\pi(c)$ , is an increasing function of  $c$ . In case the individual is victimized, he loses an amount  $x$  of good  $c$ , and, in addition, experiences a subjective loss of welfare corresponding to  $\sigma$  in monetary units. Assume that the individual takes the amount  $x$  stolen as given. In this “crime-scenario,” the expected utility of a potential victim is given by:

$$V_c(c, y) = \pi(c)[\alpha \cdot \ln(c - x) + y - \sigma] + (1 - \pi(c))[\alpha \cdot \ln c + y]. \quad (2)$$

First-order conditions for the individual’s problem in this case give the optimum level of consumption in the “crime-scenario,”  $c_c$ , implicitly from the expression:

$$\frac{\alpha}{c_c} - p + \pi(c_c) \frac{\alpha x}{c_c(c_c - x)} + \pi'(c_c) \left[ \alpha \ln \left( \frac{c_c - x}{c_c} \right) - \sigma \right] = 0. \quad (3)$$

The first two terms in this expression characterize the solution in the absence of crime. Note that the third term is positive, while the fourth is negative, since  $c_c > x$  and  $\pi(c)$  increase with  $c$ . The third term compensates for the expected reduction in the consumption of  $c$  from



the probability of  $c$  being stolen. The fourth term accounts for the fact that, with a higher  $c$ , the probability of being victimized is higher.

These last two dimensions represent the direct welfare consequences for a potential victim. Their relative importance depends on the relevance of the various dimensions for the particular type of crime under consideration. So, for example, the last term disappears for a crime whose probability of victimization is not affected by the consumption of  $c$  (inconspicuous consumption, linked to random probability of victimization). In this case,  $c_c > c_n$ , since the individual insures against the probability of losing  $x$  units of  $c$  by buying more  $c$  than before. Our quasi-linear utility function is particularly convenient because it isolates substitution effects in  $c$ , so that income effects are always reflected on  $y$  only. This means that  $\pi(c_c) \cdot \alpha \cdot x / c_c (c_c - x)$  represents exactly the increased demand for  $c$  in anticipation of the possibility of having an amount  $x$  stolen. For example, in the case where  $\pi(c_c) = 1$ ,  $c_c = (\alpha/p) + x$ , so that the amount actually consumed of  $c$  remains the same, and the loss from victimization is reflected in reduced consumption of  $y$  (by an amount  $p \cdot x$ ). Generally, this term represents a utility loss that can be measured directly in terms of reduced consumption of  $y$ . Other expenditures on public or private security and the justice system would appear here in the budget constraint as additional expenses or taxes, also reducing the amount of  $y$  consumed.

But the most commonly considered effect of crime at the individual level is probably that captured by the fourth term in expression (3). It represents the increased probability of victimization from increased consumption of  $c$ , which may be understood as related to wearing expensive jewelry, driving a fancy car, or walking in certain areas of a city at night. The increased probability of victimization is associated with higher likelihood of occurrence of the state where consumption is  $(c_c - x)$  instead of  $c_c$ , and also higher likelihood of experiencing the utility loss represented by  $\sigma$ . The term  $\sigma$  here captures all dimensions of victimization not related to the material loss directly associated with the good stolen. In general, it is associated with the possibility of other negative consequences, apart from the transfer of goods, arising from the interaction between victim and perpetrator. So it is most obviously related to the fear and trauma associated with the episode, and to the possibility of injury or death. If  $\pi(c)$  is strongly increasing in  $c$ , or if the utility loss from victimization  $\sigma$  is sufficiently high, the term

$\pi'(c_c)\{\alpha \ln[(c_c - x)/c_c] - \sigma\}$  tends to be larger in absolute value than  $\pi(c_c) \cdot \alpha \cdot x / c_c (c_c - x)$ , and  $c_c$  tends to be lower than  $c_n$ . This is probably the most appealing case, where crime represents a utility loss much more relevant than the direct welfare loss from reduced consumption, so that individuals distort their decision in order to avoid activities or types of consumption that are associated with higher probability of victimization. In this case, crime works as a tax on the consumption of certain goods, implying welfare losses similar to those observed in the presence of distorting taxes. We maintain this hypothesis through most of what follows.

*Criminals.* Suppose that criminals decide on the amount  $x$  to be stolen, but that  $x$  has to be produced with crime effort  $e$ , which generates negative utility. The negative effect of crime effort may be related to actual work or to some social norm attaching negative value to criminal activities. Suppose that criminal gain  $x$  is produced according to  $x = \ln e$ , and that criminals have an instantaneous utility function given by  $\beta \cdot x - e$ .

Criminals may be caught with a probability  $\vartheta(e, s)$ , which is increasing on the level of criminal effort and on expenditures  $s$  on some public safety technology. In case they are caught, they lose the gains from crime and experience a punishment equivalent to a utility loss  $\delta$ . In principle,  $\delta$  is also produced with some other public safety technology (and some expenditure  $j$ ), and corresponds to different dimensions of punishment once a criminal is convicted. In this setting, the perpetrators' expected utility is given by:

$$P(x, e) = \vartheta(e, s)(-e - \delta) + (1 - \vartheta(e, s))(\beta \cdot x - e). \quad (4)$$

Suppose that criminals take  $s, j$ , and the individuals' choices of  $c$  as given.<sup>6</sup> First order conditions for the problem give the optimal choice of  $e$  implicitly from:

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<sup>6</sup> We abstract from a series of complicating details here. First, we do not allow adjustments on the extensive margin, so that the number of criminals and potential victims is fixed (with the former smaller than the latter). Second, there is the matching between victims and criminals. We assume that criminals choose the amount  $x$  to be stolen from a given victim, but that they do not choose specific victims. In order to make this compatible with the assumption that the probability of victimization  $\pi$  is increasing on  $c$ , one may assume that there is a unit interval of potential victims who are randomly drawn by criminals with probability proportional to  $c$ . Finally, we assume that expenditures  $s$  affect the probability that the criminal gets caught, but that  $s$  does not affect the probability of victimization. This comes immediately from the fact that we do not allow adjustments on the extensive margin. So, literally,  $s$  affects the amount stolen in any given crime, but not the number of crimes committed. This is certainly the most limiting of the hypotheses discussed in this footnote. Nevertheless, the framework proposed is able to highlight in the simplest way possible the main issues relevant to the discussion of the welfare cost of violence.

$$(1 - \vartheta(e^*, s)) \frac{\beta}{e^*} - 1 - \frac{\partial \vartheta(e^*, s)}{\partial e} (\delta + \beta \cdot \ln e^*) = 0. \quad (5)$$

Costs of violence commonly discussed in the literature include the expenditures on police, criminal, and justice system ( $s$  and  $j$ ), the loss related to punishment of criminals (incarceration, wages lost, and so forth, represented by  $\delta$ ), and sometimes the value of goods stolen or lost ( $x$ ).

*Welfare Costs of Crime.* For given expenditures on public security  $s$  and  $j$ , an equilibrium in this economy is a combination of  $(c_c, y_c, e^*)$ , such that:  $(c_c, y_c)$  maximize the utility function (2), given  $e^*$ , subject to  $p \cdot c + y + s + j = m$ ; and  $e^*$  maximizes the utility function (4), given  $c_c$  and  $x^* = \ln e^*$ .

Typically, discussions of the optimal design of criminal justice policies do not attach positive value to the utility of criminals. In this situation, the optimal social choice of  $s$  and  $j$  would be that which leads to maximum utility from the perspective of victims, taking into account the reaction of criminals (which here would be equivalent to the solution if  $s$  and  $j$  were private goods and potential victims were aware of the decisions of criminals).

Notice that any level of crime is socially inefficient in the sense that it can never lead to a first-best allocation. If governments could freely transfer resources across individuals, first-best allocations would always imply a zero level of crime, even if governments attached positive weight to criminals' utility function. In this case, governments would simply transfer a certain amount  $x$  of the good  $c$  to criminals, but the levels of effort  $e$ , and expenditures on prevention and punishment  $s$  and  $j$ , would always be set to zero. Any amount of  $e$  allocated to extraction of  $x$  from potential victims is a social waste since it reduces the utility of both criminals and victims, and may imply other expenditures on public safety that further reduce well-being. This is roughly the perspective implicit in most of the discussion on the welfare costs of violence.

The concepts analyzed here map some of the most commonly discussed dimensions of welfare costs of violence. When measured in monetary units, the difference in expected welfare of potential victims between the "no-crime" and "crime" scenarios, or the social loss associated with crime, is:

$$L_V = s + j + \pi(c_c) \cdot (\sigma + p \cdot x) + p \cdot (c_n - c_c). \quad (6)$$

The variables  $s$  and  $j$  indicate the expenditures on crime prevention and punishment respectively, which are reflected in reduced consumption of other goods ( $y$ ). Direct utility losses from victimization, which encompass psychological traumas and fear, injury or even death, are represented by  $\sigma$ , which is measured in the same unit of  $y$ . Together with the goods lost or destroyed (value of  $p.x$ ),<sup>7</sup> these are the direct costs of victimization, which happen with probability  $\pi(c_c)$ . In addition, fear of the risk of victimization changes individuals behavior in such a way that consumption of  $c$  is reduced from  $c_n$  to  $c_c$ , representing a loss of welfare of value  $p.(c_n - c_c)$ . These different dimensions of cost can be briefly categorized as public and private security expenditures ( $s$  and  $j$ ); loss from goods stolen ( $x$ ); subjective utility loss ( $\sigma$ ); and loss from change in behavior to avoid crime ( $c_n - c_c$ ). As will be seen later, the vast majority of estimates available refer to the first three terms in this expression.

In relation to criminals, the typical discussion in the literature does not follow so closely what theory would suggest. Strictly, social costs of crime from the perspective of criminals include those associated with punishment  $\delta$  and also the effort allocated to crime  $e$ . Estimates from the literature try to get at some values related to  $\delta$  by accounting for such things as lost wages and productivity of those incarcerated, incapacitated, and killed as a consequence of criminal behavior. On top of that,  $\delta$  should also account for the direct utility loss from incarceration and other types of punishment. In relation to  $e$ , estimates should ideally try to account for the goods that could have been produced had criminals worked in the legal sector, generating value added. The social loss related to criminals, therefore, should be:

$$L_c = e + \vartheta(s,e)\delta. \tag{7}$$

As we shall see, most of the estimates of the costs of crime map some concept discussed above, and try to compare a given crime environment with the situation in the absence of crime. This is an intuitive comparison, which gives a measure of the magnitude of overall social losses implied by the existence of crime and, therefore, the importance of the

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<sup>7</sup> Whether  $x$  should be considered as a true social loss or just a transfer of resources within society depends on the relative value attributed to it by victims and criminals. Generally, at least part of the value of  $x$  represents a net social loss, since consumers who purchase the good in the market tend to value it more than criminals (Glaeser 1999). Here, we follow the most common approach in the literature and do not count the utility criminals derive from the stolen property as being socially valuable. So we consider the total value of the good stolen as a social loss.

issue in society. Nevertheless, it is unclear whether these numbers are useful from the perspective of public policy decisions.

In this context, the typical problem facing a government is how to allocate spending on crime prevention and punishment in a way that will maximize social welfare. The optimal allocation of resources would equate marginal benefits from further expenditures to marginal costs. So a government would contemplate increasing  $s$  and  $j$ , and weighing these costs against the marginal benefits. In terms of the expressions above, a government would choose  $s$  and  $j$  in order to minimize the total social loss, represented by  $L_V + L_C$ . In order to assess the benefits from increased expenditures, one would have to know how changes in  $s$  and  $j$  would affect crime effort  $e$  and, in consequence, the costs and probability of victimization, the behavior of potential victims, and the cost of punishment to criminals. These involve knowledge of a series of causal relationships that are not immediately observable by policy makers, such as the response of criminals to increased punishment or probability of apprehension, the behavioral response of potential victims to reductions in crime, and the relationship between increased punishment and increased utility loss of incarcerated criminals. These are not trivial objects to estimate, and certainly much more elusive than the overall costs of crime typically calculated in the literature. Still, there are some methodologies that seem to be closer to what one would need to analyze the optimal allocation of resources to public safety.

Having outlined a theoretical structure to guide our discussion, we now turn to the different methodologies used in the estimation of the costs of crime and violence.

### 3. Methodologies

As mentioned earlier, there is no unified framework that addresses all dimensions of the welfare costs of crime and violence. Various methodologies have been developed to deal with some aspects of the problem. Alternatively, other studies have analyzed specific consequences of crime that highlight less tangible aspects of this cost, but these do not yield explicit results that are easily expressible in monetary units. In this section, we discuss the main methodologies applied in the literature to estimate the welfare cost of violence: these include

accounting of expenditures and other costs, contingent valuation surveys, and other marginal willingness-to-pay approaches.

*Accounting.* Simple accounting is probably the most widely applied method used to estimate the welfare costs of crime. This is a straightforward use of the basic logic outlined in the last section: Societies experience several costs and losses that would not exist in the absence of crime; these costs correspond to a loss of resources that could potentially be used with other goals, and therefore, a welfare loss associated with the existence of crime. Studies using this strategy typically incorporate a combination of the following dimensions: Value of property lost or destroyed; public and private security expenditures; medical expenses for injuries and psychological damages that result from crime; wages lost by people incarcerated, incapacitated, or killed; and subjective costs associated with pain, suffering, and lost quality of life.

The specific dimensions considered in each study depend on the data available for each location and time period. Actual calculations make use mostly of secondary data. They may include public budgets and household surveys of private consumption (expenditures), official medical records and data (medical expenses), demographic information on criminals and victims and their respective sentences or incapacitation (wages and productivity lost), and data from jury awards, insurance, or other studies using some of the methodologies discussed below (pain, suffering, and quality of life).

In our simple model, we only considered out-of-pocket expenditures on crime prevention and punishment. Generally, there may be also expenditures that allow researchers to partly assess the direct utility loss ( $\sigma$ ). Medical expenses, for example, reveal a lower bound of the costs with injury, since the suffering associated with the condition should at least be equal to the money that was spent on treatment. As mentioned before, some of the estimates from this literature go as far as to include costs related to pain, suffering, and lost quality of life. But it is not clear, for example, whether incorporating both medical expenditures on injuries and direct utility loss from suffering, based on other types of estimates, would not constitute, in some dimension, double counting. Medical costs are undertaken to overcome or minimize the

costs of suffering, and at least a portion of jury awards are designed precisely to compensate for these.

This point reveals the lack of a theoretical referential in the accounting literature. Studies typically add up all the dimensions that can possibly be estimated from available data, without clearly understanding or framing the conceptual differences between the various types of costs—as in, costs that are undertaken to keep crime under control and costs that result from criminal activity. Therefore, as in the case discussed above, it is possible for double counting to occur. In addition, some of the numbers do not correspond to the relevant theoretical concepts. For example, in relation to the incarceration of criminals, the relevant social cost should be the utility loss experienced by incarcerated criminals. This includes wages lost during productive lifetime, as calculated by studies in this literature, but should also include other dimensions associated with incarceration (loss of liberty and contact with family, violence experienced in jail, and so forth).

Studies that use the accounting methodology include Miller et al. (1993) for the United States; Londoño and Guerrero (1999) for some Latin American countries and cities (Caracas, urban Colombia, El Salvador, Lima, Mexico City, and Rio de Janeiro); Brand and Price (2000) for England and Wales; Mayhew (2003) for Australia; ISER (1998) and Rondon and Andrade (2003) for Brazilian cities (Rio de Janeiro and Belo Horizonte, respectively); World Bank (2003b) for Jamaica; Altbeker (2005) for South Africa; and Bundhamcharoen et al. (2008) for Thailand. Mayhew (2003), for example, offers estimates of costs related to homicides, assaults, sexual assaults, robberies, burglaries, thefts, criminal damages (vandalism), arsons, frauds, drug offences, the criminal justice system, production lost by prisoners and victims, victim assistance, the security industry, and insurance administration. On top of budget numbers and industry data, his calculations incorporate medical costs of fatalities from hospitalized and nonhospitalized cases, estimated loss of production from people unable to work, estimates of intangible costs from available willingness-to-pay estimates (to be discussed later on), compensation awards to victims, and desired victims' compensation.

The main advantage of the accounting methodology is that, in principle, it addresses several relevant dimensions of the costs of crime. However, it also has a few drawbacks. First,

despite adequately mapping some concepts related to the overall costs of crime, it does little to provide estimates of the marginal costs and benefits relevant for policy making. Second, its lack of theoretical foundation sometimes leads to double counting, as different estimates related to similar underlying concepts are added up together. Finally, some of the sources used to back out certain numbers do not necessarily provide unbiased estimates of the relevant concepts. So, for example, jury awards offer estimates of the welfare loss associated with certain types of injuries. But it is not clear whether juries are able or supposed to provide unbiased estimates of the relevant number, which would be the subjective welfare loss attributed to the event by individuals.

*Contingent Valuation.* The contingent valuation methodology was originally designed and extensively applied by the environmental economics literature.<sup>8</sup> It relies on surveys to elicit the subjective value that individuals place on public goods, such as cleaning a polluted river, protecting endangered species, and so forth. This technique has become increasingly popular in recent criminology research, after the initial contributions of Cook and Ludwig (2000) and Cohen et al. (2004).

The logic of the contingent valuation method is simple and sensible. In order to attribute value to a good that is not transacted in the market, the best strategy is simply to ask how much people would be willing to pay for it. To this end, contingent valuation studies conduct surveys. Some of these ask individuals to choose between different policy alternatives; some offer price schedules and ask respondents to indicate the maximum they would be willing to pay for a certain outcome. In Cohen et al. (2004), for example, “respondents were asked if they would be willing to vote for a proposal requiring each household in their community to pay a certain amount to be used to prevent one in ten crimes in their community.”<sup>9</sup> In Atkinson et al. (2005), respondents were told the characteristics of a type of crime and the current risks of victimization, and then asked to express their willingness to pay to reduce the “chance of being

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<sup>8</sup> For a review, see Mitchell and Carson (1989).

<sup>9</sup> Cohen, Mark A., Roland T. Rust, Sara Steen, and Simon T. Tidd. 2004. “Willingness to Pay for Crime Control Programs.” *Criminology* 42 (1): 93.



a victim of this offence by 50 percent over the next 12 months. The payment vehicle for this change was a one-off increase in local charges for law enforcement ... with amounts varying from £0 to £5,000, where respondents were asked to place a tick against that amount which corresponded to the maximum they would be prepared to pay for reducing the risk by half".<sup>10</sup>

The hypothetical exercises performed in these studies focus on offering a given outcome to individuals and asking what they would be willing to pay for it. Under perfect conditions, this type of exercise would reveal exactly the value of certain changes in outcomes from the perspective of individuals. This is a powerful concept, close in essence to the numbers that are needed for public policy making. In what refers to the individual costs incurred by potential victims, the contingent valuation method is particularly interesting because it does not require decomposition of different types of costs. By answering what they are willing to pay for a certain outcome, individuals are taking into account whatever costs may be relevant, from their subjective perspective, as they evaluate how much a certain policy is worth to them. From the perspective of victims, this number would summarize everything there is to know. The optimal investment in public safety would compare these marginal gains to the marginal costs of implementing a certain outcome, given the technologies available and social costs associated with them (law enforcement, punishment of criminals, and so forth).

Contingent valuation studies typically focus on one crime, and therefore answers to survey questions can be used to refer to the marginal benefits associated with reductions in that particular type of crime. So, for example, Ludwig and Cook (2001) focus on injury from gun violence in the United States, Cohen et al. (2004) analyze burglary, serious assault, armed robbery, rape, sexual assault, and murder, also in the United States, and Atkinson et al. (2005) look at common assault, wounding, and serious wounding in England and Wales.

The simplicity of the contingent valuation approach makes it very appealing. Even though the methodology has not yet been applied to many different contexts, in principle it could be used as a powerful tool in the comparative analysis of marginal benefits of crime reduction. For example, the same questionnaire, implying the same set of changes in outcomes,

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<sup>10</sup> Atkinson, Giles, Andrew Healey, and Susana Mourato. 2005. "Valuing the Costs of Violent Crime: A Stated Preference Approach." *Oxford Economic Papers* 57: 568.

could be applied in different areas, regions, or countries. Responses to survey questions would indicate the overall benefits of certain policies to potential victims, irrespective of the specific cultural or institutional setting. This would not require specific knowledge of that particular setting (such as the cultural stigma associated with different types of crime) since responses to the survey would supposedly summarize all relevant benefits and costs from the perspective of victims.

Still, the contingent valuation methodology also has its drawbacks. First, it only explores one side of the cost-benefit equation—the marginal gain of reducing crime by some predetermined amount. This dimension reveals the potential benefits from a certain change in outcome, but one would need the other side of the equation to take into account the marginal cost for society to attain this change. Optimality would be the choice of a certain reduction in crime rates for which the marginal benefit to potential victims equated the marginal cost of the reduction in crime. While contingent valuation elicits the benefits from crime reduction, other methodology would be needed to estimate the policy costs involved in different crime scenarios. Notice that the latter remains extremely difficult to estimate, for it involves the technological costs related to policing, constructing and maintaining penitentiaries and the justice system, costs of punishment to criminals, and so forth. Apart from subjective costs of punishment to criminals, these are not and cannot be contemplated within the contingent valuation methodology, since they are quasi-technological parameters that cannot be revealed from preferences.<sup>11</sup>

But the most serious limitation of the contingent valuation strategy comes from what also constitutes its main strength: Its simplicity. Economists have long been skeptical of information extracted from stated preferences, rather than revealed ones. Questions that ask individuals how they would react in a certain situation, or the value they would attribute to a hypothetical good, are not real decision-making situations. Individuals do not incur the actual costs and benefits of the decision, and therefore may not put adequate thought into gathering

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<sup>11</sup> By quasi-technological parameters, we mean relationships such as the amount of additional police needed to reduce crime in a certain area by a given fraction, the corresponding expansion in the prison system to accommodate increased punishment, and so forth.

and processing information. Or they may be subject to systematic bias related to what they think the “expected” answer should be. For these reasons, most economists prefer estimates of willingness to pay based on actual behavior, or revealed preferences, rather than stated preferences.<sup>12</sup> Similar criticisms have been made regarding the booming literature on experimental economics (Levitt and List 2007).

Another potential problem with contingent valuation surveys is that they are framed according to a specific context. So when individuals are asked how much tax they would be willing to pay to reduce the incidence of crime, they may implicitly bring into their answer their perception of the quality of law enforcement agencies and other local institutions. So their answer may not exactly address the policy outcome proposed (a 50 percent reduction in crime rates, for example), but rather the specific context in which it is framed.

*Other Willingness-to-Pay Methods.* There are other methods besides contingent valuation that try to estimate the marginal willingness to pay for reductions in crime and violence. These methods typically make use of estimates obtained from hedonic price models and deal with narrower dimensions of crime.

Hedonic models regress the price of a certain good on its attributes, and back out of estimated coefficients the intrinsic value attached to each attribute.<sup>13</sup> So a house may derive its value from the quality of its living space, number of bedrooms, garage, amenities, and also from its location. The level of crime and violence in the surrounding area may be an additional attribute of a house, and individuals may be willing to pay more to live in an area with lower crime. An estimate of how much the attribute “low-crime” is worth in the pricing of a house immediately provides an estimate of the cost of crime. If, everything else constant, individuals are willing to pay more to live in an area with lower crime, it means that their willingness to pay for the corresponding reduction in violence is at least equal to that amount. This back-of-the-envelope calculation based on estimates from a hedonic regression provides a simple way of assessing the costs of location-specific crime and violence for a certain population. This was the

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<sup>12</sup> For more on this topic, see Carson et al. (2001).

<sup>13</sup> For more on this topic, see discussion in Rosen (1974).

logic of the seminal contribution of Thaler (1978), who estimated the impact of property crimes on real estate values in Rochester, New York. Other papers, such as Lynch and Rasmussen (2001) for the case of Jacksonville, Florida, apply different versions of this methodology to estimate costs of specific types of crimes.

The numbers generated from hedonic models can, in principle, be interpreted similarly to those obtained from contingent valuation surveys: They show the willingness of individuals to pay for certain reductions in crime rates.<sup>14</sup> Hedonic models have an advantage in that they rely on preferences revealed by market behavior, by analyzing the actual amount that people pay to avoid living in high-crime areas. Their limitations are the same as contingent valuation surveys in that they address only the potential victim's side of the cost-benefit analysis. Therefore, any results obtained from hedonic models should be contrasted with the costs of implementing different policies. Another limitation is that hedonic models of this type can only help evaluate the willingness to pay for crimes that can be immediately mapped into some good transacted in the market. Typically, estimates make use of real estate prices or rental rates, so the types of crimes addressed must be geographically delimited and linked to one's residential area. In this sense, contingent valuation methods are more flexible, since the hypothetical questions raised can, in principle, contemplate any type of policy change.

Other developments from the field of health economics (a field which is also based on hedonic models) have recently been used to analyze the welfare costs of crime. The so-called value-of-life methodology offers a framework in which changes in mortality rates can be valued through a marginal willingness-to-pay method. Studies in this literature make use of hedonic estimates of compensating differentials for mortality risks as benchmarks for the willingness to pay for marginal changes in mortality.<sup>15</sup> These values are then plugged into theoretical models of various degrees of complexity in order to recover, through calibration, underlying preference

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<sup>14</sup> There is the issue of nonlinearity of the willingness to pay, often neglected in the hedonic model methodology, but considered more carefully in most contingent valuation studies.

<sup>15</sup> High-risk occupations pay, on average, higher wages to compensate for the increased probability of death. As in the case of crime and real estate prices, this relationship can be used in a hedonic model setting to estimate the implicit value individuals attach to changes in survival probabilities. For a review of the hedonic strategy in the context of compensating differentials, see Viscusi and Aldy (2003).

parameters.<sup>16</sup> Once these preference parameters are recovered and given a certain wage and income profile, the theoretical models can immediately provide marginal willingness-to-pay numbers for any given shift in age-specific mortality rates. So, one can simulate the social willingness to pay for any given reduction in homicide rates by recovering the actual mortality profile due to homicide from data. This was the strategy applied by Soares (2006), who used cause- and age-specific mortality data from 73 countries to estimate the total cost of mortality due to violence across countries.

The greatest advantage of the value-of-life methodology is that it offers a rigorous theoretical framework that, once calibrated, can be used to simulate the welfare gains from any given policy change. In this sense, it also potentially offers estimates of the marginal welfare gain to potential victims, as do the contingent valuation and the hedonic real estate pricing methodologies. But the particular advantage of the value-of-life approach is that once the relevant parameters of the theoretical model are calibrated, new policy simulations can be performed without further survey data or analysis. This is precisely the advantage of having a theoretical model that is capable of simulating individuals' behavior under different scenarios.

But the advantages of the theory also come at a price. The theory's simplifying assumptions are inevitably reflected in biases of the estimates, and it is difficult to guess the extent of these biases under different circumstances. Also, the value-of-life approach is designed to deal only with changes in mortality. While it could in principle be extended to incorporate losses in welfare due to injuries and incapacitation, it will never be able to account for all relevant dimensions of welfare losses associated with crime. The simple fear of becoming a victim (and the associated trauma) cannot be summarized entirely by the welfare loss from the probability of death or injury, had these outcomes been generated under other circumstances.

Still, as with contingent valuation, the willingness-to-pay methods discussed here are also applicable to various contexts, irrespective of specific institutions or culture. Since they aim to uncover individuals' preferences through some sort of market behavior, estimates obtained

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<sup>16</sup> For examples, see Murphy and Topel (2003) or Soares (2006).

should summarize all the relevant aspects considered by individuals in the decision-making process.

#### 4. Difficult-to-Measure Costs of Crime

Several potential consequences of crime escape the scope of any of the methodologies discussed above. These go above and beyond the immediate costs related to victimization, expenditures on prevention, and punishment, and include costs associated with the effects of a violent environment on decisions affecting investment, entrepreneurship, human capital accumulation, urban development, and, ultimately, economic growth. Most of these are related in some way to changes in behavior induced by crime, but are more or less indirect or long-term effects of the crime itself. There is some evidence that crime affects all of these dimensions, but these cannot be easily incorporated into the methodologies discussed before.

The theoretical connection between crime and different types of investment is clear. By reducing expected lifespan, and, more generally, increasing uncertainty about the future, crime reduces the incentives to engage in activities that result in current costs and future benefits. The negative effect mortality has on investments in human capital has been analyzed generally by Lorentzen, McMillan, and Wacziarg (2007), and specifically by Kalemli-Ozcan (2006) in the particular case of AIDS. Though this connection has not yet been empirically established for the case of crime, it is likely that a similar mechanism operates, especially in high violence areas such as Latin America (table 1.2). But the health effects of crime are not restricted to mortality. Though more difficult to quantify in monetary terms through willingness-to-pay frameworks, welfare losses of crime due to injuries and incapacitation are also likely to be very high. For the Caribbean, for example, the United Nations Office on Drugs and Crime and the Latin American and Caribbean Region of the World Bank (2007) estimate disability-adjusted life years (DALYs) lost to violence (per 100,000 inhabitants) between 238 (Dominica) and 716 (Guyana). By increasing mortality and morbidity rates, particularly during the most productive years of life, crime should reduce investments in general and, in particular, investments in education.

In reality, some evidence suggests that not only does crime reduce the amount invested in education, but it also reduces the productivity of investments actually undertaken. Severnini

(2007) shows that in Brazil, the performance of public school students in a standardized exam seems to be negatively affected by the incidence of violence in the area where the students' school is located. Therefore, students in high-crime areas perform significantly worse than similar students in low-crime areas. The effect is particularly strong for students during adolescence and in the low end of the ability distribution, and stronger in schools with a high number of students per classroom and a high fraction of male students. A possible direct link between violence and proficiency is teacher turnover, which seems to be higher in high-violence areas.

The impact of crime on business is also potentially serious. Gaviria and Vélez (2002) argue that crime reduces investment and employment in poor urban Colombian communities. In Brazil, 52 percent of managers rank crime as a major business constraint according to the World Bank's Investment Climate Survey (World Bank 2003a). Krkoska and Robeck (2008) present more systematic evidence on the negative effects of crime on entrepreneurship. They use survey data from 9,500 firms in 26 European transition countries, plus data on additional 4,000 firms from 8 nontransition countries in the European Union and Southeast Asia. In a within-country analysis, they show that firms perceiving a higher risk of victimization display systematically lower rates of job creation (or employment growth). Interestingly, the effect is driven by the perception of incidence of street crime, not organized crime.

These results are also generally consistent with those obtained for the case of Jamaica. Using a survey of firms, World Bank (2003b) shows that 36 percent of firms in Jamaica close before dark to avoid crime, and claim they would be willing to remain open an additional 3.6 hours on average if crime was not a concern. In these same firms, private security spending amounts to 2 percent of annual revenue, while there is an average loss of three work days per year due to violence (19 percent of firms claim to be directly affected by crime).

Hamermesh (1999) and Cullen et al. (1999) analyze different aspects of crime's impact on organization of urban life and urban growth. Like the Jamaican case, Hamermesh shows that high crime tends to shift working hours away from nighttime and toward daytime, and that this shift tends to be more significant among women. His evidence indicates that the crime of homicide has the strongest effect on the distribution of working hours. Cullen et al. (1999)

analyze the impact of crime on population change across urban areas, where the change tends to be driven mostly by in-and-out migration. They show that increases in crime rates are consistently associated with declines in city population, and that this decline is more intense among the educated. In this way, crime can clearly affect the way a city functions and even its long-run dynamism.

All dimensions discussed above work toward reducing investments and productivity, and the overall efficiency of the economy. Therefore, one might expect crime also to have long-term consequences for growth rates. Though it is a considerable challenge to establish this causality empirically, there are some estimates available based on cross-country data using dynamic panel techniques. World Bank (2006), for example, uses the Arellano-Bond technique in a panel of 43 countries to estimate the impact of crime, as measured by the homicide rate, on the growth rate of income per capita. The authors find that higher crime rates at one point in time are consistently related to lower growth rates in the following five years. This effect is also consistent with the results obtained by Krkoska and Robeck (2008), who, in a cross-country context, show that countries where perception of crime was high in 2002 experienced systematically lower inflows of foreign direct investment (FDI) in the following three years. In this case, both overall crime and costs associated with organized crime seem to be related to lower levels of FDI.

Another often neglected dimension of crime is the distribution of its costs across the population. Though this issue has received increased attention in recent years, it is still understudied in both the determinants of crime and costs of crime literature. Some of the contingent valuation and other willingness-to-pay methods allow for heterogeneity, but most of the studies on costs of crime do not have as a main concern the distributive implications of the incidence of crime.

Evidence suggests that the distribution of crime in society may vary depending on the country and the type of crime, reflecting most likely the distribution of public security and the availability and effectiveness of private security against different types of crime. Levitt (1999) finds that, in the United States, the poor are more likely to be victims of violent crimes than the rich, with more mixed results for property crime. Still, when the 1990s are compared to the



1970s, property crime victimization has also become more concentrated among the poor over time. Similarly, Di Tella et al. (2006) find that most of the increase in burglary rates in Argentina during the 1990s was shouldered by the poor, since the rich were able to adopt effective protective strategies (private security, alarm systems, and so forth). In contrast, for street robberies, for which no effective protective technology was available, increases in victimization were roughly similar across rich and poor.

On the other hand, Gaviria and Pagés (2002) show that for 17 Latin American countries, the typical victim of property crime comes from rich and middle-class households. In the particular case of Colombia, Gaviria and Vélez (2002) document that individuals in the top quintile of the socioeconomic scale have a higher probability of property crime victimization, while victimization by violent crime is roughly constant across the income distribution (though the rich are most often victims of kidnappings and the poor are most often victims of homicides). The authors also find that as a result, households in the top quintile are more likely to adopt some sort of costly protective behavior, such as installing anti-theft devices at home, participating in neighborhood watch programs, hiring private security personnel, avoiding road trips, or even migrating. Like most other studies, Soares (2006) presents evidence that homicide victimization is also more common in lower socioeconomic strata in the case of Brazil.

Overall, the costs of crime have many other possible dimensions and byproducts that can be qualitatively assessed by strategies different from those discussed in the previous section. Among these, inequality in the distribution of crime is the one that deserves perhaps the most attention. In most cases, though, these dimensions cannot easily be incorporated in methodologies that try to estimate the total costs of crime and violence, sometimes because they are difficult to quantify in monetary units and sometimes because their assessment is greatly dependent on the availability of very specific data. Still, these alternative approaches offer important insights into less acknowledged dimensions of the social costs of crime and contain very relevant qualitative information.

## 5. Results from the Literature

In this section, we present evidence from the studies discussed earlier in a systematic and comparable way. This is no trivial task, since the studies use different types of data, focus on different units of analysis, and offer estimates on different types of costs of crime. This section is not intended to be an exhaustive review of all studies available on costs of crime, but rather an illustration of the types of numbers that can be obtained from methodologies such as the ones discussed in Section 3. There are certainly many omissions in this review, but we hope it captures the essence of the different strategies currently available.

In this spirit, table 1.3 summarizes the main results of some studies discussed in this paper. The table is organized by methodology, specific study in question, geographic region or area of analysis, year, types of crime or expenditures included, and main results. Since the studies are diverse in nature, main results may refer to estimates of costs of crime, potential welfare gain from crime reduction, or other consequences of crime. Also, some results are presented in monetary units, others as shares of GDP of the relevant geographic area, and some in nonmonetary terms. All monetary values were converted to U.S. dollars using the respective exchange rate and deflated to 2007 prices.

As the table makes clear, studies using the accounting methodology span various types of crimes, and in each case, incorporate different dimensions of costs. Still, when seen as a fraction of local production, the order of magnitude of the estimates is often quite similar. For the Brazilian cities of Belo Horizonte and Rio de Janeiro, costs of crime are estimated to add up to, respectively, 5 percent and 4 percent of yearly production. In the average for Latin America, once various other dimensions are incorporated, Londoño and Guerrero (1999) extrapolate country estimates and suggest that the number may be as high 14 percent of GDP (including rough estimates for some “intangible costs”). The estimated costs for Australia, England and Wales, and the United States—presented in the table as dollar values—also correspond to roughly comparable fractions of production. In the case of Australia, Mayhew (2003) estimates a cost that corresponds to 10 percent of GDP, while Brand and Price (2000) estimate numbers for England and Wales of the order of 7 percent. The U.S. number from Miller et al. (1993)—which refers to rape, robbery, assault, arson, and murder only— is a little lower than that, at

around 3 percent of GDP, but again within the same order of magnitude. In the case of Jamaica (World Bank 2003b), dimensions related to medical costs, lost productivity, and public expenditures on security add up to 3.7 percent of yearly production, with 3.1 percent coming from public expenditures on security alone. Similarly, in South Africa (Altbeker, 2005), public expenditures on criminal justice alone correspond to a yearly cost of 3.7 percent of GDP. Finally, costs of crime related to direct medical costs and loss of productivity in a relatively low crime society, such as Thailand, represent only 0.23 percent of yearly production (though these do not include expenditures on the criminal justice system).

On the whole, an overview of the accounting literature suggests that overall expenditures and costs associated with crime correspond to a significant fraction of yearly production, possibly up to 10 percent of GDP, depending on the case in question and the dimensions incorporated into the analysis.<sup>17</sup>

As mentioned before, contingent valuation studies do not generate such encompassing estimates of the overall costs of crime, but do provide numbers that are probably more useful in terms of public policy analysis. This literature shows that the subjective cost of victimization may vary significantly from crime to crime. Cohen et al. (2004), for example, find that the willingness to pay to avoid one burglary and one assault are, respectively, \$30,102 and \$84,286. The number for armed robbery and sexual incident is around \$300,000, and for murder around \$11 million. Ludwig and Cook (2001), through estimates of the willingness to pay to reduce gunshot injuries (both fatal and nonfatal), arrive at a number of roughly similar magnitude, implying a willingness to pay per injury of \$1.5 million, and a value of a statistical life between \$7 million and \$8.5 million. Atkinson et al. (2005) present numbers on willingness to pay per incident for England and Wales that are somewhat smaller than those obtained for the United States, but again within the same order of magnitude. Overall, however, the use of the

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<sup>17</sup> Dalal and Jansson (2007) estimate costs of crime (medical costs, productivity lost, and other costs) for five events experienced by specific families in the Indian regions of West Bengal and Andhra Pradesh. The events are related to physical violence, varying from a severely beaten 32-year-old man to a 50-year-old man killed by gunfire. The total cost of the events varies between 100 percent of monthly family income (\$87) in one case, to 5,811 percent of monthly family income (\$46) in another. These are interesting examples of how violence may disrupt a family's life, but since they are closer to case studies than systematic evidence, we do not include them in table 1.3.

contingent valuation approach to estimate the costs of crime is still limited when compared to the accounting methodology, and particularly so for developing countries.

Willingness-to-pay methods based on hedonic regressions give as basic output the impact of crime rates on real estate prices across areas with different incidences of crime and violence. Based on this type of variation, Thaler (1978) estimated the average cost of property crime in Rochester, New York, to be around \$2,560, while Lynch and Rasmussen (2001) estimated that high crime areas in Jacksonville, Florida, had real estate prices discounted up to 40 percent (or \$50,000), according to the incidence of crime. Finally, Soares (2006) used hedonic estimates of compensating differentials for mortality risks as inputs in the calibration of a theoretical model. The calibrated model suggests that, across 73 countries, the loss of life expectancy implied by deaths due to violence corresponds to roughly 1 percent of yearly GDP. Each additional year of life expectancy lost to violence is estimated to increase the social cost of crime by 3.8 percent of yearly GDP.

The remaining rows of table 1.3 present effects of crime estimated in particular studies that do not fit in any of the methodologies described earlier. We include them here to illustrate the various potential effects of crime and how they may be assessed. For example, Cullen et al. (1999) show that crime may reduce urban growth and development. They estimate that areas that experience increases in crime rates suffer losses in population (urban flight) on an almost one-to-one basis—each additional reported crime is associated with a one-person decline in city residents. Hamermesh (1999) shows that high crime in urban areas also affects other economic decisions, such as when people choose to work. He shows that people tend to work less during nighttime in high crime areas. Using differences in wages throughout the day, he backs out from his estimates a willingness to pay per worker (for a 75 percent reduction in crime rates) between \$397 and \$2,640. Finally, using dynamic panel techniques and a cross-country dataset, World Bank (2006) suggests that crime may reduce the long-run growth rate of the economy. According to the estimates, a 10-point reduction in homicide rates would on average imply a welfare improvement between \$2.2 and \$10 billion.

## 6. Concluding Remarks

Current estimates of the welfare costs of common crime and violence offer a broad picture of the social losses related to crime. Yet, different methodologies deliver different types of estimates, each with a particular conceptual significance. The most serious limitation of this literature at the present stage is probably its lack of theoretical foundations, and therefore lack of a simple unified framework under which the different numbers provided by the empirical studies can be appreciated and compared.

A long methodological tradition in the area has attempted to estimate the overall consequences of crime in terms of welfare loss to society. Though interesting and illustrating in and of themselves, we argue here that numbers like these are not particularly useful from the perspective of public policy formulation. Estimates closer to what a policy maker would need in order to design an optimal public safety strategy are provided by studies that try to get at marginal willingness-to-pay values. Particularly promising in this direction is the recent use of the contingent valuation methodology to unveil individuals' willingness to pay for alternative sets of potential policies. Though there are methodological concerns in relation to stated-preference strategies, in principle this idea comes close to a direct assessment of the benefit side of a cost-benefit evaluation of public safety policies.

Still, the literature is as of yet entirely silent on the cost side of this same equation. A major empirical challenge is to develop a methodology that allows the estimation of some sort of public safety production function, mapping expenditures along various dimensions on relevant outcome variables. Together with willingness-to-pay numbers for alternative policy scenarios, these would constitute ideal tools for public policy decision making.

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Table 1.1: Crime Rates (%) from Victimization Surveys (ICVS), World Regions, Average for the 1990s

Region	Burglary	Thefts	Contact Crimes	Any Crime
Latin America	11.8	16.9	15.0	43.6
Africa	12.9	16.6	11.4	39.6
Asia	3.6	11.1	4.3	18.9
Former Communist Block	6.8	12.9	7.0	31.7
North America	8.0	10.1	8.7	34.0
Oceania	8.4	9.4	8.3	33.4
Western Europe	4.2	9.5	5.8	28.1

Notes: Regional numbers are unweighted country averages. Source is ICVS (1989, 1992 and 1996/97). Burglaries include attempted burglaries. Thefts are bicycle or motorcycle and other personal thefts, including pickpocketing. Contact crimes are robberies, sexual incidents and/or threats/assaults. Any crime includes all previous categories plus theft of car/joyriding, theft from car, and car vandalism. Numbers based on major cities from each respective country.

Table 1.2: Mortality Due to Violence, World Regions, Average for the 1990s

Region	Mortality Due to Violence (per 100,000)
Latin America & Caribbean	21.8
North America	6.5
Western Europe	4.0
Former Communist Block	17.2
Western Pacific	7.8

Notes: Regional numbers are unweighted country averages. The only African country included in the WHO cause specific mortality data is Mauritius, and the only Eastern Mediterranean country is Kuwait. These regions are not included in the table. Mortality due to violence is homicide and injury purposely inflicted by other persons plus other violent deaths, from the International Classification of Diseases (ICD).

Table 1.3: Summary of Selected Studies on Welfare Costs of Common Crime and Violence

Method	Study	Unit of Analysis	Year	Type of Crime or Expenditure	Main Result (Costs of crime, potential welfare gain from crime reduction, or other consequences of crime) (in 2007 US \$ or % of production, unless otherwise noted)					
Accounting	Miller, Cohen, and Rossman (1993)	U.S.	1987	Rape, robbery, assault, arson, murder	Rape 16.72 billion	Robbery 38.46 billion	Assault 160.56 billion	Arson 1.42 billion	Murder 80.28 billion	Total 297.47 billion
	ISER (1998)	Rio de Janeiro (Brazil)	1995	Medical assistance, years to death or incapacity, material losses, expenditures with safety, justice system, insurance	Medical 43 million	Injuries and Premature Deaths 1 billion	Material Loss and Security Expenditures 1.7 billion	Total 2.8 billion (5% of GDP)		
	Londoño and Guerrero (1999)	Latin America	1990s	Medical costs, loss output, intangible costs	Human Capital 1.9%	Capital 4.8%	Transfers between Victims and Criminals 2.1%	Total Cost 14.2%		
	Brand and Price (2000)	England and Wales	1999–2000	Medical costs, loss output, intangible costs	Crime against individuals: average cost = \$3.100; total cost (billion) = \$50.4.	Commercial and public sector cost: total cost (billion) = \$14.2	Fraud and forgery: total cost (billion) = \$21.6	Traffic and motoring/other nonnotifiable offences: total cost (billion) = \$7.5	Total cost of crime (billion) = \$93.7	

Table 1.3: Summary of Selected Studies on Welfare Costs of Common Crime and Violence

Method	Study	Unit of Analysis	Year	Type of Crime or Expenditure	Main Result (Costs of crime, potential welfare gain from crime reduction, or other consequences of crime) (in 2007 US \$ or % of production, unless otherwise noted)				
	Mayhew (2003)	Australia	2001–2002	Medical costs, loss output, intangible costs	Direct Costs from Crime	Criminal Justice System	Costs of Provision for Victims	Private Security	Total Cost
					24 billion	8 billion	1 billion	4 billion	37 billion
	Rondon and Andrade (2003)	Belo Horizonte (Brazil)	1999	Public and private security expenditures, value of goods stolen, potential income lost by fatal victims, medical expenses	Expenditures on Crime Prevention	Costs from Existing Crime	Total		
					2.26%	1.6%	3.9%		
	World Bank (2003b)	Jamaica	2001	Medical costs, loss of output, public expenditure on security	Medical Costs	Lost Production (in 2001 only)	Public Expenditure on Security	Total	
					0.40%	0.20%	3.10%	3.70%	
	Altbeker (2005)	South Africa	2004	Public expenditure on criminal justice	3.10%				
	Bundhamcharoen, Odton, Mugen, Phulkerd, Dhisayathikom, and	Thailand	2005	Direct medical costs, loss of productivity	Direct Medical Costs	Loss of Productivity	Total		

Table 1.3: Summary of Selected Studies on Welfare Costs of Common Crime and Violence

Method	Study	Unit of Analysis	Year	Type of Crime or Expenditure	Main Result (Costs of crime, potential welfare gain from crime reduction, or other consequences of crime) (in 2007 US \$ or % of production, unless otherwise noted)					
	Tangcharoensatien (2008)				35 million	379 million	415 million (0.23% of GDP)			
Contingent-valuation	Ludwig and Cook (2001)	U.S.	1998	Gun violence, fatal and nonfatal	Exercise: 30% reduction in crime	WTP Total (billion)	Per Injury (million)	Value of Statistical Life (million)		
						31.2	1.52	6.9 to 8.6		
	Cohen, Rust, Steen, and Tidd (2004)	U.S.	2000	Burglary, serious assault, armed robbery, rape and sexual assault, and murder	Exercise: 10% reduction in crime	WTP per Crime—Burglary	WTP per Crime—Serious Assault	WTP per Crime—Armed Robbery	WTP per Crime—Rape, Sexual Assault	WTP per Crime—Murder (million)
						30,102	84,286	279,347	285,367	11.68
						WTP Total—Burglary* (billion)	WTP Total—Serious Assault* (billion)	WTP Total—Armed Robbery* (billion)	WTP Total—Rape, sexual assault* (billion)	WTP Total—Murder* (billion)
						12.9	14.9	13.6	15.7	18.18
	Atkinson, Healey, and Mourato (2005)	England and Wales	2001	Common assault, other wounding and serious wounding	Exercise: 50% reduction in crime	Common Assault—WTP per Crime	Wounding—WTP per Crime	Serious Wounding—WTP per Crime		

Table 1.3: Summary of Selected Studies on Welfare Costs of Common Crime and Violence

Method	Study	Unit of Analysis	Year	Type of Crime or Expenditure	Main Result (Costs of crime, potential welfare gain from crime reduction, or other consequences of crime) (in 2007 US \$ or % of production, unless otherwise noted)
					8,903      52,099      60,419
WTP	Thaler (1978)	Rochester (NY)	1971	Property crime	Hedonic model: cost of an "average" property crime roughly \$2,560
	Lynch and Rasmussen (2001)	Jacksonville (FL)	1994–1995	Rape, robbery, assault, motor-vehicle theft, burglary, larceny	Reduction of 39% of price of a home in the two deciles with the highest cost of crime (from \$129,670 to \$78,630)
	Soares (2006)	cross-country	1990s	Homicide rates	Calibration. WTP Total— WTP—Annual Exercise: 100% Present Value      Flow reduction in mortality due to violence      29%      1%
Other	Cullen and Levitt (1999)	U.S. and Chicago	1970–1980, 1990	Per capita city crime	One-person decline in city residents per reported crime
	Hammermesh (1999)	U.S.	1996	Homicide	Exercise: 75% reduction in homicide rate      Increase in Evening and Night Work      Welfare Cost of Homicide Rate on Work Timing      WTP per Worker—Present Value  0.2 hours per person      \$5.3 to \$13.2 bi      \$397 to \$2,640

Table 1.3: Summary of Selected Studies on Welfare Costs of Common Crime and Violence

Method	Study	Unit of Analysis	Year	Type of Crime or Expenditure	Main Result (Costs of crime, potential welfare gain from crime reduction, or other consequences of crime) (in 2007 US \$ or % of production, unless otherwise noted)
	World Bank (2006)	cross-country	1990s	Homicide rates	Exercise: 10 point reduction in homicide rates 2.2 to 9.4 bi

Note: Values deflated to 2007 US \$ using the CPI.

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