

# The Economic Cost of Crime

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## **Abstract**

Crime generates external costs for individuals and social costs for nations. This chapter reviews the dominant theoretical paradigms that underlie national estimates of the cost of crime and reviews the empirical methodologies that have been employed in the extant literature. The chapter closes with a brief review of empirical estimates of the costs of crime to crime victims. In the United States, the cost of crime, narrowly construed, constitutes approximately 2 percent of gross domestic product, approximately double the amount of revenue generated by the education sector and half the amount of revenue produced by the U.S. entertainment industry. Some estimates of the cost of crime are as large as 6 percent of GDP.

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## Introduction

It goes without saying that crime imposes costs on society. Indeed we do not need research to verify that crime is costly. More challenging and enduring questions involve the extent to which criminal activity results in social harms and how these harms ought to be operationalized and measured.

Industrial societies allocate a great deal of resources towards crime control. In the United States, public expenditures on criminal justice alone amount to approximately \$630 per capita or approximately 2.5 percent of gross domestic product (U.S. Census 2007). Private expenditures on crime prevention are probably at least as large.<sup>1</sup> As spending by a utilitarian social planner on crime control will be, in large part, a function of the perceived harmfulness of crime, it is crucial that researchers develop methodologies to accurately estimate just how harmful crime is. This is all the more salient when considering that governments are resource constrained. Expenditures on crime control must be traded off against expenditures on education, healthcare, public sanitation and numerous other public functions. Perhaps more importantly, given that government spending creates a corresponding deadweight loss, the opportunity cost of publicly provided crime control is ultimately the marginal productivity of the value of those resources in the hands of private actors. In short, crime is costly but so is crime control.

This chapter reviews the dominant theoretical paradigms that underlie national estimates of the cost of crime and reviews the empirical methodologies that have been employed in the recent literature. Part I discusses the theoretical basis for computing estimates of the cost of crime to individuals and society. Part II reviews the dominant methodologies that have been employed in the extant literature. Part III summarizes recent estimates of the external and social costs of crime in the United States. Part IV concludes.

## 1 Theoretical Perspectives

There is a longstanding recognition that estimating the cost of crime to society is both important and useful. Gray (1979) notes that, in the United States, attempts to compute the economic costs of crime date back at least as far as 1901. Likewise, recognizing public preoccupation with crime as a social and political issue, over the past century, numerous presidential commissions have been developed to provide an estimate of the cost of crime to society (Cohen 2000; 2009).<sup>2</sup> Early methodologies were rudimentary but, over the past thirty years, methods

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<sup>1</sup>For example, consider that, in the United States, there are more privately employed police officers than municipal and state law enforcement officers combined (MacDonald, Klick and Grunwald 2013).

<sup>2</sup>A particularly salient historical articulation of the importance of this issue is seen in the 1931 Wickersham Commission's mandate to estimate the social cost of crime.

have improved considerably giving rise to a mature academic literature. Major milestones include the development of a hedonic regression literature that has been used to estimate the *value of a statistical life*, as well as the development of methods to credibly estimate the intangible costs of crime (Cohen 1988) and methods to better map these estimates to crime data (Miller, Cohen and Wiersma 1996; Roman 2009). More recently, researchers have leveraged an old idea in economics — contingent valuation — to generate survey-based estimates of society’s “willingness to pay” to reduce crime (Cohen, Rust, Steen and Tidd 2004; Nagin, Piquero, Scott and Steinberg 2006; Cohen and Piquero 2009; Cohen, Piquero and Jennings 2010). At first glance it is perhaps surprising that economists have invested so much time in estimating a good’s cost. After all, the cost of a good or service is ordinarily determined in a straightforward manner by the intersection of supply and demand schedules. The remaining section discusses why the task of costing out crime is difficult and has proved challenging to both economists and criminologists.

## 1.1 Crime as a Non-market Good

What differentiates crime from other goods and services is that crime is a *non-market good* — that is, a good that is not traded on the free market. While the price of an apple is determined by the cost of growing, packaging, shipping and selling the apple as well as by consumer demand for apples, there is no such market for crimes. Consumers do not “demand” crime. Indeed, while purchasing an apple is completely voluntary, being victimized by crime is not.<sup>3</sup> Since a true valuation of the price of a good can only come from a voluntary agreement, it is not formally possible to compute the price and therefore the cost of a crime (Carnis 2004). In the language of Mises (1990), to calculate the cost of crime is impossible because the relevant information does not exist to do so. While we can infer the cost of crime using various proxies (e.g., a monetary award issued by a judge or jury or the decision of an individual to purchase a home in a dangerous neighborhood), these estimates are based on assumptions regarding the availability of information and the ability of individuals to rationally perceive and understand risk (Shavell 1991; Cooter and Ulen 1997; Carnis 2004). More fundamentally, using such proxies relies on an underlying assumption that the value of money is equal for all individuals. As Rothbard (1993) notes, regardless of the existence of a price, the costs and gains of any purchase are always subjective. For example, each individual will have a different price point for pain and suffering.

The previous discussion is cloaked in the language of Austrian economics but the underlying principle is simple — there is no natural way to determine the

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<sup>3</sup>In a seminal article, Ehrlich (1973) conceives of consumer’s “demand for crime” as a function of investment in victim precautions. While this is a useful idea, investments in victim precautions cannot be used to construct a proper demand function (see e.g., Cooter 1984; Carnis 2004).

price of crime and, as a result, we will have to rely on various proxies. The type of proxy used will, in turn, depend on normative decisions regarding what types of harms should be counted and which types of harms “affect” society.<sup>4</sup> An extreme but incredibly salient example of the non-market nature of crime arises in considering the cost of a homicide — in other words, the value of a human life. Individuals do not sell their lives for money to willing buyers. Indeed this question is almost existential. Nevertheless we must derive an estimate of the value of a human life if we are to quantify the cost of crime to society. Indeed national estimates of the cost of crime are highly sensitive to the researcher’s estimate of the cost of a human life (Chalfin and McCrary 2013).

Subject to our normative beliefs, the degree to which a proxy is a “good” estimate of the true cost of a given crime depends, in large part, on how close the methodology gets to capturing a market-based decision regarding individual’s demand for public safety. With regard to murder, the relevant discussion is considerably more broad and involves a conceptual discussion of the value of a lost life more generally. A detailed discussion of these considerations is provided in Section II. First, I provide greater clarity regarding the kinds of costs the literature has been most interested in measuring.

## 1.2 Social vs. External Costs

As Cohen (2000) notes, “one of the most confusing and misunderstood concepts in the cost of crime literature is the difference between “social costs and “external costs.” External costs are those costs that have been involuntarily imposed on one individual (in our case, a crime victim) by another (an offender). For example, the external costs of a robbery might include the value of the goods stolen, lost productivity, injuries, psychic harms sustained by the victim and the value of time spent dealing with the aftermath of the robbery (cancelling credit cards, obtaining a new driver’s license, etc). Likewise, the external costs of a motor vehicle theft might include the bluebook value of the vehicle, the value of personal items in the vehicle at the time of theft and the time value needed to deal with the aftermath of the crime. In the language of microeconomics, the external cost is the amount of money needed to make the individual indifferent between having been victimized and having not been victimized. In the language of civil law, this is the payment that is required to “make the individual whole.”

The notion of external costs is part and parcel of a broader and indeed fundamental concept in microeconomics known as *externalities*. First introduced

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<sup>4</sup>The importance of normative considerations has given rise to critiques of monetizing crime more generally. For example, Kelman (1981) argues on ethical grounds that safety (or the absence of crime) cannot be valued and that the resulting use of benefit-cost analysis places a premium on the consideration of efficiency over other socially-relevant goals. Prominent defenses of benefit-cost analysis in criminal justice can be found in Cohen (2000) and Adler and Posner (1999).

by British economist Arthur Pigou (1932), the concept has been applied extensively within the field of public economics and has been used to consider the welfare implications of non-market goods such as pollution, overharvesting, antibiotic resistance and, more recently, systematic risk arising from moral hazard in the financial sector. Indeed the concept of externalities was central to Ronald Coase's seminal and Nobel Prize winning idea regarding efficient mitigation of the harms of pollution (Coase 1960).<sup>5</sup> A core contribution of microeconomic theory to the study of the cost of crime is the idea that crime shares many of the same analytic properties of pollution and might be addressed accordingly (Roman and Farrell 2004).

While external costs consider the welfare of individuals, social costs consider the welfare of society as a whole. As it turns out, each of these concepts has strikingly different implications for how the cost of crime will be estimated. Consider the example introduced previously involving a robbery. As mentioned, the external costs of the robbery include the value of the stolen property, the costs of pain and suffering (including medical treatment) and the cost of the victim's time spent replacing the items. To what extent is each of these costs a social cost? Clearly the costs of pain and suffering are social costs. When an individual in society suffers this is a cost that presumably is not offset by a corresponding gain to another member of society.<sup>6</sup> The same is true of the value of the victim's time. However, the value of stolen property and the cost of medical treatment are qualitatively different. In particular, the value of the stolen property can be thought of as a transfer from one individual to another. Indeed some economists have argued that stolen property is an external, but not a social cost because the property has not been destroyed, merely transferred from one party to another (Tullock 1967; Cook 1983). Likewise, money spent on medical care is, to an extent, merely transferred from one sector of the economy to another. For example, money used to pay a hospital bill might have otherwise been used to purchase a television or, if reimbursed by an insurance company, might have been invested back into the business or returned to shareholders in the form of profit. While a loss of utility will exist (presumably the individual prefers to use the money to purchase a television than to pay a doctor), nevertheless only a portion of the external costs can properly be considered social costs.

These are not the only social costs of crime. Consider, for example, the enormous amount of resources that are devoted to crime prevention. In the public sector, these resources include spending on police, courts and prisons. In the private sector, such costs include the value of locks, surveillance equipment and investments in precaution — for example, taking a taxi as opposed

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<sup>5</sup>In Coase's example, one individual, a confectioner, imposed harms on a second individual, a physician. In particular, in producing candy, the confectioner's factory produced a great deal of noise making it difficult for the physician to treat patients in his office located next door to the confectioner's factory.

<sup>6</sup>Note that, in theory, offenders might, in fact, receive benefits as a result of harming a victim.

to walking home late at night. These are social costs in the sense that there is presumably a more productive use for these resources. Second, it is likely that crime creates downstream costs for society that are not captured by considering external costs alone. For example, high crime rates may discourage private investment in local businesses which has the effect of lowering both the quantity and quality of available employment in an urban area (Skogan 1986; Schwartz Susin and Voicu 2003). Likewise, high crime rates may induce geographically mobile higher wage earners to leave an urban area for outlying areas with lower crime rates (Cullen and Levitt 1999). Finally, higher crime rates may destroy the social fabric of communities, diminishing investments in human capital and resulting in low labor market attachment (Sampson and Groves 1989; Taylor 1995). Other downstream effects are likely as well.

In practice, researchers have generally adopted the perspective that an offender's utility ought not to count as part of society's social welfare function (Trumbull 1990; Cohen 2000). As a result, researchers have either chosen to utilize the external costs of crime as the basis for making computations or, alternatively, have utilized a hodgepodge of social and external costs, partialling out the value of goods stolen from the external costs. Whether resources spent on crime prevention are included as a cost of crime depends on the methodology employed, a topic discussed later in this chapter. More generally, research has not adequately addressed the downstream social costs of crime and consequently we know very little about the magnitude of these "multiplier effects."<sup>7</sup>

## 2 Empirical Methodologies

In the past few decades, economists have generated a number of sometimes competing and sometimes complimentary methodologies to estimate either the social or external costs of crime. As noted by Cohen (2000), the cost of crime to crime victims can be classified as either tangible or intangible. Tangible costs refer to costs that are easily monetized — for example, the value of stolen or damaged property, medical payments and lost wages due to an injury. Intangible costs refer to the types of non-market goods that create difficulties for researchers more generally — costs such as physical pain, psychological trauma and declines in quality of life resulting from a crime. While "bottom up" methodologies seek to estimate tangible and intangible costs directly, other methodologies — contingent valuation and hedonic pricing — estimate an aggregate of the two.

Methodologies can also be divided into those that estimate *ex post* measures of the cost of crime and those that estimate *ex ante* measures of the cost of crime. *Ex post* measures generally utilize victim surveys and administrative records to compute the external cost of a typical criminal event after the fact. This is the amount of money needed to make a victim whole. On the other hand,

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<sup>7</sup>This, in large part, is due to the difficulty involved in identifying exogenous variation in crime rates.

*ex ante* measures utilize secondary data to estimate individuals' willingness to pay to reduce their *risk* of victimization. As noted by Cohen (2000) and Chalfin and McCrary (2013) among others, other things equal, because public policy decisions involve choice under uncertainty, *ex ante* measures are preferred to *ex post* measures for the purposes of policy formulation.

Broadly speaking researchers have utilized three primary methodologies to estimate the cost of crime: 1) the “bottom up” cost method, 2) contingent valuation and 3) hedonic pricing. While the “bottom up” approach estimates the tangible and intangible costs of crime separately, the latter two approaches provide a reduced form estimate of the total external cost of crime. The output of one of these approaches is then often combined with an estimate of the cost of crime to taxpayers (through the operation of the criminal justice system). This section provides a brief description of each methodology and how it has been operationalized in the extant literature.

## 2.1 The “Bottom Up” Cost Method

The “bottom up” method of computing the costs of crime is an *ex post* approach used to estimate the cost of victimization after a crime has occurred. The idea is to identify the types of harms experienced by the victim and, for a typical victim, figure out how much money would be required to make that victim whole. Within the “bottom up” method, tangible and intangible costs are estimated using extraordinarily different methodologies. This section provides a brief overview of how this approach has operationalized in the extant literature.

### 2.1.1 Tangible Costs

The tangible *external* costs of crime include the cost of stolen property and expenses incurred by the victim in the aftermath of victimization that would not have been otherwise incurred. In principle, counting tangible external costs is straightforward. However, the task is complicated considerably by data limitations (Cohen 1988; Miller, Cohen and Wiersma 1996; Cohen 2000; McCollister, French and Fang 2010). At the national level, only the National Crime Victimization Survey (NCVS) collects data on the tangible costs of victimization. The NCVS asks respondents to estimate the value of any property stolen in a crime, the cost of medical care and the amount of time lost at work as a result of the victimization.<sup>8</sup> However, as noted by Cohen (2000) among others, the NCVS is likely to lead to underestimates of the true cost of crime.<sup>9</sup> Given that the

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<sup>8</sup>Productivity losses are generally calculated by multiplying hours of work missed by an estimate of the average wage in the economy.

<sup>9</sup>This is true for several reasons. First, the NCVS asks respondents only about crimes they have experienced in the past calendar year. To the extent that the cost of certain types of victimization are ongoing, the NCVS counts only the short-term tangible costs of crime. Second, the NCVS does not ask respondents to report the cost of mental health care. Third, as many costs of victimization are financed by insurance companies, victims may report only the amount that they pay out of pocket, not the total amount of money that

NCVS is an incomplete source on the costs of victimization, further research has attempted to supplement NCVS data with injury data reported in other research literatures. In particular, an influential paper by Miller, Cohen and Wiersma (1996) leverages injury data reported in the NCVS, hospital records and the value of worker compensation claims for injuries that are similar to but were not sustained in a crime to generate more credible estimates of the external cost of crime. This methodology has led to considerably higher estimates of the cost of victimization than are indicated by the NCVS alone. Other innovations include the addition of the cost of mental health treatment (Miller and Cohen 1998) and estimates of the quality of life lost as a result of victimization (Rajkumar and French 1997; McCollister, French and Fang 2010).

While the external costs of victimization, whether tangible or intangible, are absorbed by the crime victim, criminal activity also creates an additional burden that is borne by taxpayers. This burden arises from the fact that crimes must be investigated by law enforcement and, if an arrest is made, offenders may be adjudicated and subsequently incarcerated. Each of these steps consumes public resources. The extant literature has attempted to estimate the marginal cost to police and prisons and the criminal justice system resulting from an additional crime of a given type. Beginning with Miller, Cohen and Rossman (1994) who use data from a couple of localities, criminal justice costs have been tabulated using a “bottom up” approach. The general approach involves estimating the number of employee hours involved in investigating a crime, making an arrest, processing, adjudicating and incarcerating an offender. Subsequent research (Cohen 1998; Cohen and Piquero 2009; Chalfin and McCrary 2013) has used national data to compute similar estimates but the general approach is the same. For violent crimes, criminal justice costs are generally estimated to be less than one quarter of the total cost of crime; for property crimes criminal justice costs are often as much as half of the total cost of crime.

### **2.1.2 Intangible costs**

For some crimes, the majority of costs are likely tangible. For example, the primary cost involved in a burglary or motor vehicle theft is the value of the stolen property. However, for violent crimes such as rape or aggravated assault, many of the costs are far less tangible and include costs associated with pain and suffering, psychological trauma and diminished quality of life. As these costs cannot be directly estimated, they must be indirectly estimated using data from some other policy domain.

The primary innovation in this area is to use civil jury awards as a proxy

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is spent by society as a result of their victimization. Finally, the NCVS does not inquire about the costs of behavioral changes following victimization. As Cohen (2000) notes, in the aftermath of criminal victimization, victims may incur costs as a result of moving to a safer neighborhood and purchasing locks, cameras or security systems that they would not have otherwise purchased.



for the value of nonfatal injuries involving pain and suffering and diminished quality of life, a method pioneered in Cohen (1988).<sup>10</sup> The approach is based on the idea that civil juries are tasked with applying society's underlying normative values to make whole an individual who has been seriously injured (Roman 2009).<sup>11</sup> Generating estimates of the cost of crime using jury awards involves a three-step process. First, jury awards are linked to the occurrence of specific injuries in order to estimate the intangible costs of a given injury.<sup>12</sup> Next, hospital records are used to identify the types of injuries that are associated with each crime. Finally, each crime is ascribed a jury-based cost, given the typical types of injuries that are sustained.<sup>13</sup>

Since Cohen's seminal 1988 paper, this basic approach has been extended in various ways. Recognizing that injuries sustained in non-criminal events may result in a different set of harms than injuries resulting from crime victimization, Miller, Cohen and Wiersma (1996) obtained data from civil cases involving serious physical and sexual assaults as opposed to other types of injuries.<sup>14</sup> The methodology has also been extended by Rajkumar and French (1997) who map jury awards to injury data obtained from the NCVS, Roman (2009) who links injuries reported in National Incident Based Reporting System (NIBRS) data to injury-specific jury awards and, most recently, by McCollister, French and Fang (2010).

## 2.2 Contingent Valuation

Contingent valuation is a survey-based valuation technique used to value goods that are not bought and sold in the free market, and for which prices are therefore difficult to compute. Often used to determine the value of an environmental resource such as a national park, the methodology also has broad applicability to assessing the effect of crime on community well-being. Typically, contingent valuation survey questions ask individuals how much money they would be willing to pay for an increase in some non-market good (such as safety), or, alternatively, how much money they would need to be fully compensated for a decrease in the quantity of a non-market good. For example, respondents might be asked to indicate their willingness to pay to reduce their risk of burglary by one per-

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<sup>10</sup>Punitive damages are excluded from the calculation.

<sup>11</sup>The technique relies on the assumption that the size of jury awards are invariant to unmodeled case or plaintiff-specific factors.

<sup>12</sup>Intangible costs are computed by subtracting direct economic losses from the total value (non-punitive portion) of the jury award.

<sup>13</sup>Using the jury award method, the cost of fatal injuries is computed indirectly using an extant estimate of the value of a statistical life and the risk of death arising from a given crime.

<sup>14</sup>Roman (2009) engages in an extensive critique of the methodology employed in Cohen, Miller and Wiersma (1996) noting that the regression models used to predict jury awards explain little of the variation in the dependent variable and that the inclusion of the size of claimed losses as a predictor variable likely introduces endogeneity into the model. Roman also criticizes the use of mean awards instead of medians which results in considerably larger estimates of the cost of victimization.

cent. Questions may be open-ended but respondents are typically asked to pick a number from a list of choices (Arrow et al 1993). Survey responses are typically averaged to develop an estimate of difficult-to-observe costs. With respect to the cost of crime, leading examples of contingent valuation surveys include Ludwig and Cook (2001), Cohen, Steen, Rust and Tidd (2004) and Cohen and Piquero (2009) who sample randomly from the U.S. population, Zarkin, Cates and Bala (2000) and Nagin, Piquero, Scott and Steinberg (2006) who sample randomly from a specific city or state and Brand and Price (2000) and Atkinson, Healy and Mourato (2005) who use a random sample in the United Kingdom. Of these studies, only Cohen, Rust, Steen and Tidd (2004) and Cohen and Piquero (2009) produce estimates for all of the leading crime types.

Contingent valuation has several advantages over the “bottom up” cost method. First, it provides an *ex ante* measure of the cost of crime as opposed to computing costs that are incurred after the fact. Second, it is, by far, the most direct way to assess individuals’ preferences over safety as respondents are asked explicitly how much money they would be willing to spend to reduce their victimization risk by a small amount. Third, given that survey respondents have a thorough understanding of how criminal victimization might affect them, contingent valuation can estimate the total external costs of crime, both tangible and intangible. Finally, the methodology has long been in use in other fields within economics and, as a result, there is a long literature documenting best practices in its use.<sup>15</sup> Naturally, the use of contingent valuation is not without controversy. In particular, contingent valuation surveys are especially prone to four main sources of bias. First, respondents may engage in strategic behavior, intentionally inflating their answers in an attempt to gain favor for a policy they support (Mitchell and Carson 1989). Second, respondents may ignore their own income constraints when devising a value for a resource and price a good beyond what they could reasonably afford (Cohen 2009). Third, since stated preferences are hypothetical, responses may be arbitrary since the respondent does not actually need to pay the stated price. Fourth, the approach heavily discounts the responses of those with little or no wealth since they may highly value a good but have no means of paying for that good. In addition, contingent valuation suffers from the bias that is a concern with respect to survey data more generally — for example, low response rates may lead the analyst to generalize from a non-random sample, which, in turn, may bias estimates. These criticisms and others have generated a large and growing literature that seeks to use *revealed* rather than *stated* preferences to estimate the cost of crime, the chief of which is known as hedonic pricing.

### 2.3 Hedonic Pricing

Hedonic pricing is an econometric technique used to estimate the value of a non-market good by decomposing the total value of a market good into each

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<sup>15</sup>See Cohen 2009 for a more detailed discussion with respect to crime.

component part, one of which is the non-market good that is of interest. Applying this approach to study the cost of crime, the canonical approach has been to compare the price of otherwise similar homes in neighborhoods with differing exposure to crime (Thaler and Rosen 1975; Thaler 1978; Clark and Cosgrove 1990; Linden and Rockoff 2008). In a regression framework, the idea is to regress home price on a vector of characteristics of the home including the crime rate in the surrounding neighborhood. An advantage of using hedonic pricing to value non-market goods is that the model estimates the cost of crime using *revealed* rather than *stated* preferences. In other words, hedonic pricing uses actual consumer behavior in the market place to develop estimates, which avoids many of the biases introduced by contingent valuation. An advantage relative to the “bottom up” cost method is that hedonic pricing uncovers the cost of crime using an *ex ante* as opposed to an *ex post* methodology.

A related approach has been to use hedonic pricing to estimate the “value of a statistical life,” a concept that has important implications for how we estimate the cost of a murder. These studies attempt to estimate the value of a human life more generally by understanding how individuals trade off risk and money in making actual market decisions. In particular, the idea is that individuals reveal their preferences over risk in the everyday decisions they make to purchase goods or services or obtain employment in risky jobs. By observing individuals’ willingness to pay to avoid a small increase in risk, economists estimate society’s *ex ante* willingness to pay to avoid the loss of a life (Viscusi and Aldy 2003).<sup>16</sup>

In the labor market context, these models seek to estimate the value of a compensating wage differential associated with employment in a riskier job. A related literature estimates the VSL using data on individuals’ preferences over risky products and considers individuals’ willingness to pay for safer automobiles (Atkinson and Halvorson 1990; Dreyfus and Viscusi 1995) and to purchase and use safety-enhancing products such as smoke detectors (Dardis 1980), bicycle helmets (Jenkins, Owens and Wiggins 2001) and safety belts (Ashenfelter and Greenstone 2004).<sup>17</sup> The VSL is estimated using the ratio of the compensating differential to a small change in risk.<sup>18</sup>

<sup>16</sup>As noted by Viscusi and Aldy (2003), the economic literature has focused on willingness-to-pay estimates of the VSL rather than willingness-to-accept measures of mortality risk since a seminal contribution of Schelling (1968).

<sup>17</sup>Under this approach, the relevant parameter is the price-risk tradeoff, as opposed to the wage-risk tradeoff.

<sup>18</sup>Estimates from these types of studies are routinely used by regulatory agencies such as the Environmental Protection Agency, the Federal Aviation Administration and the Consumer Product Safety Commission to evaluate the cost-beneficiality of a range of policy interventions. Following a summary in Viscusi and Aldy (2003), the hedonic pricing model is motivated by the following representation of an individual’s utility function over risk and either prices or wages:

$$Z = (1 - p)U(w) + pV(w) \tag{1}$$

In (1), utility is a function of the probability of an injury ( $p$ ) and the  $w$  which is either the wage in the labor market context or the price in the product market context.  $U(w)$  is the

An issue with the hedonic pricing model is that to the extent that individual-level factors that predict both an individual's wage and his occupational risk are not fully captured by by included covariates, the coefficient on the probability of a fatal injury will reflect a mixture of the compensating wage differential (which must be identified in order to compute the VSL) and unmodeled selection into risky jobs. This problem is, to an extent, solved by conditioning on individual fixed effects using panel data (see Brown 1980). A related issue is that the model assumes that individuals have accurate information on the risks associated with each type of job or product. For these reasons, economists have expressed considerable doubts as to the veracity of many hedonic pricing estimates (Cohen 2009).<sup>19</sup>

### 3 Empirical Estimates of the Cost of Crime

Having reviewed the primary methodologies used to estimate the tangible and intangible costs of crime, I now provide a brief review of findings from the extant literature. Estimates of the cost of non-murder index crimes and murder are discussed separately. As the vast majority of prior research focuses on index crimes, I will not review the costs of white collar crimes such as fraud or embezzlement. Indeed the cost of such crimes relies on very different methodologies than those reviewed in this chapter. In other cases, illegal activity does not lead directly to a victimization, the most prominent example being sale or possession of drugs. The vast majority of prior research does not provide costs for victimless crimes and, in keeping with this tradition, I will not discuss the cost of victimless crimes in this chapter.<sup>20</sup>

utility of an uninjured individual and  $V(w)$  is the utility of an injured individual. Rewriting (1), the tradeoff between the prices/wages and the level of risk is given by:

$$\frac{dw}{dp} = -\frac{Z_p}{Z_w} = \frac{U(w) - V(w)}{(1-p)U'(w) + pV'(w)} \quad (2)$$

Following this representation of the representative individual's utility function, the hedonic pricing model estimates a linear function of  $w$  that depends on  $p$ . Accordingly, the crux of this model is to regress the worker's wage or the price of a product on a measure of the riskiness of a job classification or product and a vector of control variables that capture other job- or product-specific characteristics. A general form for this regression is presented in (3):

$$w_i = \alpha + \beta p_i + \gamma_1 X_i + \gamma_2 H_i + \epsilon_i \quad (3)$$

In (3),  $X$  is a vector of individual characteristics and  $H$  is a vector of job- or product-specific characteristics which, in practice, often includes the risk of a non-fatal injury.  $\beta$ , the coefficient on  $p_i$  is an estimate of the responsiveness of wages or prices to the risk of a fatality.

<sup>19</sup>Chalfin and McCrary (2013) suggest that estimates from the labor market might be particularly credible as individuals tend to have greater information about occupational risks than risks from defective or otherwise unsafe products or criminal victimization.

<sup>20</sup>This is not to say that harmful addictive behaviors such as drug use and gambling do not impose external costs on society. Presumably these behaviors generate collateral consequences for friends, family members and employers. However, the same can be said for many legal behaviors such as smoking and overeating. Accordingly these costs are qualitatively different than those imposed by crime.

### 3.0.1 Non-Murder Index Crimes

Estimates from prior research on non-murder index crimes are presented in **Table 1**. The table presents nine sets of estimates from eight studies spanning a twenty-five year period. These studies were chosen because they have relatively complete coverage of index crimes and use U.S. data. For each study, I have indicated whether a given type of tangible cost was included in the estimate and have indicated whether jury awards were used, at least in part, to estimate intangible victim costs. Estimates of the cost of a given index crime are given in 2010 dollars. It is no surprise that rape is the costliest crime in eight of nine studies — the average cost of a rape is approximately \$168,000 with estimates ranging from \$75,000 to \$304,500. After rape, the costliest crime is aggravated assault (median = \$89,000) followed by robbery (median = \$41,000). The cost of property crime is substantially lower with median estimates for burglary, larceny and motor theft of \$5,000, \$2,100 and \$9,300, respectively. Despite a couple of outliers, on the whole, estimates are remarkably similar. Virtually all of the estimates for a given crime are of the same order of magnitude and differences in cost estimates are sufficiently small as to make it unlikely that a researcher’s choice of cost methodology will be an important driver of whether a given intervention is found to be cost effective.

Two other points are worth noting. First, for rape, burglary and motor vehicle theft, contingent valuation leads to generally larger estimates than the “bottom up” cost approach. This either indicates that juries tend to underestimate the cost of pain and suffering to crime victims or, alternatively, that individuals overestimate the pain and suffering associated with victimization. Second, as noted by Roman (2009), the cost of crime appears to be increasing over time. This might reflect increasing risk aversion or a change in society’s preferences (perhaps driven by changes in demography). An alternative explanation is that, as the literature has become more sophisticated, additional costs have been included that were excluded in the older literature.

### 3.0.2 The Value of a Human Life

As noted, the costliest crime of all, murder, also presents the greatest analytic and philosophical difficulties with respect to estimating costs. Candidate methodologies to estimate the value of a life include jury awards for wrongful death cases, contingent valuation and hedonic pricing. The importance of this question has led to the development of a large and mature literature that extends well beyond the criminal justice context. With respect to criminal justice, the cost of murder has been estimated using jury awards or contingent valuation. Meanwhile, a companion literature has leveraged hedonic pricing to estimate the *ex ante* value of a life given individuals’ market decisions. **Figure 1** summarizes this literature which, by my count, consists of approximately seventy

papers. The figure consists of four panels each of which provides the full range of estimates of the value of a life for a given type of study. Panel A presents the estimated cost of a murder from the criminal justice domain. These estimates range from a low estimate of \$1.6 million (Roman 2009) to a high estimate of \$10.9 million (Cohen, Steen, Rust and Tidd 2004). Overall, the average value among these studies is \$5.7 million (median = \$4.8 million).

Panel B presents estimates of the value of a statistical life from thirty-one studies involving individuals' labor market decisions. In particular, these studies capture the extent to which individuals demand higher wages for work with a greater risk of fatality. The range of estimates in these studies is extraordinarily high — overall, the average value among these studies is \$9 million (median = \$8 million). Panel C presents similar estimates from thirteen studies of individuals' decisions over risky products. These estimates are considerably smaller than those in the labor market literature, with a mean estimate of \$3.4 million (median = \$1.8 million). Finally, Panel D presents nineteen studies conducted by U.S. regulatory agencies ranging from the Environmental Protection Agency to the U.S. Food and Drug Administration. These studies which are used by federal agencies to determine whether a program is cost-effective have yielded a mean estimate of \$5.3 million (median = \$6.4 million). While each methodology has tended to yield a different range of estimates of the value of a life, it is perhaps reassuring that all of the estimates are of the same order of magnitude. In particular, the central tendency of all four approaches suggests that the value of a life lies between \$3 million and \$8 million. In other words, an intervention that prevents two murders will be cost-effective if it costs \$2 million but not if it costs \$20 million.

## 4 Conclusion

Over the last thirty years, tremendous progress has been made with respect to the development of empirical estimates of the cost of crime. Important innovations include increasingly sophisticated methodologies to estimate the intangible costs of crime, the application of contingent valuation to pricing public safety and the use of hedonic pricing to estimate society's revealed preferences over fatal risk. Applying median estimates of the cost of each index crime in the literature to the number of index crimes reported in the United States in 2012 yields an estimate of the cost of index crimes that is approximately \$200 billion if only UCR index crimes reported to the police are counted and as high as \$310 billion when unreported crimes are accounted for (see **Table 2**). This represents approximately 2 percent of U.S. GDP. Of the \$310 billion, over \$250 billion is attributable to violent crimes, mainly to murder and aggravated assault. Property crimes are far less costly constituting less than \$60 billion in losses. It is important to note that these costs are narrowly construed in that they do not credibly account for dynamic responses of individuals to increases in crime nor are the costs of non-index crimes counted. Indeed, one estimate suggests that

the aggregate cost of crime to society exceeds \$1 trillion (Anderson 1999). To put these numbers in perspective, \$1 trillion is approximately the size of the U.S. healthcare sector. \$310 billion is approximately half the size of the U.S. arts and entertainment industries.

The prominence of murder and aggravated assault (which often involve the use of deadly force) suggests that aggregate estimates of the cost of crime to society are heavily dependent on having credible estimates of the cost of these crimes. To wit, doubling the cost of property crimes results in only a 15 percent increase in crime's aggregate cost. Given this basic fact, future research should prioritize improving the credibility of these estimates.

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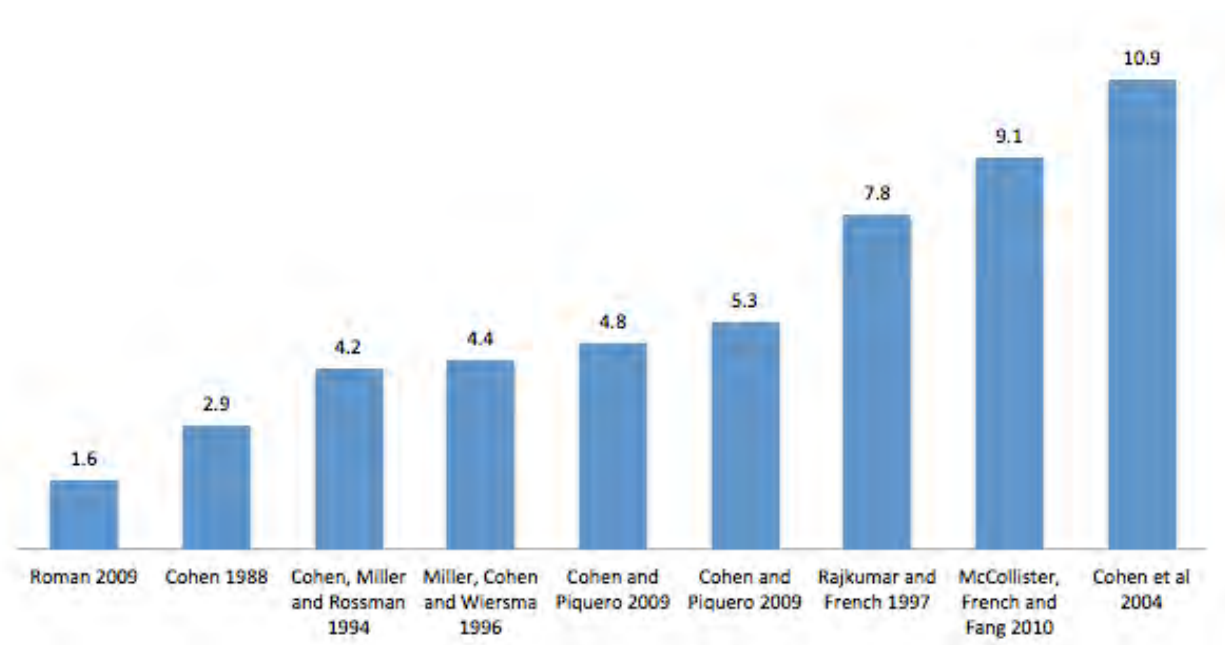
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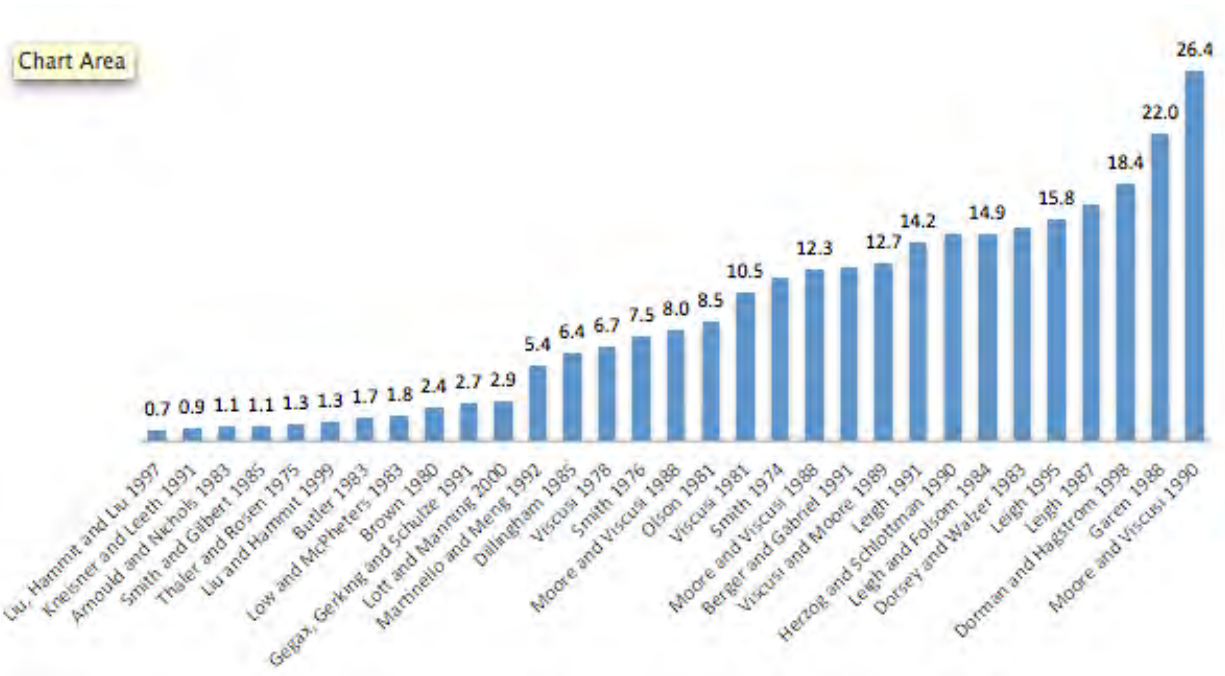
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FIGURE 1. ESTIMATES OF THE VALUE OF A HUMAN LIFE  
2010 CONSTANT DOLLARS (\$ MILLIONS)

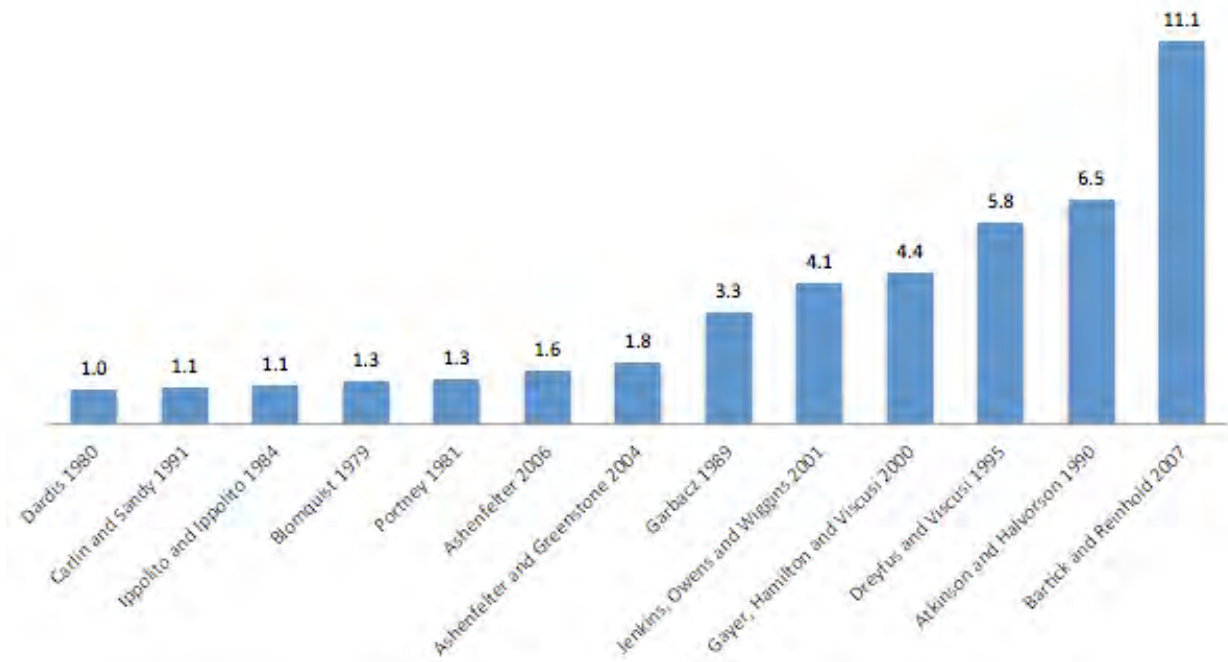
A. Crime Studies



B. Labor Market Studies



### C. Product Market Studies



### D. Regulatory Agency Studies

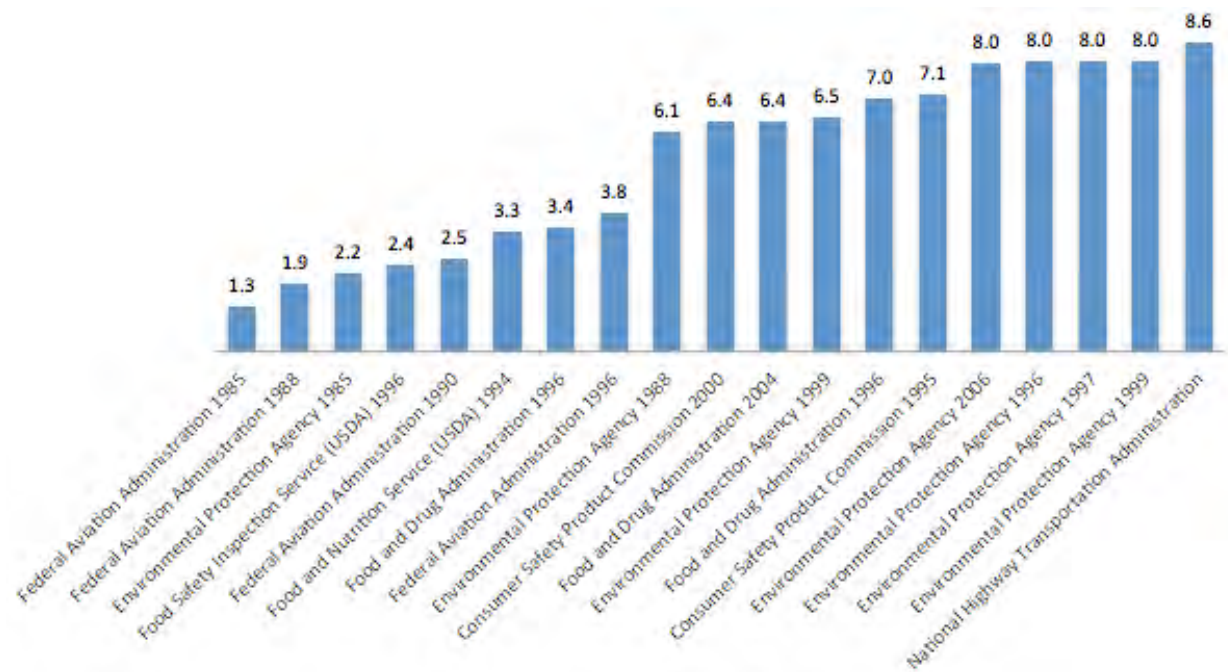


TABLE 1. SUMMARY OF FINDINGS IN THE EXTANT LITERATURE

	"Bottom Up" Studies'							Contingent Valuation Studies	
	Cohen (1988)	Cohen, Miller & Rossman (1994)	Miller, Cohen & Wiersma (1996)	Rajkumar & French (1997) &	Cohen & Piquero (2009)	Roman (2009)	McCollister, French & Fang (2010)	Cohen et al (2004)	Cohen & Piquero (2009)
Property losses	X		X	X	X		X	-	-
Medical care	X	X	X	X	X		X	-	-
Mental health care	X	X	X	X	X			-	-
Productivity losses	X	X	X	X	X		X	-	-
Criminal justice cost		X	X	X	X		X	-	-
Intangible costs	jury awards	jury awards*	jury awards*	jury awards	jury awards	jury awards	jury awards*	-	-
Rape	\$98,942	\$83,466	\$125,663	\$75,014	\$157,500	\$157,858	\$243,184	\$267,147	\$304,500
Robbery	\$24,410	\$34,295	\$18,777	\$46,949	\$24,150	\$302,569	\$42,733	\$89,804	\$40,950
Assault	\$23,255	\$25,939	\$21,666	\$123,943	\$57,750	\$146,554	\$108,090	\$156,823	\$89,250
Burglary	\$2,601		\$2,166	\$4,406	\$5,250	\$5,612	\$6,527	\$28,180	\$36,750
Larceny	\$347		\$534	\$1,490	\$2,940	\$2,682	\$3,567	\$827	\$4,200
Motor vehicle theft	\$6,066		\$5,777	\$9,232	\$9,540	\$19,163	\$10,880	\$5,466	\$17,850

Note: Table reports nine estimates of the cost of non-murder index crimes from eight prior studies. All costs are reported using 2010 constant dollars.

TABLE 2. AGGREGATE COST OF CRIME IN THE UNITED STATES, 2012

Index Crime	Incidence	Cost	Subtotal (\$ millions)	Percent of Total
A. UNIFORM CRIME REPORTS				
Murder	14,287	\$5,600,000	\$80,007	38.7
Rape	84,376	\$157,500	\$13,289	6.4
Robbery	354,522	\$40,950	\$14,517	7.0
Assault	760,739	\$89,250	\$67,895	32.8
Burglary	2,103,787	\$5,431	\$11,425	5.5
Larceny	6,150,598	\$2,086	\$12,830	6.2
Motor vehicle	721,053	\$9,341	\$6,735	3.3
Total	10,189,362		\$206,701	100.0
B. NATIONAL CRIME VICTIMIZATION SURVEY				
Murder	14,287	\$5,600,000	\$80,007	25.6
Rape	346,830	\$157,500	\$54,625	17.5
Robbery	741,760	\$40,950	\$30,375	9.7
Assault	996,110	\$89,250	\$88,902	28.5
Burglary	3,764,540	\$5,431	\$20,445	6.6
Larceny	15,244,700	\$2,086	\$31,800	10.2
Motor vehicle	633,740	\$9,341	\$5,919	1.9
Total	21,727,680		\$312,076	100.0

Note: Table reports the aggregate cost of index crimes in the United States given the number of either Uniform Crime Reports index crimes (Panel A) or criminal victimization estimates using the National Crime Victimization Survey (Panel B) in 2012. For each index crime, the cost employed is the median among estimates in the extant literature.