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The Imprisoner's Dilemma: A Cost-Benefit Approach to Incarceration

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ABSTRACT: Depriving an individual of life or liberty is one of the most intrusive powers that governments wield. Decisions about imprisonment capture the public imagination. The stories are told daily in newspapers and on television, dramatized in literature and on film, and debated by scholars. The United States has created an ever-increasing amount of material for discussion as the state incarceration rate quadrupled between 1980 and 2000. While the decision to incarcerate an individual is given focused attention by a judge, prosecutor, and (occasionally) a jury, the overall incarceration rate is not.

In this Article, I apply a cost–benefit approach to incarceration with the goal of informing public policy. An excessive rate of incarceration not only deprives individuals of freedom, but also costs the taxpayers large amounts of money. Too little imprisonment harms society in a different way—through costs to victims and even non-victims who must increase precautions to avoid crime. Striking the right balance of costs and benefits is what good law and public policy strive for.

Changes to the inmate population may be made in several different ways. One insight that I stress in this Article is that the precise form of a proposed incarceration policy change is crucial to properly evaluating the impact of the change. Therefore, I analyze several potential policy changes and their implications for sentencing and imprisonment. The calculations are informed by recent empirical work on the various ways in which

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imprisonment impacts overall welfare. I find that the benefits of limited one-time prisoner releases and the reclassification of some crimes exceed the costs.

INTRODUCTION

On May 23, 2011, in *Brown v. Plata*, the United States Supreme Court upheld a ruling that California's prisons were so overcrowded that they violated inmates' Eighth Amendment protections.[1] The state was ordered to reduce its prison population by about 35,000 inmates within two years,[2] a number equivalent to the entire incarcerated populations of Switzerland, Denmark, Norway, Sweden, Ireland, and Belgium combined.[3]

Prior to the finding in *Brown v. Plata*, the California legislature had already passed a bill aimed at reducing incarceration in the state, due to both the pending litigation in the Supreme Court and the severe budgetary crisis.[4] The situation in California is emblematic of the states as a whole, where existing incarceration policies and tight budgets have led to rampant overcrowding in prisons.[5] After a two-decade period in which incarceration

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1. Brown v. Plata, 131 S. Ct. 1910, 1944–47 (2011) (upholding the ruling of a three-judge panel, finding that there was sufficient evidence to conclude that the prison population "should be capped at 137.5% of design capacity"); *see also* PAUL GOLASZEWSKI, LEGISLATIVE ANALYST'S OFFICE, A STATUS REPORT: REDUCING PRISON OVERCROWDING IN CALIFORNIA 3 & fig.1 (2011) (estimating inmate population reductions in the following amounts in order to meet the rulings of the federal courts: 11,000 by December 27, 2011; 10,000 by June 27, 2012; 6000 by December 27, 2012; and 8000 by June 27, 2013).

2. The ruling could technically be satisfied by building additional prisons to house the 35,000 excess inmates. This possibility, however, is financially and politically infeasible, and thus discussion has focused largely on reduction of state prison inmates. *See* GOLASZEWSKI, *supra* note 1, at 7 ("[T]he federal court is not ordering the state at this time to implement specific measures to reduce overcrowding in its prisons. Rather, the court is providing the state with the flexibility to determine how best to limit the population in the prison system to 137.5 percent of design capacity within two years."); *id.* at 5–6 (arguing that "little progress has been made on" plans to add additional prison capacity and that such plans are likely to "have little impact on the state's ability to comply with the three-judge panel's ruling in the next two years").

3. *See* ROY WALMSLEY, INT'L CTR. FOR PRISON STUDIES, WORLD PRISON POPULATION LIST 5–6 tbl.4 (8th ed. 2009).

4. SBX3 18, 2009–2010 Sess. (Cal. 2009) (enacted) (amending state law to increase the monetary threshold for classifying certain crimes as felonies, establish parole reentry courts, increase the credits that inmates could earn to reduce their in-prison sentence, and make ineligible for return to prison violations by certain non-serious, non-violent parolees).

5. *See* W. Wesley Johnson et al., *Getting Tough on Prisoners: Results from the National Corrections Executive Survey, 1995*, 43 CRIME & DELINQ. 24, 25 (1997) ("According to the American Civil Liberties Union *Status Report* on state prisons, 33 jurisdictions were at that time under court order or consent decree because of overcrowding and/or conditions in specific prisons, and entire prison systems in 9 jurisdictions have been declared unconstitutional because of overcrowding and/or conditions. Only three states—Minnesota, New Jersey, and North Dakota—had never been under court order for prison overcrowding or conditions, although many of New Jersey's jails that house state prisoners are under court order." (citation omitted)); *see also, e.g.*, Baker v. Holden, 787 F. Supp. 1008, 1018 (D. Utah 1992) (holding that double celling of inmates would constitute "deliberate indifference" in certain circumstances (internal quotation marks omitted)); Ruiz v. Estelle, 503 F. Supp. 1265, 1383–84 (S.D. Tex. 1980) (holding that prisons in Texas were overcrowded, resulting in inadequate sanitation, recreational facilities, health care, hearing procedures for discipline, and access to courts), *aff'd*

rates nearly quadrupled,[6] combined with the worst economic recession since the 1930s, many have begun to question whether the costs from incarcerating additional prisoners outweigh the benefits.[7] This Article seeks to address that question from an empirical cost–benefit perspective.

The purpose of a cost–benefit analysis is to attempt to aggregate all of the effects of changes in incarceration and measure them in a single unit: dollars.[8] This allows the policymaker to concretely identify the expected impact of any policy change and consider how different policies might yield superior net benefits. While it may seem unusual to put a dollar value on things such as pain or fear from crime, this is exactly what judges and jurors do in calculating damages. The cost–benefit approach has been used successfully in numerous other fields[9] (often with hard-to-quantify characteristics) but to this point has had limited application to incarceration and crime.

Judge Richard Posner points out the need for careful empirical work on incarceration in a recent review of William Stuntz's book *The Collapse of American Criminal Justice*:

> It is apparent from this important book that the causality of crime and punishment is immensely complex. Intelligent reform will require an understanding of that causality, and such an understanding cannot be obtained without statistical analysis that measures the respective weights of all the conjectured causal

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in part, *rev'd in part*, 679 F.2d 1115 (5th Cir. 1982); *A Chronology of Major Events/Developments*, S.C. DEP'T CORRECTIONS, http://www.doc.sc.gov/about_scdc/AgencyHistory1.jsp (last visited Nov. 19, 2012) (explaining that two class action lawsuits by inmates in South Carolina resulted in consent decrees that forced the state to reduce prison overcrowding).

6. *See Key Facts at a Glance: Incarceration Rate, 1980–2009*, BUREAU JUST. STAT., http://bjs.ojp.usdoj.gov/content/glance/tables/incrttab.cfm (last visited Nov. 19, 2012) (reporting the "[n]umber of sentenced inmates incarcerated under state or federal jurisdiction per 100,000 population" as 139 in 1980 and 478 in 2000).

7. PEW CTR. ON THE STATES, STATE OF RECIDIVISM: THE REVOLVING DOOR OF AMERICA'S PRISONS 2 (2011) [hereinafter PEW, REVOLVING DOOR], *available at* http://www.pewstates.org/uploadedFiles/PCS_Assets/2011/Pew_State_of_Recidivism.pdf (finding high rates of recidivism that "suggest that despite the massive increase in corrections spending . . . the system designed to deter [criminals] from continued criminal behavior clearly is falling short"); *id.* at 19–23 (describing approaches, other than incarceration, taken by Oregon, Michigan, and Missouri to decrease recidivism).

8. I will discuss the limitations of this approach in Part II.

9. *See, e.g.*, Carolyn Buxton Bridges et al., *Effectiveness and Cost–Benefit of Influenza Vaccination of Healthy Working Adults: A Randomized Controlled Trial*, 284 JAMA 1655, 1655–56 (2000) (performing a cost–benefit analysis on administering influenza vaccines to healthy working adults); Richard L. Revesz, *Environmental Regulation, Cost–Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L. REV. 941, 943–44 (1999) (discussing issues in cost–benefit analysis on environmental regulation).

> factors. No one has done that, though Steven Levitt may have come closest. . . . The rigorous analysis of data is indispensable . . . .[10]

This Article responds to this need and adds a new perspective to the legal scholarship on criminal law and punishment, the vast majority of which has been historical and normative in nature.[11] The new approach is only possible due to recent advances in empirical methodology of the law and economics of crime. These advances are crucial in quantifying the components that enter into a cost–benefit analysis. These components include the response of crime to longer sentences (general deterrence), the salutary effect of incarceration (if any, known as specific deterrence), and the costs of crime, among others.

Until recently, social scientists lacked the tools and data necessary to answer even some of the most basic questions about criminal behavior, such as "Do longer prison sentences deter crime?" While simple to pose, such questions present methodological difficulties for social scientists because they cannot perform randomized experiments (which in this case would require random law changes) to test the proposition directly. Beginning largely in the 1990s, economists began using several new methodologies, including natural experiments,[12] instrumental variables ("IVs"),[13] differences-in-differences,[14] and other approaches that allow for causal

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10. Richard A. Posner, *Incarceration Blues*, NEW REPUBLIC (Oct. 26, 2011, 12:01 PM), http://www.tnr.com/article/books/magazine/96711/earl-warren-supreme-court-criminal-justice-system? (reviewing WILLIAM J. STUNTZ, THE COLLAPSE OF AMERICAN CRIMINAL JUSTICE (2011)).

11. For the most recent examples of excellent work along these lines, see STEPHANOS BIBAS, THE MACHINERY OF CRIMINAL JUSTICE (2012); PAUL H. ROBINSON, WOULD YOU CONVICT? SEVENTEEN CASES THAT CHALLENGED THE LAW (1999); and STUNTZ, *supra* note 10.

12. *See, e.g.*, Daniel Kessler & Steven D. Levitt, *Using Sentence Enhancements To Distinguish Between Deterrence and Incapacitation*, 42 J.L. & ECON. 343 (1999) (using sentence enhancements as a natural experiment to differentiate between the effects on crime rates from deterrence versus incapacitation); Steven D. Levitt, *The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation*, 111 Q.J. ECON. 319 (1996) (using prison overcrowding litigation as a natural experiment to explore the effect of prison population size on crime rates).

13. *See* JOSHUA D. ANGRIST & JÖRN-STEFFEN PISCHKE, MOSTLY HARMLESS ECONOMETRICS: AN EMPIRICIST'S COMPANION 115 (2009) ("Undoubtedly . . . the most important contemporary use of [instrumental variable] methods is to solve the problem of omitted variables bias (OVB). [Instrumental variable] methods solve the problem of missing or unknown control variables, much as a randomized trial obviates extensive controls in a regression."); David S. Abrams & Chris Rohlfs, *Optimal Bail and the Value of Freedom: Evidence from the Philadelphia Bail Experiment*, 49 ECON. INQUIRY 750, 760–61 (2011) (using instrumental variables to explore the effect of bail on pre-trial outcomes—release, re-arrest, and failure to appear). *See generally* Yair Listokin, *Does More Crime Mean More Prisoners? An Instrumental Variables Approach*, 46 J.L. & ECON. 181 (2003) (using the abortion rate as an instrumental variable to estimate the elasticity of prison admissions with respect to crime).

14. *See* ANGRIST & PISCHKE, *supra* note 13, at 227 ("In some cases, group-level omitted variables can be captured by group-level fixed effects, an approach that leads to the differences-

inference even when randomized experiments are unavailable.[15] These techniques, along with the increased availability of large digitized datasets of criminal justice data, make a cost–benefit analysis of incarceration feasible for the first time.[16] This is the first article to use sophisticated empirical estimates to arrive at precise valuations of specific policy changes, but builds on much important previous work. In so doing, this Article will hopefully be the first of a new type of analysis—a scientific analysis of crime and decision making about criminal justice.

While these advances make a cost–benefit analysis possible, its application must be tied to *specific policy changes*. For example, two methods of reducing a prison population are by a one-time prisoner release and by decriminalizing certain low-level offenses. Each may result in the same net change in prisoners (the benefit), but the effect on crime rates (the cost) may be dramatically different.

In this Article, I perform cost–benefit analyses for three types of policy changes. The first policy change is a marginal change in the average sentence length for all crimes. This change is not intended to be realistic but is the simplest way the methodology may be illustrated. It allows for some of the calculations utilized by the more realistic policy changes to be introduced in a simpler setting. The second policy change is similar but more realistic: a shift in allowable sentences for some crimes. This could include reclassifying some felonies as misdemeanors or certain parole violations as not triggering re-incarceration.[17] The third policy change is a one-time release of a certain number of prisoners, chosen by the amount of time remaining on their sentences, type of crime, age, health, or a combination thereof.

While crime reduction is certainly not the only purpose nor the only effect of incarceration, it is the benefit I focus on here. Retribution for wrongful acts is an important function for imprisonment and thus should be

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in-differences (DD) identification strategy."). *See generally* David S. Abrams, *Did TRIPS Spur Innovation? An Analysis of Patent Duration and Incentives To Innovate*, 157 U. PA. L. REV. 1613 (2009) (using a differences-in-differences framework to study the relationship of duration of intellectual property protection and quantity of innovation).

15. *See* ANGRIST & PISCHKE, *supra* note 13, at 221 (describing fixed effects, differences-in-differences, and panel data as useful strategies when good instrumental variables cannot be found).

16. *See, e.g.*, Steven D. Levitt, *Why Do Increased Arrest Rates Appear To Reduce Crime: Deterrence, Incapacitation, or Measurement Error?*, 36 ECON. INQUIRY 353 (1998) (using data on reported crimes from the FBI's *Uniform Crime Reports* to explore whether the negative relationship between arrest rates and crime is due to deterrence, incapacitation, or measurement error); Gary Sweeten & Robert Apel, *Incapacitation: Revisiting an Old Question with a New Method and New Data*, 23 J. QUANTITATIVE CRIMINOLOGY 303 (2007) (using the National Longitudinal Survey of Youth to estimate crimes avoided by incapacitation).

17. This could also be made in the other direction, so the change in incarceration numbers need not be a decrease.

included in the cost–benefit calculation.[18] Unfortunately, there are currently no good estimates of how much people value retribution, so it may be viewed as a factor that is omitted from the calculus. One may interpret the results of this study as providing an implicit bound on the value of retribution.[19]

While the aim of this Article is to introduce a new approach to evaluating punishment, the analysis is limited to the issue of the proper extent of incarceration. It does not speak to the best way to allocate criminal justice resources more broadly, including policing, job training, drug programs, and a host of other alternatives to incarceration that may impact the prevalence of crime.[20] However, as long as incarceration continues to be the dominant method of punishment for serious crime it is important to precisely examine its effects.

My empirical analysis shows that when reductions in prison populations become necessary, one-time prisoner releases are generally more cost-effective than crime reclassification. This is largely because one-time releases do not diminish general deterrence and release only the lowest-cost offenders. However, by assumption, one-time releases cannot be repeated and are thus not a general solution. Thus crime reclassification can still be a powerful tool in reducing the aggregate burden of crime and incarceration costs.

The rest of the Article proceeds as follows. In Part I, I describe potential policy changes in more detail and discuss the mechanisms through which these policy changes impact crime. Since the accuracy of the values used in the cost–benefit analysis is crucial to its validity, I go into some detail on the derivation of these values in Part II. This includes an explanation of the importance of causal inference, a discussion of the techniques used to approximate randomized experiments, and a summary of the key scholarship that makes use of these approaches.

Part III introduces an analytical framework for performing the cost–benefit analysis, based on the parameters identified in Part II. The model is then calibrated using these parameters, and I report quantitative predictions for each of the various policy changes. In Part IV, I discuss the implications of these results for current and future policy decisions. Part V concludes

18. *See, e.g.*, BIBAS, *supra* note 11, at 119 ("Despite academic skepticism, popular morality is an enduring foundation for criminal justice. Descriptively, it is what drives criminal justice policy."); Paul H. Robinson & Robert Kurzban, *Concordance and Conflict in Intuitions of Justice*, 91 MINN. L. REV. 1829, 1892 (2007) (finding people's "shared intuitions of justice" may shape "criminal justice debates").

19. For example, if the costs of the current incarceration level appear to exceed the benefits by $10 million, that could imply that the public values the current level of retribution at $10 million.

20. Some of these approaches may be more cost-effective than incarceration, but they are not considered here.

with a brief discussion of how this type of analysis and future extensions augment current approaches to the study of criminal justice.

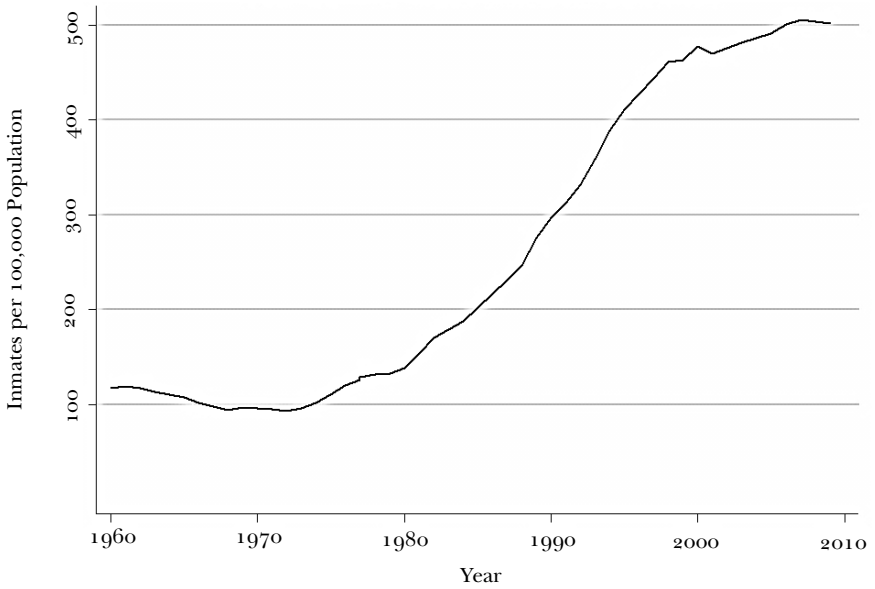
I. OVERVIEW OF POLICY CHANGES

A. TYPES OF POLICY CHANGES

In order to make concrete policy recommendations about incarceration, it is necessary to have specific policy changes in mind. With the substantial growth in the incarceration rate (Figure 1) and spending (Figure 2) over the past thirty years, a number of policies have recently been considered, each aimed at improving the cost–benefit ratio. In this Article, I use three general types of policy changes, which account for most recent changes in incarceration policy and many of those currently being contemplated—sentence length modification, revision of the eligibility requirements for crimes, and one-time release of prisoners. Each policy change implicates the costs and benefits of incarceration in different ways, which I detail below.

FIGURE 1

INCARCERATION RATE IN THE U.S., 1960–2009

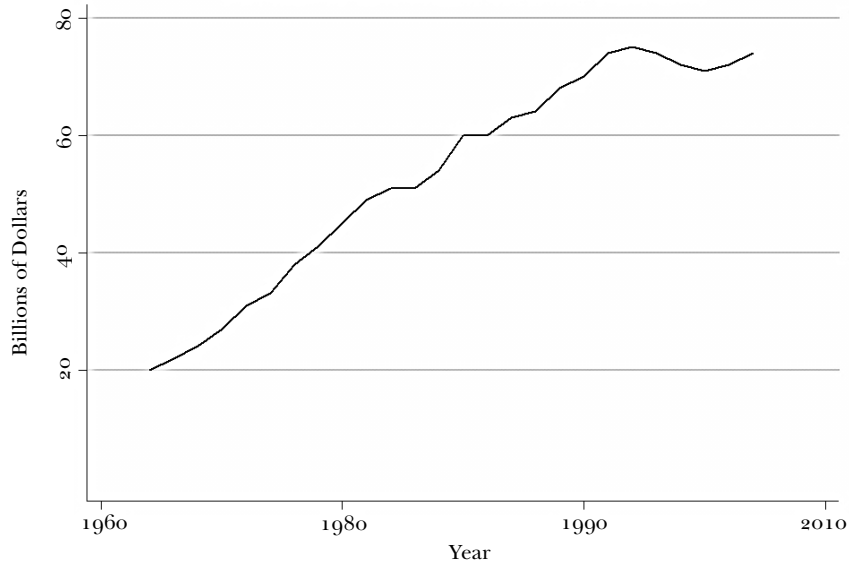


Source: UNIV. AT ALBANY, SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS ONLINE tbl. 6.28.2009, http://www.albany.edu/sourcebook/pdf/t6282009.pdf (last visited Nov. 29, 2012).

The key to correct implementation of the cost–benefit analysis is identifying the mechanisms through which each of these policy changes acts. I explore how each of the policy changes impacts five costs and benefits of incarceration: general deterrence, specific deterrence, incapacitation, value of freedom, and prison costs.[21] These five are the focus because they will be most affected by changes in incarceration and because they are readily measurable. In addition to these factors, there are a number of additional components that could impact the cost–benefit analysis that I will discuss later. First, I begin with a detailed discussion of the chosen policy changes.

FIGURE 2

CORRECTIONS SPENDING IN THE U.S., 1982–2007



Source: TRACEY KYCKELHAHN, BUREAU OF JUSTICE STATISTICS, JUSTICE EXPENDITURES AND EMPLOYMENT, FY 1982–2007—STATISTICAL TABLES 6 tbl.5 (2011), *available at* http://www.bjs.gov/content/pub/pdf/jee8207st.pdf.

The first policy change is an increase or decrease of all sentences by a certain percentage, for example a proposal to increase all criminal sentences in a state by ten percent. This policy change is not realistic, and its purpose is to provide a simple point of comparison with the other, more realistic policy changes. The analysis of this proposed change can give insight into more realistic proposals where sentences may change according to offense

21. The value of freedom incorporates the loss not only to the inmate, but also to relatives and friends. It also incorporates foregone wages. *See infra* Part II.E.2.

type or offender criminal history. The complication of adding variation to each of the components of the cost–benefit calculation may then be invoked to examine other policy changes.

The second type of policy change is one that reclassifies some crimes so that they either gain or lose eligibility for incarceration. An increase in the minimum threshold that delineates felony larceny from $500 to $1000 (in a jurisdiction where misdemeanors may not be punished by incarceration) is an example of such a change. This decreased penalty for thefts of property valued between $500 and $1000 leads to a lower prison population.[22] Another common policy change of this type deals with "technical violations"—infractions that lead to a revocation of parole but which are not otherwise crimes. Some states have recently changed rules so that failure of a single drug test while on parole does not trigger automatic incarceration.[23]

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22. *See, e.g.*, GOLASZEWSKI, *supra* note 1, at 4 (describing how California amended state law to "increase the dollar threshold for certain property crimes to be considered a felony, thus making fewer offenders eligible for prison"); PEW CTR. ON THE STATES, ARKANSAS'S 2011 PUBLIC SAFETY REFORM: LEGISLATION TO REDUCE RECIDIVISM AND CURTAIL PRISON GROWTH 11 (2011) [hereinafter PEW, ARKANSAS], *available at* http://www.ncsl.org/documents/cj/pew/ARhandout Aug2011.pdf (explaining that the Public Safety Improvement Act passed in Arkansas "[r]aise[d] the threshold for felony theft from $500 to $1,000 to reduce the number of felony convictions for low-level offenders"); *see also* ACLU, SMART REFORM IS POSSIBLE: STATES REDUCING INCARCERATION RATES AND COSTS WHILE PROTECTING COMMUNITIES 18 (2011), *available at* http://www.aclu.org/files/assets/smartreformispossible.pdf (stating that Texas "[e]liminated prison sentences for juvenile misdemeanors"); PEW CTR. ON THE STATES, SOUTH CAROLINA'S PUBLIC SAFETY REFORM: LEGISLATION ENACTS RESEARCH-BASED STRATEGIES TO CUT PRISON GROWTH AND COSTS 6 (2010) [hereinafter PEW, SOUTH CAROLINA], *available at* http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/sentencing_and_corrections/PSPP_South_Carolina_brief.pdf (explaining that South Carolina's Omnibus Crime Reduction and Sentencing Reform Act of 2010 "[i]ncreas[ed] the property value threshold from $1,000 to $2,000 for all felony property crimes, making all property crimes below $2,000 misdemeanors").

23. *See, e.g.*, GOLASZEWSKI, *supra* note 1, at 4 (stating that, in order to reduce overcrowding, California enacted legislation to "make ineligible for revocation to prison violations by certain parolees with no serious, violent, or sex offenses"); PEW, REVOLVING DOOR, *supra* note 7, at 23 ("Today released offenders in Missouri are subject to 'e-driven supervision' (the 'e' is for evidence), which uses a new risk assessment tool to categorize parolees and help set supervision levels. When violations occur, officers have a range of sanctions they may impose, from a verbal reprimand or modification of conditions, to electronic monitoring, residential drug treatment or 'shock time' in jail."); Patrick McGreevy, *California Launches Plan To Cut Prison Population*, L.A. TIMES (Jan. 26, 2010), http://articles.latimes.com/2010/jan/26/local/la-me-prisons26-2010jan26 (describing a recent change in California law, where inmates "will no longer be returned to prison for technical violations such as alcohol use, missed drug tests or failure to notify the state of an address change"); Michael D. White et al., Halfway Back: An Alternative to Revocation for Technical Parole Violators 11–12 (Jan. 2010) (unpublished manuscript), *available at* http://www.cecintl.com/pdf/research/Halfway%20Back%20paper%20for%20CJPR.pdf (describing Kentucky's "Halfway Back" program, "an alternative to incarceration for offenders who have non-violent technical violations which would normally trigger revocation proceedings" (quoting David P. Munden et al., *Intermediate Sanctions*

An additional type of policy change that falls within this category, but would lead to a larger prison population, is the addition of new substances to the category of illegal drugs.[24] The third type of policy change is a one-time release of prisoners. Unlike the previous two categories, this change only works in one direction: it decreases the incarcerated population. This has been a policy change that has been used in the past, albeit reluctantly, as a response to prison overcrowding.[25] For example, Alabama released 1100 prisoners in 1981 following a court order.[26]

The impact of a prisoner release will vary substantially depending on which prisoners are chosen for release. Some of the most common groups include those with minimal time remaining on their sentences, elderly or medically infirm prisoners, or those convicted only of relatively minor crimes.[27] Inmates with minimal time remaining on their sentences are more

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and the Halfway Back Program in Kentucky, 9 CRIM. JUST. POL'Y REV. 431, 437 (1998)) (internal quotation marks omitted)).

24. Drugs are not considered in this Article because of lack of good data on the cost of drug crimes.

25. *See, e.g.*, Valerie Olander, *Overcrowded County Jail Releases Some Prisoners*, DETROIT NEWS, Aug. 20, 2009, at 6A (describing the release of fifteen nonviolent inmates from a Michigan jail due to overcrowding); Peter Applebome, *Texas, in Emergency, To Free 185 from Crowded Prisons*, N.Y. TIMES (Feb. 28, 1987), http://www.nytimes.com/1987/02/28/us/texas-in-emergency-to-free-185-from-crowded-prisons.html (describing the release of about 185 Texas inmates due to a federal court order to remedy prison overcrowding); *Cruel and Unusual Punishment:* Ruiz v. Estelle *(1980)*, TEX. POL., http://www.laits.utexas.edu/txp_media/html/just/features/0505_01/ruiz.html (last visited Nov. 19, 2012) (describing that Texas first responded to a court order to reduce prison overcrowding by expanding early release programs through parole or probation); Melissa MacBride & Rob McMillan, *150 IE Inmates To Be Free Due to Realignment*, ABC LOCAL, KABC (Dec. 9, 2011), http://abclocal.go.com/kabc/story?section=news/local/inland_empire&id=8461125 (describing the release of 150 prisoners from a California jail due to overcrowding); John T. McQuiston, *50 Ordered Released from Overcrowded Jail in Jersey*, N.Y. TIMES (Mar. 5, 1981), http://www.nytimes.com/1981/03/05/nyregion/50-ordered-released-from-overcrowded-jail-in-jersey.html (describing the release of fifty individuals "awaiting trial or grand-jury appearances" from a county jail in New Jersey due to overcrowding).

26. Wendell Rawls Jr., *Powell Lifts Alabama Stay and 222 Prisoners Go Free*, N.Y. TIMES (July 26, 1981), http://nytimes.com/1981/07/26/us/powell-lifts-alabama-stay-and-222-prisoners-go-free.html ("About four months ago, Mr. Graddick severely criticized the state's Pardons and Paroles Board after it released about 1,100 prisoners and handed over a convicted murderer to Georgia prison officials so he could be imprisoned on another charge in that state.").

27. *See, e.g.*, ACLU, *supra* note 22, at 21 (noting that Texas created a medical parole program to permit the "release of mentally or terminally ill prisoners to supervision in a medical facility"); *id.* at 58–59 (describing legislation enacting elderly parole eligibility in Wisconsin, Louisiana, and Ohio); PEW, ARKANSAS, *supra* note 22, at 11 (explaining that Arkansas passed legislation "to allow inmates diagnosed by two doctors, one not affiliated with the Department of Correction, as having a terminal illness and a life expectancy of two years or less or as permanently incapacitated and posing no threat to public safety to be paroled with an approved transfer plan"); PEW, SOUTH CAROLINA, *supra* note 22, at 8 (explaining that South Carolina passed legislation to "[a]llow[] parole for an inmate who is terminally ill, geriatric or permanently incapacitated upon the petition of the Department of Corrections").

likely to have been convicted of relatively minor crimes, which may decrease the likelihood of, or harm caused by, recidivism.[28] However, they will also be younger than prisoners released based on age. Age-based release is sometimes the preferred policy because of the well-known relationship between criminality and age: crime is a young-man's game.[29] In all known cases of prisoner releases, those released are highly non-representative of the criminal population. Prisoners chosen to be released early are chosen because there is a lower likelihood of recidivism and a lower likelihood that they will commit particularly costly crimes if released.

B. MECHANISMS BY WHICH INCARCERATION IMPACTS CRIME

In order to understand the relative merits of these different policy changes it is important to understand their consequences, in particular their impact on crime rates. Changes in sentencing policies can impact crime primarily in three ways: general deterrence, specific deterrence, and incapacitation. Each policy will act through more than one of these mechanisms, but the effect depends on the exact policy change.

General deterrence is the reduction in crime that occurs due to the expectation of punishment; longer sentences yield lower crime rates.[30] An individual need not experience punishment in order to be generally deterred: A would-be thief may contemplate stealing a television but decide not to commit the crime for fear of being caught, prosecuted, and punished. Of course, the decision to commit crime will generally not be a conscious and explicit weighing of costs and benefits, just as the purchase of a candy bar does not usually involve an explicit quantification of the benefits and costs. But individuals do tend to buy less candy when the price rises and steal fewer televisions when the penalty increases.[31]

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28. At any given time, some proportion of inmates serving lengthy sentences will also be within a short period of release, but they are much less likely to be members of the pool of inmates within, for example, three months of release. To be concrete: compare an inmate serving a twenty-five year sentence for murder with one serving a one year sentence for manslaughter. The former will be within three months of release for only one percent of his sentence, while twenty-five percent of the latter's prison term will come when he is at least this close to the end of his sentence.

29. *See* Travis Hirschi & Michael Gottfredson, *Age and the Explanation of Crime*, 89 AM. J. SOC. 552, 556–61 (1983) (displaying age distributions that demonstrate that criminal propensity tends to peak in the late-teens).

30. *See* David S. Abrams, *Estimating the Deterrent Effect of Incarceration Using Sentencing Enhancements*, AM. ECON. J.: APPLIED ECON., Oct. 2012, at 32.

31. Economists call this "as-if" modeling: individuals behave as if they go through sometimes complicated calculations, but in fact the cognitive process is often nearly instantaneous and not nearly as explicit as economists' equations. *See* Alan James MacFadyen, *Beliefs in Behavioral and Neoclassical Economics*, *in* HANDBOOK OF CONTEMPORARY BEHAVIORAL ECONOMICS: FOUNDATIONS AND DEVELOPMENTS 183, 194–95 (Morris Altman ed., 2006).

Specific deterrence, unlike general deterrence, only impacts offenders who have been caught, convicted, and incarcerated. Specific deterrence is the impact that the experience of incarceration has on subsequent offending.[32] The name implies that it should have a negative effect on recidivism, but there are theories that predict that lengthier incarceration could breed greater recidivism rates. The most prominent such theory is that of "criminal capital formation," the notion that inmates learn skills from their peers while incarcerated that make them more productive and active criminals upon release.[33] Any empirical estimate of specific deterrence will not be able to separate this effect from the original notion that the longer one is imprisoned, the less likely he will be to recidivate when released. Thus, as I use the term in this Article, specific deterrence captures the aggregate effect of the experience of incarceration on subsequent offending.

Incapacitation is the simplest of the mechanisms by which incarceration impacts crime. The physical separation of inmates from the general population precludes those inmates from committing crime on the public.[34] The magnitude of the incapacitation effect is simply the number of crimes that would have been committed had an individual not been incarcerated. This number should account for any *replacement effect*, whereby some of the crimes that an inmate would have committed are committed by a non-incarcerated individual.[35]

Thousands of papers have been written on the three aforementioned subjects, including many attempts to empirically estimate the magnitude of the various effects. In order to perform the cost–benefit analysis of the policy changes, it is necessary to have accurate values for the impact of general deterrence, specific deterrence, and incapacitation on crime. This is no easy feat. In the next Part, I discuss why obtaining causal estimates is so difficult in the social sciences and what advances have been made recently in doing so. I then detail some of my own work as well as several other recent studies that use these techniques to obtain substantially more precise estimates of these crime-affecting mechanisms than have previously been produced. These estimates are then used to perform the cost–benefit calculations.

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32. David S. Abrams, Building Criminal Capital vs. Specific Deterrence: The Effect of Incarceration Length on Recidivism 2 (Dec. 2011) (unpublished manuscript), *available at* https://www.law.upenn.edu/cf/faculty/dabrams/workingpapers/AbramsRecidivism.pdf.

33. *See generally* Patrick Bayer, Randi Hjalmarsson & David Pozen, *Building Criminal Capital Behind Bars: Peer Effects in Juvenile Corrections*, 124 Q.J. ECON. 105 (2009).

34. This, of course, does not mean that no crime occurs within prison. I discuss the challenges of incorporating costs of this type later in the Article. *See infra* Part II.C.

35. This effect seems particularly likely to be important with drug crimes, where incarcerating one dealer may just expand another dealer's territory.

II. CAUSAL INFERENCE AND THE INPUTS TO COST–BENEFIT ANALYSIS

As I discuss some of the key empirical works on crime in the pages that follow, *causal inference* will be a unifying concept. The goal of much social science research is to identify the causal impact of *A* on *B*; for example, the impact of a legal education on earnings or the effect of race on sentencing. The best way to approach these questions is with a randomized experiment. This helps avoid common impediments to causal inference. For example, a simple comparison of the earnings of lawyers and non-lawyers could be explained not by the impact of a legal education, but rather by differences in the type of person who chooses to become a lawyer.[36]

One may attempt to control for these differences by comparing individuals who are otherwise similar (e.g., similar educational background, age, income, etc.) and differ only in their exposure to a legal education. While controlling for these types of observable characteristics, in virtually all cases, there will be *unobservable* characteristics that one cannot control for. In this example, important unobservable characteristics may include motivation, drive, character, relatives who are attorneys, interest in legal questions, etc.

It may seem logical that a study controlling for observable characteristics but ignoring unobservable characteristics would still get pretty close to the correct answer. While this seems sensible, it turns out to be completely wrong. In a groundbreaking paper published in 1986, Robert LaLonde showed that even when controlling for all observables one may not only get the size of the effect wrong, *one may not even get the sign correct.*[37] In this example, that means that one might conclude that law school increases earnings, when in fact the opposite is true.

LaLonde showed this surprising result by analyzing data from a temporary employment program aimed at increasing subsequent earnings. Unlike most such programs, this one was easy to evaluate because those chosen to participate were drawn at random from all eligible applicants to the program—a true randomized experiment. Normally, to assess the program's impact, one would simply compare the subsequent earnings of those who received the training (the treatment group) with those who did not (the controls).

LaLonde's insight was to perform the analysis in two ways. In addition to the traditional approach just mentioned, he also analyzed the data as though it were not a randomized experiment, and individuals could choose in a non-random way whether to be in the treatment group, much as people

36. This is known as a selection effect. *See* ANGRIST & PISCHKE, *supra* note 13, at 12–15.

37. Robert J. LaLonde, *Evaluating the Econometric Evaluations of Training Programs with Experimental Data*, 76 AM. ECON. REV. 604, 616 & tbl.6, 617 (1986).

choose (non-randomly, one hopes) whether to attend law school.[38] He then attempted to control for the observable characteristics of those individuals to estimate the impact of the training program in the standard non-experimental method of analysis.[39] He found that the estimated effect of the program from the non-experimental analysis was not only a different magnitude as the (correct) experimental analysis indicated, it was a different sign![40] The experimental analysis showed that the program increased subsequent earnings of workers, while the non-experimental analysis implied that it decreased their earnings.[41]

LaLonde's paper—and a number that have been written since[42]—began a revolution in empirical economics.[43] The work clarified the importance of using randomized experiments to answer questions in the social sciences—carefully using control variables is not enough. So how would one answer the question about the impact of legal education on earnings? Here is an example in which one could hypothetically perform the desired randomized experiment: take a group of law school applicants just on the cusp of being admitted and randomly select half for admission.[44] A comparison of subsequent earnings would answer the question that was initially posed with no need for any complicated analysis or extensive control variables. This is the beauty and simplicity of the randomized experiment.

While the emphasis on the randomized experiment has had a profound impact on economic research, for most questions of interest, especially in the domains of law and crime, it is impossible or unrealistic to perform a randomized experiment. For example, the second question posed above—the impact of race on criminal sentencing—would seem to require that race be randomly assigned, a concept that seems inherently difficult.[45] Even the

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38. *Id.* at 615–17.

39. *Id.*

40. *Id.* at 617 ("[T]he nonexperimental procedures produce estimates that are usually positive and larger than the experimental results for the female participants, and are negative and smaller than the experimental estimates for the male participants.").

41. *Id.* at 616 tbl.6.

42. *See, e.g.*, Rajeev H. Dehejia & Sadek Wahba, *Propensity Score-Matching Methods for Nonexperimental Causal Studies*, 84 REV. ECON. & STAT. 151 (2002); Rajeev H. Dehejia, *Was There a Riverside Miracle? A Hierarchical Framework for Evaluating Programs with Grouped Data*, 21 J. BUS. & ECON. STAT. 1 (2003); Robert J. LaLonde & Rosa M. Cho, *The Impact of Incarceration in State Prison on the Employment Prospects of Women*, 24 J. QUANTITATIVE CRIMINOLOGY 243 (2008).

43. Though Steve Levitt has become the most public face of this style of economic research, it also includes a large fraction of economic empiricists trained in the past fifteen years.

44. For purposes of this hypothetical, assume there is only one law school that they wish to attend.

45. The closest any recent research on the topic has come is a field experiment where résumés were mailed to employers and the *name* of the applicant was randomly assigned to be black or white sounding. Résumés with black-sounding names resulted in substantially fewer job

legal education experiment is one that would be unlikely to pass muster with most Institutional Review Boards or law school deans.

Thus, for most real-world questions, researchers use proxies for the ideal randomized experiments they would perform in an idealized world. The quasi-experimental techniques employed include instrumental variables, regression discontinuity, natural experiments, difference-in-difference, and other approaches.[46] Together, over the past decade, the application of these techniques has substantially advanced our understanding of the various mechanisms by which incarceration affects crime. I now discuss some of the most important studies in several areas and explain how their use of quasi-experimental techniques has advanced the field to the point where an initial utilitarian calculus is now realistic. I then use the results of these studies to implement the cost–benefit calculation in the section that follows.

A. EMPIRICAL STUDIES OF GENERAL DETERRENCE

1. Background

Incarceration (and other penalties) can reduce crime simply by its threatened use. This effect is called general deterrence, and it has the advantage of potentially reducing crime without increasing costs at all (or even reducing them)—because crime reduction due to longer sentences is concomitant with a reduction (although an increase in duration) of incarcerated individuals.[47] There has been and continues to be much debate among economists and criminologists about the magnitude and even existence of general deterrence. In order to evaluate the impact of a change in incarceration policy, it is crucial to have a good estimate of the deterrent effect. I report some of the most recent findings from my own work and from the work of others which typically find a non-zero, but relatively small, general deterrent effect.

There has been a great deal of research on general deterrence over the past several decades, but until recently there was no consensus as to the

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interviews. *See* Marianne Bertrand & Sendhil Mullainathan, *Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination*, 94 AM. ECON. REV. 991, 997–98 (2004).

46. These techniques are described below, in conjunction with the papers that employ them.

47. Mark C. Stafford & Mark Warr, *A Reconceptualization of General and Specific Deterrence*, 30 J. RES. CRIME & DELINQ. 123, 123 (1993) ("[Daniel] Nagin (1978) defines general deterrence as the 'imposition of sanctions on one person [in order to] demonstrate to the rest of the public the expected costs of a criminal act, and thereby discourage criminal behavior in the general population.'" (second alteration in original) (quoting Daniel Nagin, *General Deterrence: A Review of the Empirical Evidence*, *in* DETERRENCE AND INCAPACITATION: ESTIMATING THE EFFECTS OF CRIMINAL SANCTIONS ON CRIME RATES 95, 96 (Alfred Blumstein et al. eds., 1978))).

existence and magnitude of a deterrent effect.[48] In the past fifteen years, greater attention has been paid to careful identification, as well as separating deterrence and incapacitation effects.[49]

As illustrated in the previous Subpart, most convincing research on general deterrence will employ a technique that approximates the ideal experiment that one would run if one could. In this case, that experiment would involve a randomly assigned sentence—for example, a sentence adopted by two states that are otherwise identical. Absent random variation, one would not be able to distinguish a correlation between sentence length

48. Nagin finds evidence for an overall deterrent effect in the criminal justice system, but believes more work is needed to better establish that increased sentences deter crime. Daniel S. Nagin, *Criminal Deterrence Research at the Outset of the Twenty-First Century*, 23 CRIME & JUST. 1, 36–37 (1998). In a 2003 article, Anthony N. Doob and Cheryl Marie Webster review a handful of papers by economists and a large number by criminologists and conclude that the lack of strong evidence for deterrence supports the proposition that there is a null effect. Anthony N. Doob & Cheryl Marie Webster, *Sentence Severity and Crime: Accepting the Null Hypothesis*, 30 CRIME & JUST. 143, 189 (2003). These authors along with Franklin E. Zimring pay particular attention to Daniel Kessler and Steven D. Levitt's 1999 paper, which they do not finding convincing. Cheryl Marie Webster, Anthony N. Doob & Franklin E. Zimring, *Proposition 8 and Crime Rates in California: The Case of the Disappearing Deterrent*, 5 CRIMINOLOGY & PUB. POL'Y 417, 417 (2006) ("In particular, the addition of annual crime levels for all years (versus only the odd-numbered years that Kessler and Levitt examine) calls into question the prima facie support for a deterrent effect presented by Kessler and Levitt."); *see also* Doob & Webster, *supra*, at 166 (critiquing Kessler and Levitt's 1999 paper, finding, for example, that there was a "risk of contamination by incapacitation effects" and that the analysis "of only odd-numbered years still remains a mystery"). In a 2004 article, Paul H. Robinson and John M. Darley take a more nuanced view that there are circumstances where increased sentences may deter, although they argue that the magnitude is insufficient to influence policy decisions. Paul H. Robinson & John M. Darley, *Does Criminal Law Deter? A Behavioural Science Investigation*, 24 OXFORD J. LEGAL STUD. 173, 205 (2004). In the *Handbook of Law and Economics*, Levitt and Thomas J. Miles discuss several economic studies that find evidence for general deterrence, but conclude that more research on the topic is necessary. Steven D. Levitt & Thomas J. Miles, *Empirical Study of Criminal Punishment*, *in* 1 HANDBOOK OF LAW AND ECONOMICS 455, 488–89 (A. Mitchell Polinsky & Steven Shavell eds., 2007). Isaac Ehrlich, in a 1981 article, performed some of the most publicized empirical work on deterrence by an economist and focused to a great extent on murder. Isaac Ehrlich, *On the Usefulness of Controlling Individuals: An Economic Analysis of Rehabilitation, Incapacitation, and Deterrence*, 71 AM. ECON. REV. 307, 319 (1981) ("[I]n a large class of cases, efficient crime control requires only the imposition of deterring punishments or the promotion of general legitimate earning opportunities, without any attempt at individual control.").

49. *See, e.g.*, Francesco Drago, Roberto Galbiati & Pietro Vertova, *The Deterrent Effects of Prison: Evidence from a Natural Experiment*, 117 J. POL. ECON. 257, 258–60 (2009) (using a natural experiment in Italy to corroborate a general deterrence theory, finding that an extra month in expected sentence reduces the likelihood to recommit a crime by 1.3%); Eric Helland & Alexander Tabarrok, *Does Three Strikes Deter? A Nonparametric Estimation*, 42 J. HUM. RESOURCES 309, 315–17 (2007) (finding that California's three-strikes law has a deterrent effect and reduces third-strike arrests by 17–20%); Levitt, *supra* note 16, at 360–70 (finding deterrence to be a more important factor than incapacitation in explaining "the negative correlation between arrest rates and crime").

and crime (perhaps because states with longer sentences have higher crime rates to begin with) from a causal impact of sentence length.

Earlier, I discussed how determining the impact of law school on earnings would require us to randomly select for admission and rejection among a group of applicants on the cusp of admission. This discontinuity in outcome among presumably similar applicants is key to distinguishing between causation and mere correlation. Quantifying the general deterrent effect of a policy is even more difficult because one not only needs to discern causation but also distinguish between the impact of the policy through general deterrence from the impact of the policy through incapacitation. Several recent studies take pains to distinguish these effects, using California ballot measures,[50] changes in sentence length at the age of majority,[51] and a natural experiment in Italian prisons.[52]

One technique that has been commonly used in measuring the impact of general deterrence is known as "regression discontinuity." One example of this technique is attempting to determine the general deterrent effect of sentence length by looking at changes in crime rates at the age of majority. Since sentence lengths vary discontinuously at this age, one would expect crime rates to drop discontinuously. This should be true, even though there is a general trend in criminality with age. But because that trend should be smooth (that is, there is no reason to expect that one's criminal propensity drops or rises sharply from one day or week to the next), by focusing on a short period just before and after the age of majority, one should only detect the impact of the change in sentence length on crime.[53]

2. Recent Literature

David S. Lee and Justin McCrary apply this approach in a 2009 article to estimate general deterrence using a large data set of high-frequency data from Florida.[54] They find a drop in crime of two percent around this discontinuity and suggest that part of the low response might be due to "myopic behavior."[55] Levitt's 1998 article uses cross-state differences in the relative harshness of adult sanctions versus juvenile sanctions.[56] He finds that those states with larger jumps in punishment have larger decreases in adult

50. *See generally* Webster, Doob & Zimring, *supra* note 48.

51. David S. Lee & Justin McCrary, *The Deterrence Effect of Prison: Dynamic Theory and Evidence* (Ctr. for Econ. Policy Studies, Working Paper No. 189, 2009), *available at* http://www.princeton.edu/ceps/workingpapers/189lee.pdf.

52. *See generally* Drago, Galbiati & Vertova, *supra* note 49.

53. This technique is widely used in economics. *See* ANGRIST & PISCHKE, *supra* note 13.

54. Lee & McCrary, *supra* note 51, at 2–3.

55. *Id.* at 32–33.

56. *See* Steven D. Levitt, *Juvenile Crime and Punishment*, 106 J. POL. ECON. 1156 (1998).

crime compared to juvenile crime.[57] In a 2009 article, Randi Hjalmarsson examines offender perceptions of penalties and finds that they vary much less than actual changes at the age of majority.[58] She finds little evidence of deterrence in self-reported data.[59]

Differences-in-differences is another widely used technique in empirical economics that may also be used to obtain careful estimates of general deterrence.[60] The first "difference" in this technique is often a law change. For example, in Kessler and Levitt's 1999 paper, they use a change in sentence lengths in California.[61] Many studies simply compare crime rates after such a law change relative to before the law change and ascribe any difference to the causal effect of the law. This can be problematic if there are overall trends—such as a national economic downturn—that also affect crime. The solution is to use a second "difference," often another state, as a control group to account for these overall trends. As long as the larger trends affect both states similarly, this effect will be "differenced out" and the remaining effect will be the law change of interest. Triple difference is just an extension of differences-in-differences, where a third dimension is used to allow for more complicated overall variation.[62]

In their 1999 article Kessler and Levitt use changes due to the passage of Proposition 8 in California in 1982, which provided for sentence enhancements for a particular set of crimes.[63] The authors use a differences-in-differences and triple-difference approach, using variation by time, state, and type of crime to isolate the effect of the California law change. They separate deterrence from incapacitation by examining changes in short-term crime rates for serious offenses with lengthy, underlying sentences and find the mean three-year deterrent effect to be eight percent.[64]

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57. *Id.* at 1156 (finding that "changes in relative punishments can account for 60 percent" of the differential growth rates in juvenile and adult violent crime between 1978 and 1993).

58. Randi Hjalmarsson, *Crime and Expected Punishment: Changes in Perceptions at the Age of Criminal Majority*, 11 AM. L. & ECON. REV. 209, 231–33 (2009) ("[C]onsistent with the objective data, there is evidence of a jump in the perceived chance of jail at the age of criminal majority. However, the size of the jump is perceived to be smaller than that which is measured in the various types of objective data.").

59. *Id.* at 245 ("The analysis also finds little evidence of a discontinuous change in delinquent behavior, over and above general aging trends, at the age of criminal majority. Significant evidence of deterrence is only consistently seen when considering thefts of less than $50.").

60. *See* ANGRIST & PISCHKE, *supra* note 13.

61. Kessler & Levitt, *supra* note 12, at 343.

62. To be precise, triple difference allows for overall variation, such as national trends that may vary in their effect across states.

63. *See* Kessler & Levitt, *supra* note 12, at 352–59.

64. *Id.* at 343 ("Proposition 8 appears to reduce eligible crimes by 4 percent in the year following its passage and 8 percent 3 years after passage."). I elaborate on their method of separating deterrence from incapacitation below.

Another paper close in subject matter to that described in Part II.A.3 below is that of Thomas B. Marvell and Carlisle E. Moody in which they examine the effect of gun laws on a range of outcomes.[65] Using a data set on firearm-sentencing enhancements, prison population, and crime, the authors find little evidence that firearm-sentencing enhancements have an impact on either deterrence or incapacitation.[66]

In recent work, I treat the passage of "add-on gun laws" by different states as a repeated "natural experiment" to estimate general deterrence.[67] Economists use the term "natural experiment" to denote any event that is not predictable and causes a heterogeneous effect.[68] Many law changes qualify as natural experiments if their implementation is relatively rapid and their passage uncertain. For example, if a state legislature were to enact a hotly contested bill that would raise toll road rates immediately, this law change could serve as a useful way to estimate the value of using a toll road to drivers (by examining the change in number of vehicles per day after its passage). Lotteries can be extremely useful natural experiments, such as the Vietnam Draft Lottery which was used to estimate the effect of military service on subsequent earnings.[69] In a 1990 article, Joshua D. Angrist compares the earnings of men whose draft numbers were selected with those that were not and found that military service decreased earnings by about fifteen percent.[70]

3. Using Add-On Gun Laws To Estimate General Deterrence

Add-on gun laws result in enhanced sentences for defendants convicted of possessing a firearm while committing a crime. These laws grew popular in the United States in the 1970s and 1980s, with approximately thirty states adopting one of these laws by 1996.[71] The key to distinguishing deterrence from incapacitation is the fact that add-on laws apply only to defendants who would otherwise receive sentences of incarceration. Thus, the short-term impact of an add-on gun law should be purely deterrent.

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65. Thomas B. Marvell & Carlisle E. Moody, *The Impact of Enhanced Prison Terms for Felonies Committed with Guns*, 33 CRIMINOLOGY 247, 247 (1995) (estimating the impact of mandatory-minimum laws and sentence enhancements on "state prison populations, prison admissions, UCR crime rates, and gun use in homicides, assaults and robberies").

66. *Id.* (finding little evidence that mandatory-minimum-sentencing laws and sentence enhancements reduced crime or increased prison populations).

67. *See generally* David S. Abrams, *supra* note 30.

68. ANGRIST & PISCHKE, *supra* note 13, at 7–8.

69. Joshua D. Angrist, *Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records*, 80 AM. ECON. REV. 313, 313–14 (1990).

70. *Id.* at 314.

71. *See* Jon S. Vernick & Lisa M. Hepburn, *State and Federal Gun Laws: Trends for 1970–99*, *in* EVALUATING GUN POLICY: EFFECTS ON CRIME AND VIOLENCE 345, 392–95 (Jens Ludwig & Philip J. Cook eds., 2003).

Consider the change in the gun robbery rate between the month before and the month after an add-on gun law goes into effect in a jurisdiction where robbery carries a sentence of six years and the add-on is two years. After the law change, criminals convicted of gun robbery will now receive sentences lasting eight years, rather than six. If there is no deterrent effect of the add-on law, there will be no difference in the number of defendants newly incarcerated the month before the introduction of the add-on law and the month after. If there is a change in the number of gun robberies in the month after the law's introduction, it cannot be due to a change in incapacitation, and the change may be attributed to the deterrent effect of the increased sentence length.

Several characteristics of add-on gun laws make them ideal for isolating the deterrent effect of incarceration. First, add-on laws were adopted in many different states, yielding many separate experiments to the analysis. Thus, I am able to expand on previous studies of deterrence,[72] which usually focus on a single state.[73] Second, the laws are generally only applied in cases where the underlying crime would merit a sentence of at least several years. This allows a good amount of time to detect the deterrent effect. Finally, add-on laws were adopted over a long time period (over forty years), during which there was substantial variation in crime rates. The temporal and cross-sectional variation in the adoption of add-on laws makes it possible to control for time trends and state fixed effects.

In order to measure the deterrent effect of add-on gun laws, it was necessary to hand-clean data from the *Uniform Crime Reports* ("*UCR*")[74] and collect data from state legislative histories on add-on gun laws as well as from published sources. The main empirical results are from a regression of the reported gun robberies rate on a dummy variable indicating that the add-on law had passed.[75] Essentially, the analysis is aggregating the data from all states that passed an add-on gun law and redefining the timing so that time zero in each state is when the law was passed (Figure 3). For example, if the law was passed in 1976 in Michigan and 1995 in North Carolina, year zero is 1976 in Michigan and 1995 in North Carolina. Table 1 reproduces these results, with each column representing a separate regression.[76]

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72. *See, e.g.*, Abrams, *supra* note 30.

73. *See, e.g.*, Kessler & Levitt, *supra* note 12 (examining deterrent effect of sentence enhancements in California); Colin Loftin & David McDowall, *The Deterrent Effects of the Florida Felony Firearm Law*, 75 J. CRIM. L. & CRIMINOLOGY 250 (1984).

74. The *UCR* is the most comprehensive collection of U.S. crime data, assembled annually by the FBI from over 17,000 local jurisdictions. *Uniform Crime Reports*, FED. BUREAU INVESTIGATION, http://www.fbi.gov/about-us/cjis/ucr/ucr (last visited Nov. 21, 2012).

75. *See* Abrams, *supra* note 30.

76. The log specification is preferred because it counts equivalent relative declines in per capita gun robberies equally. "Balanced panel" indicates that data points were included only if they were within seven years prior to, or six years after, the effective date for an add-on law. This

Across specifications there appears to be a consistent finding that gun robbery rates decline after add-on gun laws go into effect. The impact is insignificant in the first year but is statistically significant at the 1% level after two or three years.[77] The coefficients in Table 1 provide an estimate of the magnitude of the impact of the laws. Although the coefficients vary somewhat across specifications, there is a decline of 5–18% within the first three years of introduction of the law. In the preferred specification (column 8), which is the most conservative,[78] there is an impact which seems to level off to 6% within two years, and 5% within three years. Note that the addition of state-specific time trends does not affect the coefficient substantially. This provides some support for the notion that the timing of add-on gun laws is random.

In order to gain more information on the timing of the impact of the law change, I also estimate a regression of log per-capita gun robberies on dummy variables for year relative to the date of passage of the law change in a particular state.[79] The results, reported in Figure 3, support the findings discussed above. Gun robbery rates, both with and without controlling for state trends, are fairly stable in the years preceding implementation of an add-on gun law, then decline for approximately two years, and then level out.

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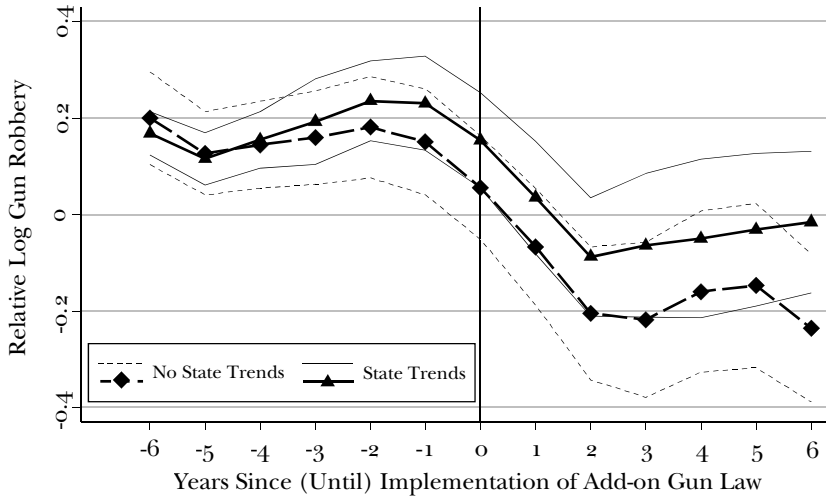
is the maximum range of data that is available for all states that passed add-on laws. In half of the specifications, the data is restricted to years after 1974 due to a discontinuity in several variables in a large number of agencies in 1975 in the *UCR* data. All errors reported allow for intra-state correlation and are weighted by state population. All specifications included state and year effects, and the controls for poverty rate, unemployment rate, racial composition, age composition, lagged police population share, and lagged imprisoned population.

77. This means there is less than a 1% likelihood that a result of size was found by chance.

78. This specification includes a balanced panel restricted to post-1974 data and with state-specific time trends. Panel data includes the same units observed at different points in time; for example, a panel data set may have annual data on individuals. However, there may not be an observation for every person in every year. For instance, in a panel, Person 1 may be represented for Years 1 to 5, Person 2 may be represented for Years 3 to 5, and Person 3 may be represented for Year 5 only. Balanced-panel data, on the other hand, would feature only those people with corresponding data in all of the years within the designated time period. For instance, using the previous example, a balanced panel for Years 3 to 5 would only feature Person 1 and Person 2, but not Person 3, who does not have data available for the full time period. Unbalanced panels will give more weight to states with no missing data, a problem that can be solved by restricting to a balanced panel.

79. *See* Abrams, *supra* note 30, at 43–44.

FIGURE 3
GUN ROBBERY RATE RELATIVE TO ADD-ON GUN LAW EFFECTIVE DATE



All regressions control for state and year fixed effects. For details, see tables.

The evidence from *UCR* data on gun robberies supports the notion that criminals are deterred by the implementation of add-on gun laws. There are a number of important confounds that could belie this interpretation, and they are addressed at length in my 2012 article.[80] But it is important to take note of the strength of the evidence presented here. By using panel data with state and time fixed effects, the attempt is made to rule out the possibility that spurious results could be obtained due to an overall national time trend in crime or endogeneity in passage of add-on gun laws.[81] Making use of timing dummies relative to the law's effective date allows for the detection of the dynamic response of crime relative to implementation of the law.

80. *See* Abrams, *supra* note 30.

81. The problem of endogeneity is a common one in the social sciences. In this case, the concern is that states pass add-on gun laws in response to changes in crime, making them unlike the ideal randomized experiment in which the timing of the law passage would be random.

TABLE 1

GENERAL DETERRENCE: IMPACT OF ADD-ON GUN LAWS ON GUN ROBBERY RATES

	Dependent Variable: Gun Robbery							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After Add-On Law	-0.142	-0.173**	-0.127**	-0.090	-0.168	-0.179**	-0.108**	-0.054*
Effective Date	(0.0776)	(0.0524)	(0.0406)	(0.0245)	(0.0859)	(0.0612)	(0.0300)	(0.0244)
State-Specific Time Trends	No	Yes	No	Yes	No	Yes	No	Yes
Balanced Panel	No	No	Yes	Yes	No	No	Yes	Yes
Restrict to Post-1974	No	No	No	No	Yes	Yes	Yes	Yes
Observations	15,516	15,516	2975	2975	12,979	12,979	2234	2234
R-Squared	0.168	0.179	0.182	0.190	0.165	0.175	0.182	0.187

* indicates significance at $p < 0.05$ ** indicates significance at $p < 0.01$

Note: This table reports the impact of add-on gun laws on gun robbery rates within three years of the law change. The data consists of agency-year level observations. Standard errors reported in parentheses are clustered at the state level to allow for intrastate correlation in error structure. All specifications include state and year fixed effects. Controls include poverty rate, unemployment rate, racial composition, age composition, lagged police population share, and lagged imprisoned population share.

Adapted from Abrams, *supra* note 30.

Several of the most recent empirical papers on general deterrence have now been discussed, but each uses a slightly different approach. To be useful, it is necessary to have one statistic with which to compare the papers: elasticity. Elasticity is the percentage change in one variable in response to a percentage change in another. The elasticity of crime with respect to sentence length (due to general deterrence) is defined as:

$$\eta_{GD} = \frac{\%\Delta crime}{\%\Delta s} = \frac{\frac{\Delta crime}{crime}}{\frac{\Delta s}{s}}$$

Here *crime* is the number of criminal acts committed annually—whether detected or not—and *s* is the mean sentence length. This quantity may be estimated using any of the approaches discussed above.[82]

We can compare the elasticities that each of these studies find. "A quick back-of-the-envelope calculation yields an elasticity of approximately -0.10" in my 2012 article.[83] This magnitude is consistent with that found by Lee

82. As discussed above, η_{GD} is a negative number since longer sentences decrease crime.

83. Abrams, *supra* note 30, at 54.

and McCrary.[84] They bound allowable elasticities consistent with their data and model to have a magnitude no greater than -0.13,[85] although their preferred parameter values yield elasticities close to 0.[86] The largest recent empirical elasticity estimates come from Francesco Drago, Roberto Galbiati, and Pietro Vertova's 2009 article using Italian data, in which they find a magnitude of -0.74 for seven months.[87] This may be an indication that the substantially lower incarceration rate in Italy makes it difficult to extrapolate to the United States. A calculation using Eric Helland and Alexander Tabarrok's results from examining three-strikes-induced change in a 2007 article yields an elasticity around -0.07.[88]

B. Empirical Studies of Specific Deterrence

1. Background

While general deterrence operates on the general public through the threat of sanction, specific deterrence acts on the individual offender who has already received a punishment.[89] Understanding how the length of sentence affects recidivism is essential to a rational criminal justice policy, so it should not be surprising that a number of attempts have been made to estimate this relationship. As discussed above, theory suggests that the relationship between time served and recidivism could be either positive or negative. Incarceration could have a rehabilitative effect, which would lead to a negative relationship, or a criminogenic effect, which would result in a positive one. Most likely both effects are present and either may dominate, depending on the individuals and sentence length. Any empirical study will only detect the *net* effect; it cannot distinguish the positive and negative components.

A large fraction of studies on specific deterrence potentially suffer from a problem known as omitted variables bias ("OVB"). OVB is caused by the fact that most regressions do not include all of the variables that could impact a phenomenon. For example, many studies of specific deterrence

84. Lee & McCrary, *supra* note 51, at 34 (determining that the most negative sentence length deterrence elasticity is -0.13).

85. *Id.*

86. *Id.* at 32–33 ("The point estimates from our discontinuity analysis indicate an approximately 2 percent decline in the rate of criminal offending when a juvenile turns eighteen, when the expected incarceration length conditional on arrest jumps discontinuously by roughly 230 percent. This suggests a small 'reduced-form' elasticity of -0.007.").

87. *See* Drago, Galbiati & Vertova, *supra* note 49, at 258.

88. *See generally* Helland & Tabarrok, *supra* note 49.

89. LARRY J. SIEGEL, CRIMINOLOGY 125 (11th ed. 2012) ("The theory of specific deterrence (also called special or particular deterrence) holds that after experiencing criminal sanctions that are swift, sure, and powerful, known criminals will never dare repeat their criminal acts." (emphasis omitted)).

lack information on criminal history, severity of crime, or other personal traits that may impact subsequent recidivism. This causes the estimates of the impact of sentence length on recidivism to be biased.[90] Since most studies of specific deterrence suffer from this problem, I focus primarily on a few recent economic studies that attempt to explicitly account for it. They do so with a variety of approaches: matching techniques, regression discontinuity, instrumental variables, natural experiments, and even a field experiment.

2. Recent Literature

Two relatively recent reviews—Daniel S. Nagin, Francis T. Cullen, and Cheryl Lero Jonson's 2009 article; and Shawn D. Bushway and Raymond Paternoster's 2009 article—both discuss empirical work on recidivism and specific deterrence (the former is a much more extensive survey).[91] They cover a range of studies and both note the lack of consensus on the topic.[92] One important reason for the lack of consensus is that studies often seek to answer slightly different questions. There is variation in the definition of recidivism (re-arrest, re-incarceration, etc.), in whether the focus is the existence (the extensive margin) or amount (the intensive margin) of recidivism, in the duration of time subjects are monitored for recidivating activity, in the initial law enforcement action whose effect is being investigated, and in the geographic locale.

Some recent work addresses the OVB problem squarely, using quasi-experimental and IV techniques.[93] Quasi-experimental techniques have leveraged one-time prisoner releases and statutory changes in sentence lengths.[94] For example, in a 2007 article, Ilyana Kuziemko applies two

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90. *See* ANGRIST & PISCHKE, *supra* note 13, at 115.

91. *See* Shawn D. Bushway & Raymond Paternoster, *The Impact of Prison on Crime*, *in* DO PRISONS MAKE US SAFER? THE BENEFITS AND COSTS OF THE PRISON BOOM 119 (Steven Raphael & Michael A. Stoll eds., 2009); Daniel S. Nagin, Francis T. Cullen & Cheryl Lero Jonson, *Imprisonment and Reoffending*, 38 CRIME & JUST. 115 (2009).

92. *See* Nagin, Cullen & Jonson, *supra* note 91, at 177 ("A remarkable fact is that despite the widespread use of imprisonment across democratic nations and the enormous expansion of the prison system in the United States, rigorous investigations of the effect of incarceration on reoffending are in short supply.").

93. *Cf.* Paul Nieuwbeerta, Daniel S. Nagin & Arjan A.J. Blokland, *Assessing the Impact of First-Time Imprisonment on Offenders' Subsequent Criminal Career Development: A Matched Samples Comparison*, 25 J. QUANTITATIVE CRIMINOLOGY 227 (2009) (using propensity score matching to detect the effect of first incarceration on recidivism in the Netherlands).

94. For an example of the use of one-time prisoner releases to quantify specific deterrence, see *infra* notes 95–97 and accompanying text. Drago, Galbiati, and Vertova examine a natural experiment in Italy where all inmates incarcerated in 2006 received up to a three-year sentence commutation. Drago, Galbiati & Vertova, *supra* note 49, at 265 ("The [Collective Clemency Bill] reduces prison sentences by 3 years for a large number of inmates but does not extinguish the offense. As a consequence, on August 1, 2006, all those with a

approaches to estimate the magnitude of specific deterrence using data from Georgia state prisons.[95] A natural experiment that led to the release of 901 prisoners in 1981 provides the potential to compare prisoners with similar sentences and varying lengths of time served, where the variation is determined exogenously by when their sentences began.[96] The identifying

residual prison sentence of less than 3 years were immediately released from residential facilities."). While the experiment is dramatic and substantial deterrence is detected, the interpretation is difficult. *Id.* at 278 ("Our findings show that a policy that commutes actual sentences in expected sentences significantly reduces inmates' recidivism. Moreover, the results provide credible evidence that a 1-month increase in expected punishment lowers the probability of committing a crime. This corroborates the theory of general deterrence. The results indicate a large deterrent effect of expected punishment."). Since prisoners with longer sentence reductions also face higher penalties upon re-arrest, the net effect must be a combination of specific and general deterrence. *Id.* at 278–79. If, as some other studies suggest, the impact of specific deterrence is negative (less crime after longer incarceration) then general deterrence must dominate here since defendants who received greater commutations had larger drops in recidivism.

An even more recent paper using a European natural experiment uses the 1996 Bastille Day pardon in France to estimate the effect of sentence reductions on recidivism. Eric Maurin & Aurelie Ouss, *Sentence Reductions and Recidivism: Lessons from the Bastille Day Quasi Experiment* 3 (Inst. for the Study of Labor, Discussion Paper No. 3990, 2009), *available at* http://ftp.iza.org/dp3990.pdf ("[I]ndividuals who were in French prisons by Bastille Day benefited from a basic sentence reduction of one week, plus one additional week of reduction per residual month of sentence by Bastille Day, with total reduction not exceeding 4 months. By construction, this collective pardon generated a very significant discontinuity in the relationship between time served in prison and prospective date of release."). They find that a greater sentence reduction via the pardon leads to an increase in expected future recidivism. *Id.* at 21. For an example of the use of statutory changes in sentence length to quantify specific deterrence, see *infra* notes 98–100 and accompanying text.

In a 2009 article, Hjalmarsson uses a regression discontinuity approach made possible by the Washington State juvenile-sentencing guidelines. Randi Hjalmarsson, *Juvenile Jails: A Path to the Straight and Narrow or to Hardened Criminality?*, 52 J.L. & ECON. 779, 781 (2009) ("An individual is sentenced to a state facility for a minimum of 15 weeks if he or she falls above a prespecified cutoff in the grid; otherwise, he or she receives a more minor sanction, such as a fine or probation. Even in the absence of random assignment to residential placement, a causal effect can be identified by comparing the recidivism behavior of individuals on either side of the prespecified cutoffs, only one group of which was incarcerated."). She finds that juveniles who are incarcerated have a lower probability of recidivism than those that receive a local sanction that does not involve incarceration. *Id.* at 800 (finding that incarcerated youth have a thirty-seven percent lower risk of recidivism than unincarcerated youth). This is in contrast to the study by Paul Nieuwbeerta, Daniel S. Nagin, and Arjan A.J. Blokland discussed above, which found a positive effect of first incarceration on recidivism in the Netherlands. Nieuwbeerta, Nagin & Blokland, *supra* note 93, at 251.

95. Ilyana Kuziemko, *Going Off Parole: How the Elimination of Discretionary Prison Release Affects the Social Cost of Crime* 13–22 (Nat'l Bureau of Econ. Research, Working Paper No. 13380, 2007), *available at* http://www.nber.org/papers/w13380.pdf?.

96. *Id.* at 15 ("On March 18, 1981, the governor of Georgia ordered the state's Department of Corrections to free up more than 900 beds in order to reduce overcrowding in local jails. The GDC ranked its current non-violent inmates by day of prospective release (already set by the parole board) and released the first 901 on the list. Those at the top of the

assumption hinges sharply on there being no time trend or other direct relationship between date of incarceration and likelihood of recidivism. Using this approach and another making use of prisoner risk assessments, Kuziemko finds that sentence length has a substantial negative effect on recidivism: a three percent decline in recidivism for every extra month served.[97]

While Kuziemko uses a one-time prisoner release to estimate specific deterrence, Bushway and Emily G. Owens use a statutory change in sentence length. Bushway and Owens take a behavioral approach to understanding the impact of sentence lengths on crime.[98] A 2001 law change in Maryland provides them with a natural experiment whereby a natural reference for sentence length is changed but the actual sentences remain the same.[99] While not directly comparable to other studies examined, the authors find that shorter sentences relative to a reference point lead to higher recidivism rates.[100]

Four recent papers take an instrumental-variables approach to the question of specific deterrence, three of which use very similar instruments. Instrumental variables are another commonly used technique to simulate a randomized experiment. In this context, the ideal experiment would be to see sentences randomly assigned to offenders so that the researcher could measure their subsequent recidivating behavior. Due to ethical and legal restrictions, researchers instead look for circumstances in which a device influences sentence length in a random way and does not influence recidivism in any other way. In a 2011 article, I use the randomly assigned public defender ("PD") as the instrumental variable.[101] The assumption is that, because PDs vary in skill, the random assignment will impact sentence length but will not otherwise affect recidivism. Thus, a comparison of similar defendants, some of whom were randomly assigned to very good PDs and

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list had served almost all of the time the parole board recommended, but those at the bottom of the list had served considerably less time than was originally recommended.").

97. *Id.* at 24 ("The preferred estimates in Col. (4), for example, suggest that each month served decreases the probability of recidivism by about 3.0 percentage points . . . .").

98. Shawn D. Bushway & Emily G. Owens, Framing Punishment: A New Look at Incarceration and Deterrence 13–16 (Jan. 2010) (unpublished manuscript), *available at* www.human.cornell.edu/pam/people/upload/Framing-Jan-2010.pdf (using, as a natural experiment, the revision of the voluntary Maryland Sentencing Guidelines, which increased the recommended sentence length for several offenses to match judges' sentencing behavior).

99. *Id.*

100. *Id.* at 30–31 ("Conditional on the actual punishment that someone receives, increasing the recommended sentence by 10% will increase recidivism by 0.74 percentage points, roughly 1.2% of the mean. . . . Longer sentences are associated with lower recidivism rates.").

101. Abrams, *supra* note 32, at 14.

some of whom were unlucky and had very poor ones, will give a measure of the specific deterrent effect of sentence length.

3. Using Randomly Assigned Attorneys To Estimate Specific Deterrence

In a previous article I investigated the impact of individual attorneys on case outcomes using data from the Office of the Clark County Public Defender (Las Vegas, Nevada).[102] One of the central findings of this article is that there is substantial heterogeneity in attorney ability.[103] Because public defenders are randomly assigned to first-time offenders and there is large variation in expected sentence by attorney, I use attorney assignment as an instrument for sentence length. Based on attorney assignment, I then estimate the impact of time served on recidivism.[104]

An IV regression is also known as "two-stage least squares" ("2SLS"), where the first stage is a regression of the independent variable (sentence length) on the instrument (PD identity). Since sentences cannot be negative, I use a tobit regression for the first stage. A tobit regression is appropriate when the dependent variable must be non-negative. The results of the IV regression are best reported visually, as in Figure 4, which plots recidivism rates against predicted sentence length. This figure shows a complicated relationship between recidivism and sentence length, one that is not well-captured in a standard linear regression. There is a generally negative relationship between recidivism and sentence length, although this relationship does not appear to be very linear. While longer sentences may reduce recidivism for short sentence lengths, the effects rapidly peter out. The relationship is best approximated by a negative linear relationship for short sentence lengths and zero effect for longer ones.

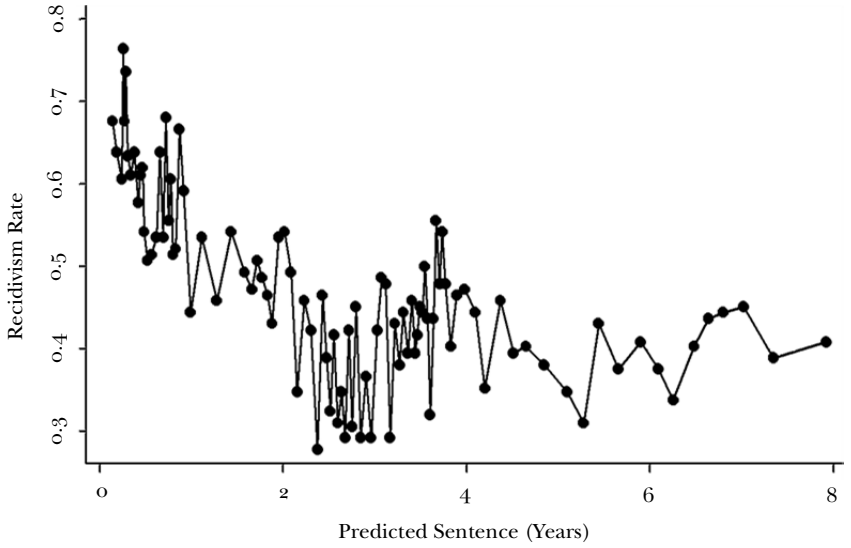
102. *See generally* David S. Abrams & Albert H. Yoon, *The Luck of the Draw: Using Random Case Assignment To Investigate Attorney Ability*, 74 U. CHI. L. REV. 1145 (2007).

103. *Id.* at 1166 ("Going from the tenth to ninetieth percentile of public defender ability decreases the defendant's expected sentence length by 5.8 months, or 82 percent of the mean sentence.").

104. Abrams, *supra* note 32, at 21 ("While longer sentences may reduce recidivism for short sentence lengths, the effects rapidly diminish."). One challenge present in this context is that the relationships investigated are complicated and may not be well-suited to a single coefficient as in an ordinary least-squares or probit regression. I estimate both ordinary least-squares and IV regressions in this paper, using different assumptions about the sentencing distribution. Depending on the model for the sentencing distribution, I find either a negative relationship or, more frequently, no significant relationship between recidivism and sentence length. The relationship between the variables is not always monotonic, and I further explore it through non-parametric techniques.

FIGURE 4

THREE-YEAR RECIDIVISM RATE VS. PREDICTED SENTENCE
FIRST STAGE TOBIT



Several other papers have taken similar approaches. The closest to that used in my 2011 paper is found in a 2009 study by Emily Turner.[105] Employing the Clark County data set used here, Turner instruments for sentence length using random assignment to attorney and heterogeneity in attorney performance.[106] She finds a mostly insignificant relationship between sentence length and recidivism, although one that varies somewhat by the recidivism window.[107]

In a 2013 publication Charles Loeffler uses judge-specific sentencing tendencies and random case assignment to obtain exogenous variation in

105. *See* Emily Elizabeth Turner, Using Random Case Assignment and Heterogeneity in Attorney Ability To Examine the Relationship Between Sentence Length and Recidivism (2009) (unpublished M.A. thesis, University of Pennsylvania) (on file with University of Pennsylvania Library).

106. *Id.* at 3 ("Heterogeneity in attorney performance permits investigation into the relationship between sentence length and recidivism with random assignment to defenders serving as a proxy for random assignment of actual sentences.").

107. *Id.* at 26–27 ("The results presented reveal no significant relationship between sentence length and recidivism within one year of street time. . . . [One] factor potentially affecting these results could stem from sample selection. The date range of the sample was based on the case opening date rather than closing because random assignment occurs when cases begin. This introduces the possibility for truncation bias.").

sentence length.[108] This study, using data from Essex County, New Jersey, also focuses on the extensive margin and does not find a strong relationship between incarceration and recidivism.[109]

Donald Green and Daniel Winik in a 2010 article take a very similar approach to that employed by Loeffler.[110] The article uses data from the D.C. Superior Court and both find little relationship between sentence length and recidivism.[111] They find a negative and statistically significant relationship between incarceration length and recidivism using ordinary least-squares regressions.[112] The sign becomes positive and the effect statistically insignificant, however, when IV estimation is performed, although the standard errors are larger.[113]

Perhaps the single most significant contribution to the literature on specific deterrence comes from a little-known field experiment performed by the California Department of Corrections in the 1970s.[114] The authors randomized a six-month early release among felons serving time in 1970.[115] They compare one- and two-year recidivism rates between the treatment and control groups and find no significant difference.[116] However, a simple t-test on the data indicates that the early release group recidivated at a

108. Charles E. Loeffler, *Does Imprisonment Alter the Life Course? Evidence on Crime and Employment from a Natural Experiment*, CRIMINOLOGY (forthcoming 2013) (online version at 7–8), *available at* http://onlinelibrary.wiley.com/doi/10.1111/1745-9125.12000/pdf ("The individual sentencing tendencies of judges have long been shown to be a strong predictor of whether and for how long a convicted criminal will be sentenced to prison. As such, interjudge sentencing disparities are an appropriate form of exogenous variation: They predict assignment to treatment and the *outcome* of the treatment only through the mechanism of the treatment itself. Thus, for those individuals whose sentences were affected by this random variation in assignment to treatment, unbiased estimates of the effect of imprisonment on different life-course outcomes can be produced." (citations omitted)).

109. *Id.* at 15 ("In practice, judges who use substantially less imprisonment have virtually the same cumulative caseload recidivism rates as judges who use substantially more imprisonment.").

110. *See* Donald P. Green & Daniel Winik, *Using Random Judge Assignments To Estimate the Effects of Incarceration and Probation on Recidivism Among Drug Offenders*, 48 CRIMINOLOGY 357 (2010).

111. *Id.* at 381 ("[I]ncarceration seems to have little net effect on the likelihood of subsequent rearrest.").

112. *Id.* at 375–76 tbl.6.

113. *Id.* at 377–78 tbl.7.

114. JOHN E. BERECOCHEA & DOROTHY R. JAMAN, CAL. DEP'T OF CORR., TIME SERVED IN PRISON AND PAROLE OUTCOME: AN EXPERIMENTAL STUDY, REPORT NUMBER 2 (1981).

115. *Id.* at 1–6.

116. *Id.* at 16 ("Within the first year and second year following release to parole, the experimentals and controls did not differ on the likelihood of their being returned to prison . . . . And there were no statistically significant differences between the experimentals and controls among those who were not returned to prison. The conclusion from this project is that prison terms can be reduced without affecting recidivism to a significant and practical degree.").

significantly higher rate, supporting the notion of a negative relationship between recidivism and sentence length.[117] Taken together, these studies seem to find fairly consistent evidence of specific deterrence for low sentence ranges, but not for longer ones. I use the results of my 2011 paper[118] to calibrate the specific deterrence components of the cost–benefit calculation below.

C. EMPIRICAL STUDIES OF INCAPACITATION

1. Background

While the deterrence effects discussed so far focus on how the threat or experience of incarceration modifies the current or future commission of crime, incapacitation measures a much more direct effect: the current reduction in crime due to removing inmates from society.[119] The values of the effects on incapacitation discussed below are taken not from my own research, but from several recent papers that produce the most credible estimates of the crime-reduction impact of incapacitation. I review some of these papers and then use their estimates in calculations in Part III.B.

There are several important challenges inherent in incapacitation research. First, the relationship between incapacitation length and crime is a complicated one, with the causal arrow almost certainly going in both directions. In other words, there may be a positive correlation between prisoners and crime rates, but that does not mean that prison causes crime. The level of imprisonment surely affects crime, but the level of crime must also affect the prison population. Two potential solutions to this problem have been attempted: (1) structural modeling of the relationship and (2) the use of instrumental variables to break the simultaneity. The aim of either approach is to find a causal estimate of the elasticity of crime with respect to incarceration rate and/or the average number of offenses averted due to incapacitation (λ in the criminology literature). The advantages of IV strategies have been discussed above. The shortcoming of structural modeling is that the estimates are right only if the (untestable) model is correct. Still, in some circumstances the assumptions of the model may be reasonable and there may be few other available approaches.

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117. Author's calculations.

118. *See* Abrams, *supra* note 32.

119. SIEGEL, *supra* note 89, at 127 ("Placing offenders behind bars during their prime crime years should lessen their lifetime opportunity to commit crime. The shorter the span of opportunity, the fewer offenses they can commit during their lives; hence crime is reduced. This theory, known as the incapacitation effect, seems logical." (emphasis omitted)).

2. Recent Literature

Levitt attempts to separate incapacitation from deterrence by comparing the impact of arrest rates on crime rates for one crime with crime rates for other crimes.[120] While there are endogeneity concerns with this approach, Levitt finds a larger impact of deterrence than incapacitation.[121] His incapacitation estimates suggest that an additional person-year of incapacitation prevents 5.1 to 8.2 index crimes, depending on category.[122] He notes that these numbers are somewhat lower than self-reports of twelve to fifteen estimated crimes per year.[123] This disparity could be due to multiple-offender commission of single crimes.[124] Offender reports also do not account for "replacement" effects—the result that foregone crimes not committed by incarcerated offenders are likely to be at least partially replaced by non-incarcerated individuals.[125]

Some of the best recent work on incapacitation was published in an issue of the *Journal of Quantitative Criminology* organized by Shawn D. Bushway and Peter Reuter. The papers in this issue summarize much previous work from both the economic and criminology perspectives, and add new estimates. An article by Alex R. Piquero and Alfred Blumstein surveys much of the recent literature and reports on estimates of the elasticity of crime with respect to incapacitation:

> Estimates of the crime-reduction potential of incapacitation are both numerous and diverse, reflecting different assumptions made by different researchers (Cohen 1983; Visher 1987). Most incapacitation studies suggest that prison exerts a significant suppression effect on crime; however, the estimated effects vary markedly from study to study depending on the extent of incapacitation, how much the prison population is increased, and the values of the model parameters used (Spelman 2000a; Weatherburn et al. 2006). In an early review, Cohen (1978, pp. 219–221) estimated elasticities of -0.05 to -0.70, while Spelman's (1994, p. 220) estimates ranged from -0.12 to -0.20, with a best guess estimate of -0.16. DiIulio and Piehl (1991), using Wisconsin prisoner data from 1989, report an elasticity estimate of -0.22, while Piehl and DiIulio's (1995) analysis of New Jersey offender data indicates an elasticity estimate of -0.26. Likewise, Weatherburn

120. *See* Levitt, *supra* note 16.

121. *Id.* at 368–69 & tbl.7 (finding that deterrence is generally a stronger predictor of the effects of arrest than is incapacitation).

122. *Id.* at 369–70.

123. *Id.* at 370.

124. *Id.*

125. *Id.*

> and colleagues (2006) carried out an analysis of burglary offenders from New South Wales and obtained an adjusted elasticity of burglary with respect to imprisonment of -0.3. Many of these estimates include an elasticity of -0.2, meaning that a 5% increase in the prison population would achieve a 1% reduction in crime.[126]

Piquero and Blumstein include a number of studies that do not overcome the endogenous relationship between incarceration rates and crime. Still, the range of elasticities (-0.3 to -0.2) estimated in these studies are not far off from others that attempt to deal with this problem more explicitly.[127] I summarize the elasticity estimates from the most reliable studies in Table 2.

TABLE 2

INCAPACITATION

Paper	**λ (Crimes/Year Avoided)**	**Elasticity**
Marvell & Moody (1994)		0.16
Levitt (1996)	5–8	0.31
Sweeten & Apel (2007)	4.9–8.4	
Bhati (2007)—person	1.93	0.93
Bhati (2007)—property	9.47	0.69
Owens (2009)	1.5	
Johnson & Raphael (2011)—property	9	0.15–0.21
Johnson & Raphael (2011)—violent	0.15	0.06–0.11

Note: This table reports estimates from selected papers of averted crimes due to incapacitation and incapacitation elasticity of crime.

Sources: Avinash Singh Bhati, *Estimating the Number of Crimes Averted by Incapacitation: An Information Theoretic Approach*, 23 J. QUANTITATIVE CRIMINOLOGY 355, 369 fig.4 (2007); Levitt, *supra* note 12, at 345 tbl.8; Thomas B. Marvell & Carlisle E. Moody, Jr., *Prison Population Growth and Crime Reduction*, 10 J. QUANTITATIVE CRIMINOLOGY 109, 133 (1994); Emily G. Owens, *More Time, Less Crime? Estimating the Incapacitation Effect of Sentence Enhancements*, 52 J.L. & ECON. 551, 554 (2009); Sweeten & Apel, *supra* note 16, at 318; Rucker Johnson & Steven Raphael, How Much Crime Reduction Does the Marginal Prisoner Buy? 2–3 (Oct. 2010) (unpublished manuscript), *available at* http://ist-socrates.berkeley.edu/~ruckerj/johnson_raphael_crimeincarcJLE.pdf.

In the same issue of the *Journal of Quantitative Criminology*, Avinash Singh Bhati uses a structural model of the offending process to estimate the

126. Alex R. Piquero & Alfred Blumstein, *Does Incapacitation Reduce Crime?*, 23 J. QUANTITATIVE CRIMINOLOGY 267, 270 (2007).

127. *See id.*

incapacitation effect.[128] He estimates his information-theoretic model using data from about a dozen state prisons on inmates released in 1994.[129] He finds estimates of mean crimes averted that are in line with other studies. For property crimes, an average of 8.47 are averted per year of incarceration; the mean is 1.93 for crimes against persons.[130] Bhati's elasticity estimates are substantially larger in magnitude than much other work, with a mean of 0.93 for crimes against persons and 0.69 for property crimes.[131]

In a 2009 article Emily G. Owens uses a natural experiment to attempt to estimate the magnitude of the incapacitation effect.[132] A 2001 change in Maryland law reduced sentences for young offenders with juvenile records.[133] Owens is thus able to gain a causal estimate of incapacitation on crime for this group. She finds a comparatively low impact of the foregone incarceration: about 1.5 crimes per year, a number several times lower than other estimates.[134] This may be because the affected group is a particularly low-offending one.

Most recently, in a 2011 article, Rucker Johnson and Steven Raphael use the fact that incarceration rates adjust to permanent shocks with a dynamic lag in order to estimate incapacitation effects.[135] They find "elasticities of between -0.06 and -0.11 for violent crime and between -0.15 and -0.21 for property crime."[136] Moreover, they present evidence that the magnitude of the elasticities has declined in more recent years.[137]

Examined together, there is a good deal of variation in incapacitation elasticities (Table 2). Thus for the main cost–benefit analysis, I choose estimates in the middle of the range but examine the impact of variation in the incapacitation effect as part of the sensitivity analysis.

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128. Avinash Singh Bhati, *Estimating the Number of Crimes Averted by Incapacitation: An Information Theoretic Approach*, 23 J. QUANTITATIVE CRIMINOLOGY 355, 357 (2007).

129. *Id.* at 361 ("[Bureau of Justice Statistics] tracked a sample of 38,624 prisoners released from 15 state prisons in 1994 for a period of 3 years.").

130. *Id.* at 365–66.

131. *Id.* at 368–69.

132. Emily G. Owens, *More Time, Less Crime? Estimating the Incapacitative Effect of Sentence Enhancements*, 52 J.L. & ECON. 551, 551–54 (2009).

133. *Id.* at 554 ("On July 1, 2001, a policy change reduced the age at which an offender's juvenile record was excluded from the criminal history, from 26 to 23 years.").

134. *Id.* ("[O]ffenders are arrested at a mean rate of 2.8 times per year and are involved in approximately 1.5 index crimes . . . .").

135. Rucker Johnson & Steven Raphael, How Much Crime Reduction Does the Marginal Prisoner Buy? 31–32 (Oct. 2010) (unpublished manuscript), *available at* http://ist-socrates.berkeley.edu/~ruckerj/johnson_raphael_crimeincarcJLE.pdf.

136. *Id.* at 2–3.

137. *Id.* (finding smaller elasticities for the 1991–2004 time period compared to the 1978–1990 time period, suggesting "that recent increases in incarceration have generated much less bang-per-buck in terms of crime reduction").

D. COST OF CRIME

Of crucial importance in thinking about incarceration from a utilitarian perspective is the ability to use a single measure to balance the different costs and benefits that it produces. Although it may seem inadequate, or in some cases inappropriate, the approach that economists take is to denominate all the quantities in dollars. This requires determining the cost of crime, the figure in this calculus with perhaps the greatest uncertainty.

There are several primary methods used to estimate the costs of crime, of which I focus on the two most prominent: the bottom-up and the top-down approaches.[138] Research using the bottom-up approach attempts to list all the ways in which crime can inflict costs on society, then it estimates each of these costs and aggregates them.[139] The other primary approach goes by several different names: top-down, willingness-to-pay, or contingent valuation. Rather than aggregating up various costs, research using this method relies on surveys of individuals that ask a series of questions aimed at determining the total amount that a reduction in crime would be worth.

The first challenge of the bottom-up approach is to enumerate all of the potential social costs of crime.[140] Mark Cohen and co-authors have written extensively about calculating the cost of crime from this perspective. For example, in a 1988 study by Cohen, he uses a variety of data sources to estimate medical costs and lost wages.[141] To this, he adds "pain and suffering" costs by comparing the distribution of injuries with jury awards in personal injury cases.[142] Ted R. Miller, Cohen, and Brian Wiersema, in a 1996 article, take a similar approach, but the jury awards are from cases

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138. The other main approach that I do not detail here is called hedonic pricing. This approach infers the cost of crime by comparing similar assets, for example houses, that vary only by the area crime rates where they are located. There has not been much recent research along these lines because it is very difficult to find such comparisons where crime rates are the only difference. *See, e.g.*, Richard Thaler, *A Note on the Value of Crime Control: Evidence from the Property Market*, 5 J. URB. ECON. 137 (1978).

139. *See, e.g.*, TED R. MILLER, MARK A. COHEN & BRIAN WIERSEMA, NAT'L INST. OF JUSTICE, VICTIM COSTS AND CONSEQUENCES: A NEW LOOK 1 (1996), *available at* https://www.ncjrs.gov/pdffiles/victcost.pdf; Mark A. Cohen, *Pain, Suffering, and Jury Awards: A Study of the Cost of Crime to Victims*, 22 LAW & SOC'Y REV. 537 (1988); Mark A. Cohen, Ted R. Miller & Shelli B. Rossman, *The Costs and Consequences of Violent Behavior in the United States*, *in* 4 UNDERSTANDING AND PREVENTING VIOLENCE: CONSEQUENCES AND CONTROL 67, 69–70 (Albert J. Reiss, Jr. & Jeffrey Roth eds., 1994).

140. Some of the costs included are not truly social costs as economists traditionally think of them. For example, $100 stolen from an individual and gained by the thief would count as no net social cost. In the cost of crime literature, this distinction is usually made by calling the aggregate costs "external costs." I use the term social costs here for convenience.

141. Cohen, *supra* note 139, at 542–43 (describing the use of insurance claim data, survey data on lost work days by injury, and data on court awards for injuries to estimate medical costs and lost wages).

142. *Id.* at 543–44 (describing the use of jury-awards data to estimate pain and suffering).

involving crimes.[143] Implicit in this approach is the assumption that juries are making awards of the amounts that individuals would be "willing to accept" to offset the crime. Of course, the shortcoming of these studies is that they omit a number of important costs. In a 1994 article, Cohen, Miller, and Shelli B. Rossman do include estimates of criminal justice costs, but this still leaves out a number of potentially important costs, such as fear, avoidance, costs to the offender, and costs to the community.[144]

Table 3 summarizes the cost of crime estimates from several different papers, which use differing methodologies. One may note the substantial variation in the estimates across both crime categories and methodologies. The contingent valuation methodology used in Cohen, Miller, and Rossman's 1994 article tends to give the highest estimates for most types of crime. This may be due to the fact that costs not included in a bottom-up approach are included with a contingent valuation approach. This approach more directly obtains the value that is appropriate for a utilitarian calculation, the total cost to society.[145] To do so, surveys ask respondents questions like, "Would you be willing to pay an extra $200 to reduce the likelihood of burglary by 10%?" Follow-up questions raise or lower the monetary amount to attempt to elicit the true value of the crime reduction to the respondent. By aggregating data from hundreds or thousands of subjects, these studies attempt to arrive at an average willingness-to-pay to avoid crime.

143. *See* MILLER, COHEN & WIERSEMA, *supra* note 139, at 2 (describing the use of data from the National Crime Victimization Survey, which "polls people over age 12 about rape, robbery, assault, larceny, burglary, and motor vehicle theft").

144. *See* Cohen, Miller & Rossman, *supra* note 139, at 91–101 (quantifying victim costs, including medical care, mental health care, and lost cash and property, but not quantifying indirect monetary and nonmonetary losses).

145. *See* Mark A. Cohen & Alex R. Piquero, *New Evidence on the Monetary Value of Saving a High Risk Youth*, 25 J. QUANTITATIVE CRIMINOLOGY 25, 35 (2009) (explaining that contingent valuation studies reduce the drawback of "bottom-up" studies not accounting for all potential costs of crime by asking individuals "to assess their value of reduced crime—regardless of what the cost components are").

TABLE 3
COST OF CRIME

	Bottom-Up			CV	Propensity Model	
Crime Type	**Cohen (1988)**	**Miller, Cohen & Wiersema (1996)**	**French & McCollister (2008)**	**Cohen, Miller & Rossman (2004)**	**Roman (2012) Mean**	**Roman (2012) Median**
Rape	103,525	131,287	222,374	267,884	158,293	19,150
Robbery	25,522	19,618	47,078	262,233	282,654	90,052
Assault	24,375	23	124,285	79,122	136,493	67,496
Burglary	2780	2264	4418	28,258	4501	792
Motor Vehicle Theft	6337	6036	9258	5481	15,369	6887
Theft	367	558	1494	829	2689	194

Source: Adapted from John K. Roman, *How Do We Measure the Severity of Crimes? New Estimates of the Cost of Criminal Victimization*, *in* 17 MEASURING CRIME & CRIMINALITY: ADVANCES IN CRIMINOLOGICAL THEORY 37, 61–62 (John MacDonald ed., 2011), and adjusted to 2010 dollars. CV indicates contingent valuation methodology.

While contingent valuation studies are more inclusive than bottom-up studies, they have some shortcomings as well. They rely on subjective responses by individuals to hypothetical questions rather than actual market transactions. Individuals may very well overestimate their willingness to pay in order to seem more altruistic to the surveyor or simply because of the absence of the need to actually make a payment.[146] This method is also sensitive to public knowledge of crime, which some studies have suggested can be quite inaccurate.[147]

Nevertheless, there are several recent studies that have used the contingent valuation approach. These studies generally have found higher costs of crime than studies that use the bottom-up approach.[148] The studies tend to focus on particular crimes or regions. For example, in a 2001 article, Jens Ludwig and Philip J. Cook employ the contingent valuation approach to quantify the benefits of reducing gun violence,[149] whereas Cohen and Piquero examine several different types of crime.[150] Cohen, Rust, Steen &

146. Mark A. Cohen, *Valuing Crime Control Benefits Using Stated Preference Approaches*, *in* COST–BENEFIT ANALYSIS AND CRIME CONTROL 73, 100–02 (John K. Roman, Terence Dunworth & Kevin Marsh eds., 2010).

147. *See id.* at 103–08.

148. *See, e.g.*, *id.* at 81 ("In the case of rape, Cohen and his coauthors (2004) used a willingness-to-pay [contingent valuation] methodology and estimated the cost to be $237,000 in 2000 dollars. This is about twice the estimate using the bottom-up approach . . . ."); *id.* at 88–89 tbl.4.4.

149. *See* Jens Ludwig & Philip J. Cook, *The Benefits of Reducing Gun Violence: Evidence from Contingent-Valuation Survey Data*, 22 J. RISK & UNCERTAINTY 207 (2001).

150. Cohen & Piquero, *supra* note 145, at 27.

Tidd's 2004 article is one of the most comprehensive contingent valuation studies, having sampled hundreds of subjects about an array of different crimes.[151] I use this study as the basis of some of the crime cost estimates in the cost–benefit calculation.

An additional limitation of most cost of crime studies is that they do not account for the substantial variation in crime costs, even within a particular crime category. Almost all crime studies to date report just one number, the mean expected cost of a particular category of crime. As discussed above, even getting to this value is a monumental challenge. This data limitation is a large part of the reason why there have been few prior attempts at cost–benefit analysis of incarceration and why those attempts that have been performed have had large uncertainties.[152] Most realistic changes in prison policy will cause an increase or decrease in crime, but the extra or averted crimes will likely have a cost well below the average crime. Until recently, though, crime cost data was not detailed enough to value these low cost crimes.

A recent paper by John Roman acknowledges the heterogeneity in crime severity, even within a particular category, and attempts to estimate its magnitude.[153] The intuition can be illustrated by considering the cost of a robbery. Most robberies will not involve physical harm to the victim, and thus the principal costs will be loss of property, psychological, and criminal justice costs. But in some robberies (fifteen percent or fewer, according to Jennifer L. Truman's 2010 report) the victim will be injured, adding medical bills, increasing psychological costs, criminal justice costs, and other intangibles.[154] Most robberies will have low costs, but the few particularly violent ones with much higher costs will substantially raise the average. Figure 5 illustrates the distribution of costs of a typical crime category. The bulk of crimes have low costs as depicted by the much higher line for low dollar amounts, but there is a long tail with higher costs. This causes the mean crime cost to be much higher than the median cost.

In considering policy changes, it is crucial to recognize that crime costs are distributed this way and that the cost of the marginal crime deterred or

151. Mark A. Cohen, Roland T. Rust, Sara Steen & Simon T. Tidd, *Willingness-To-Pay for Crime Control Programs*, 42 CRIMINOLOGY 89 (2004); *see also* Cohen, *supra* note 146, at 87 tbl.4.3.

152. John J. DiIulio, Jr. & Anne Morrison Piehl, *Does Prison Pay? The Stormy National Debate over the Cost-Effectiveness of Imprisonment*, BROOKINGS REV., Fall 1991, at 28; John J. Donohue III, *Assessing the Relative Benefits of Incarceration: Overall Changes and the Benefits on the Margin*, *in* DO PRISONS MAKE US SAFER? THE BENEFITS AND COSTS OF THE PRISON BOOM, *supra* note 91, at 269, 302–03.

153. *See* John K. Roman, *How Do We Measure the Severity of Crimes? New Estimates of the Cost of Criminal Victimization*, *in* 17 MEASURING CRIME & CRIMINALITY: ADVANCES IN CRIMINOLOGICAL THEORY 37 (John MacDonald ed., 2011).

154. JENNIFER L. TRUMAN, BUREAU OF JUSTICE STATISTICS, CRIMINAL VICTIMIZATION, 2010, at 7 (2011), *available at* http://bjs.ojp.usdoj.gov/content/pub/pdf/cv10.pdf.

not deterred may well be substantially different from the mean cost. In the next Part, I use this fact to obtain much more realistic estimates of the impacts of particular policy changes.[155] Later, I discuss how this differs from previous analyses and leads to substantially different and clearer predictions.[156]

The main reason previous studies have generally not incorporated the substantial heterogeneity in crime cost was due to the lack of empirical estimates of this heterogeneity. John K. Roman's 2011 paper uses a similar approach to Miller, Cohen, and Wiersema's bottom-up approach to calculating crime cost, but makes use of a substantially more detailed data set of jury awards.[157] This allows him to not only improve upon the earlier work of Cohen and his coauthors by gaining a more precise estimate of mean crime cost but also to add information about the distribution of the crime costs (Table 4).[158] Roman uses propensity-score matching in order to partially control for the fact that jury awards may vary between crime and non-crime cases.[159]

155. *See infra* Part III.

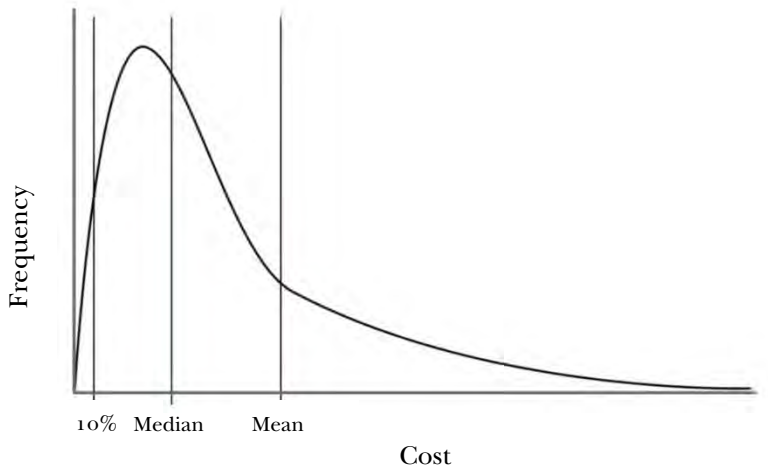
156. *See infra* Part IV.

157. *See* MILLER, COHEN & WIERSEMA, *supra* note 139; Roman, *supra* note 153, at 42–45.

158. Roman, *supra* note 153, at 57–59.

159. *Id.* at 51; *see also* ANGRIST & PISCHKE, *supra* note 13, at 86–91 (discussing some of the technique's limitations); Paul R. Rosenbaum & Donald B. Rubin, *The Central Role of the Propensity Score in Observational Studies for Causal Effects*, 70 BIOMETRIKA 41 (1983) (giving an introduction to propensity scores).

FIGURE 5
LONG-TAIL PROPERTY OF COST OF CRIME



Beyond a better understanding of how much crime costs can vary within a particular type of crime, incarceration policies would be better informed if we knew how crime costs vary according to other characteristics. For example, it is well-known that age is an important predictor of the rate of offending, but almost nothing is known about how the cost of crime varies with offender age.

TABLE 4
DISTRIBUTION OF CRIME COST

Crime Type	Mean	90%	75%	Median	25%	10%
Rape	151,454	241,443	217,191	19,150	3,569	1,411
Robbery	282,654	612,964	338,792	90,052	69,200	19,150
Assault	136,493	338,792	157,255	567,496	13,455	619
Burglary	5,267	6,256	2,619	927	263	14
Motor Vehicle Theft	17,984	46,337	20,146	8,059	3,022	45

Source: Adapted from Roman, *supra* note 153, at 57, 59, and adjusted to 2010 dollars.

One recent paper by Cohen and Piquero does examine how costs vary by age of offender for a group of repeat offenders.[160] They also examine how the cost of crimes committed by individuals varies by the number of police

160. Cohen & Piquero, *supra* note 145, at 31 & tbl.3, 39 & tbl.8, 40 & fig.1.

contacts.[161] This is exactly the type of data that can be extremely valuable to policymakers when considering what groups to release and what costs to expect. In this Article I use the findings of crime cost variation by crime category—but not by other characteristics—because of limits on available information on the incarcerated population and crime along other dimensions.

E. COST OF INCARCERATION

1. Cost of Prisons

Any policy change that decreases the prison population will increase the likelihood and costs of crime, but will also decrease the total costs to the government of imprisonment. In this Subpart, I discuss estimates of the direct costs of imprisonment, which include costs of feeding, housing, and monitoring prisoners; healthcare costs; and capital costs. In the next Subpart, I discuss additional costs associated with prison, many of which currently have no monetary estimates.

One simple way to estimate incarceration costs per prisoner is by simply obtaining state budget data and dividing it by the prison population. The most recent studies that report such data come from the Vera Institute of Justice and the Pew Center on the States.[162] These studies differ slightly in their methodologies, with the Vera Institute adding expenditures that appear in state budgets but are outside the states' corrections budgets.[163] The Vera study reports data for 2010,[164] whereas the Pew study has data from 2006 and 2008.[165] Additionally, the Vera study only includes forty states,[166] while the Pew study covers all fifty.[167]

Nonetheless, the findings of the two studies are quite similar, with an average annual cost per inmate of $31,360 (in 2010 dollars) in the Vera study and $31,537 (in 2008 dollars) in the Pew study.[168] This amounts to a

161. *Id.* at 30 & tbl.2.

162. CHRISTIAN HENRICHSON & RUTH DELANEY, VERA INST. OF JUSTICE, THE PRICE OF PRISONS: WHAT INCARCERATION COSTS TAXPAYERS (2012), *available at* http://www.vera.org/download?file=3542/Price%2520of%2520Prisons_updated%252oversion_072512.pdf; PEW CTR. ON THE STATES, ONE IN 100: BEHIND BARS IN AMERICA 2008 (2008) [hereinafter PEW, ONE IN 100], *available at* http://www.pewstates.org/uploadedFiles/PCS_Assets/2008/one%20in%20100.pdf.

163. These costs include such items as retiree health care costs for corrections employees, employee benefits, pension contributions, capital costs, and hospital and other health care costs for inmates. *See* HENRICHSON & DELANEY, *supra* note 162, at 2.

164. *See id.* at 3.

165. *See* PEW, ONE IN 100, *supra* note 162, at 5.

166. *See* HENRICHSON & DELANEY, *supra* note 162, at 6.

167. *See* PEW, ONE IN 100, *supra* note 162, at 8.

168. *See* HENRICHSON & DELANEY, *supra* note 162; PEW, ONE IN 100, *supra* note 162.

daily expenditure of approximately $86. These figures are in line with those found in previous works.[169]

Beyond the relative consistency in average daily prison costs, there is substantial variation across states. Both the Vera and Pew studies find that some states' annual costs are below $15,000 per prisoner, while others range above $50,000. Some of this is due to regional variation, with northeastern and western states averaging over $40,000 per prisoner per year, while the average in the South is only $22,000 per year. Costs per prisoner may also vary due to the differences in the capacities at which state prisons operate. Generally, operating a prison at or above capacity tends to decrease costs per inmate.

Since by far the largest component of prison costs—over two-thirds—is spent on employee compensation, it should come as no surprise that there is substantial regional variation.[170] Twenty-six percent of costs go to prisoner living expenses, with medical care accounting for just under half of that component (Figure 6).[171] Utilities, housing, and food make up the rest (with food accounting for just four percent of overall prison expenditures).[172] Capital expenditures also account for only four percent of the prison expenditures.[173]

169. In a 2007 article, David M. Bierie reports daily costs of $58 to $76 (2005 dollars) in Maryland, depending on the security level of the facility. David M. Bierie, Cost Matters: Application and Advancement of Economic Methods To Inform Policy Choice in Criminology 157 tbl.11 (2007) (unpublished Ph.D. dissertation, University of Maryland), *available at* http://drum.lib.umd.edu/bitstream/1903/6786/1/umi-umd-4271.pdf. These costs likely exclude some of the items identified in Vera's study and, thus, are likely 10–20% lower than actual costs. In a 2004 article James J. Stephan reports average operating costs of $62 per day (2001 dollars) in 2001, calculated using census data. JAMES J. STEPHAN, BUREAU OF JUSTICE STATISTICS, STATE PRISON EXPENDITURES, 2001, at 1 (2004), *available at* http://bjs.ojp.usdoj.gov/content/pub/pdf/spe01.pdf. Levitt cites several previous estimated costs of prison. *See* Levitt, *supra* note 12. These include Joel Waldfogel's 1993 article that estimated annual costs at $28,500 and John J. DiIulio and Anne Morrison Piehl's 1995 article that estimated $25,000. *Id.* at 347. A 1998 article by John Donohue and Peter Siegelman put the annual cost at $35,000, but this includes prisoners' estimated lost earnings and, therefore, is not comparable to the other figures. *Id.*

170. *See* STEPHAN, *supra* note 169, at 4.

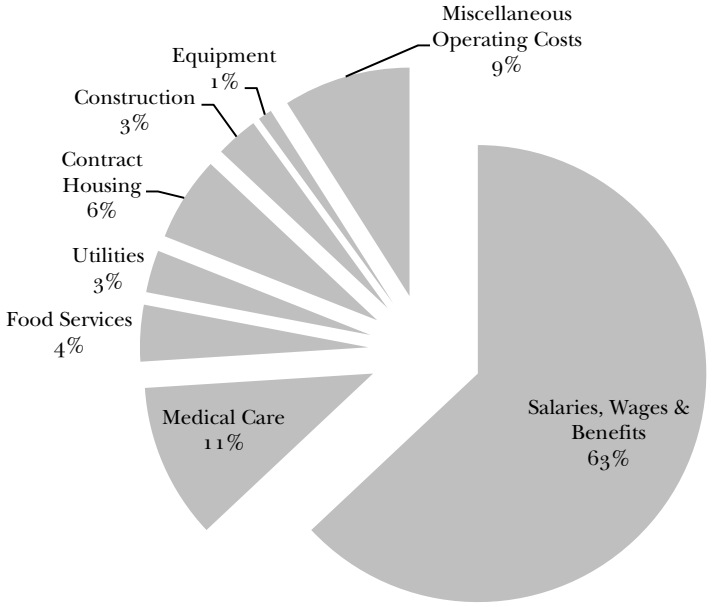
171. *Id.* at 6. This figure is from the most recent data available in 2001. Given the tremendous growth in healthcare costs since then, they almost certainly comprise the majority of prisoner living expenses today.

172. *Id.* at 6–7.

173. *Id.* at 4–5.

FIGURE 6

TOTAL PRISON EXPENDITURES BY COMPONENT



For purposes of the cost–benefit analysis, I don't consider the average prisoner, but rather the one likely to be affected by the examined policy change. Since data on prison costs are sparse to begin with, it is unsurprising that there are no studies that attempt to estimate variation in cost per prisoner. In all likelihood there is no substantial variation beyond that due to regional variation and different levels of security—most prisoners are subject to similar conditions. Therefore, I will use $86 as the base daily cost of imprisonment.

2. Lost Productivity and the Value of Freedom

While incarcerated, offenders are restricted from performing work that could be beneficial both to themselves and to society. They also lose a number of other opportunities afforded to those who are free, including the right to spend time with loved ones and friends, to eat what they please, to engage in preferred activities, and to go where they would like.

Some commentators believe that inmates' lost freedom should not be incorporated into any sort of cost–benefit or welfare analysis.[174] Foregone

174. Because of controversy over whether to include the value of freedom in cost–benefit analyses, some studies have expressly excluded value of freedom. *See, e.g.*, Cohen, Miller &

wages may be included since they could give an estimate of societal and not just offender loss due to gains from employment.[175] Whether to include the impact on families and friends is also a difficult question.[176]

In addition to the question of whether to include offenders' loss of freedom, one must determine how to quantify this seemingly abstract concept. The only recent paper on the subject is my 2011 article with Chris Rohlfs, which examined the most common domestic example of people literally paying for their freedom: bail.[177] Since bail is not generally set randomly, we made use of the random variation in bail amounts induced by the Philadelphia Bail Experiment to estimate defendants' willingness to pay for freedom.[178] The subjects of the study were all accused of felonies and most were eventually convicted and incarcerated. Thus, the application of this study's findings to the present study is appropriate.

The estimates of the value of freedom range substantially. We estimated the value of freedom for serious offenders at approximately $1000 for 90 days of freedom.[179] For less serious offenders, the value of freedom is estimated at $6800 for 90 days, though this estimate has a great deal of uncertainty.[180] While the value for serious offenders may seem low, the characteristics of the population help explain it. Only twenty-five percent of the serious offenders in the sample were employed, and those who were

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Rossman, *supra* note 139 at 83 ("[Another] potential cost is the value of lost freedom to an incarcerated offender. Beyond the social productivity loss, some would argue that society should consider the impact that prison has on the offender. Even if one wanted to include this as a cost element, it is particularly difficult to monetize."); Jeff L. Lewin & William N. Trumbull, *The Social Value of Crime?*, 10 INT'L REV. L. & ECON. 271, 278 (1990) ("We believe that the exclusion of criminal gains is mandated by the fundamental premises underlying welfare economics and cost–benefit analysis, which require that economists respect the constraints imposed by political and social institutions. Treating criminal gains as a contribution to social welfare ignores the reality that certain acts are not permitted but are expressly prohibited by criminal legislation." (footnote omitted)). *But see* Abrams & Rohlfs, *supra* note 13, at 753–54 (estimating inmates' value of freedom in order to determine the socially optimal level of bail).

175. *See* Mark A. Cohen, *Measuring the Costs and Benefits of Crime and Justice*, *in* 4 CRIMINAL JUSTICE 2000: MEASUREMENT AND ANALYSIS OF CRIME AND JUSTICE 263, 274 (David Duffee ed., 2000).

176. *Id.* (considering the psychological cost to the offender's family as a cost of society's response to crime).

177. *See* Abrams & Rohlfs, *supra* note 13.

178. *Id.* at 751 ("[J]udges randomly assigned to the treatment group were given bail guidelines to use, while members of the control group set bail as they had previously. The bail guidelines caused the treatment judges to set considerably lower levels of bail than those set by the control group. . . . This experiment allows us to obtain unbiased estimates of the effects of bail on posting, failure-to-appear at trial, and rearrests.").

179. *Id.* at 767 (estimating a criminal defendant to forego an average of $949 for every 90 days of incarceration).

180. *Id.* at 766 (estimating the value of freedom of a less serious offender to be $6770 for every 90 days of incarceration).

likely earned close to the minimum wage, around $300 per week.[181] This yields an expected loss of wages of around $1000 when accounting for all of the unemployed defendants, a figure that is similar to the estimated value of freedom.

The value of freedom also will incorporate any other differences between incarceration and freedom. These differences include foregone wages that the defendant could have been earning while incarcerated. This also includes the impact on friends and family, to the extent the inmate internalizes these effects. It also could include positive benefits from healthcare and reliable meals, which may be important to some of the most impoverished offenders.[182]

3. Other Costs of Incarceration

Thus far, this Article has focused on a number of mechanisms that should account for the first-order impacts of changes in incarceration. Before proceeding to the calculations of the impact of the proposed policy changes, I will briefly discuss other potential mechanisms by which incarceration changes could impact a cost–benefit analysis.[183]

Incarcerating offenders will lower other criminal justice costs, including those for policing, courts, and probation officers. I account for these costs by assuming that a large fraction of offenders would otherwise be on probation if they were not incarcerated and that these costs would be of similar magnitude.

A large number of inmates would likely impose costs on the state through welfare, foodstamps, and other social benefits if they were free. Thus, this may be seen as a net saving. At the same time, detention facilities must provide medical and mental health care to their wards. These costs are included in the costs of prisons, so it is likely that there is no appreciable net cost–benefit effect from social benefits.

One concern often raised about incarceration is its impact on long-term employment prospects.[184] A forward-looking offender should incorporate

181. *Id.* at 767.

182. The estimates are also likely to be a lower bound, since some offenders are likely credit constrained; therefore, they would be willing to pay more to avoid incarceration, but cannot borrow.

183. This list is not exhaustive, and any calculation like the one in this Article will necessarily be limited.

184. *See* BIBAS, *supra* note 11, at 22 ("Rather than reintegrating convicts, it exiled them from society for years, making it hard for them to resume law-abiding lives when they returned. One of the biggest barriers to reentry was that prisons bred idleness, not job skills and responsibilities."); *see also* Jeffrey R. Kling, *Incarceration Length, Employment, and Earnings* (Nat'l Bureau of Econ. Research, Working Paper No. 12003, 2006), *available at* http://www.nber.org/papers/w12003.pdf (investigating the labor market consequences of increasing sentence length).

this into the value of freedom. Diminished job opportunities may also result in higher recidivism rates, which are reflected in a lower specific deterrence estimate.[185]

Rehabilitation is sometimes put forth as a goal of incarceration.[186] While I do not attempt to quantify rehabilitation in moral dimensions, the economic effects may be quantified in terms of increased job prospects and decreased criminality. As mentioned above, any change in offending behavior due to incarceration will be incorporated into the specific deterrence estimates.

Much has been written about the long-term societal consequences of mass incarceration.[187] These are perhaps the most difficult elements to quantify, and include such phenomena as the promotion of racial stigma, poverty, absent parents, loss of economic mobility, distorted marriage markets for black women, detrimental effects on children, and increases in juvenile crime.[188] These large-scale, societal harms are certainly of a magnitude that they would significantly impact a cost–benefit analysis. However, in this Article I confine myself only to the consideration of policy changes with relatively short-term impacts on incarceration. Because the policy changes discussed in this Article do not result in the abolition of the large-scale use of incarceration in society, I assume that these long-term effects will remain relatively unchanged.[189]

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185. Of course, many potential offenders may not fully account for these future costs, which would make the value of freedom an underestimate.

186. *Cf.* BIBAS, *supra* note 11, at 15 ("In the twentieth century, rehabilitation- and then retribution-speak resurged in popular and academic discussion. But these theories did not reverse the fundamental shape of criminal justice in practice. In the professionalized world of lawyers, criminal justice remained fundamentally a mechanism of social control through prison.").

187. *See, e.g.*, James P. Lynch & William J. Sabol, *Assessing the Effects of Mass Incarceration on Informal Social Control in Communities*, 3 CRIMINOLOGY & PUB. POL'Y 267, 267 (2004) (finding that mass incarceration weakens "family formation, labor force attachments, and patterns of social interaction among residents"); Bruce Western et al., *The Labor Market: Consequences of Incarceration*, 47 CRIME & DELINQ. 410, 410 (2001) (reviewing the evidence to find a negative effect of incarceration on earnings).

188. *See, e.g.*, BIBAS, *supra* note 11, at 134 ("Incarceration also cuts prisoners off from their families, friends, and neighbors. Responsibilities as husbands and fathers are key factors that tame young men's wildness and encourage them to settle down. Thus, prisoners who do not maintain family relationships are much more likely to reoffend. Careful empirical studies confirm that marriage and fatherhood appear to inhibit crime after release; one longitudinal study found that marriage may reduce reoffending by 35%.").

189. Some other potential costs not explicitly accounted for include the increased spread of disease among inmates and crime committed within prisons, including prison rape. These costs are largely borne by the inmates, and thus, should be incorporated in the value of freedom.

An additional cost that has not been included is the deadweight loss of taxation.[190] This is simply the notion that since taxes distort choices (for example, an individual will work less than she would otherwise if she must pay income tax) they impose a social cost. Since incarceration is paid for out of tax revenue, these costs should be adjusted upward to account for the deadweight loss. Estimates for appropriate adjustment factors range from twenty-five percent upward.[191]

Some cost–benefit analyses incorporate this cost, while others do not. For the purposes of this analysis and the vast majority of proposed policy changes, the correct approach is to not incorporate the deadweight loss.[192] Louis Kaplow illustrates the intuition well in a 2004 paper with an example relevant to this article.[193] Assume that a crime-reduction strategy provides a benefit to individuals of 3% of income, and can be financed with a 2.5% increase in taxes. With no labor force distortion this clearly passes the cost–benefit test, but one might expect the increased tax rate to decrease the amount each individual works to such an extent that the policy would not have a net benefit. In actuality, individuals will not reduce their labor supply because the crime-reducing policy increases the utility of income such that it offsets the higher tax rate. For example, individuals may be less fearful of theft and so will work more even though taxes have increased. Therefore I proceed to the cost–benefit calculation with no need to account for deadweight loss of taxation.

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190. *See, e.g.*, Martin Feldstein, *Tax Avoidance and the Deadweight Loss of the Income Tax*, 81 REV. ECON. & STAT. 674 (1999).

191. JIM SAXTON, U.S. CONG. JOINT ECON. COMM., ECONOMIC BENEFITS OF PERSONAL INCOME TAX RATE DEDUCTIONS 13 (2001), *available at* http://www.jec.senate.gov/republicans/public (select "April" and "2001" from pull-down menus; click "Go"; follow "Economic Benefits" hyperlink) ("The Office of Management and Budget (OMB) incorporates a 25 percent deadweight loss measure into federal cost–benefit analyses. OMB rules require that each additional dollar of tax revenue count as a cost of $1.25 because taxes 'create an excess burden which is a net loss to society.' Therefore, for new government projects to make economic sense, they must generate benefits at least 25 percent greater than their explicit financing costs." (emphasis omitted)). "Scholarly research finds that the deadweight loss associated with general taxation ranges from 25 to 40 cents per dollar raised. An OMB 'rule of thumb' assumes that the deadweight loss associated with federal taxation equals 25-percent of revenues." Jerry Ellig & Jerry Brito, *Toward a More Perfect Union: Regulatory Analysis and Performance Management*, 8 FLA. ST. U. BUS. REV. 1, 13–14 (2009) (footnotes omitted).

192. *See generally* Louis Kaplow, *The Optimal Supply of Public Goods and the Distortionary Cost of Taxation*, 49 NAT'L TAX J. 513 (1996).

193. Louis Kaplow, *On the (Ir)Relevance of Distribution and Labor Supply Distortion to Government Policy*, J. ECON. PERSP., Fall 2004, at 159, 161–62.

III. COSTS AND BENEFITS OF THREE POLICY CHANGES

A. *ANALYTICAL FRAMEWORK*

Before computing the costs and benefits of imprisonment and averted crime, it is necessary to have a clear framework for how the components will be quantified and aggregated. The simplest way to do so is by going through each policy change and writing down an equation for the costs and the benefits.

First, I introduce several concepts that will be used throughout. As discussed in detail in Part II, each of the main mechanisms by which changes in sentencing may affect crime is measured somewhat differently. For general deterrence, scholars tend to estimate an elasticity of crime. As noted above, elasticity is the percentage change in one variable in response to a percentage change in another.

$$\eta_{GD} = \frac{\%\Delta crime}{\%\Delta s} = \frac{\frac{\Delta crime}{crime}}{\frac{\Delta s}{s}}$$

Here *crime* is the number of criminal acts committed annually (whether or not detected) and *s* is the mean sentence length. This quantity may be estimated using natural experiments or event studies, as in Kessler and Levitt and Abrams.[194]

Studies on specific deterrence tend to focus on the impact changes in time served have on subsequent recidivism rates. They estimate a derivative, $\frac{drecid}{ds}$, the change in recidivism rate in response to a one-unit change in sentence length.[195] As discussed in Part II, specific deterrence seems to be effective for relatively short sentences, but then falls to zero.[196] Since recidivism tends to be defined as a binary variable (either an ex-inmate does or does not reoffend during a time interval after release), in order to find an expected change in crime rate, one must use an estimate of average offending rate.

The average offending rate is usually denoted by the Greek letter λ, representing the number of additional crimes a prisoner would be responsible for annually when released.[197] As illustrated below, λ is necessary

194. Abrams, *supra* note 30; Kessler & Levitt, *supra* note 12. As discussed above, η_{GD} is a negative number because longer sentences decrease crime. *See supra* note 82 and accompanying text.

195. $\frac{drecid}{ds}$ could theoretically be positive if criminal capital accumulation outweighed the rehabilitative or deterrent effect of incarceration, but this does not appear to be empirically supported. *See supra* Part I.B.

196. For simplicity, I assume it has a linear effect to some cutoff, and then an effect of zero.

197. This is assumed to be the number of crimes committed in the "replacement" value, the number that would be committed in his or her absence.

for the calculation of the value of both specific deterrence and incapacitation.

Many of the variables discussed below are likely to vary (in some cases substantially) depending on different factors, such as type of crime, severity of crime, offender age, geographic location, and others. The empirical literature on the economics of crime is in its infancy, and thus, in most cases, it is unknown how much each one of these characteristics affects the parameters. When possible, I will use data that shows variation along some of these dimensions. For example, I will use the substantial variation in cost even within a particular category of crime depending on its severity. In addition, I will present the numerical results separately for different categories of crime. Thus, one may think about this framework as describing a representative crime within a category, e.g., a representative robbery or burglary.[198]

1. Policy 1: Increase All Sentence Lengths by $x\%$

An increase in sentence lengths will deter some people from committing crimes in the first place through general deterrence.[199] We can calculate this crime-reduction benefit in dollars as[200]:

$$Benefit_{GD} = \bar{c}x\eta_{GD} * crime$$

Here $\bar{c}$ is the cost of an average crime and the other variables are as defined above. An $x\%$ increase in sentence lengths will reduce crime through general deterrence by $x\eta_{GD}$.[201] This will yield a total reduction of crime of $x\eta_{GD} * crime$, which has a total value (in dollars) of:

$$\bar{c}x\eta_{GD} * crime$$

One may use a somewhat similar calculation for the incapacitation benefit of an $x\%$ increase in all sentence lengths[202]:

$$Benefit_{Inc} = \bar{c}x\lambda * prison$$

198. *See supra* Table 3 for a full list of crime categories considered.

199. Of course, x can also be negative if the policy change is a decrease in sentence lengths. I use positive changes in sentence lengths for expositional simplicity.

200. The benefit will come out negative since η_{GD} is a negative number—it is a cost savings. For simplicity, I drop the signs on numbers when performing the calculations.

201. As used in the equations, x is a decimal. For example, a 25% increase in sentence lengths is equivalent to using $x = 0.25$ in the equations.

202. Note that mean sentence length is not in this equation. This is because I implicitly assume that the timing of crimes is random and, thus, that the prison population reflects the mean sentence length. An increase in average sentence length of $x\%$ will result in an increased prison population of $x\%$.

Here, instead of an elasticity, I introduce λ, the number of additional crimes—above the replacement crime rate—a prisoner would be responsible for annually if released. The term $prison$ is simply the prisoner count. Thus, increasing all sentences by $x\%$ is the equivalent of increasing the prison population by $x * prison$.[203] This will result in $x\lambda * prison$ averted crimes, with an attendant cost savings of $\bar{c}x\lambda * prison$.

The calculation for specific deterrence is a bit more complicated, since specific deterrence does not appear to have an impact for all sentence lengths, but only for relatively short sentence lengths:

$$Benefit_{SD} = \bar{c} * \underbrace{x * \bar{s}_{effective} * \frac{drecid}{ds}}_{\text{Change in recid. rate}} * \underbrace{\lambda * prison_{effective}}_{\text{\# crimes for which spec. det. is effective}}$$

Here the subscript *effective* indicates the sentencing interval over which specific deterrence is effective; $\frac{drecid}{ds}$ is the amount the recidivism rate is reduced as the sentence length s increases within the effective interval; $\bar{s}_{effective}$ is the mean sentence length in the effective interval, and thus $x * \bar{s}_{effective}$ is the change in sentence length due to an $x\%$ overall increase in sentences. For small x's, $x * \bar{s}_{effective} * \frac{drecid}{ds}$ yields a good approximation for the decrease in recidivism rate due to specific deterrence. The term $prison_{effective}$ is the number of prisoners in the effective interval, so $\lambda * prison_{effective}$ denotes the number of crimes they would commit annually if not incarcerated. Multiplying this by the change in recidivism rate yields the expected total reduction in crime. Multiplying this by $\bar{c}$ gives the benefit of this reduction in dollars. The net benefit will simply be the sum of the benefits of crime reduction by each of the three mechanisms.[204]

The costs of increasing all sentences by $x\%$ come primarily from increased expenditures for imprisonment, and are substantially easier to compute:

$$Cost = (CP + VoF) * x$$

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203. This will actually be something of an overestimate since life and death sentences cannot be increased. This should not have a huge impact on the results, as life sentences account for only 0.3% of all sentences handed down to felons annually. *See* SEAN ROSENMERKEL ET AL., BUREAU OF JUSTICE STATISTICS, FELONY SENTENCES IN STATE COURTS, 2006—STATISTICAL TABLES 7 tbl.1.4 (2009), *available at* http://bjs.ojp.usdoj.gov/content/pub/pdf/fssc06st.pdf. Of course, this translates to a larger percentage of the prison population, but it is still a small minority. *See id.*

204. There is one small caveat—at what time does each of the benefits accrue? For general deterrence it will be immediate, but for specific deterrence and incapacitation, it will not be until after the increased sentences are experienced (at a time after the change is made). For simplicity, I assume no discount rate throughout this Article.

Where CP is the total expenditure on imprisonment and VoF is the value of freedom to a prisoner.

2. Policy 2: Crime Reclassification

One way states have dealt with prison overcrowding is by reclassifying some crimes so that they are no longer punishable by incarceration. The crimes most likely to be reclassified tend to be those that are lowest cost (e.g., possession of small amounts of drugs or low-value larcenies). One way to conceptualize a reclassification of some crimes is as a 100% decrease in sentence length, which could be seen as an application of the equations from the first policy change. When using that approach, however, it is important to note that the cost of the crimes committed by individuals that are now free due to non-incarceration is likely to be on the low end of the crime cost distribution. In other words, we must replace the mean cost $\bar{c}$ in the equations above with a new quantity, c_r, which represents the mean cost of only the low-end crimes.

To be concrete, I consider the impact of reclassifying the least serious r% of crimes that were previously subject to incarceration so that they may now not result in incarceration. I assume that individuals know exactly which sentence they are subject to, and thus, the policy change only impacts individuals who commit the reclassified crimes.

Unlike the first policy change, incarceration is assumed to decrease for this policy change, so crime changes will result in increased costs (since now sentences are lower and more potential criminals are on the streets). The cost due to general deterrence is:

$$Cost_{GD} = c_r * \eta_{GD} * crime_r$$

Where c_r indicates the mean cost of crime for the lowest r percent and $crime_r$ is the amount of crime attributable to the lowest r percent.[205]

The specific deterrence effect will be:

$$Cost_{SD} = c_r * s_r * \frac{drecid}{ds} * \lambda * prison_r$$

where s_r is the mean sentence of the bottom r percent of sentences and $prison_r$ is the number of prisoners impacted by the crime reclassification.[206] This multiplied by the derivative of recidivism yields the change in

205. We can approximate $crime_r$ as $r * crime$ if we assume that there is no correlation between cost per crime and quantity of crime committed. This is equivalent to the general deterrence equation for the first policy change where x is 1, since the sentence length is reduced to 0, or 100%.

206. I approximate this as $r * prison$, which is likely an overestimate. The true cost of specific deterrence is likely lower.

recidivism rate. Multiplying this by $\lambda * prison_r$ gives the total expected increase in crime, and taking the product of that with c_r gives the total cost.[207]

The cost from reduced incapacitation is easiest to quantify:

$$Cost_{Inc} = c_r \lambda * sentshare_r * prison$$

where $sentshare_r$ is the share of overall sentence length of the lowest r percent.[208]

The benefit of this policy change will come from reduced costs of imprisonment (including value of freedom):

$$Benefit = (CP + VoF) * sentshare_r$$

3. Policy 3: Prisoner Release

A one-time release of prisoners could be (and has been) implemented in multiple ways, including releasing: (a) those with the least time remaining on their sentences; (b) those who have committed the least serious crimes; or (c) the oldest or most ill inmates. The calculation for each type of release is similar; only the exact parameter values differ. I assume here a one-time release of *N* prisoners, which results in a mean sentence reduction of *D* days.

The general deterrent effect depends on how potential offenders view the release. If it is truly seen as a one-time release, then it will have no impact on their expectation of future punishment and, thus, no cost due to decreased general deterrence. If potential criminals do think a prisoner release is likely to be repeated within their offending careers, then it will decrease their expected sentence length and should have a general deterrence cost. The magnitude will depend on their assessment of the likelihood of recurrence and the specific type of release. I assume that potential criminals do not update their expected sentence based on one-time releases and, thus, that $Cost_{GD} = 0$.

As discussed in the Subpart on specific deterrence, there have been at least two studies of exactly such prisoner releases.[209] These studies provide estimates for the cost of such releases by virtue of decreased specific deterrence which can be quantified as:

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207. This requires two assumptions: (1) that sentence length corresponds to the same percentile of crime cost and (2) that the bottom r percent of sentences are all in the region where longer sentences specifically deter (i.e., that they are below the kink in Figure 4). If these assumptions do not hold, the cost due to decreased specific deterrence would likely be substantially lower.

208. This can be computed as $\int_0^r sent * f(sent)\, dsent/senttotal$.

209. *See supra* Part II.B.

$$Cost_{SD} = c_\theta \frac{D}{365} * \frac{drecid}{ds} * \lambda N$$

where c_θ is the cost per crime that will not be specifically deterred due to the shorter sentence. The parameter θ is used because the correct cost will likely be below the mean and vary depending on whether the prison release is policy (a), (b), or (c). This equation is an upper bound on specific deterrence costs, assuming that all released prisoners have short enough sentences that a somewhat longer sentence would have decreased crime upon release. With this assumption, $D * \frac{drecid}{ds}$ will be the change in recidivism rate per released prisoner, and λN multiplied by the quantity will be the total extra crimes.

It is difficult to know precisely what part of the cost distribution is appropriate to use, but for all three scenarios it should certainly be below the mean. We can conservatively use the tenth or twenty-fifth percentile as the average cost per crime.

The incapacitation effect is once again the easiest component to calculate. It is:

$$Cost_{Inc} = c_\theta \lambda N \frac{D}{365}$$

which is simply the amount of time the released prisoners will now be free and capable of committing crimes. Again, the correct value of c_θ is certainly below the median, and is likely very close to zero for the oldest released prisoners.

The benefit from a prisoner release is due to the reduced prison expenditures and value of freedom lost, and may be expressed as:

$$Benefit = (CP + VoF)N \frac{D}{365}$$

That is, the aggregate number of years these prisoners will not be incarcerated ($N \frac{D}{365}$) times the sum of the annual prison and value of freedom cost. I now use the best empirical estimates of these parameters as identified in Part II to perform the calculations described.

B. EMPIRICAL ANALYSIS

To this point, I have discussed the need for evaluating explicit policy changes using precise causal estimates of the primary mechanisms by which incarceration affects crime: general deterrence, specific deterrence, and incapacitation. I have just presented the analytical framework with which to perform the cost–benefit analysis and now am at the point of performing these calculations.

In this Subpart, I perform the cost–benefit analysis for each of the three policy changes. Since there are substantial differences across categories of crime, I do the analysis separately for each of six categories.[210] Ideally, the analysis would also take other types of variation into account, such as region or criminal history. The data that would be necessary for an analysis of that specificity does not currently exist, but I am able to take prisoner age into account to some extent in the evaluation of the third policy. Whenever they exist, I use estimates that are specific to the crime category, such as offending rates and prison populations. When some parameters are not available by type of crime (for example, general deterrence), I use the overall mean.[211]

Before beginning the cost–benefit calculations, it is first necessary to introduce a few additional values that will be necessary: crime levels and incarceration rates. The Uniform Crime Reporting Program ("UCR") assembles crime data collected by the FBI from nearly 17,000 law-enforcement agencies across the country.[212] This is by far the most comprehensive picture of crime in the United States. Since a good deal of crime goes unreported to law enforcement, these numbers must be adjusted by the reporting rate. The National Crime Victimization Survey ("NCVS"), produced by the Bureau of Justice Statistics ("BJS"), collects data on crime victimization from a national sample of individuals and households.[213] One of the data elements they collect is the fraction of crimes that were reported to the police. I use this data for 2010 and combine it with *UCR* data on reported crimes to get an estimate of the overall crime rate.[214] Figures 7 and 8 display how the reported crime rate has varied over the last fifty years.

210. *See supra* Table 3.

211. Doing the analysis separately by type of crime requires an additional simplifying assumption that criminals only commit crimes in a single category. This is clearly an oversimplification, but it is one that is worth making in order to gain some insight into the differential impact of incarceration policies by type of crime.

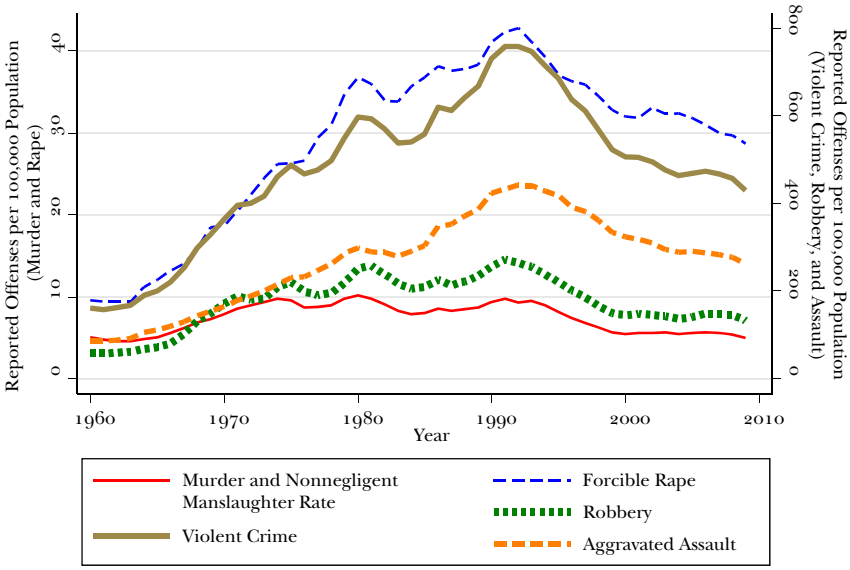
212. *See Uniform Crime Reports*, *supra* note 74.

213. TRUMAN, *supra* note 154.

214. NCVS also produces estimates of national crime levels based on its sampling. There is some concern that this may result in the undercounting of certain populations, including the homeless, individuals in institutions, and highly mobile populations. *Id.* at 6. The NCVS also only counts crimes against adults, which will also result in a lower number. *Id.*

FIGURE 7

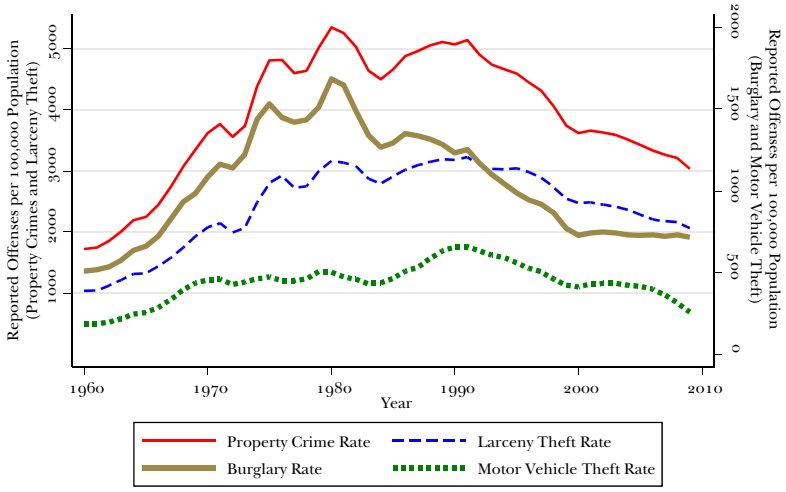
REPORTED VIOLENT CRIME RATES IN THE U.S., 1960–2009



Source: *Uniform Crime Reports*, *supra* note 74.

FIGURE 8

REPORTED PROPERTY CRIME RATES IN THE U.S., 1960–2009



Source: *Uniform Crime Reports*, *supra* note 74.

To get the incarcerated population for each type of crime, it is necessary to sum up the federal, state, and local jail populations.[215] In 2010, the BJS reported prisoners by crime only for state prisons.[216] I interpolated the values for jails in 2010 using the distribution of jail inmates by crime from 2002 (the last time it was reported) and adjusting for the overall jail population change.[217] For federal prisons, I assumed the same distribution of types of crime as in state prison. Therefore, I added fifteen percent to each state prison total because that is the ratio of the total federal to state prison populations.[218]

1. Policy 1: Increase All Sentence Lengths by *x*%

The cost–benefit analysis will be strongly dependent on the cost of crime estimates. In light of the recent advances in the cost of crime literature, I present the analysis of Policy 1 using four different cost of crime estimates (Table 5). For these calculations, I set $x = 10\%$ for an overall sentence length increase of 10%. It is easy to tell the impact of a prison population decrease of 10% by simply changing the signs on all of the calculated values. For the main calculations, I use the parameter estimates derived from the research discussed above.[219]

215. In this Article, I make the simplifying assumption that incarceration in a jail, state prison, or federal prison has the same effects. I also do not account for varying levels of security in prisons. While these facilities indubitably have different impacts, current data availability does not allow me to measure it.

216. PAUL GUERINO ET AL., BUREAU OF JUSTICE STATISTICS, PRISONERS IN 2010 (2011), *available at* http://bjs.ojp.usdoj.gov/content/pub/pdf/p10.pdf.

217. DORIS J. JAMES, BUREAU OF JUSTICE STATISTICS, PROFILE OF JAIL INMATES, 2002 (2004), *available at* http://bjs.ojp.usdoj.gov/content/pub/pdf/pji02.pdf.

218. *See* GUERINO ET AL., *supra* note 216; TODD D. MINTON, BUREAU OF JUSTICE STATISTICS, JAIL INMATES AT MIDYEAR 2010—STATISTICAL TABLES (2011), *available at* http://bjs.ojp.usdoj.gov/content/pub/pdf/jim10st.pdf.

219. I use an elasticity of 10% for general deterrence. I allow incapacitation to vary according to crime type by calculating it from the crime rate and prison population for each crime, using an elasticity of 15%. The specific deterrence effect is computed using the cutoffs described in Abrams. *See* Abrams, *supra* note 32. The cost of prison is estimated at $86 per day based on Vera and Pew. *See supra* notes 162–69 and accompanying text.

TABLE 5

COST–BENEFIT CALCULATIONS: POLICY 1

Crime Cost Data Source		Rape	Robbery	Assault	Burglary	Motor Vehicle Theft	Theft
Roman (2012) Mean	**Total Benefit**	781,756,000	5,682,578,000	6,736,787,000	564,125,000	543,907,000	2,327,476,000
	Gen. Deter.	268,361,000	1,795,665,000	1,768,964,000	165,327,000	135,841,000	521,426,000
	Spec. Deter.	23,721,000	179,590,000	229,532,000	18,426,000	18,854,000	83,446,000
	Incapacitation	489,674,000	3,707,323,000	4,738,291,000	380,372,000	389,212,000	1,722,604,000
	Cost	296,847,000	920,182,000	888,280,000	723,666,000	135,837,000	395,932,000
	Net Benefit	**484,909,000**	**4,762,396,000**	**5,848,507,000**	**(159,541,000)**	**408,070,000**	**1,931,544,000**
	Net Benefit / Prisoner	**5897**	**18,683**	**23,768**	**(796)**	**10,844**	**17,611**
Roman (2012) Median	**Total Benefit**	94,574,000	1,810,439,000	3,331,353,000	99,267,000	243,728,000	168,316,000
	Cost	296,847,000	920,182,000	888,280,000	723,666,000	135,837,000	395,932,000
	Net Benefit	**(202,273,000)**	**890,257,000**	**2,443,073,000**	**(624,399,000)**	**107,891,000**	**(227,616,000)**
	Net Benefit / Prisoner	**(2460)**	**3492**	**9928**	**(3115)**	**2867**	**(2075)**
Cohen et al. (2004)	**Total Benefit**	1,322,986,000	5,272,030,000	3,905,157,000	3,541,776,000	193,978,000	717,968,000
	Cost	296,847,000	920,182,000	888,280,000	723,666,000	135,837,000	395,932,000
	Net Benefit	**1,026,139,000**	**4,351,848,000**	**3,016,877,000**	**2,818,110,000**	**58,141,000**	**322,036,000**
	Net Benefit / Prisoner	**12,479**	**17,072**	**12,260**	**14,058**	**1545**	**2936**
Cohen (1988)	**Total Benefit**	511,274,000	513,109,000	1,203,044,000	348,452,000	224,265,000	317,344,000
	Cost	296,847,000	920,182,000	888,280,000	723,666,000	135,837,000	395,932,000
	Net Benefit	**214,427,000**	**(407,073,000)**	**314,764,000**	**(375,214,000)**	**88,428,000**	**(78,588,000)**
	Net Benefit / Prisoner	**2608**	**(1597)**	**1279**	**(1872)**	**2350**	**(717)**

Note: This table reports results of a cost–benefit calculation of a 10% increase in all sentence lengths, based on 2010 values of crime and incarceration rates using four different sources for crime costs. All figures are in 2010 dollars. See text for additional detail.

There are several points to note about Table 5. The costs and benefits are substantial, measuring in either the hundreds of millions or billions of dollars. In addition, a 10% increase in sentence length appears to have substantial net benefits for each of the crime categories except for burglary. This is due, in large part, to the substantial benefit of incapacitation, which is the largest benefit for each crime. General deterrence is important as well, but specific deterrence does not affect the results much.

This is borne out by a sensitivity analysis I performed (not reported in the tables) where I modified several of the parameter values. Modifying the parameters used for values of freedom, general deterrence elasticity, specific deterrence parameters, and cost of prison did not change the results significantly. The only reasonable parameter change that was significant was the incapacitation elasticity. When it was allowed to exceed 21%, all crime categories, including burglary, benefited from the longer sentences.

When using the median costs of crime, as presented in Roman's 2012 article, the policy change produces increased net costs for theft and rape, in

addition to burglary.[220] This is unsurprising because the median cost is lower than the mean for all crime categories, and thus, the reduction in crime from the increased sentence length is worth less. Now, even when performing a sensitivity analysis, the direction of the net benefit remains the same for all crime categories.

Cohen, Miller, and Rossman's 2004 article, which uses the contingent valuation method, has the higher crime costs for several categories.[221] This naturally makes longer sentences appear more cost effective as can be seen in the third section of Table 5, where the benefits outweigh the costs for all crime categories. Choosing a very low incapacitation elasticity (less than 0.05) causes a slight net loss for theft and motor vehicle theft, but all other categories retain a strong net benefit.

Finally, the cost–benefit analysis of Policy 1 using the crime costs from Cohen's 1988 article shows a net benefit for burglary, motor vehicle theft, and rape.[222] This cost–benefit calculation is also sensitive only to the elasticity of incapacitation. If it is set to 0.05, the policy yields net losses for all of the crime categories (although the losses are small). Taken together, it appears that the cost–benefit calculations for Policy 1 are somewhat sensitive to both the cost of crime values and the incapacitation elasticity. I discuss this further in Part IV.

It is important to note that while the figures in Table 5 are quite large, part of the reason they are so substantial (several times larger than the values in Table 6) is the huge number of affected prisoners. A 10% increase in all sentence lengths is the equivalent of adding over 200,000 prisoners nationwide. Thus, for comparison with Table 6, it is informative to look at the net benefit per prisoner. These numbers are still not directly comparable to those from the other policy changes, but they give the reader a better idea of the impact.

2. Policy 2: Crime Reclassification

For the cost–benefit calculation of Policy 2, I assume that the least costly 10% of crimes in each category are reclassified so that they are no longer subject to incarceration. This change will increase crime rates, but decrease costs of incarceration. The results of this cost–benefit analysis and that for Policy 3 are reported in Table 6.[223] One of the most significant differences from the Policy 1 analysis is that the costs of crime are substantially lower because the released individuals commit fewer and less costly crimes. This

220. *See* Roman, *supra* note 153, at 57–59.

221. *See* Cohen, Rust, Steen & Tidd, *supra* note 151, at 103.

222. *See* Cohen, *supra* note 139.

223. The analysis cannot be performed for theft because Roman does not report the full distribution of the cost of this crime.

effect is evident for all of the mechanisms because the magnitude of the impact on crime is substantially lower, in general, than in the first policy.

The net effect of Policy 2 is positive for each crime except for robbery. This is due largely to the substantial savings on incarceration costs. The benefit-to-cost ratio is greatest for property crimes, where the increase in expected costs of crime is under $1 million in each case. In fact, the cost of the bottom decile of theft is so low that it is not estimated in Roman's 2012 article,[224] and therefore I am unable to calculate the exact level of expected benefit.

Robbery is the one crime for which the cost–benefit analysis implies that more inclusive penalties might be optimal. This is due in large part to the fact that most robberies are quite costly, even at the low end of the distribution.

TABLE 6

COST–BENEFIT CALCULATIONS: POLICIES 2 & 3

Policy		Rape	Robbery	Assault	Burglary	Motor Vehicle Theft	Theft
Crime Reclassification	**Benefit**	25,813,000	42,604,000	59,071,000	56,880,000	12,905,000	22,885,000
	Total Cost	1,976,000	68,229,000	3,511,000	153,000	162,000	-
	Gen. Deter.	1,160,000	48,814,000	1,523,000	29,000	18,000	-
	Spec. Deter.	436,000	7,786,000	559,000	30,000	27,000	-
	Incapacitation	380,000	11,629,000	1,429,000	94,000	117,000	-
	Net Benefit	**23,837,000**	**(25,625,000)**	**55,560,000**	**56,727,000**	**12,743,000**	**22,885,000**
	Net Benefit / Prisoner	**2899**	**(1005)**	**2258**	**2830**	**3386**	**2087**
One-Time Prisoner Release	**Benefit**	5,934,000	5,934,000	5,934,000	5,934,000	5,934,000	5,934,000
	Total Cost	95,900	1,781,700	157,900	10,900	59,200	-
	Gen. Deter.	-	-	-	-	-	-
	Spec. Deter.	8700	162,000	14,400	1000	5400	-
	Incapacitation	87,200	1,619,700	143,500	9900	53,800	-
	Net Benefit	**5,838,100**	**4,152,300**	**5,776,100**	**5,923,100**	**5,874,800**	**5,934,000**
	Annualized Net Benefit / Release	**35,515**	**25,260**	**35,138**	**36,032**	**35,738**	**36,099**

Note: This table reports results of a cost–benefit calculation under two different incarceration policy changes, based on 2010 values of crime and incarceration rates, using Roman (2012) for crime costs. The crime reclassification assumes 10% of crimes in each category become not subject to incarceration. The one-time prisoner release assumes a release of 1000 prisoners in the bottom decile of crime cost with an average remaining sentence of 60 days. All figures are in 2010 dollars. See text for additional detail.

The results displayed in Table 6 are fairly stable with respect to changes in various parameter values. When using a substantially lower cost for the tenth-percentile robbery, as suggested by Cohen's 1988 article,[225] the resulting cost–benefit analysis parallels the rest of the crime categories: some

224. Roman, *supra* note 153.

225. Cohen, *supra* note 139, at 546.

reduction in penalties would be beneficial. Other parameter changes have little impact on the results. The per-prisoner values are generally in the low thousands of dollars. Given that a number of states have tens of thousands of prisoners, this translates to millions of dollars of potential savings and little expected increase in crime. This is true for all crimes examined except robbery, where expanding the number of offenders eligible for incarceration would maximize the net benefits.

3. Policy 3: Prisoner Release

The results of the cost–benefit calculation for the final policy change are reported in Table 6. This policy calls for the one-time release of a certain set of prisoners. For the calculation, I assume that 1000 prisoners are released early, leading to an average sentence reduction of sixty days. The prisoners could be chosen based on age, health, severity of crime, time left on sentence, or other criteria. Regardless of how they are chosen, the prisoners released will certainly offend far less than average and commit less costly crimes. I assume that both the cost of crime and offending rates will be in the tenth percentile.

The cost–benefit analysis shows that this policy results in a substantial net benefit for all crimes. The costs of decreased specific deterrence and incapacitation are small. This is due in large part to the fact that the extra crimes the released prisoners commit will likely not be very costly.

The most significant effect here is simply from the savings in prison costs. Even a reduction in a relatively small number of inmates (less than one percent of the California state prison population) for two months saves millions of dollars. This overwhelms the small increase in crime costs and leads to a substantially positive net benefit as well as a large benefit-to-cost ratio for each crime. Even when using a higher cost of crime or larger elasticities, the net benefits of this policy change are still large and positive for all crimes.

The savings per release are over $20,000 per year for each of the crime categories, an impressive figure that is substantially larger than the savings found for Policy 2. There is one caveat, however. This policy is not very scalable: the cost–benefit analysis is only applicable if the released offenders are some of the least frequent offenders and commit low cost crimes. The number of prisoners that could be released under this policy, with gains of this magnitude, depends on the specific policies that determine who is released.

IV. DISCUSSION

I have argued in this Article that cost–benefit analysis is the most effective way to inform policy decisions. There are several important points that are clear from the calculations above. Of the policies examined, the one-time prisoner release appears to be by far the most cost-effective

approach. This is almost entirely due to the fact that prisoner releases tend to pick out just those inmates who are least likely to cause substantial harm. They may be chosen due to the severity of offense, age, health, or remaining sentence length, all characteristics which predict low crime costs. Of course, the accuracy of the cost–benefit calculation for one-time releases depends in part on the selection of these low cost inmates. It also depends partially on the assumption that one-time releases do not cause a reduction in general deterrence, because would-be offenders understand that they will be unaffected. This assumption seems like a good one, since a search of the literature revealed only one example of a state with repeat prisoner releases in the past forty years (Alabama).[226]

The fact that prisoner release is cost effective across all crime categories examined may be somewhat surprising, given the large divergence in costs and offending rates by category. This is due to the fact that in categories with more costly crimes offending rates are frequently lower. But more to the point this reemphasizes the importance of using the cost of the actual crimes that would be committed by released prisoners, which will be well below the average.

Given these findings, what is a policymaker to do? Is prisoner release the solution to any budgetary or overcrowding problems? By its nature, one-time releases cannot be repeated, or they will begin to erode general deterrence and thus increase crime more substantially. For a state that has not had a substantial prisoner release in a couple of decades (an average offending career) this is the most cost-effective choice.

But policymakers looking for long-run improvements in the effective use of incarceration should also consider the second policy option, reclassification of some crimes. The results of this analysis show that net benefits increase for most crimes, including all property crimes, when the lowest level offenses do not lead to incarceration. Simply put, incarcerating someone for stealing a $1000 laptop is not very cost-effective. The opposite is true for robbery, however, where the cost–benefit analysis indicates that a broadening of the definition of robberies that are penalized by incarceration would be preferable.

California has already begun implementing just such law changes, including raising the threshold value for felony larceny. In addition, small violations of parole, such as missing a drug test or failing to update an address after a move, no longer trigger automatic incarceration. For property crimes, these changes appear to be cost-effective, and something that other states should consider emulating.

In comparison to prior cost–benefit research on incarceration, this Article adds a great deal of precision due to the concrete policy changes

226. Rawls, *supra* note 26.

considered, the focus on precisely estimated parameters in the cost–benefit analysis, and the separate analysis by crime category. John Donohue looked at the average cost of crime and found that the cost–benefit calculation could suggest an increase or decrease in incarceration depending on the parameter values.[227] Owens' findings mostly go in the opposite direction as those found here.[228] She suggests that greater incarceration for young offenders may be beneficial.[229] The fact that she has relatively large uncertainty and that she focuses only on youthful offenders (who have the highest offending rates) means that her results may still be compatible with this Article.

Earlier cost–benefit calculations by Levitt did incorporate variation in costs according to the type of crime.[230] However the uncertainties in his estimates led him to conclude only that the costs and benefits of crime are around the same order of magnitude. DiIulio and Piehl wrote in response to a 1987 National Institute of Justice report by Edwin W. Zedlewski that found the benefits of incarceration outweighed the costs by a factor of ten.[231] DiIulio and Piehl suggest that Zedlewski's result is substantially off. They find that the benefits outweigh the costs for the median cost criminal (across all crimes) but that the reverse is true for lower percentiles.[232] This is entirely consistent with the results of this study.

I have included the value of lost freedom as one of the components of the cost of incarceration for a few reasons. First, it includes much more than just a prisoner's foregone rights, but also includes foregone wages and the impact on loved ones. Second, a cost–benefit analysis generally includes the net effects on all individuals, even if they commit crimes. But importantly, the magnitude of the value of freedom is small and, as was seen in the previous Part, does not impact the direction of the findings. Thus, if one believes this cost should be eliminated from the calculations, the results would be largely unchanged.

The biggest growth in incarceration in the last two decades has been in drug crimes, a category that is not covered in this analysis due to the fact

227. Donohue, *supra* note 152, at 305.

228. *See* Owens, *supra* note 132.

229. *Id.* at 572.

230. Levitt, *supra* note 12.

231. EDWIN W. ZEDLEWSKI, NAT'L INST. OF JUSTICE, MAKING CONFINEMENT DECISIONS 1 (1987), *available at* http://www.d.umn.edu/~jmaahs/Correctional%20Assessment/Articles/prison%20pays%20articles.pdf; DiIulio & Piehl, *supra* note 152; *see also* Anne Morrison Piehl & John J. DiIulio, Jr., *"Does Prison Pay?" Revisited: Returning to the Crime Scene*, BROOKINGS REV., Winter 1995.

232. DiIulio & Piehl, *supra* note 152, at 33–34 & tbl.5.

that these cost estimates are virtually non-existent.[233] Given the widely divergent views that exist on the utility of many penalties for drugs, this is an area of particular interest for future work. Incorporating cost estimates for drug crimes and better estimates of incapacitation effects are the two advances that will most improve future analyses of the costs and benefits of incarceration.

V. CONCLUSION

The question of how best to deter unlawful behavior has existed for as long as societies have been governed by laws. This Article shows how it is possible to reduce crime by using incarceration in a more cost-effective manner. The cost–benefit analysis performed here breaks new ground in several ways. I use new, more accurate causal estimates of general deterrence, specific deterrence, and incapacitation. I also use new estimates of the cost of crime, which account for the enormous variation in the damage crime inflicts, even within a single category. This enables me to evaluate policy changes in a realistic way. I am also able to perform the analysis for specific types of crime, rather than aggregating all crimes together, which allows for more realistic possibilities of increased penalties for some crimes and decreased penalties for others.

The results of the cost–benefit analysis are striking. The benefits of one-time prisoner releases greatly outweigh the costs for all crime categories considered. For all crime categories, except robbery, reducing the scope of crimes subject to incarceration yields a net benefit as well. For robberies, my calculations show that the opposite is true: their costs are high enough that a greater rate of incarceration for these crimes is warranted.

The goal of the cost–benefit analysis is to use concrete numbers to help make better-informed decisions about the use of imprisonment. In so doing, this study complements and extends the traditional legal literature which focuses largely on history and theory, but generally has no good way to trade off countervailing effects, like the desire for low crime as well as low spending.

For example, William Stuntz's excellent new book, *The Collapse of American Criminal Justice*, focuses on the historical and ethical origins of our criminal justice system, as well as current problems.[234] Frank Zimring's *The City That Became Safe* takes a more quantitative look at recent crime trends in the United States, with a particular focus on the large declines in crime in

233. Cohen and Piquero and others have attempted to calculate long-term costs of drug usage, but these studies do not provide the level of specificity necessary to perform a cost–benefit analysis. *See* Cohen & Piquero, *supra* note 145, at 47.

234. STUNTZ, *supra* note 10.

New York City in the late 1990s and 2000s.[235] Zimring's work helpfully identifies trends and correlations, but it does not take advantage of the recent developments in economic methodology necessary to make precise policy recommendations. Stephanos Bibas, in the incredibly creative book, *The Machinery of Criminal Justice*, focuses on some of the aspects of criminal justice that are less amenable to the sort of analysis employed in this Article.[236] Incarceration policy should certainly be premised at least in part on the preferences of the populace, but the goal of this Article is to better inform policymakers about those components that can be captured with a cost–benefit approach.

This work has immediate, practical implications. Many states are dealing with budgetary crises that have forced reductions in vital expenditures. Reductions in spending on incarceration, if implemented correctly, can ease budgetary pressures without significantly increasing the costs of crime. California can use these recommendations as a guide to responding to the prison-population requirement of *Brown v. Plata*.[237]

As available data improves, policy decisions should rely on this type of analysis whether or not there are severe economic pressures. Overspending on incarceration is wasteful both in terms of lost productivity of inmates and the additional burden on taxpayers, and underspending (as in the category of robberies) can be dangerous. Further research will make such cost–benefit calculations even more useful. More studies that estimate crime costs, elasticities, prison costs, and other parameters for different regions, age groups, and types of crime are needed. Going forward, the cost–benefit approach should be expanded to other areas of criminal justice, including policing, alternate sanctions, and prisoner reentry programs. The era of a scientific approach to criminal justice policy is beginning.

235. FRANKLIN E. ZIMRING, THE CITY THAT BECAME SAFE (2011).

236. BIBAS, *supra* note 11.

237. *See supra* notes 1–2 and accompanying text.