

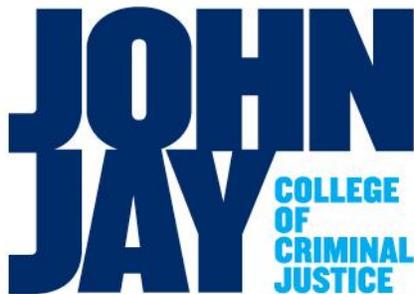
DEPARTMENT OF ECONOMICS

Working Paper

Evidence from Cocaine and Marijuana Mandatory Minimum Sentencing

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Abstract:

Simultaneity between prison populations and crime rates makes it difficult to isolate the causal effect of changes in prison populations on crime. This paper uses marijuana and cocaine mandatory minimum sentencing to break that simultaneity. Using panel data for 50 states over 40 years, this paper finds that the marginal addition of a prisoner results in a higher, not lower crime rate. Specifically, a 1 percent increase in the prison population results in a 0.28 percent increase in the violent crime rate and a 0.17 percent increase in the property crime rate. This counterintuitive result suggests that incarceration, already high in the U.S, may have now begun to achieve negative returns in reducing crime. As such it supports the work of a number of scholars (Western 2006, Clear 2003) who have suggested that incarceration may have begun to have a positive effect on crime because of a host of factors.

Introduction

The U.S. incarcerates more of its own people than any other country. With just below 5% of the world's population, the U.S. houses almost 25% of the world's prisoners (Parenti 1999; Stern 2005). Since 1970, the actual incarcerated population has grown seven-fold (Western 2006) and as of 2008, the U.S. had 1.6 million in its federal and state prisons¹. Researchers have debated the causes of this sharp increase (Parenti 1999, Gilmore 2008, Levitt 2004, Spelman 2000, Wacquant 2001, Stern 2005, Western 2006, Clear 2008, Useem and Piehl 2008, Dyer 2000, Wilson et al 2002, Austin et al 2007, Frampton et al 2008) and multiple hypotheses about the unusually high level of US incarceration are often presented in the literature. Thus for example, it is argued that incarceration is a response to the high rates of violent crime in the US, it is a result of the continuing legacy of racial mistrust, it is a consequence of intolerance for drug crime, it is to make profits for multinational corporations, it is to absorb surpluses created by neoliberal restructuring and so on. For all of these intuitions however, there is an underlying belief that incarceration is fundamentally a containment and deterrent device. That is, they rely on a 'common-sense' notion that the rise in prison population, apart from responding

1 An additional , 700,000 are in its jails and over 5 million were under supervision in the probation and parole system (Warren et al 2008); Incarceration is usually measured per 100,000. As of January 1, 2008, The incarceration rate is 750 per 100,000. This number includes jails. The incarceration rate per 100,000, according to Useem and Piehl (2008), increased five-fold between 1973 and 2005 from 96 to 491. These latter rates do not include jail and federal populations.

to the requirements of justice, also acts as a deterrent to crime. Crime is the prime mover in the expansion of imprisonment (Useem and Piehl 2008, Liedka et al 2006, Spelman 2005, Spelman 2000, Levitt 1996, Marvell and Moody 1994). More recent research challenges this simple relationship and suggests that crime and incarceration are complexly linked. Literature from the sociology of crime (Clear 2008, Clear 2007, Western 2006, Clear et al 2003) has begun to examine the ways in which incarceration works to destroy the social fabric of marginalized populations, thereby creating the conditions for increased hopelessness and decreased sociality. A consistent theme in this literature is that the level and forms of incarceration that currently prevail may serve to actually reinforce and increase crime and that thus, incarceration may have not hit zero or even decreasing returns in deterring crime.

For the most part, this prediction has not been tested using modern econometric techniques. A major problem with studies on the relationship (from either the orthodox or the revisionist perspective) is that they do not account for endogeneity. Increased incarceration is assumed to reduce the amount of crime but at the same time it is assumed that increases in crime will translate into higher rates of incarceration. This simultaneity will cause the OLS and GLS estimates of the effects of prisons on crime to underestimate the true magnitude of the effect. As of writing, only four published studies (to my knowledge) explicitly address the issue of simultaneity and attempt to separate the effect of incarceration on crime from the effect of crime on incarceration (Levitt 1996, Spelman 2000, Kovandzic et al. 2004, and Spelman 2005). These studies use instrumental variables to break this simultaneity. Table 1 and Table 2 summarizes the results of both sorts of studies.

Among the studies which account for simulataneity, it should be noted that these studies ask slightly different questions. Levitt (1996) and Kovandzic et al (2004) ask whether prisoner releases affect crime, while Spelman (2005) asks whether prisoner increases affect crime. Econometrically, this

corresponds to different LATE estimates, and suggests the presence of substantial heterogeneity in the relationship between incarceration and crime, even when causality is established². The population affected by prisoner releases could be substantially different from the population affected by prisoner additions.

Spelman, 2005 is the perhaps the only study which tries to ask whether increasing incarceration at the margin has an effect on crime. The results from his study suggest that increasing incarceration reduces crime. However, there are significant questions about the instruments utilized. In particular, several of the instruments he uses (number of police officers hired, expenditure on police) can be argued to be endogenous to the question at hand and therefore not valid to counter the endogeneity problem.

I ask a similar question to Spelman (2005). Does adding prisoners increase or decrease crime? This paper however utilizes an alternative, more plausible instrument at a different level of aggregation. Specifically, in order to address the problem of simultaneity, I use Cocaine and Marijuana mandatory minimum legislation as a plausible instrument for incarceration. The adoption of these laws, as I shall describe below, were not directly related to the level of violent or property crime but did result in significant increases in the prison population. Furthermore, by using this instrumental variable for a panel of 50 states over 45 years, I find that increased incarceration has a significant and positive causal effect on crime. Specifically, a 1 percent increase in the prison population is associated with a .28% increase in the violent crime rate. Such a finding provides the first econometrically well-grounded support for the hypotheses espoused by revisionists. It may indeed be that higher incarceration has now actually begun to drive violent crime. While there is a positive effect of incarceration on property crime (an elasticity of .17), this effect is not statistically significant.

2 See in particular Imbens, Angrist and Krueger (1994) on this point

The outline of this paper is as follows. In section I of this paper, I discuss the history and implementation of cocaine and marijuana mandatory minimums. Section II is a discussion of the method and describes the data used in the analysis. The relationship between incarceration levels and crime rates using mandatory minimums for cocaine and marijuana is econometrically estimated in Section III. Section IV offers a brief conclusion and directions for further research.

Section I: A Brief History of Mandatory Minimum Sentencing

The indeterminate sentencing structures that dominated state systems through the 1970s fragmented over the last 30 years, replaced by patchworks of determinate and structured sentencing, mandatory sentencing, habitual offender laws, and truth-in-sentencing laws. Through a series of progressions and regressions, states have adopted, abandoned, or altered various sentencing strategies at different points in time to address diverse and often conflicting objectives. After 30 years of experimentation and flux, the fragmentation in sentencing and corrections policies across states has created an array of approaches to the use of imprisonment as numerous as they are complex (Stemen et al 2006, 1).

Prior to the 1970s, all fifty states had an indeterminate sentencing model where judges exercised broad discretion over the disposition and duration of sentences imposed and parole boards maintained authority over the duration of sentences served through discretionary release (Tonry, 1996; Stemen et al 2006). Sentences were indeterminate in that the sentence received vary greatly from the actual sentence served and that the judge and the parole board had great discretion to tailor the sentence, including probation, to an individual based on the rehabilitative ideal.

The indeterminate system reflected the ideology of rehabilitation. The goal of indeterminate sentencing was rehabilitation through the individualization of the sentence. This could only be achieved by tailoring a sentence to the unique characteristics of the individual and the particular situation. States did not have standard sentences for particular crimes since this would undermine the rehabilitative ideal by not allowing the judge to wield great discretion to impose a sentence length, within a range set by state statutes, based on the judge evaluation of the individual circumstance. State statutes included few

restrictions for a judge to impose sentence length (including probation). The final authority of the actual sentence served rested with the parole board. Within a wide range of limits, the parole boards had great discretion when to release a prisoner. Parole boards could release a prisoner at any time between some minimal time served and the maximum limit of the sentence.

In a prominent case, George Jackson, a famous Black revolutionary, was sentenced for driving the getaway car in an armed robbery of a gas station in 1960 to one-to-life (James 2003, 84). The release of George Jackson was in the hands of the parole board which could decide to release Jackson in a range of one year or never. In the atmosphere of rebellion in the late 1960s and early 1970s this indeterminate sentencing was confronted as many saw it as putting the power of release of prisoners in the hands of the prison administrators. Radical and liberal activists challenged indeterminate sentencing as they saw the potential for abuse and racial discrimination in the wide discretion of judges and parole boards. There was also a challenge to indeterminate sentencing from a different constituency of the population. Goldwater's presidential campaign started a war on crime and the indeterminate system was challenged by those who believed that judges were too lenient on criminals and time served by prisoners was too short.

By the mid-1970s sentencing reform was introduced under the political pressure from both constituencies. This led to determinate sentencing in which sentence length was primarily determined by the sentence imposed by the sentencing court and ensured sentence lengths and dispositions were uniform and imposed according to a set of prescribed criteria. These reforms resulted in the initial adoption of new sentencing guidelines which abolished discretionary release by a parole board and reduced the power of the judge by statute.

These initial sentencing reforms focused on a move to determinate sentencing. The first step of this was pushed by the left and parole boards were abolished. These initial reforms mostly abolished

the authority of the parole board and was not focused on sentencing decisions but instead about release decisions. Prisoners would be automatically released after their term was up. The push for sentencing reform also came from the right. James Q. Wilson in his 1975 book, *Thinking about Crime*, discusses the problems with the courts, which he describes as the “crucial agency in the system” (Wilson 1975, 163). The main problem is the “idiosyncratic beliefs of the judges” (Wilson 1975, 166). Rehabilitation, according to this view had failed and needed to be abandoned. Instead deterrence should be supported. The way to solve crime, Wilson argued, was to eliminate the disparities in sentencing and sentences should be the “deprivation of liberty.” Repeat offenders should “invariably result in in an increased deprivation of liberty” (Wilson 1975, 180).

After the initial reforms, a challenge continued from the right to push for more “tough-on-crime” policies to correct what they perceived to be a failed system. Since rehabilitation fell out of favor, harsher punishment began to be in vogue. Mandatory sentences, repeat-offender laws, and truth-in-sentencing laws proliferated through the 1980s and 1990s in a climate which demanded the imposition of harsher and harsher penalties. Mandatory minimum sentencing was introduced as part of this political and ideological battle. This policy was adopted at different times by different states and was premised on a single idea, having strict and visible penalties on crime which were not alterable at discretion by the parole board or judge. The content of each mandatory minimum sentence law has differed considerable from state to state and the particular crimes which come under this purview also differ considerably.

Mandatory minimum laws impact procedural aspects of a state’s sentencing system (by constraining sentencing and release decisions for certain offenses), mandatory sentencing laws are substantively focused at particular offenses (e.g. drug offenses, violent offenses, or sex offenses) or specific triggering events (offenses involving use of a firearm, against a minor, or in proximity to a

school). Stemen et al (2006) reveals three factors that affect mandatory sentencing provisions: 1) whether the law alters the duration of the sentence for the underlying offense, 2) whether the law requires the judge to alter the duration of the sentence imposed, and 3) whether the law requires the judge to impose incarceration. Based on these factors, Stemen et al infer several types of mandatory sentencing laws may: 1) *discretionary sentence enhancements* in which the law alters the duration of the sentence for the underlying offense but allows the judge to impose the same length of sentence for the underlying offense that would otherwise be available by law and still allows the judge to impose a non-incarceration sanction for the underlying offense; 2) *mandatory sentence enhancements* in which the law alters the duration of the sentence for the underlying offense and requires the judge to impose a different length of sentence than would otherwise be available or required by law, but still allows the judge to impose a non-incarceration sanction; 3) *mandatory enhanced incarceration* in which the law alters the duration of the sentence for the underlying offense, requires the judge to impose a different length of sentence than would otherwise be required or available by law, and requires the judge to impose incarceration; 4) *mandatory incarceration* in which the law requires the judge to impose incarceration, but does not alter the statutory term for the underlying offense and does not require a specific length of sentence be imposed; and 5) *enhanced mandatory incarceration* in which the law alters the duration of the sentence for the underlying offense and requires the court to impose incarceration, but does not require the judge to impose a different length of sentence than would otherwise be required or available by law.

The increased use of mandatory sentencing laws has been held out as a major cause of increases in prison populations since 1973, when the first mandatory sentence was implemented in New York. Stemen et al (2006) shows that states with more mandatory sentencing laws have higher incarceration rates than other states. States have imposed more prohibitions against the granting of probation and

have proscribed more mandatory minimum sentences for offenses. In many cases, judges are now constrained in their abilities to set either the disposition or duration of many sentences.

By 2007, these laws had become so pervasive that Raphael and Stoll (2007) conclude that the lion's share of the increase in prison population could be explained because of sentencing laws. These have resulted in an increase in the average time served, and an increase in the likelihood of being sent to prison. “In other words, so many Americans are in prison because through our collective public choices regarding sentencing and punishment we have decided to place so many Americans in prison” (Raphael and Stoll 2007, 34). They estimate that 80 to 85 percent of prison expansion can be explained through these sentencing changes which increased both how long one goes to prison (expansion among the intensive margin) and who goes to prison (expansion along the extensive margin). Raphael and Stoll results show that at the most 17 percent of the expansion can be explained by criminal behavior while the rest is a result of changes in sentencing.

This historical account then gives support to the validity of using the introduction of mandatory minimums as an instrumental variable, one which is not correlated with the crime rate but does increase the prison population. I use further a particular type of mandatory minimum sentencing law—mandatory minimum sentences in cocaine and marijuana, which have differed widely both in scope and timing in different states. For example, Georgia has a mandatory minimum sentence of 120 months for the possession of cocaine, while in Michigan the sentence is for 12 months. Given the variation in both timing and intensity of the laws, mandatory minimum sentencing is a compelling instrument.

A preliminary graphical check for this is presented in Figure 1. This traces the growth rate of total prison populations in states with Marijuana Mandatory Minimums versus those which did not implement them. The year coefficients depicted are from regression of Prisoners Per Capita on Year,

for the two groups. As is evident, prison populations grew faster in states with mandatory minimum sentencing than those without, providing prima facie evidence for the effect.

Section II: Methodology and Data: Correlations between Marijuana and Cocaine Mandatory Minimums, Prison Populations, and Crime Rates in the Raw Data

The methodology in this paper follows that of Levitt (1996) very closely. Levitt's paper was the first to try to separate the endogeneity issues that mire the relationship between incarceration and crime. Increased incarceration is assumed to reduce the amount of crime but at the same time it is assumed that increases in crime will translate into higher rates of incarceration. This simultaneity will cause the OLS and GLS estimates of the effects of prisons on crime to underestimate the true magnitude of the effect. An obvious solution to the presence of random regressors is the use of an instrumental variable, which can be used to get around this simultaneity. The instrumental variable that is needed is one which is correlated with changes in the size of the prison population and which is not directly correlated with crime rates, other than through the prison population. Levitt uses the status of state prison overcrowding litigation arguing that prison overcrowding litigation will be related to crime rates only through its impact on prison populations, making it a valid instrumental variable. Such an argument suggests that the change in the prison population on the crime rate can be found by taking the effect of legislation on the crime rate, and dividing by the effect of legislation on the prison population. This logic can also be illustrated in a schematic form:

$$(\Delta Crime / \Delta Legislation) / (\Delta Prison Population / \Delta Legislation) = \Delta Crime / \Delta Prison Population$$

This paper uses the same logic and model specification but uses a different instrumental variable: marijuana and cocaine mandatory minimums³. As suggested earlier, the marginal addition of a prisoner to the ranks of the incarcerated can have different effects than the marginal removal of a prisoner on the crime rate .

This paper uses state level panel data for the 50 states not including the District of Columbia, running from 1971 through 2006 to assess this relationship. The data on prison population recorded the number of people who were in the state prison system on December 31, and were serving sentences of at least a year. This includes prisoners who were under the control of the state prison system but housed in local jails or in prisons in other states due to overcrowding, but it does not include the majority of the incarcerated population in local jails, nor does it include those incarcerated in federal prisons. Thus, the prison population data captures 65% of U.S. Prisoners. Incarceration data is obtained from the Bureau of Justice Statistics.

Crime statistics came from the FBI's *Uniform Crime Reports*, which compiles annually the number of different types of crimes that are reported to police. Crime data was available for seven different types of crime, which were divided into the categories of violent crime and property crime. Violent crime consists of murder and non-negligent manslaughter, forcible rape, aggravated assault and

³ Levitt (1996) employs the status of state prison overcrowding litigation as an instrumental variable. "Over the past 30 years, prisoners' rights groups have brought numerous civil suits alleging unconstitutional conditions in prisons. In twelve states the entire state prison system either is currently or has formerly been under court order concerning overcrowding" (Levitt 1996, 323). Levitt shows that this overcrowding litigation is correlated with a decrease in the size of the prison population and that it is otherwise unrelated to crime rates. But there are some problems with the use of this instrument. The main problem is that this instrument captures the release of the marginal prisoner on the crime rates. The larger point is to evaluate the crime-reduction effectiveness of incarceration on a substantial scale. What should be measured is not the release of the marginal prisoner on crime rates but instead the marginal addition of a prisoner on crime rates. In the current climate of "tough-on- crime" policies a released prisoner faces many obstacles to reintegrate as a productive member of society. In the face of these obstacles it is not difficult to see why most released prisoners return to prison within three years (Travis 2005). Levitt's instrument captures this tendency. Released prisoners increase the crime rate. The instrumental variables, cocaine and marijuana sentencing guidelines, employed in this paper measure the marginal addition of a prisoner. The implementation of both cocaine and marijuana mandatory minimums legislation increased the size of the prison population but is otherwise unrelated to the crime rate.

robbery. Property crimes consist of burglary, larceny and motor-vehicle theft. All other crimes such as drug sale, drug possession, tax-evasion or insider trading are not included in these commonly used crime rates.

The instrumental variable chosen for this paper is the marijuana and cocaine mandatory minimum laws as coded by the Stemen et al (2006) study. In this study there are a series of coded mandatory minimum law variables associated with cocaine and marijuana including the severity levels of cocaine and marijuana, possession of cocaine and marijuana and the sale of cocaine and marijuana. There exists great variation in these mandatory minimum laws. The study coded this variation, from the types of offenses targeted to the lengths of sentences mandated to the impact the laws have on judicial discretion and release from prison.

For the mandatory minimum laws, the data was taken from the following study ICPSR 4456: *Impact of State Sentencing Policies on Incarceration Rates in the United States, 1075-2002*⁴.

Other variables that I use include control variables such as per capita income in the state, its unemployment rate, the percentage of the state's population that is Black, the percentage of the population that lived in metropolitan areas, the number of police per capita, and the percentage of the population in different age groups. This data was taken from the *Statistical Abstract of the United States*. Table III gives summary statistics for 50 states for the data described used in the analysis.

Table IV looks at the effect of varies coded cocaine and marijuana laws on prison populations, violent crime and property crime. Two effects can be observed. First, some of the coded legislation does not have a large impact on prison populations and some even a negative effect. Overall the coded

4 This four year study was conducted under leadership of Don Stemen at the Vera Institute of Justice with funding provided by a grant from the National Institute of Justice Grant No.: NIJ 2002-IJ-CX-0027.

cocaine and marijuana legislation does have a positive impact. For certain coded legislation it has a positive impact on prison population which is even significant. The second observation is that overall the coded legislation does not have a significant impact on crime rates. All regressions in Table IV are OLS estimates with White-heteroskedasticity consistent standard errors in parentheses. All regressions are robust clustered state effects.

Section III: Estimates of the Elasticity of Crime with respect to Prisoner Populations

Following Levitt (1996), The basic specification used to estimate the elasticities of crime with respect to the prison population is:

$$\Delta \text{Ln} (\text{Crime}_{st}) = \beta \Delta \text{Ln} (\text{Prison}_{st-1}) + X_{st} \mathbf{q} + \gamma_{st} + \varepsilon_{st}$$

Where the subscript s corresponds to states, and t indexes years. Crime and Prison are the relevant per capita crime and incarceration rates. The variables are either the change from the previous year or the growth rate from the previous year, to help avoid the bias associated with non-stationary time-series data. In addition, year controls are included to correct for consistent differences in growth rates between years. Logs are used so that results will be reported in elasticities and can be compared to other studies. The prison variable is lagged since data on prison populations are snapshots as of December 31. X_{st} is a vector of covariates, and γ_{st} is a vector for year dummies. In some of the cases, the state-fixed effects are also included. Levitt uses the litigation status as an instrument for the prison population. β_{st} is the elasticity of the crime rate with respect to the prison population, which Levitt predicted to be negative and with a stronger negative effect when using the instrumental variable. If no instruments were used, simultaneity would make the number of prisoners be positively correlated with

the residuals of the crime equation, potentially inducing a positive bias in the estimates of β_{st} . But if the instrumental variable is a valid instrument the estimation should lead to consistent estimates.

Formally: the first-stage equation is thus given by:

$$\Delta \ln (\text{Prisoners}_{st-1}) = \lambda_{-1} Z + X'_{st} q + \gamma_{st} + \varepsilon_{st}$$

However, suppose the true model is instead

$$\begin{aligned} \Delta \ln (\text{Crime}_{st}) = & \beta_{-1} \Delta \ln (\text{Prisoners_added}_{st-1}) + \beta_{-2} \Delta \ln (\text{Prisoners_released}_{st-1}) + X'_{st} q + \gamma_{st} \\ & + \varepsilon_{st} \end{aligned}$$

with the first stage equation given by:

$$\Delta \ln (\text{Prisoners_released}_{st-1}) = \lambda_{-1} Z + X'_{st} q + \gamma_{st} + \varepsilon_{st}$$

Where Z is a vector of legislation corresponding to Levitt's instruments. While the resulting estimates of β_{-1} will be consistent and internally valid, they may not be the parameters of interest. Given that the macro trend in incarceration has been a steep increase, the more relevant parameter for understanding

the recent history of imprisonment in the US is likelier to be β_{-1} . Thus, I use a different first stage equation given by :

$$\Delta \ln (\text{Prisoners_added}_{st-1}) = \lambda_{-2} \text{MM} + X'_{st} q + \gamma_{st} + \varepsilon_{st}$$

where MM refers to a vector of mandatory minimum sentencing laws.

Given that I do not observe separate flows for released and added prisoners, the true model is not estimable. Thus I estimate equation 1 with TSLS, where the first-stage equation is:

$$\Delta \ln (\text{Prisoners}_{st-1}) = \lambda_{-1} Z q + X'_{st} q + \gamma_{st} + \varepsilon_{st}$$

If the resulting coefficients are substantially different, and the exclusion restrictions are satisfied by both instruments, then this suggests the presence of substantially treatment effect heterogeneity. As Imbens and Angrist (1994) have shown, the IV estimate is only valid for the population of "compliers", the subset of the population whose behavior is altered by the instrument. If mandatory minimums affect a different population of potential criminals than prison overcrowding legislation, then the two estimates are likely to differ, despite both being internally valid.

Table V summarizes the estimates of the elasticities of crime with respect to prison populations. The OLS estimates are negatively correlated but not significant. The 2SLS estimates are positively

correlated for both the violent crime and the property crime.⁵ The violent crime estimate is significant but the property crime rate is not. The results show that an increase incarceration leads to an increase in violent crime. The percent Black and the Police per capita are positively correlated but are also not significant. For violent crime the 2SLS result shows that for a 1% increase in the prison population there will be a .28% increase in the violent crime rate. This result is different from previous studies. Levitt finds a significant negative elasticity on violent crime of -.42, for example. In addition, the estimate precision is higher using the mandatory minimums instrument, with a standard error on the 2SLS estimate of .11, compared to .24 for the overcrowding legislation IV estimates. The only other study which shows a positive correlation is Liedka, Phiel and Useem (2006) study where there is a positive correlation for high incarceration states.

Section IV: Conclusion and Further Research

Using Mandatory Minimums for Marijuana and Cocaine as an instrument for changes in the prison population, this paper attempts to estimate the marginal productivity of increased incarceration on crime. The estimates obtained are in the opposite direction of those estimates obtained by most previous studies. Increasing incarceration does not have a negative effect on crime but instead has a positive effect. A one-percent increase in incarceration leads to a .28 percent increase in violent crime.

The results in this paper point to the fact the incarceration does not just reduce crime, but that increased incarceration may lead to an increase in crime. Our society has relied heavily on incarceration and this might not increase our social welfare and might actually even decrease it. In light of these results we should reconsider the massive use of incarceration to solve our problems.

⁵ The difference between the estimates in this paper and Levitt's is likely due to the heterogeneity in treatment effects as described above.

Theoretically, incarceration can decrease crime through the following four mechanisms. The first mechanism is deterrence. This means that the threat of incarceration will deter a potential offender from committing a crime. Secondly, incapacitation, which means that if a person is removed from society they cannot commit any crimes for the time period they are removed. Third, rehabilitation is the belief that a person will become rehabilitated while incarcerated and when they are returned to society the ex-offender will become a productive member of society again. Lastly is the idea of retribution, the sudden loss of liberty will shock an offender to leave the life of crime behind.

But these are not the only possible effects of incarceration on crime. Clear (1996) discusses three crime-enhancing effects of incarceration: A replacement effect, a normalization effect and a disrupted community effect. We can also imagine a number of possible crime-enhancing effects of incarceration: crowding-out of preventative funding, obstacles to re-entry, increasing inequality, extending the 'criminal age' or the various institutional incentives. A positive relationship between crime and incarceration might point to the fact that these crime-enhancing effects tend to become stronger during periods of high incarceration. The empirical results of this paper support the possibility of these crime-enhancing effects of incarceration.

Further studies should follow two different paths. Since incarceration is very group and place specific, studies should disaggregate to the lowest possible levels. The best possible studies will be done at the neighborhood or block-group level. A second path of further study should explore how incarceration rates produce changes that relate to social welfare. Quite a few scholars have started to address the social collateral consequences of mass incarceration. What has not been done yet is how these collateral consequences feedback to crime. These studies will give us a more complete picture of the effects of incarceration on crime and vice versa.

TABLE I

Studies of Impact of Incarceration Rate on Crime Rates that do not account for Simultaneity

<i>Study</i>	<i>Data</i>	<i>Estimated % change in crime rates due to a 10% increase in incarceration rates</i>
Devine, Sheley and Smith (1988)	National—1948-1985	-28 (violent offenses) -19.9 (property offenses)
Marvell and Moody (1997,1998)	National—1958-1995	-7.9 (violent offenses) -9.5 (property offenses)
Marvell and Moody (1994)	49 states—1971-1989	-1.6 (index offenses)
Besci (1999)	50 states and D.C.—1971-1993	-0.46 (violent offenses) -0.93 (property offenses)
Rapheal and Winter-Ebmer (2001)	50 states—1971-1997	Not significant (violent offenses) -1.1 (property offenses)
Donahue and Levitt (2001)	50 states—1973-1997	Not significant (violent offenses) -1.6 (property offenses)
Levitt (2001)	50 states—1950-1999	-1.3 (violent offenses) -.076 (property offenses)
Defina and Arvenites (2002)	50 states and D.C.—1971-1998	Not significant (murder, rape, assault, robbery) -1.1 (burglary) -0.56 (larceny) -1.4 (auto theft)
Kovandzic and Sloan (2002)	57 Florida counties—1980-1998	Not significant (index offenses)
Washington State Institute for Public Policy (2003)	39 Washington counties—1980-2001	-2.4 (index offenses)
Liedka, Piehl and Useem (2006)	50 states and D.C.—1970-2000	-.118 (index offenses; states with incarceration rates <325) +0.05 (index offenses; states with incarceration rates > 325)
Kovandzic and Vieraitis (2006)	58 Florida counties—1980-2000	Not significant (index offenses)

TABLE II

Studies of Impact of Incarceration rates on Crime Rates that do account for Simultaneity

<i>Study</i>	<i>Data</i>	<i>Estimated % change in crime rates due to a 10% increase in incarceration rates</i>
Levitt (1996)	50 states and D.C.—1971-1993	-3.8 (violent offenses) -2.6 (violent offenses)
Spelman (2000)	50 states and D.C—1991-1997	-4.0 (index offenses)

Spelman (2005)	254 Texas Counties—1990-2000	-4.4 (violent offenses) -3.6 (property offenses)
Kovandzic, Sloan and Vieraitis (2004)	188 cities(>100,000)—1980-2000	Not significant (all offenses)

TABLE III

Variable	Summary Statistics				
	Observations	Mean	Std. Dev.	Min	Max
	<i>per 100,000 residents where applicable</i>				
Prison Population	1828	256.1	202.4	20.3	1920.9
Violent Crime	1826	457.7	301.4	38.0	2921.8
Murder	1826	7.2	6.7	.2	81.1
Rape	1826	32.5	14.2	4.1	100.7
Assault	1826	273.1	168.6	25.0	1557.6
Robbery	1826	144.9	147.1	6.1	1675.8
Property Crime	1825	4205.5	1243.9	1255.8	9512.1
Burglary	1826	1052.6	425.8	301.1	2907.9
Larceny	1826	2747.1	782.8	762.7	5833.8
Motor vehicle Theft	1826	405.1	234.7	83.2	1839.9
Marijuana Possession					
Number of Severity Levels	1603	2.5	1.9	0	7
Minimum Sentence	1571	4.1	8.2	0	48
Marijuana Sale					
Number of Severity Levels	1603	2.2	1.8	0	7
Minimum Sentence	1571	11.5	16.9	0	63
Marijuana Sentencing					
Number of Enhancements	1603	5.3	3.6	0	18
Cocaine Possession					
Number of Severity Levels	1639	1.5	1.9	0	6
Minimum Sentence (FO)	1603	24.4	41.4	0	240
Maximum Sentence(FO)	1603	64.2	52.8	6	240
Cocaine Sale					
Number of Severity Levels	1639	1.8	1.8	0	6
Maximum Sentence (small)	1603	267.0	266.8	12	999
Minimum Sentence (28oz)	1603	36.4	46.6	0	240
Cocaine Sentencing					
Number of Enhancements	1603	5.2	3.5	0	18
Habitual Offender laws for Drugs					
Presence of	1738	.05	.2	0	1
Police Employees	1834	2.9	1.6	.25	25.1
Black (% of Population)	1836	.11	.12	.002	.71

TABLE IV
Short-run Impact of Drug Legislation

	Δ ln Prison Population (1)	Δ ln Violent Crime (2)	Δ ln Property Crime (3)
Marijuana Possession			
Number of Severity Levels	.002 (.004)	-.0001 (.016)	-.0001 (.013)
Minimum Sentence	.065 (.021)*	.012 (.009)	.008 (.009)
Marijuana Sale			

Number of Severity Levels	.001 (.013)	.018 (.024)	.012 (.019)
Minimum Sentence	.043 (0.16)*	.012 (.033)	.006 (.012)
Marijuana Sentencing			
Number of Enhancements	-.002 (.002)	-.0003 (.018)	.001 (.012)
Cocaine Possession			
Number of Severity Levels	-.001 (.003)	.0001 (.013)	.0002 (.0009)
Minimum Sentence (FO)	.053 (.021)*	.016 (.016)	.015 (.021)
Maximum Sentence(FO)	.026 (.019)	.008 (.011)	.006 (.017)
Cocaine Sale			
Number of Severity Levels	.003 (.004)	.0002 (.008)	.002 (.013)
Maximum Sentence (small)	.027 (.013)*	.004 (.012)	.005 (.011)
Minimum Sentence (28oz)	.036 (.017)*	.010 (.007)	.023 (.021)
Cocaine Sentencing			
Number of Enhancements	.003 (.003)	-.001 (.004)	-.003 (.002)
Habitual Offender laws for Drugs			
Presence of	-.004 (.003)	-.003 (.006)	.001 (.013)
Δ In Police	.088 (.039)*	.081 (.042)	.022 (.015)
Δ In %Black	.031 (.014)*	.044 (.059)	.005 (.012)
Robust, Cluster by State	Yes	Yes	Yes
R ²	.35	.42	.57
Observations	1434	1328	1328

note: estimates in bold and * are statistically significant at .05 level

TABLE V
The Impact of Prison Populations on Aggregate Crime Categories

	Δ In Violent Crime		Δ In Property Crime	
	OLS (1)	IV (2)	OLS (3)	IV (4)
Δ In Prison Population (t-1)	-.054 (.066)	.28 (.11)*	-.012 (.018)	.17 (.12)
Δ In Police	.037 (.043)	.042 (.048)	.002 (.045)	.004 (.024)
Δ In % Black	.023 (.029)	.029 (.017)	.018 (.025)	.001 (.010)
Year Controls	Yes	Yes	Yes	Yes
State controls	Yes	Yes	Yes	Yes

Instrument No Yes No Yes
note: estimates in bold and * are statistically significant at .05 level

FIGURE I
**Prison Population Total Growth:
Mandatory Minimum State vs. No Mandatory Minimum States**

