Increase in the Length of Incarceration and the Subsequent Labor Market Outcomes: Evidence from Men Released from Illinois State Prisons

Haeil Jung

Abstract

The sharp rise in U.S. incarceration rates has heightened long-standing concerns among scholars and policymakers that lengthy incarceration permanently harms the future labor market outcomes of prisoners. If true, then lengthy prison sentences will not only punish criminals for crimes committed, but will also make it far more difficult for ex-prisoners to reenter society as productive citizens. To investigate this claim I examine how increase in duration of incarceration affects subsequent earnings and employment. Comparing long-serving prisoners with short-serving ones in the Illinois state prison system, I find that the length of incarceration is positively associated with earnings and employment, even though these effects attenuate over time. The positive effects are stronger for individuals convicted of economically motivated and less violent crimes (such as property- and drug-related offenses) than for those convicted of violent crimes (such as person-related offenses). The effect is also stronger for prison entrants with self-reported drug addiction problems. The deterrent effect of lengthy incarceration and rehabilitation during incarceration are possible reasons for this positive effect. However, because this paper analyzes men who served less than four years in Illinois prison and excludes the population of men who served their terms exclusively in jail, readers should be cautious about generalizing findings of this paper. © 2011 by the Association for Public Policy Analysis and Management.

INTRODUCTION

Federal and state incarceration rates have increased drastically over the last several decades. Approximately 110 per 100,000 U.S. residents were in state and federal prisons between 1935 and 1970, but by 2005 nearly 500 per 100,000 were imprisoned.[1] Although incarceration rates of both men and women have increased over time, the skyrocketing rise in the prison population is largely due to increases in the imprisonment of male offenders.[2] Raphael and Stoll (2007) and Blumstein (2002) attribute this sharp rise not to an increase in crime rates but to a series of public policy innovations regarding sentencing and punishment at the state and federal levels since the mid-1970s. These innovations increased the likelihood both

[1] U.S. Department of Justice, Bureau of Justice Statistics, Sourcebook of Criminal Justice Statistics. Online at http://www.albany.edu/sourcebook/pdf/t6282005.pdf.

[2] The incarceration rate of male prisoners has increased more than fourfold since 1970; currently 93 percent of all prisoners are men.

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that a convicted individual would be sentenced to prison (certainty of punishment) and that he would serve a longer amount of time in prison (severity of punishment).[3]

The question is whether these policy innovations do more harm than good to society. Cook (1980) points out that in order to use scarce social resources efficiently, it is important to consider whether crime rates are more responsive to changes in the certainty or the severity of punishment. Spelman (2000) questions the positive net benefit of the expansion of imprisonment by these policy changes, even though empirical studies show that doubling current U.S. prison capacity would reduce index crime rates by 20 to 40 percent.

Particularly, many claim that incarceration permanently harms the future labor market outcomes of prisoners, which leads to social and economic deterioration in minority communities, where released prisoners tend to be concentrated. Western and Beckett (1999) argue that incarceration is to be blamed for the low employment rate of black men. In contrast, others, including Becker (1968), in his theory of rational behavior of criminals, argue that certain conviction and lengthy incarceration have discouraged criminals from committing new crimes and have provided youngsters with a clear signal that crimes do not pay. Of these two main policy innovations—certainty and severity of punishment—this paper focuses on the latter and investigates whether an increase in the length of incarceration conditional on incarceration impairs men's subsequent labor market prospects.[4]

Numerous studies show that it is extremely difficult for ex-prisoners with lengthy prison stays to succeed in society upon release. Western (2002) argues that an increase in the length of incarceration can not only lead to the deterioration of prisoners' marketable skills, but may also contribute to the learning of new illegal skills resulting from interaction with other prisoners. Lengthy incarceration may also lead to the loss of family and social ties as well as economic assets, leaving men with less social and economic capital upon release (Wilson & Vito, 1988). Holzer (1996) and Schwartz and Skolnick (1962) claim that the stigma of incarceration makes finding jobs in the legitimate labor market even more difficult for ex-prisoners.[5] Holzer, Offner, and Sorenson (2005) also suggest that previous incarceration can account for half or more of the decline in employment activity among black men aged 25 to 34. In short, an increase in the length of incarceration appears to permanently damage men's career prospects and, perhaps even worse, may also lead to recidivism (Waldfogel, 1994).

However, the idea that lengthy incarceration undermines one's ability to participate in society as a productive citizen is not universally accepted. Several theoretical and empirical studies suggest that an increase in the length of incarceration may actually increase an individual's preference for legitimate market activity and augment his or her ability to participate in the labor market. Bridges and Stone (1986) and Stafford and Warr (1993) argue that ex-prisoners may become "scared straight" by the unpleasant experience of incarceration, that is, specific deterrence of punishment through incarceration experience.[6] Additionally, individuals released from

[3] For example, mandatory minimum sentencing laws and the Truth in Sentencing Act contribute to the growth in time served.

[4] The length of incarceration is the duration that men actually served in prison, not the sentence length. In Illinois, inmates convicted of nonviolent crimes serve 50 percent of their sentences incarcerated. After release from incarceration, they are supervised by parole officers for the remainder of their sentences. Illinois Department of Corrections: http://www.idoc.state.il.us/subsections/faq/default.shtml#01.

[5] There is no clear relationship between the length of incarceration and stigma.

[6] The scared straight effect of incarceration is related to the specific deterrence of punishment that discourages the criminal from future criminal acts. Bridges and Stone (1986) point out that experiencing punishment may have the greatest influence when the risks of punishment are uncertain, when the experience is directly relevant to the type of offense, and when punishment for previous offenses is salient to the offender.

prison may consider the threat of often severe repeat offender penalties when contemplating additional illegal activities (Miceli & Bucci, 2005). Supervision and other parole-related obligations may similarly discourage ex-prisoners from illegal activities and encourage work. The intensity of parole supervision is directly correlated with type and severity of offense and thus indirectly correlated with duration of incarceration.[7]

Furthermore, the longer inmates stay in prison, the more likely they are to be exposed to prison rehabilitation programs. Lattimore, Witte, and Baker (1990) suggest that carefully integrated and implemented vocational training and reentry programs for young property offenders can reduce their recidivism rate. Knight et al. (1997) and Knight, Simpson, and Hiller (1999) show that those who receive targeted drug treatment programs both during and after prison stays engage in reduced criminal activity and drug use upon release.

In this paper I examine how increases in the length of incarceration affects subsequent earnings and employment of men who were released from Illinois state prisons into Cook County between the first quarter of 1995 and the second quarter of 2003. I use ex-prisoners who served shorter prison terms as a comparison group for those who served longer terms, controlling for observed individual characteristics and unobserved, time-constant characteristics using a fixed effects model. I find that an increase in the length of incarceration has a *positive* effect on earnings and employment, although these effects attenuate over time.

The positive effects are stronger for individuals convicted of economically motivated and less violent crimes (such as property- and drug-related offenses) than for those convicted of violent crimes (such as person-related offenses). Also, the effect is stronger for men with self-reported drug addiction. These findings suggest that the positive consequences of lengthy incarcerations may outweigh the negative ones primarily through the deterrent effect or rehabilitation process in prison.[8] However, the population of men who served their terms exclusively in jail (approximately half of the state and federal prison population in 2008)[9] is large and is not included in this paper. This paper analyzes men who served less than four years in Illinois prison. Thus, readers need to be careful of generalizing the findings.

This paper proceeds as follows: The following section discusses previous studies related to incarceration and labor market outcomes. The third section describes the data and provides summary statistics associated with ex-prisoners' labor market participation after their first spell of incarceration. The fourth section provides empirical strategies used to estimate the effect of incarceration length on earnings and employment, and the fifth section provides estimates from different regression specifications. Specifically, the estimates in the fifth section compare men with different offense types and drug addiction records and suggest possible mechanisms linking increases in the length of incarceration to labor market outcomes. The sixth section describes sensitivity analyses as well as limitations of this study. The final section discusses the policy implications of the findings.

[7] For example, according to the Illinois Department of Corrections (IDOC), sex offenders are placed within a different type of monitoring system, the Sex Offender Supervision Unit, than other types of offenders. Violent offenders are categorized by the IDOC and are under the electronic monitoring system too. In addition, the Parole Division of the IDOC has a comprehensive approach to management of offenders charged and/or convicted of domestic violence crimes. I learned from conversations with a staff member at the IDOC that different types of parole supervision are directly related to types and severity of offense. However, I do not have any official documents from the IDOC to support this claim. General information about parole programs by the IDOC is available at http://www.idoc.state.il.us/subsections/departments/parole_division/default.shtml.

[8] The rehabilitation process includes direct rehabilitation through prison programs and indirect rehabilitation through regular nutrition intake or no or limited access to alcohol and drugs in prison.

[9] Refer to Bureau of Justice Statistics at http://bjs.ojp.usdoj.gov/content/glance/tables/corr2tab.cfm.

PREVIOUS STUDIES

Using the illegal activity survey in the 1980 wave of the 1979 cohort of the National Longitudinal Survey of Youth (NLSY79), Freeman (1991) reports that youths who had been in jail worked substantially fewer weeks per year than those who had not. Waldfogel (1994) uses the data from the federal criminal justice system and finds that ex-convicts who were imprisoned have lower employment and earnings than those ex-convicts who did not go to prison. Using arrestee records from the California Adult Criminal Justice Statistical System, Grogger (1995) points out that jail time negatively affects employment, while arrests or convictions by themselves have no effect on employment. Western and Beckett (1999) use the NLSY79 and find that juvenile incarceration is associated with a small but persistent decrease in weeks worked seven years after being released. Employing the same data, Western (2002) shows that incarceration lowers the level and growth of wages among incarcerated men. In an experimental study, Pager, Western, and Sugie (2009) examine whether criminal records work as barriers to employment for young black and white men. They find a significant negative effect of a criminal record on employment outcomes, especially for black men. However, their finding is limited to the effect of stigma related to criminal records.

In contrast to these studies, Kling (2006) and LaLonde and Cho (2008) show that incarceration *does not* impair the subsequent earnings and employment of ex-prisoners. According to Kling (2006), an increase in the length of incarceration is unlikely to disrupt men's employment and earnings potential following incarceration in either the state prison system in Florida or the federal judicial system in California. LaLonde and Cho (2008) find that incarceration does not appear to harm the employment prospects of female ex-prisoners following their first incarceration spell in Illinois state prisons. In addition, Jung (2009) revisits Western (2002) and shows that when a better comparison group is used for the treatment group of incarcerated men, the effect is switched from negative to positive or null in real hourly wage, employment, and real earnings.

When measuring the effect of incarceration on labor market outcomes, two distinct effects should be considered: the effect of being sentenced to prison and the effect of time spent in prison.[10] Although most of the previous studies on this subject do not analyze them separately, Kling (2006) focuses exclusively on the effect of incarceration length on subsequent earnings and employment.

Kling uses an innovative instrumental variable (IV) approach to identify the effect of incarceration length on the earnings and employment of male prisoners. However, the results are not statistically significant (likely because of a weak instrument problem).[11] He does not account for whether the observed period of incarceration is the first spell or a later one.[12] In addition, he does not separately analyze different offense types such as person-, property-, or drug-related crime. As noted in Blumstein (2002), imprisonment for drug-related offenses contributes to a large

[10] While the former is the result of receiving a prison sentence, the latter is the result of institutional treatment, which may be good or bad.

[11] Specifically, Kling uses the random assignment of court judges to control for length of incarceration, independent of the individual characteristics of the offender. However, he acknowledges the argument made by Anderson, Kling, and Stith (1999) that the introduction of the Federal Sentencing Guidelines for offenses committed after November 1, 1987, substantially reduced inter-judge disparity, reducing the power of this instrumental variable research design.

[12] In this paper, I narrow the population of interest to ex-prisoners who served their first incarceration in prison. This means that all the ex-prisoners in my sample served their term not because of technical parole violations but because of new felony charges. In terms of public policy, this focus is appropriate because this paper intends to investigate the consequence of the sentencing and punishment policies that increase the incarceration length of newly committed crimes. Narrowing the population of interest to ex-prisoners who served their first incarceration in prison also mitigates the issues arising from unobserved heterogeneity of repeat offenders.

fraction of the increase in the prison population.[13] It is therefore important to look at drug-related offenders separately in order to properly evaluate the effect of an increase in the length of incarceration on labor market outcomes. Because violent offenders behave differently from other offenders, this paper evaluates these person-related offenders that are more violent than others separately as well (Grogger, 1998). In addition to this, I evaluate drug-addicted prison entrants to provide an indirect examination of the effect of drug treatment programs and of no or limited access to drugs in prison on labor market outcomes.[14]

In summary, this paper focuses on the effect of an increase in the length of incarceration conditional on incarceration and thereby distinguishes the effect of this specific policy innovation from other policy effects. Furthermore, this paper shows that the effect varies by offense type and also by drug addiction when beginning incarceration, which may help us determine the possible mechanisms linking incarceration duration and labor market outcomes.

DATA AND DESCRIPTIVE STATISTICS

This study's sample consists of Cook County males released from the Illinois state prison system after their first incarceration between the first quarter of 1995 and the second quarter of 2003—a total of 34 calendar quarters.[15] These data (from the administrative records of the Illinois Department of Corrections [IDOC]) are matched with earnings data from the Illinois Department of Employment Security (IDES) using inmates' Social Security numbers.[16]

IDOC records include prison admission and release dates, demographic information including inmates' race and ethnicity, birth date, years of schooling, marital status, offense categories, and self-reported measures of substance abuse. Those records were augmented with quarterly earnings histories from unemployment insurance (UI)–covered jobs obtained from IDES; these earnings data are restricted to ex-prisoners' labor market outcomes in the formal sector of the labor market.[17] Although this is a limitation, it seems reasonable to focus on formal sector earnings, given that they are more likely to represent legitimate, law-abiding (and taxable) earnings behavior. Also, according to Kornfeld and Bloom (1999), impact estimates based on UI and survey data tend to be comparable, whereas on average, survey-reported earnings tend to be higher than UI-reported earnings.

I use real quarterly earnings in 2003 dollars. Individuals who have real quarterly earnings that equal or exceed $20,000 at any point are eliminated from the sample because of possible errors in those earnings reports. These individuals are less than 1 percent of the sample, and their exclusion does not affect the main analysis.

To get an accurate estimate of the effect of incarceration length, I use the actual duration of time in prison that men served rather than the sentence length they received. Analyzing the unbalanced panel data, in order to sufficiently observe earnings and employment records prior to incarceration for ex-prisoners with different incarceration lengths, I eliminate those who served four years or more, which amounts to discarding roughly 8 percent of the ex-prisoners in my sample. I also

[13] From 1980 to 1996, drug-related offenses climbed from the single category of offense with almost the lowest incarceration rate to the crime with by far the highest incarceration rate (Blumstein, 2002).
[14] La Vigne et al. (2003) report, especially, that even though funding for substance abuse treatment varies from institution to institution, some form of substance abuse programming has been offered at each Illinois state prison.
[15] Male ex-prisoners in the data committed a crime in Cook County and served their first incarceration in Illinois state prisons. It is assumed that these ex-prisoners were involved in legal and illegal activities in Cook County.
[16] The Chapin Hall Center for Children, IDOC, and IDES worked together to match inmates in the sample.
[17] UI data may not capture all of ex-prisoners' labor market activities because many young and low-skilled workers work in informal sectors and earnings records from IDES cannot catch those earnings histories.

Table 1. Offense categories of Illinois state prisoners released from the first incarceration between 1995 first quarter and 2003 second quarter.

Offense Type	Number	Percent	Main Offenses
Person	7,111	24.06	Robbery, battery, murder (or attempted murder),* armed violence, home invasion, vehicular hijacking, possessing and using illegal arms
Property	6,611	22.36	Burglary, auto theft, retail theft, document forgery, arson
Drug	14,792	50.04	Sale or possession of illegal drugs, substance abuse, driving under influence of drug
Sex	916	3.10	Sexual assault or abuse, rape, violation of sex offender registration
Others	130	0.44	
Total	29,560	100.00	

* This count excludes first-degree murder convictions.

exclude ex-prisoners with first-degree murder convictions because they are not likely to be released from prison.[18] Individuals in the sample were all 18 to 64 years old over the sample period. Most of the ex-prisoners released from their first incarceration were paroled (99.91 percent).[19] Thus, the longitudinal data consists of 29,560 individuals over 34 quarters. The longitudinal data are unbalanced in terms of quarters relative to prison entry and exit, as the number of quarters pre- and post-incarceration is not necessarily equal for all prisoners.[20]

One shortcoming of the data is that pretrial jail records, participation in drug treatment, and training programs during stays in state prison are unavailable.[21] In addition, the data do not include information on parole supervision immediately after incarceration. With the exception of the data on employment, earnings, age, and timing of prison terms, all information is time invariant.

Descriptive Statistics

Tables 1 and 2 present summary statistics on the categories of offenses committed and the length of incarceration associated with the crime. The descriptive statistics associated with specific offense categories are shown in Table 1. Drug-related offenses account for 50 percent of all crimes while person- and property-related crimes

[18] When I eliminate ex-prisoners who served four years or more, all with first-degree murder convictions are eliminated because of their lengthy incarceration.

[19] Typically, offenders do not serve out their full sentence. By statute, "good time" indicates the percentage of their sentences that inmates must spend incarcerated. For example, some inmates convicted of nonviolent crimes must spend 50 percent of their sentences incarcerated, whereas others who are convicted of violent crimes must spend 85 percent of their sentences incarcerated under "truth in sentencing" laws. Under these same laws, those who are convicted of murder are required to spend 100 percent of their sentences incarcerated. After release from incarceration, they are supervised by parole officers during the remainder of their term. See the Illinois Department of Corrections at http://www.idoc.state.il.us/subsections/faq/default.shtml#01.

[20] Assuming the number of pre- and post-incarceration quarters over which individuals are observed is not correlated with individuals' unobserved characteristics, conditional on their observed characteristics, the resulting estimates will be unbiased (Cameron & Trivedi, 2005). In the fixed effects model, individual heterogeneity is also controlled for.

[21] Jails are locally operated correctional facilities that confine persons before or after adjudication. Inmates sentenced to jail usually have sentences of a year or less, but jails also incarcerate persons imprisoned for a wide variety of other reasons. The average time spent in jail is roughly four to six months (excluding individuals charged with murder). See Bureau of Justice Statistics' jail statistics at http://bjs.ojp.usdoj.gov/index.cfm?ty=tp&tid=12.

Table 2. Offense categories and incarceration length in years.

	Offences Categories			
Incarceration Length (year)	Person	Property	Drug	Total
Length <3 months	9.3%	15.2%	28.7%	20.8%
3 months ≤ length < 1 year	33.6%	52.1%	42.2%	42.4%
1 ≤ length < 2	20.8%	22.9%	17.8%	19.7%
2 ≤ length < 3	22.7%	7.0%	8.2%	11.5%
3 ≤ length < 4	13.6%	2.8%	3.1%	5.6%
Total	100.0%	100.0%	100.0%	100.0%
Mean (*SD*)	1.54* (1.12)	0.92 (0.75)	0.84 (0.82)	1.06 (0.96)

* Incarceration length in years.

account for approximately 24 and 22 percent, respectively. Sex-related crimes make up a small fraction of total offenses, around 3 percent.

Table 2 shows incarceration length across the three largest categories: person-, property-, and drug-related offenses. I create five categories of incarceration length: less than 3 months, 3 months to 1 year, 1 to 2 years, 2 to 3 years, and 3 to 4 years. Overall, roughly 21 percent of men in the data served less than three months. Drug law violators served less time compared to those who committed person- and property-related crimes. Approximately 71 percent of prisoners held for drug-related crimes served less than one year in prison. In contrast, about 57 percent of prisoners held for person-related crimes served one to four years. Because these categories are associated with different incarceration lengths, I control for the offenses of ex-prisoners in the analysis.

These numbers also show that holding crime class (indicating the relative seriousness of the crimes for which inmates are being imprisoned) is associated with incarceration length. "Holding crime classes" (seriousness of crime) range from 1 to 4: Class 1 stands for most-violent offenses and Class 4 for least-violent offenses.[22] State defendants are sentenced as a Class X offender if they are convicted of multiple Class 1 or Class 2 felonies. Roughly 80 percent of individuals categorized as Class X offenders serve two to four years, whereas for Class 4 offenses approximately 67 percent of individuals serve less than three months. Thus, I control for holding crime class as well when estimating the effect of incarceration length.

I also look at the security levels of the institutions from which ex-prisoners are released and the characteristics of ex-prisoners within each release institution type.[23] About 80 percent of all ex-prisoners were released from a medium- or minimum-security prison, approximately 8 percent of them from a maximum-security prison, and 9 percent of them from an Adult Transition Center (ATC).[24] I find that almost every prisoner released from an ATC served more than three months. Drug law violators constitute the largest fraction of ATC inmates. Less-educated individuals are more likely to have been released from maximum security prisons. Also noteworthy is the lack of systematic difference in racial composition in the different security levels of the release institution.

[22] See Illinois Department of Corrections at http://www.idoc.state.il.us/subsections/reports/statistical_presentation_2004/appendix_b.shtml.

[23] Release institutions indicate state prison facilities from which prisoners are paroled.

[24] Some prisoners may serve their last several months in an Adult Transition Center. The Illinois Department of Corrections (IDOC) determines which prisoners are qualified, and to which center a prisoner is referred, based on time remaining to be served, the nature of the crime for which the inmate was sentenced, and whether an inmate represents a threat to the community. Prisoners are generally placed in or near their home community to allow for an easier readjustment. See Safer Foundation at http://www.saferfoundation.org/services-programs/adult-transition-center.

In the sample, approximately 32 percent of men report being addicted to at least one type of drug at the start of their incarceration, including marijuana, cocaine, and heroin. In particular, roughly 35 percent of men convicted of property-related offenses are addicted to drugs, compared to 27 percent of men convicted of person-related offenses and 32 percent of men convicted of drug-related offenses. First-time prison entrants with drug addiction serve about one month longer than those with no drug addiction.

Finally, male ex-prisoners' demographic information indicates that these individuals are, not surprisingly, disadvantaged compared to the general population: They are less educated, predominantly black (76 percent), and mostly single (76 percent). The average release age for men in this sample is 31, which is consistent with the usual peak imprisonment age in the U.S. (Blumstein, 2002). The average incarceration length in the data is 1.06 years, while the median is 0.71 years. Thus, over 50 percent of ex-prisoners in the sample spent less than 1 year in prison.

Longitudinal Comparisons of Labor Market Outcomes

Figures 1 to 4 show the earnings and employment patterns of ex-prisoners grouped by incarceration length: less than 3 months, 1 to 2 years, and 3 to 4 years. For the sake of brevity, the figures do not show the 3 months to 1 year and 2 to 3 years groups. Real quarterly earnings include positive earnings and no earnings, and quarterly employment equals 1 for positive quarterly earnings and 0 for no earnings. Real quarterly earnings when working include only positive earnings. The findings from Figures 1 to 4 are consistent when I use all five incarceration length groups. Quarter 0 in the horizontal axis of Figures 1 through 4 indicates the period of incarceration, including the entry and exit quarters, while Quarter -1 represents the last quarter prior to incarceration, Quarter 1 represents the first quarter after incarceration exit, and so on. Thus, Quarter 0 in fact represents multiple quarters that make up the duration of incarceration.

In Figure 1 it can be seen that earnings fall drastically over the two years prior to incarceration and then rebound immediately following release. As shown in Figures 2 and 4, this is mainly caused by employment. In the program evaluation literature, this phenomenon is called Ashenfelter's dip, and is usually observed in the earnings patterns of participants in government training programs (Ashenfelter, 1978; Heckman, LaLonde, & Smith, 1999). Immediately prior to incarceration in a state prison, criminal activity and jail time may be the cause of falling earnings. The rehabilitation process, parole supervision, and the scared straight effect of incarceration may explain the subsequent recovery of earnings. Recovery may also be explained by a simple rebound from the low-level earnings right before incarceration, as routinely witnessed in job training literature.

As shown in Figures 1 and 2, there is little difference in the earnings and employment rates among individuals with different incarceration lengths prior to prison entry. After incarceration, however, ex-prisoners who spent more time in prison earn more and have higher rates of employment. This supports the use of individuals serving different periods of time in prison as counterfactuals for one another. The Main Results section shows that the estimated effects of incarceration on quarterly earnings and employment follow the patterns depicted in these figures.

Some of the men in the sample returned to prison after their first incarceration because of new crimes or parole violation. I record their earnings over these reincarceration periods as 0.[25] The Limitations and Sensitivity Analysis section discusses possible bias introduced by this practice. Note, however, that reincarceration is practically unavoidable in a population of ex-prisoners and

[25] Kling (2006) records the earnings of men over these reincarceration periods as 0, too.

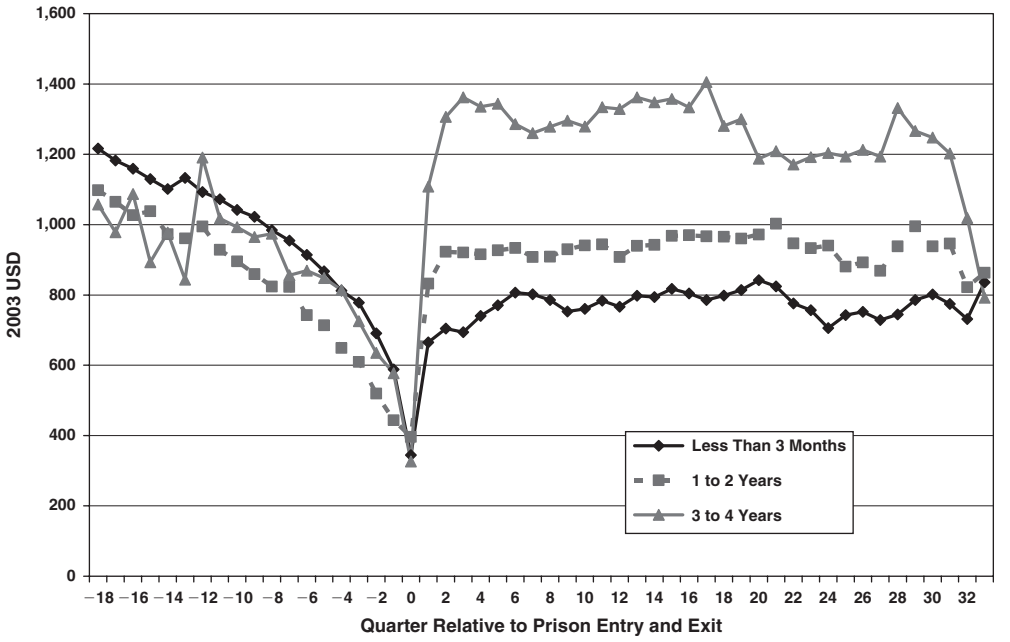

Figure 1. Real quarterly earnings by the first incarceration length.

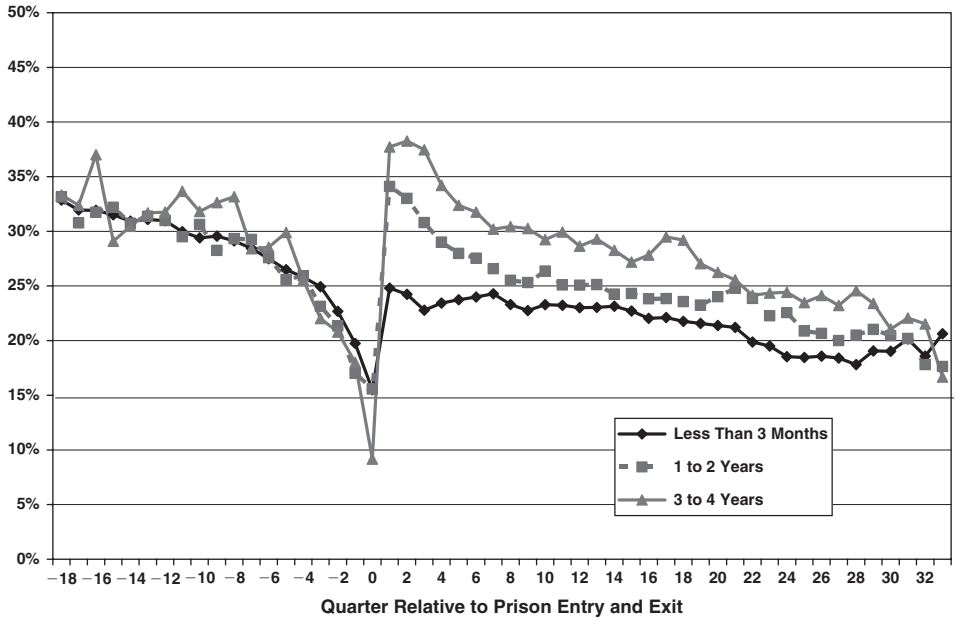

Figure 2. Quarterly employment by the first incarceration length.

needs to be understood as one of the intermediaries between incarceration duration and labor market outcomes.

The fraction of men in prison after the first incarceration, shown in Figure 3, suggests that there is no clear relationship between different incarceration lengths and recidivism. Additionally, the systematic difference among groups

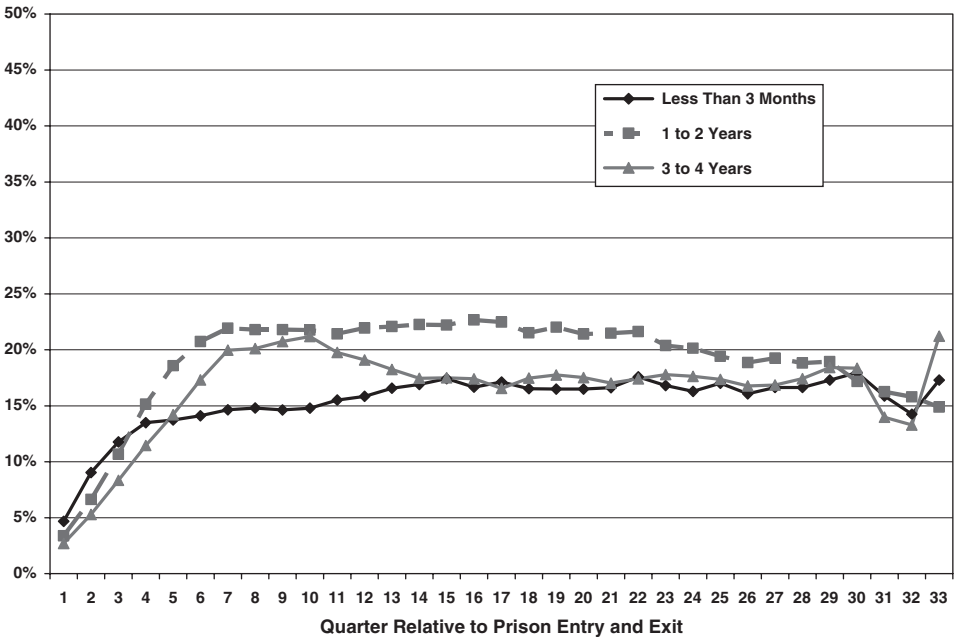

Figure 3. Percentage of ex-prisoners in prison by the first incarceration length.

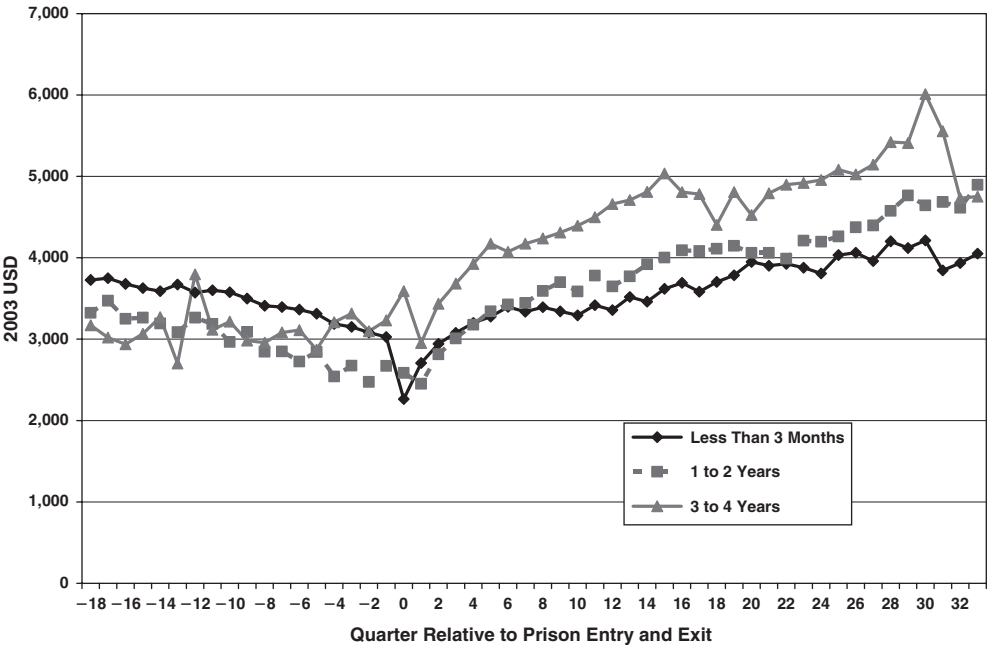

Figure 4. Real quarterly earnings when working by the first incarceration length.

with different incarceration lengths, as shown in Figure 4, suggests that employed ex-prisoners who served longer prison terms exhibit an increase in hours worked or in wage rates received. Good, Pirog-Good, and Sickles (1986) show that more employment leads to fewer crimes, at least for youth. However, it is not clear from these figures whether more employment lowers recidivism

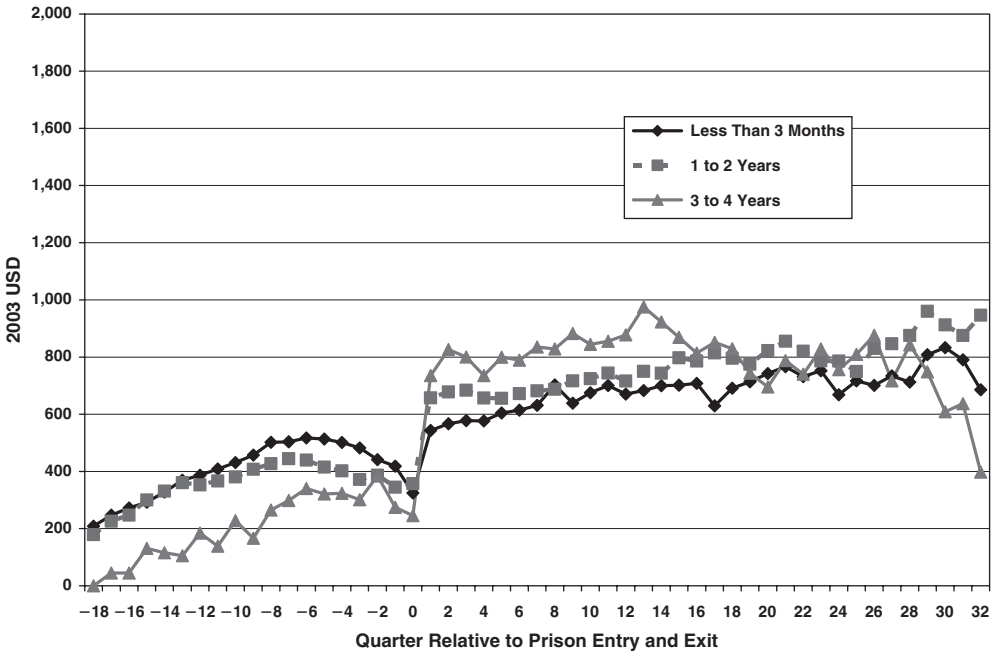

Figure 5. Real quarterly earnings: Paroled at age 18 to 24.

because of the simultaneous relationship between employment and criminal activity after incarceration.

Figures 5 through 7 show that the positive relationship between incarceration length and labor market outcomes cannot be entirely attributed to the aging of young offenders during their time in prison. This positive relationship is robust over different parolee age groups. For example, Figure 5 shows that incarceration length is positively associated with post-incarceration earnings for 18- to 24-year-old ex-prisoners, even though the association is not clear in later periods.[26] Figures 6 and 7 indicate that, even for older parolees, individuals with longer incarceration experienced higher earnings after incarceration. However, a slight "maturity" effect can be seen in Figure 5, where men with three to four years of incarceration entered prison at younger ages and had lower pre-incarceration earnings than other incarcerated groups.

EMPIRICAL STRATEGY

I use two specifications to estimate the effect of different incarceration lengths on the earnings and employment outcomes of ex-prisoners. The first is a linear specification using the interaction between continuous incarceration length and periods relative to prison entry and exit. The second is a step-function specification using the interaction between the different incarceration length dummy variables and the periods relative to prison entry and exit. Because different incarceration lengths are considered different treatments, these two specifications are flexible forms of difference-in-differences estimators.[27]

[26] All individuals are at least 16 years old at any time in this figure.
[27] Refer to empirical strategies used in Jacobson, LaLonde, and Sullivan (1993) and Grogger and Michalopoulos (2003).

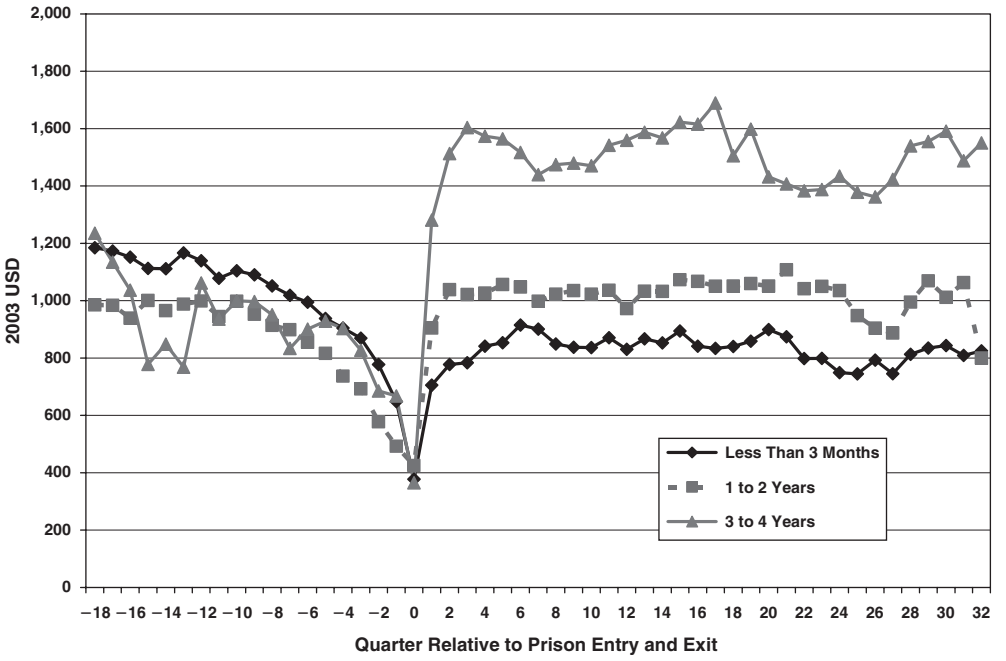

Figure 6. Real quarterly earnings: Paroled at age 25 to 39.

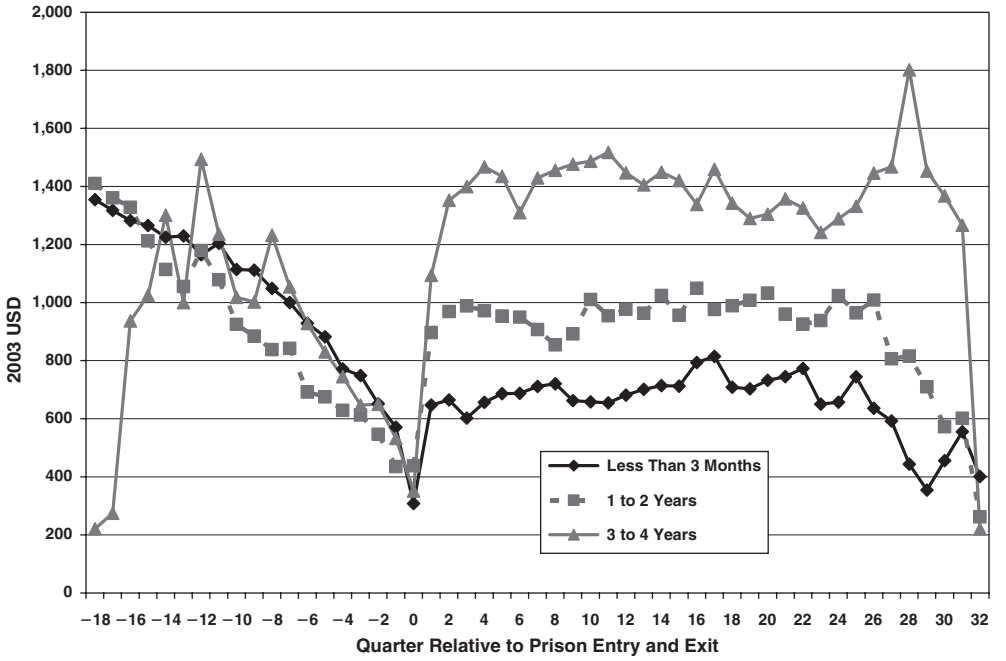

Figure 7. Real quarterly earnings: Paroled at age 40 to 64.

The fixed effects model estimated is:[28]

$$y_{it} = \alpha_i + \gamma_t + \lambda_k + A_{it}\pi + H_{i\tau}\beta + g(P_i, D_{i\tau}, \delta) + \varepsilon_{it}$$

for $i = 1, 2, \ldots, n$, $t = 1, \ldots, 34$, $k = -18, \ldots, -1, 1, \ldots, 33$, and $\tau = -2, -1, 1, 2$ where n is the number of persons in the sample, t is the calendar quarter, k is the quarter relative to the first incarceration, and τ is the period relative to the first incarceration. $\tau = -2$ is for more than 2 years before incarceration ($-18 \leq k \leq -9$), $\tau = -1$ for two years right before incarceration ($-8 \leq k \leq -1$), $\tau = 1$ for two years immediately following incarceration ($1 \leq k \leq 8$), and $\tau = 2$ for more than two years after incarceration ($9 \leq k \leq 33$). The analysis does not include observations in $k = 0$, the prison entry and exit quarters and the quarters in between, because these are the treatment period.

The outcomes y_{it} are real quarterly earnings, quarterly employment, and the log of real quarterly earnings conditional on employment for individual i at time t.[29] The individual fixed effect is represented by α_i, γ_t is an indicator variable for quarter t with the reference period of year 1995, and λ_k is an indicator variable for the kth quarter from incarceration with the reference period of $k = -9$ or before. $A_{i\tau}$ is a set of indicator variables for each age from 18 to 64 (the reference group is comprised of ages 29 to 31).[30] $H_{i\tau}$ is a set of the interactions between periods relative to prison entry and exit, and demographic and criminal characteristics.[31] I include these interactions because it is possible that demographic and criminal information may be associated with labor market outcomes differently at different time periods relative to incarceration.[32]

For the *linear* specification of the effect of incarceration length on labor market outcomes the functional form of $g(P_i, D_{i\tau}, \delta)$ is:

$$g(P_i, D_{i\tau}, \delta) = P_i\, D_{i,\tau=-1},\, \delta_{-1} + P_i\, D_{i,\tau=1},\, \delta_1 + P_i\, D_{i,\tau=2},\, \delta_2$$

where P_i is the first incarceration length and $D_i\tau$ is an indicator variable for period τ, where $\tau \in \{-1, 1, 2\}$. δ_τ summarizes the effects of incarceration length on labor market outcomes for period τ, comparing men with different incarceration lengths, conditional on incarceration. The first coefficient, δ_{-1}, tests whether incarceration length is correlated with pre-incarceration labor market outcomes. If the estimate of this coefficient comes out quantitatively and statistically significant, it is a warning sign that there may be selection into different incarceration lengths prior to imprisonment, which may not be controlled for in the model. This is analogous to the preprogram test suggested by Heckman and Hotz (1989).[33]

The second and third coefficients, δ_1 and δ_2, indicate the short-run (the first and second year after incarceration) and long-run (the third year and beyond) effects of incarceration length on earnings and employment. If the linear incarceration length

[28] In order to obtain consistent estimators, it is assumed that $E(\varepsilon_{it}' X_{is}) = 0$ and $E(\varepsilon_{it}' \alpha_i) = 0$ where t, $s \in \{1, 2, \ldots, T\}$ and X_{it} is the vector of time-varying observables in this equation (Wooldridge, 2002).

[29] A regression with the log of real quarterly earnings as a dependent variable estimates the effect of the length of incarceration on the earnings growth, conditional on employment.

[30] By doing so, I try to control for the pure maturity effect of aging during incarceration. These age indicators capture any nonlinear pattern of labor market outcomes over age.

[31] Refer to Appendix Table A1 for details. All appendices are available at the end of this article as it appears in JPAM online. See the complete article at wileyonlinelibrary.com.

[32] It is important to include an expected cost related to committing a new crime, such as the expected punishment. However, I could not find a valid variable for the expected punishment because it is the product of the punishment and the probability of receiving punishment conditional on committing a crime.

[33] Prior to treatment, the estimated treatment effect should be 0 for both the treatment and the comparison groups.

Table 3. Mean and standard deviation of outcome variables.

	Quarter Relative to Prison Entry and Exit							
	−18 to −9		−8 to −1		1 to 8		9 to 33	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Real quarterly earnings $	1,037	2,382	746	2,049	907	2,177	980	2,438
Employment rate	0.32	0.46	0.26	0.44	0.28	0.45	0.24	0.43
Real quarterly earnings when working $	3,322	3,255	2,950	3,180	3,224	3,062	4,053	3,481
Log (real quarterly earnings)	7.43	1.42	7.21	1.50	7.42	1.42	7.71	1.39

analysis is consistent with the descriptive findings in Figures 1 to 4, estimates of δ_1 and δ_2 should be nonnegative.

The step function specification of the effects of incarceration length on labor market outcomes takes the following functional form:

$$g(P_i, D_{i\tau}, \delta) = \sum_{j=1}^{4} \{P_i{}^j D_{i,\tau=-1}\delta^j_{-1} + P_i{}^j D_{i,\tau=1}\delta_1{}^j + P_i{}^j D_{i,\tau=2}\delta_2{}^j\}$$

where $P_i{}^j$ is an dummy variable for individual i in incarceration-length group j: j = 1 for 3 months to 1 year in prison, j = 2 for 1 to 2 years, j = 3 for 2 to 3 years, and j = 4 for 3 to 4 years. The reference group is individuals with less than 3 months in prison. Thus, δ^j_τ summarizes the effects of incarceration group j for period τ compared to the reference group. The first set of coefficients, δ^j_{-1}, again allows me to test for selection bias in the sample. If these effects are small and statistically insignificant, it implies that those individuals with different incarceration lengths are valid counterfactuals for one another. The second and third sets of coefficients, δ^j_1 and δ^j_2, specify the short- and long-run effects of incarceration length for those who served longer prison sentences than those in the reference group. For example, δ^1_1 measures the short-run effect for ex-prisoners who spent three months to one year in prison compared to those incarcerated for less than three months. The patterns shown in Figures 1 though 4 suggest that $0 \leq \delta^1_1 \leq \delta^2_1 \leq \delta^3_1 \leq \delta^4_1$ for the short run and $0 \leq \delta^1_2 \leq \delta^2_2 \leq \delta^3_2 \leq \delta^4_2$ for the long run.

Huber–White robust standard errors are used to account for the large n, small T panel structure of the data, so serial correlation and heteroskedasticity should not be an issue. For the sake of comparison, I present the estimation results from a pooled OLS specification alongside the results from the fixed effects models.[34] These will give an indication of the direction and size of the bias caused by individual heterogeneity.

MAIN RESULTS

In Table 3, I present the means and standard deviations of the outcome variables: real quarterly earnings, employment rate, real quarterly earnings conditional on employment, and the log of real earnings, measured over the four relative periods. These are consistent with the longitudinal pattern of earnings and employment described in the Descriptive Statistics section.

[34] The pooled OLS model also controls for time-invariant demographic characteristics: race, schooling, marriage, children, offense categories, holding crime classes, ATC-related variables, and incarceration length.

Incarceration Effects on Earnings and Employment

Tables 4A and 4B show the regression estimates of the effects of the length of the first incarceration on real quarterly earnings (including no earnings as 0). Table 4A presents the estimates of the linear specification, and Table 4B provides the results from the step-function specification. The numbers shown in columns 1 to 3 in Tables 4A and 4B are generated by the pooled OLS regression model, and the coefficients in columns 4 to 6 are estimated using the fixed effects model. All standard errors are robust with individuals clustered over time. Calendar and relative quarters as well as age indicators are controlled for in the specifications present in columns 1 and 4. Interactions between individual demographic variables and relative periods are added in columns 2 and 5. Columns 3 and 6 present the results from the full specifications, additionally controlling for interactions between crime-related variables and relative periods.

Table 4A. The effect of incarceration length on real quarterly earnings[a] (linear estimation).

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-prison test[b]	12.6 (21.2)	2.6 (21.1)	17.7 (30.7)	−19.8 (18.6)	−18.2 (18.7)	33.9 (27.8)
Short-run effect[c]	153.4 (27.7)**	153.7 (27.5)**	80.4 (38.5)**	217.4 (26.6)**	216.2 (26.7)**	197.1 (36.3)**
Long-run effect[d]	121.8 (30.7)**	123.5 (30.7)**	17.2 (43.7)	190.2 (27.7)**	191.9 (27.9)**	147.3 (38.2)**
H_0: Short-run effect = long-run effect[e]	Reject	Reject	Reject	Reject	Reject	Reject
Controls						
Relative quarter/calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race, education, and drug addiction × relative period[g]	No	Yes	Yes	No	Yes	Yes
Crime-related categories[h] × relative period	No	No	Yes	No	No	Yes
R^2	0.012	0.033	0.040	0.012	0.012	0.013
Number of observations	841,602	841,602	841,602	841,602	841,602	841,602
Number of individuals	29,560	29,560	29,560	29,560	29,560	29,560

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] Real quarterly earnings include positive earnings and no earnings as 0.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Reject H_0 if p-value is less than 0.05.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime class, offense categories, and release institution security categories.

Table 4B. The effect of incarceration length on real quarterly earnings[a] (step-function estimation).

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-prison test[b]						
3 months to 1 year in prison[e]	2.6	−3.6	64.0	−9.1	−14.0	40.9
	(35.9)	(35.5)	(42.4)	(33.2)	(33.1)	(39.9)
1 year to 2 years in prison	−41.8	−59.8	17.4	−88.6	−90.8	−3.4
	(48.1)	(47.7)	(59.6)	(43.4)**	(43.3)**	(54.4)
2 years to 3 years in prison	58.4	26.7	118.7	−22.9	−21.1	135.3
	(67.7)	(66.3)	(85.2)	(57.0)	(56.9)	(76.1)*
3 years to 4 years in prison	42.8	37.6	161.0	−28.0	−22.6	160.5
	(103.3)	(103.3)	(127.1)	(98.9)	(98.9)	(120.7)
Short-run effect[c]						
3 months to 1 year in prison	135.1	130.5	70.7	129.5	123.1	55.4
	(47.3)**	(46.5)**	(55.9)	(42.2)**	(42.1)**	(50.9)
1 year to 2 years in prison	235.0	225.1	116.7	262.9	255.2	178.8
	(61.4)**	(60.8)**	(75.2)	(55.3)**	(55.1)**	(67.1)**
2 years to 3 years in prison	406.7	400.6	246.8	561.7	556.0	505.1
	(92.7)**	(90.5)**	(111.1)**	(83.3)**	(83.3)**	(103.1)**
3 years to 4 years in prison	482.4	518.4	408.2	607.0	602.5	579.8
	(129.3)**	(129.5)**	(158.6)**	(129.7)**	(129.8)**	(152.2)**
Long-run effect[d]						
3 months to 1 year in prison	184.7	177.0	125.4	164.2	157.3	105.7
	(57.4)**	(56.3)**	(68.7)**	(46.1)**	(46.0)**	(55.7)*
1 year to 2 years in prison	209.5	197.0	72.7	218.3	216.6	149.7
	(71.8)**	(71.1)**	(89.3)	(58.8)**	(58.7)**	(72.3)**

(*Continued*)

Table 4B. (*Continued*)

		Pooled OLS Model			Fixed Effects Model		
		(1)	(2)	(3)	(4)	(5)	(6)
2 years to 3 years in prison	385.1 (103.6)**	380.0 (101.5)**	181.4 (127.1)	553.8 (87.7)**	554.5 (88.0)**	477.8 (109.4)**	
3 years to 4 years in prison	425.5 (141.3)**	463.7 (141.7)**	299.3 (176.0)**	537.2 (134.6)**	538.9 (134.9)**	478.4 (158.9)**	
Controls							
Relative quarter/calendar quarter/age[f]		Yes	Yes	Yes	Yes	Yes	Yes
Race, education, and drug addiction × relative period[g]		No	Yes	Yes	No	Yes	Yes
Crime-related categories[h] × relative period		No	No	Yes	No	No	Yes
R^2		0.012	0.033	0.040	0.012	0.012	0.013
Number of observations		841,602	841,602	841,602	841,602	841,602	841,602
Number of individuals		29,560	29,560	29,560	29,560	29,560	29,560

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] Real quarterly earnings include positive earnings and no earnings as 0.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Less than three months in prison as the reference group.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than 2 years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime classes, offense categories, and release institution security categories.

In Table 4A, the effects of incarceration length are specified by the interactions between continuous incarceration length and periods relative to prison entry and exit.[35] The pre-prison coefficients imply that incarceration length is not associated with pre-prison earnings; these coefficients are small and not significant in all specifications. Thus, the models pass the preprogram test suggested by Heckman and Hotz (1989).[36]

The fixed effects estimates shown in columns 4 to 6 are greater than those of the pooled OLS model shown in columns 1 to 3.[37] The effects become smaller when controlling for crime-related variables in columns 3 and 6. Because holding crime class (severity index of crime) and offense categories are strongly correlated with incarceration length, this result is not surprising. Estimates in column 6, the fully specified fixed effects model, indicate that the short-run effect is approximately $197 in additional quarterly earnings per year of incarceration. As shown in the hypothesis test in the fourth row, the long-run effect (approximately $147 per year of incarceration) is significantly smaller than the short-run effect.

Table 4B provides the estimated effects of incarceration using the step-functions specification.[38] Consistent with Table 4A, incarceration length appears to be uncorrelated with pre-prison earnings; however, some coefficients for pre-prison test in columns 4 to 6 are relatively large and statistically significant. Therefore, it is possible that there is a weak nonlinear correlation between unknown time-varying individual characteristics and incarceration length.

Similar to Table 4A, the fixed effects estimates are greater than the pooled OLS estimates. The pooled OLS estimates appear to be negatively biased because the model does not control for individual heterogeneity, such as individual earning capacity, that is positively correlated with labor market outcomes and negatively correlated with incarceration length. In other words, highly skilled workers are working in high-paying jobs and are less likely to be involved in the serious crimes that are associated with longer periods of incarceration. Thus, contrary to the concern that positive estimated effects are overstated, it seems that the positive effects of incarceration length on labor market outcomes are underestimated.

Column 6 of Table 4B shows that longer incarceration is associated with higher real quarterly post-incarceration earnings. That is, as expected, $0 < \hat{\alpha}^1 < \hat{\alpha}^2 < \hat{\alpha}^3 < \hat{\alpha}^4$ for the short run and $0 < \hat{\delta}^1 < \hat{\delta}^2 < \hat{\delta}^3 < \hat{\delta}^4$ for the long run, even though the long-run effects are smaller than the short-run effects. For example, over the first two years following incarceration, ex-prisoners who spent three to four years in prison earned roughly $580 more than ex-prisoners in the reference group. In the long run, the amount is reduced to approximately $478. This finding is consistent with the results presented in Table 4A.

Tables 5A and 5B report the estimated effects of incarceration length on employment (any positive earnings as 1 and no earnings as 0), using the same format as Tables 4A and 4B. Overall the estimates are less precise, but are consistent with the findings presented earlier—longer incarceration is associated with higher rates of post-prison employment. The estimated effects of pre-incarceration characteristics indicate that unobserved factors are uncorrelated with incarceration length. As in Tables 4A and 4B, the coefficients on both the long- and short-run effects in the fixed effects model are larger and estimated more precisely than in the OLS model.

[35] The coefficient estimates of the main effects of incarceration length in the pooled OLS model are not presented, but are uniformly small and statistically insignificant.
[36] Prior to treatment, the estimated treatment effect should be 0 for both the treatment and comparison groups.
[37] In Kling (2006), the OLS estimate of the effect of incarceration is also biased downward compared to the IV estimate.
[38] The estimated coefficients of the main effects of incarceration length in the pooled OLS model are not presented. They are relatively small and most of them are statistically insignificant.

Table 5A. The effect of incarceration length on quarterly employment[a] (linear estimation).

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-prison test[b]	−0.004	−0.005	0.003	−0.009	−0.009	0.002
	(0.004)	(0.004)	(0.005)	(0.004)**	(0.004)**	(0.005)
Short-run effect[c]	0.025	0.025	0.012	0.043	0.043	0.033
	(0.005)**	(0.005)**	(0.007)*	(0.005)**	(0.005)**	(0.006)**
Long-run effect[d]	0.008	0.008	−0.005	0.028	0.029	0.017
	(0.005)	(0.005)*	(0.007)	(0.005)**	(0.005)**	(0.007)**
H_0: Short-run effect = long-run effect[e]	Reject	Reject	Reject	Reject	Reject	Reject
Controls						
Relative quarter/ calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race, education, and drug addiction × relative period[g]	No	Yes	Yes	No	Yes	Yes
Crime-related categories[h] × relative period	No	No	Yes	No	No	Yes
R^2	0.013	0.024	0.030	0.014	0.015	0.017
Number of observations	841,602	841,602	841,602	841,602	841,602	841,602
Number of individuals	29,560	29,560	29,560	29,560	29,560	29,560

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] Quarterly employment equals 1 for positive quarterly earnings and 0 for no earnings.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Reject H_0 if p-value is less than 0.05.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime class, offense categories, and release institution security categories.

Estimates in column 6 of Table 5A indicate that in the short run, an additional year of incarceration is associated with a 3.3 percentage point increase in the employment rate; in the long run, the effect declines significantly to 1.7 percentage points. The estimates in Table 5B are consistent with those in Table 5A—longer incarceration is associated with a higher quarterly post-incarceration employment rate. Again, the long-run effects are smaller than the short-run effects. For example, estimates in column 6 indicate that in the short run, ex-prisoners who were incarcerated for three to four years experienced employment rates 8.6 percentage points higher than those in the reference group. In the long run, this effect is reduced to 5.1 percentage points. It seems that the positive effects of longer incarceration diminish over time.

Table 5B. The effect of incarceration length on quarterly employment[a] (step-function estimation).

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-prison test[b]						
3 months to 1 year in prison[e]	−0.009	−0.010	0.005	−0.008	−0.009	0.005
	(0.007)	(0.007)	(0.008)	(0.006)	(0.006)	(0.007)
1 year to 2 years in prison	−0.014	−0.015	0.004	−0.019	−0.019	0.001
	(0.009)	(0.009)*	(0.011)	(0.008)**	(0.008)**	(0.010)
2 years to 3 years in prison	−0.006	−0.010	0.015	−0.023	−0.023	0.009
	(0.013)	(0.013)	(0.016)	(0.011)**	(0.011)**	(0.014)
3 years to 4 years in prison	−0.025	−0.025	0.006	−0.037	−0.036	0.001
	(0.020)	(0.020)	(0.023)	(0.019)**	(0.019)*	(0.021)
Short-run effect[c]						
3 months to 1 year in prison	0.014	0.013	−0.004	0.021	0.020	0.003
	(0.008)*	(0.008)	(0.010)	(0.008)**	(0.008)**	(0.009)
1 year to 2 years in prison	0.046	0.046	0.016	0.065	0.064	0.039
	(0.011)**	(0.011)**	(0.014)	(0.010)**	(0.010)**	(0.013)**
2 years to 3 years in prison	0.063	0.063	0.022	0.091	0.091	0.059
	(0.016)**	(0.016)**	(0.020)	(0.015)**	(0.015)**	(0.018)**
3 years to 4 years in prison	0.065	0.070	0.035	0.116	0.116	0.086
	(0.024)**	(0.024)**	(0.028)	(0.024)**	(0.024)**	(0.027)**
Long-run effect[d]						
3 months to 1 year in prison	0.003	0.001	−0.008	0.012	0.010	0.002
	(0.010)	(0.010)	(0.012)	(0.008)	(0.008)	(0.010)
1 year to 2 years in prison	0.010	0.009	−0.013	0.030	0.031	0.014
	(0.012)	(0.012)	(0.015)	(0.011)**	(0.011)**	(0.013)
2 years to 3 years in prison	0.021	0.021	−0.013	0.052	0.054	0.027
	(0.017)	(0.017)	(0.022)	(0.016)**	(0.016)**	(0.019)
3 years to 4 years in prison	0.018	0.023	−0.005	0.075	0.078	0.051
	(0.025)	(0.025)	(0.029)	(0.025)**	(0.025)**	(0.028)*

(*Continued*)

Table 5B. (*Continued*)

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Controls						
Relative quarter/calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race, education, and drug addiction × relative period[g]	No	Yes	Yes	No	Yes	Yes
Crime-related categories[h] × relative period	No	No	Yes	No	No	Yes
R^2	0.013	0.025	0.030	0.014	0.015	0.017
Number of observations	841,602	841,602	841,602	841,602	841,602	841,602
Number of individuals	29,560	29,560	29,560	29,560	29,560	29,560

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] Quarterly employment equals 1 for positive quarterly earnings and 0 for no earnings.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Less than three months in prison as the reference group.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than 2 years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime classes, offense categories, and release institution security categories.

Table 6A. The effect of incarceration length on the log of real quarterly earnings[a] (linear estimation).

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-prison test[b]	0.024	0.014	0.020	0.015	0.016	0.048
	(0.020)	(0.019)	(0.030)	(0.018)	(0.018)	(0.028)*
Short-run effect[c]	0.094	0.094	0.071	0.231	0.233	0.226
	(0.021)**	(0.021)**	(0.030)**	(0.024)**	(0.024)**	(0.033)**
Long-run effect[d]	0.084	0.079	0.039	0.210	0.210	0.197
	(0.022)**	(0.022)**	(0.033)	(0.025)**	(0.025)**	(0.035)**
H_0: Short-run effect = long-run effect[e]	Don't reject	Don't reject	Reject	Reject	Reject	Reject
Controls						
Relative quarter/ calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race, education, and drug addiction × relative period[g]	No	Yes	Yes	No	Yes	Yes
Crime-related categories[h] × relative period	No	No	Yes	No	No	Yes
R^2	0.039	0.071	0.080	0.023	0.023	0.025
Number of observations	220,706	220,706	220,706	220,706	220,706	220,706
Number of individuals	21,651	21,651	21,651	21,651	21,651	21,651

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] The log of real quarterly earnings conditional on employment includes only positive quarterly earnings as natural log values.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Reject H_0 if p-value is less than 0.05.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime class, offense categories, and release institution security categories.

I present the estimated effects of incarceration length on the log of real quarterly earnings conditional on employment (only positive earnings are used) in Tables 6A and 6B. The estimates are consistent with earlier findings: Longer periods of incarceration are associated with increased earnings for ex-prisoners. In line with the findings presented earlier, the estimated effects of pre-prison characteristics in both the linear and step-function specifications suggest that incarceration length is not associated with labor market outcomes prior to incarceration. As before, the fixed effects estimates are larger than the pooled OLS.

The linear specification results shown in column 6 of Table 6A suggests that, in the short run, one additional year of incarceration is associated with a 22.6 percent

Table 6B. The effect of incarceration length on the log of real quarterly earnings[a] (step-function estimation).

	Pooled OLS Model			Fixed Effects Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-prison test[b]						
3 months to 1 year in prison[e]	−0.035	−0.028	0.025	−0.025	−0.026	0.038
	(0.035)	(0.034)	(0.041)	(0.032)	(0.032)	(0.039)
1 year to 2 years in prison	−0.076	−0.100	−0.020	−0.074	−0.073	0.020
	(0.047)	(0.046)**	(0.059)	(0.043)*	(0.043)*	(0.055)
2 years to 3 years in prison	0.066	0.059	0.077	0.041	0.043	0.115
	(0.062)	(0.061)	(0.085)	(0.057)	(0.057)	(0.080)
3 years to 4 years in prison	0.054	0.036	0.056	0.061	0.055	0.120
	(0.099)	(0.098)	(0.120)	(0.099)	(0.099)	(0.118)
Short-run effect[c]						
3 months to 1 year in prison	0.066	0.061	0.039	0.136	0.131	0.084
	(0.042)	(0.041)	(0.048)	(0.040)**	(0.040)**	(0.047)*
1 year to 2 years in prison	0.129	0.123	0.085	0.224	0.227	0.177
	(0.053)**	(0.052)**	(0.065)	(0.054)**	(0.054)**	(0.067)**
2 years to 3 years in prison	0.225	0.236	0.186	0.559	0.563	0.506
	(0.070)**	(0.068)**	(0.092)**	(0.072)**	(0.073)**	(0.094)**
3 years to 4 years in prison	0.304	0.315	0.307	0.739	0.729	0.688
	(0.097)**	(0.099)**	(0.122)**	(0.115)**	(0.115)**	(0.136)**
Long-run effect[d]						
3 months to 1 year in prison	0.149	0.134	0.100	0.186	0.180	0.131
	(0.048)**	(0.046)**	(0.055)*	(0.045)**	(0.045)**	(0.054)**
1 year to 2 years in prison	0.188	0.158	0.095	0.207	0.208	0.159
	(0.059)**	(0.058)**	(0.072)	(0.059)**	(0.059)**	(0.074)**
2 years to 3 years in prison	0.238	0.230	0.142	0.555	0.556	0.498
	(0.076)**	(0.074)**	(0.100)	(0.077)**	(0.078)**	(0.101)**

(*Continued*)

Table 6B. (*Continued*)

		Pooled OLS Model			Fixed Effects Model		
		(1)	(2)	(3)	(4)	(5)	(6)
3 years to 4 years in prison	0.350 (0.103)**	0.346 (0.104)**	0.304 (0.131)**		0.714 (0.120)**	0.695 (0.120)**	0.654 (0.143)**
Controls							
Relative quarter/calendar quarter/age[f]		Yes	Yes	Yes	Yes	Yes	Yes
Race, education, and drug addiction × relative period[g]		No	Yes	Yes	No	Yes	Yes
Crime-related categories[h] × relative period		No	No	Yes	No	No	Yes
R^2		0.040	0.072	0.081	0.023	0.023	0.025
Number of observations		220,706	220,706	220,706	220,706	220,706	220,706
Number of individuals		21,651	21,651	21,651	21,651	21,651	21,651

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] The log of real quarterly earnings conditional on employment includes only positive quarterly earnings as natural log values.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Less than three months in prison as the reference group.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime classes, offense categories, and release institution security categories.

increase in earnings; in the long run, this effect is reduced to 19.7 percent. The earnings growth as a result of one year of incarceration is considerable when compared to the estimates of earnings growth associated with a single year of education, typically around 6 to 10 percent in real earnings (Card, 1999). Thus, this estimate requires caution.

Consistent with Table 6A, Table 6B shows that longer incarceration is associated with higher post-prison earnings growth, even though the long-run effects are smaller than the short-run effects. For example, estimates in column 6 indicate that in the short run, ex-prisoners incarcerated between one and two years experienced a 17.7 percent increase in earnings conditional on employment compared to those with less than three months of incarceration. In the long run, the effect is reduced to approximately 16 percent. In sum, it seems that ex-prisoners who spend more time in prison earn more and have a higher employment rate upon exit from prison, although these positive effects attenuate over time.

Two Possible Channels of Causation

The positive effects of an increase in incarceration length on labor market outcomes are likely the result of rehabilitation while in prison, the deterrent effect of serving time in prison, or a combination of the two. This claim is supported by the following analysis of ex-prisoners based on their offense categories and rates of drug addiction.

Table 7 shows that the effects of incarceration length on real quarterly earnings vary by the ex-prisoners' offense categories and drug addiction history.[39] The linear specification is estimated using the fixed effects model with full controls.[40] For ease of reference I include the estimates from column 6 of Table 4A, displayed here under in the column labeled "All." The pre-prison test shows findings similar to those presented earlier; overall, the effects are relatively small and not significant, even though there are some substantive estimates in the "Person" column.

The results presented in Table 7 imply that the positive effect of incarceration length on real quarterly earnings is relatively strong for ex-prisoners convicted of drug-related offenses and moderate for those convicted of property-related offenses. For ex-prisoners convicted of person-related offenses, the effects are positive but imprecisely estimated. The estimates from the three offense types are not statistically different from one another. On the other hand, the positive effect is statistically greater for prison entrants with histories of drug addiction than for those without drug addiction, at least in the short run.

The short-run effect of one year of incarceration is approximately $249 per quarter for those with drug-related offenses, $204 for those with property-related offenses, and $169 for those with person-related offenses. For an additional year of incarceration, prison entrants with drug addiction almost double the increase in post-incarceration earnings over two years following exit compared to those with no drug problems: approximately $302 and $157, respectively. The effects attenuate over time, though the attenuation is statistically significant only for drug addicts and those with drug-related offenses.

Table 8 shows that the effects of incarceration length on employment vary by offense categories and history of drug addiction. The specification is the same as in Table 7. The short-run and long-run effects indicate that the positive effect of incarceration length on employment is relatively strong for those with drug-related

[39] I do not present the result for sex offenders because they constitute a very small fraction of the sample, roughly 3 percent.

[40] Estimates of the step-function specification are not provided here. They are mostly consistent with those of the linear specification.

Table 7. The effect of incarceration length on real quarterly earnings[a] over different offenses and drug addiction.

	Offense Types			Prison Entrance with Drug Addiction		
	Person	Property	Drug	Yes	No	All
Pre-prison test[b]	76.7 (65.7)	17.0 (59.0)	32.1 (33.0)	45.4 (54.6)	33.4 (32.7)	33.9 (27.8)
Short-run effect[c]	169.1 (78.0)**	203.9 (80.1)**	248.9 (48.4)**	301.7 (65.5)**	157.4 (43.8)**	197.1 (36.3)**
Long-run effect[d]	140.6 (81.3)*	153.3 (83.8)*	166.6 (51.5)**	220.1 (68.1)**	122.8 (46.3)**	147.3 (38.2)**
H_0: Short-run effect = long-run effect[e]	Don't reject	Don't reject	Reject	Reject	Don't reject	Reject
Controls						
Relative quarter/ calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race and education × relative period[g]	Yes	Yes	Yes	Yes	Yes	Yes
Crime-related categories[h] × relative period	Yes	Yes	Yes	Yes	Yes	Yes
Offense categories × relative period	.	.	.	Yes	Yes	Yes
Drug addiction × relative period	Yes	Yes	Yes	.	.	Yes
R^2	0.017	0.011	0.015	0.014	0.014	0.013
Number of observations	196,841	189,431	427,403	265,152	576,450	841,602
Number of individuals	7,111	6,611	14,792	9,299	20,261	29,560

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] Real quarterly earnings include positive earnings and no earnings as 0.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Reject H_0 if p-value is less than 0.05.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime classes and release institution security categories.

offenses and moderate for those with property-related offenses. For these two offense categories, the effects are stronger during the first two years after incarceration, about 4 to 5 percentage points per year in prison. These effects attenuate significantly to approximately 2 to 3 percentage points in the long run.

The estimated effects for those who committed person-related offenses are close to zero and not significant in either the short run or the long run. They are statistically lower than the effects for those with drug-related offenses. Also, the short-run

Table 8. The effect of incarceration length on quarterly employment[a] over different offenses and drug addiction.

	Offense Types			Prison Entrance with Drug Addiction		
	Person	Property	Drug	Yes	No	All
Pre-prison test[b]	0.005 (0.010)	0.008 (0.010)	−0.001 (0.007)	−0.004 (0.009)	0.004 (0.006)	0.002 (0.005)
Short-run effect[c]	0.005 (0.013)	0.042 (0.013)**	0.050 (0.009)**	0.051 (0.012)**	0.025 (0.007)**	0.033 (0.006)**
Long-run effect[d]	−0.005 (0.013)	0.022 (0.014)	0.031 (0.010)**	0.030 (0.013)**	0.013 (0.008)*	0.017 (0.007)**
H_0: Short-run effect = long-run effect[e]	Reject	Reject	Reject	Reject	Reject	Reject
Controls						
Relative quarter/ calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race and education × relative period[g]	Yes	Yes	Yes	Yes	Yes	Yes
Crime-related categories[h] × relative period	Yes	Yes	Yes	Yes	Yes	Yes
Offense categories × relative period	.	.	.	Yes	Yes	Yes
Drug addiction × relative period	Yes	Yes	Yes	.	.	Yes
R^2	0.022	0.020	0.016	0.019	0.017	0.017
Number of observations	196,841	189,431	427,403	265,152	576,450	841,602
Number of individuals	7,111	6,611	14,792	9,299	20,261	29,560

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] Quarterly employment equals 1 for positive quarterly earnings and 0 for no earnings.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Reject H_0 if p-value is less than 0.05.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime classes and release institution security categories.

effect of an additional year of incarceration is a roughly 5 percentage point increase in the employment rate for prison entrants with histories of drug addiction compared to a 2.5 percentage point increase for those without drug problems. They are statistically different from each other at the 10 percent level.

I present the effect of incarceration length on the log of real quarterly earnings over ex-prisoners' offense categories and drug addiction histories in Table 9. The specification is the same as in Tables 7 and 8. Although the pre-prison controls are

Table 9. The effect of incarceration length on the log of real quarterly earnings[a] over different offenses and drug addiction.

	Offense Types			Prison Entrance with Drug Addiction		
	Person	Property	Drug	Yes	No	All
Pre-prison test[b]	0.092 (0.051)*	0.091 (0.059)	0.017 (0.044)	0.067 (0.058)	0.044 (0.032)	0.048 (0.028)*
Short-run effec[c]	0.152 (0.057)**	0.305 (0.073)**	0.281 (0.053)**	0.299 (0.064)**	0.198 (0.039)**	0.226 (0.033)**
Long-run effect[d]	0.149 (0.060)**	0.270 (0.078)**	0.206 (0.057)**	0.252 (0.067)**	0.174 (0.042)**	0.197 (0.035)**
H_0: Short-run effect = long-run effect[e]	Don't Reject	Don't Reject	Reject	Don't Reject	Don't Reject	Reject
Controls						
Relative quarter/ calendar quarter/age[f]	Yes	Yes	Yes	Yes	Yes	Yes
Race and education × relative period[g]	Yes	Yes	Yes	Yes	Yes	Yes
Crime-related categories[h] × Relative period	Yes	Yes	Yes	Yes	Yes	Yes
Offense categories × relative period	.	.	.	Yes	Yes	Yes
Drug addiction × relative period	Yes	Yes	Yes	.	.	Yes
R^2	0.030	0.026	0.027	0.025	0.027	0.025
Number of observations	56,740	49,162	106,061	66,832	153,874	220,706
Number of individuals	5,179	4,961	10,752	6,881	14,770	21,651

** $p < 0.05$; * $p < 0.1$; Huber–White robust standard errors clustered within an individual are in parentheses.

[a] The log of real quarterly earnings conditional on employment includes only positive quarterly earnings as natural log values.

[b] The pre-prison selection test is for two years immediately prior to incarceration, and the reference period is more than two years prior to incarceration.

[c] The effect for two years immediately following incarceration.

[d] The effect for third year and beyond following incarceration.

[e] Reject H_0 if p-value is less than 0.05.

[f] Dummy variables for age.

[g] The period relative to prison entry and exit, the relative period τ, is defined as follows: $\tau = -2$ is for more than two years prior to incarceration, $\tau = -1$ for two years immediately prior to incarceration, $\tau = 1$ for two years immediately following incarceration, and $\tau = 2$ for third year and beyond following incarceration with $\tau = -2$ as a reference period.

[h] Dummy variables for holding crime classes and release institution security categories.

not significant at the 5 percent level, they are relatively large for person- and property-related ex-prisoners.

The estimated short- and long-run effects of incarceration length on earnings growth suggest that the positive effect is relatively strong for those with drug- and property-related offenses—approximately 28 to 30 percent per year in prison in the short run and between 20 to 27 percent in the long run. More moderate effects are found (an increase of roughly 15 percent in both the short and long run) for

those with person-related offenses. Across the three offense types the estimated effects are not statistically different from one another. Hypothesis tests show that for person- and property-related offenders, the effect is constant over time, and for drug-related ex-prisoners it appears to attenuate significantly. The short-run effect is much stronger for men with drug addiction than for those without drug problems—approximately a 30 and 20 percent increase in earnings per year of incarceration, respectively; nevertheless, they are not statistically different from each other. The 30 percent increase for men with drug addiction seems too high even after considering the low pre-incarceration earnings level of those ex-prisoners. Thus, one needs to be cautious about this estimate.

In summary, these results suggest that men convicted of economically motivated and less-violent offenses such as property- or drug-related crimes experience higher increases in earnings after incarceration than other men in the data. In addition, the effect is stronger for men with self-reported drug problems. This suggests two possible channels through which an increase in incarceration length positively impacts labor market outcomes: Drug addicted entrants may improve their health because of rehabilitation programs available to them during incarceration or no or limited access to drugs and alcohol. Also, generally speaking, individuals convicted of person-related offenses are more likely to be violent offenders compared to those convicted of property- or drug-related crimes, who are more likely to be motivated by economic circumstances. The specific deterrence of lengthy incarceration seems to be more effective for economically motivated and less-violent offenders, which is implied by the greater positive impact of incarceration length on labor market outcomes of property- or drug-related ex-prisoners.

LIMITATIONS AND SENSITIVITY ANALYSES

In the data, there are several possible sources of variation in time served in prison. Prior criminal record, types and seriousness of committed crimes, random assignment of sentencing judge, and an individual's behavior in prison can all contribute to variation in prison terms among individuals. It is ideal to control for all of these factors, excluding random assignment of sentencing judge. In this analysis, the model controls for types and seriousness of committed crimes directly. It also controls for prior criminal record using the fixed effects model because this is a time-constant variable. However, there is no way to perfectly control for time-variant unobserved characteristics using the present data, even if I control for education, race, and drug addiction interactions with periods relative to the first incarceration. I ran the regression model with time served as the dependent variable, controlling for other criminal and demographic characteristics to check whether there are potential omitted variables influencing the labor market outcomes. *R*-squared of the regression is 0.56. This is fairly large compared to typical regressions in the social sciences studying individual-level data. In summary, demographic and criminal characteristics are highly correlated with incarceration length. This implies that incarceration length may be correlated with time-variant unobserved variables that are not controlled for in the fixed effects model. These time-variant variables can reflect an ex-prisoner's propensity for good behavior. If they are negatively correlated with incarceration length and positively correlated with labor market outcomes, then the estimated impact of incarceration length on labor market outcomes is underestimated. Thus, this in turn helps support the estimated impact because, as the previous section shows, incarceration length has a positive impact on labor market outcomes.

Another possible omitted variable is an expected cost related to committing a new crime, such as the expected punishment, that is difficult to measure because it is the product of the punishment and the probability of receiving punishment conditional on committing a crime. Excluding the expected punishment may cause positive bias if it is positively correlated with incarceration length and earnings.

Some studies, to avoid these complications, use instrumental variables, such as random assignment of sentencing judge in Kling (2006). However, valid instrumental variables are not available in this study. Furthermore, instrumental variables cast doubt on the analysis if there is a heterogeneous response to the treatment under the random coefficient model (Heckman, LaLonde, & Smith, 1999). For example, if convicts with higher future returns to lengthy incarceration are sentenced to longer terms of incarceration, the estimates in this paper may be positively biased and the estimates using instrumental variables may be ambiguous.

The population of men who served their terms exclusively in jail is large (about half of the state and federal prison population in 2008) and is not included in this analysis. Contrary to findings in this paper, the length of time in jail may negatively affect men's labor market outcomes by disrupting their employment and residential situations. Also, it is possible that the different institutional characteristics of jails and prisons bring about different impacts of incarceration on employment and earnings. For example, rehabilitation programs are more readily available in prison than in jail, which may result in different labor market outcomes. Thus, it is important to be cautious about generalizing findings from this paper to men who served in jail.

The sample is an unbalanced longitudinal panel in terms of quarter relative to the first incarceration because individuals are observed over various lengths, depending on the timing of their first incarceration. I generated the main results in this paper using a perfectly balanced panel that includes 7,528 men, each with less than three years of incarceration, paroled between 1995 and the second quarter of 2003, and with data available ten quarters before and after incarceration. The results are all consistent with those described earlier, though less precise because of the small sample size.

Pretrial jail time served by prisoners prior to incarceration is not available. If time in jail and time in prison are positively correlated with each other, then the impact of duration of time in prison on post-prison earnings may be positively biased. To explore this possibility, the earnings of men who eventually landed in prison were examined for a two-year period prior to imprisonment. Analyses revealed that pre-prison earnings were not associated with the subsequent length of incarceration. Although this is not definitive, it suggests that this potential source of bias is not large.

Perhaps the positive relationship between incarceration length and labor market outcomes is due to parole supervision following release from prison. If the intensity of parole supervision is correlated with incarceration length and earnings in the same direction, then the estimated effect of incarceration length may be positively biased. However, the intensity of parole supervision is directly correlated with type and severity of offense, which are controlled for in the regression model, as opposed to incarceration length itself.[41] Additionally, the effect of intensity of parole supervision on the labor market outcomes of parolees is ambiguous. For example, according to Petersilia and Turner (1993), intense supervision programs increase the incidence of technical violations, which can lead to the reincarceration of violators and thus cause them to lose their jobs.

It is possible to argue that the *R*-squared in the regression results is small, 0.011 to 0.08, and therefore the explanatory power of the model is limited. *R*-squared is important when research intends to predict the outcome variable from the regression model. However, if research focuses on consistent estimators to show causation, a large *R*-squared is only helpful to improve the efficiency of the estimates. A small *R*-squared is also common in other studies using administrative data on

[41] Thus, variables related to type and severity of offense work as proxy variables for the intensity of parole in the regression model.

incarcerated individuals, because the behavior of these individuals is explained less well by conventional socioeconomic variables. For example, *R*-squared in LaLonde and Cho (2008) is 0.06 to 0.07, while Kling (2006) does not even provide *R*-squared.

The earnings and employment records in the sample are from UI-covered jobs. Thus, this study does not consider labor market outcomes from informal employment. If earnings and employment of men in the informal sector are negatively correlated with the length of incarceration, then the estimates of effect of incarceration in this study may be positively biased. Considering the positive relationship between incarceration length and earnings from UI-covered jobs in this study, it is less likely that men serving shorter incarceration terms earn more than those with longer terms in the informal labor market. Also, as mentioned earlier, it seems reasonable to focus on formal sector earnings given that they are more likely to represent legitimate, law-abiding (and taxable) earnings behavior.

Finally, there may be a concern that treating a reincarcerated man's earnings and employment after his first incarceration as 0 may cause bias because reincarceration affected by unobservables, which are not controlled for, physically prevents them from working. Suppose that there is a social experiment where a fraction of convicted men is randomly assigned to serve one year in a control state and the remaining convicted men are randomly assigned to serve two years in a treatment state. Then the effect of one more year of incarceration can be consistently estimated by subtracting the average earnings of the control group from that of the treatment group under the assumption that the treatment and control groups face the same job market conditions. If men in the comparison group (as set out in this study) are more prone to be reincarcerated than those in the ideal control group (as set out in the thought experiment), it may cause the overestimation of the effect. This can happen if time-varying unobservables are positively correlated with reincarceration rates and are negatively correlated with incarceration duration.

DISCUSSION AND CONCLUSION

A sharp rise in the incarceration rate of men since the mid-1970s has led some researchers to question whether incarceration harms the marketable skills of working-age men. Two distinct effects of incarceration are at issue—one is the effect of being sent to prison and the other is the effect of spending time in prison. This paper focuses on the latter and examines how an increase in incarceration length, conditional on incarceration, affects the earnings and employment of male ex-prisoners who were released from their first incarceration in Illinois state prisons. Comparing prisoners who served longer terms with those who served shorter ones while controlling for individual heterogeneity, I find that the post-prison earnings and employment are higher for those with longer terms of incarceration. However, as discussed in the Limitations and Sensitivity Analyses section, the population of men who served their terms exclusively in jail is large and is not included in this paper. Also, this paper analyzes men who served less than four years in Illinois prison. Thus, readers need to be careful about generalizing the findings.

Specifically, I find that for each year served in prison, real quarterly earnings increase by $197, the rate of employment increases by 3.3 percentage points, and real quarterly earnings, conditional on employment, increase by 22.6 percent during the two years following incarceration. These effects, while positive and significant, attenuate in the long run. From society's perspective, these improvements are not likely to offset the average per year incarceration cost of approximately $21,000 per person in 2003 dollars.[42]

[42] The Illinois Department of Corrections reports that they spent $20,929 per inmate during fiscal year 2003.

The empirical findings presented in this paper suggest that, as far as labor market outcomes are concerned, the positive consequences of lengthy incarceration outweigh the negative ones. In other words, increases in prison sentences do not make it harder for a person to reenter society as an able and productive citizen. As earlier demographic descriptions suggest, because most ex-prisoners are unskilled and socially disadvantaged prior to incarceration, the skill set deterioration from lengthy incarceration terms appears to be almost negligible.

According to the literature in the field, this positive effect of incarceration length may be attributable either to rehabilitation during incarceration or to the specific deterrent effect of lengthy incarceration. Focusing on the rehabilitation aspect, La Vigne et al. (2003) report that Illinois state prisons provide education, employment readiness programs, physical and mental health treatment, and substance abuse treatment programs. Even though funding for substance abuse treatment varies from institution to institution, some form of substance abuse program is offered at each IDOC facility; in addition, the number of prisoners served by IDOC substance abuse treatment programs has increased steadily since 1990. However, according to IDOC, its current substance abuse treatment program does not provide a comprehensive continuum of care for offenders in need of treatment; that is, there are limited resources to provide services to all inmates in need of such assistance.

Using a sample of Illinois state prisoners, La Vigne, Visher, and Castro (2004) report that two-thirds of the respondents in their study participated in a variety of other programs and services during their prison term and half of the respondents took part in more than one program.[43] Life skills (42 percent) and employment readiness (39 percent) were the most common programs in which respondents participated, though a significant share also took part in substance abuse (28 percent), anger management (23 percent), GED and basic education (23 percent), residential substance abuse treatment (22 percent), and counseling programs (21 percent). Thus, their findings of program participation rates can reflect the participation rates of those in my study. Their findings imply that a nontrivial fraction of state prisoners have a chance to participate in a variety of rehabilitation programs.

However, according to La Vigne et al. (2004), state prisoners' chances to participate in prison programs during the 1990s were reduced nationwide. For example, the number of soon-to-be-released prisoners who reported participating in vocational programs dropped from 31 percent in 1991 to 27 percent in 1997. In educational programs, the number dropped from 43 percent to 35 percent over the same period. In addition, the number for substance abuse treatment dropped from 25 percent in 1991 to 10 percent in 1997. In prerelease training programs, only about 13 percent reported participating in both 1991 and 1997. Thus, not all incarcerated men are readily accepted into and participate in prison programs. This implies that inmates who spend more time in prison are more likely to have a chance to participate in such limited programs. In fact, according to some anecdotes, it frequently takes a prisoner some time after starting incarceration to enroll in a rehabilitation program because the programs are crowded. This supports the positive effect of lengthy incarceration on labor market outcomes because inmates with longer incarceration length have a greater chance to participate in prison programs.

I find evidence in favor of both the positive effect of the rehabilitation process and the deterrent effect of lengthy incarceration. First, the effect of longer incarceration is stronger if men are convicted of property- or drug-related crimes than person-related crimes. Generally speaking, person-related offenders may be considered to

[43] They use a sample consisting of 400 male respondents based on the population of inmates who were released from Illinois prisons in calendar year 2001. This sample was obtained from IDOC and represents only those ex-prisoners who received sentences of one year or more to ensure that these data represent individuals who were sentenced to serve time in the state prison system.

be more violent convicts than those convicted of property- or drug-related crimes. It seems that lengthy incarceration is an effective deterrent among men who are less violent and more economically motivated, which is implied by this finding. Second, the positive effects are stronger for men with self-reported histories of drug addiction. It is possible that drug addicted prisoners make more effective use of the rehabilitation programs available to them or they overcome their addiction because of no or limited access to drugs during incarceration.

From a policy perspective, these findings do not necessarily imply that policymakers need to mechanically increase the length of time served in prison. Nor do they clearly tell which aspects of the incarceration experience cause the observed effect—something that needs to be more fully understood in order to be useful to policymakers. However, it seems that rehabilitation programs and the deterrent effect of lengthy incarceration partly contribute to the positive association between incarceration duration and labor market outcomes. In addition, it is widely held that rehabilitation programs are mainly available for prisoners who serve longer terms because of limited resources in prison. Thus, an important policy question is how to make such programs available to prisoners who serve shorter sentences. To answer this question, future research should examine how different levels of exposure to rehabilitation programs are correlated with incarceration length. If policymakers are able to understand how these facets of the penal system affect different offenders, they can begin to reallocate resources in a more efficient manner, promoting rehabilitation and successful reintegration into society through alternative programs with shorter (and less expensive) incarceration terms.

HAEIL JUNG is an Assistant Professor at Indiana University, 1315 E. 10th St., SPEA 331, Bloomington, IN 47405.

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APPENDIX

Table A1. Dummy variables of demographic/criminal characteristics.

	Variable Definition	Reference Group
Race	Black and non-black	Black
Education	Less than high school, high school, more than high school, and education missing	Less than high school
Drug addiction at prison entrance	Starting their first incarceration with drug addiction and without drug addiction	Men without drug addiction
Offense categories	Drug, person, property, sex, and others	Drug-related offenders
Holding crime classes	Class X, Class 1, Class 2, Class 3, and Class 4	Class 4
Release institution security categories	Maximum security, medium security, minimum security, adult transition center, and other facilities or no records	Minimum security