# THE IMPACT OF INCARCERATION ON JUVENILE CRIME: A REGRESSION DISCONTINUITY APPROACH*

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*Abstract*

This paper identifies the effect of incarceration on the post-release criminal behavior of juveniles. I employ a regression discontinuity design, capitalizing on discontinuities in punishment that arise as a result of Washington State's unique juvenile sentencing guidelines. Whether or not an individual is incarcerated is determined by whether his criminal history and current offense characteristics place him in a cell of the sentencing grid that is located above a pre-specified cutoff. Thus, I can identify the impact of incarceration on juvenile crime by essentially comparing individuals on either side of the cutoff. The results indicate a strong deterrent effect of incarceration; i.e. individuals who are incarcerated have lower propensities to be reconvicted of a crime. This effect, however, is heterogeneous across individuals with different criminal histories. Specifically, individuals with either the most minor or most serious criminal history scores are not significantly deterred; rather, the largest deterrent effect occurs for those with mid-level criminal histories. In addition, a cost-benefit analysis indicates that the social benefits of incarceration, which can be attributed to deterrence and incapacitation, never justify the costs when: (i) the current offense is a misdemeanor or (ii) the individual has a minor criminal history. For the most part, Washington State's sentencing grid imposes incarceration in accordance with these findings.

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## I. Introduction

According to the U.S. Department of Justice, juveniles were involved in 16 percent of all violent crime arrests and 32 percent of all property crime arrests in 1999.[1] In addition, research indicates that just a small percentage of juvenile offenders are responsible for the overwhelming majority of these crimes. For instance, Wolfgang (1981) found that six percent of all boys account for more than 50 percent of all arrests. This pattern of repeat offending persists into the criminal behavior of adults. A Bureau of Justice Statistics study of more than 270,000 individuals released from prisons in 1994 found that more than two-thirds were rearrested for a felony or serious misdemeanor within three years. In addition to the high percentage of repeat offenders in the criminal population, it is commonly believed that most adult criminal careers begin in an individual's juvenile years (Greenwood, 1995).

Thus, it is important for society to identify any measures capable of breaking these patterns of juvenile crime and re-offending. While non-traditional sanctions, such as boot camps, are increasingly being explored, the majority of today's juvenile offenders are still subject to more traditional punishments, including probation, fines, and detention. In fact, more than 100,000 juvenile offenders are held in residential placement facilities on a given day in the United States.[2] Despite the magnitude of this statistic, there is little knowledge of how incarceration impacts a juvenile's post-release criminal activity (recidivism). It is the goal of this paper to fill in this knowledge gap.

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1 The age of juvenile jurisdiction varies greatly across states. In Washington State, the focus of this paper, the upper age limit of juvenile jurisdiction is 18. By law, children under the age of 8 are incapable of committing a crime and in no case may be charged in juvenile court. A child between ages 8 and 12 is presumed incapable of a crime, but this can be rebutted by the prosecutors at a capacity hearing.

2 This statistic is based on the October 29, 1997 Census of Juveniles in Residential Placement and reported in *Juvenile Offenders and Victims: 1999 National Report*.

In theory, the effect of incarceration on recidivism is ambiguous. The basic implication of Becker's (1968) economic model of crime is that the expected probability and severity of punishment have a deterrent effect on an individual's propensity to commit a crime. Thus, if incarcerating a juvenile causes him to update his beliefs, such that he deems future punishment to be more likely and more severe, then incarceration would have a deterrent effect. More exactly, this relationship could be characterized as specific deterrence; i.e. the inhibiting effect of incarceration on the post-release criminal activity of the person incarcerated.[3] It is possible, however, that sanctions such as incarceration exacerbate the criminal activity of the punished individual. For instance, labeling theory posits that legal punishment may increase future offending among those who are sanctioned as a result of increased self-identification as a delinquent or criminal (Lemert, 1967; Schwartz and Skolnick, 1962). Alternatively, incarceration could result in harsh stigmas or substantial increases in criminal capital through peer effects, making it more likely that an individual returns to crime.[4]

I estimate the relationship between incarceration and recidivism behavior in a manner that bypasses an issue plaguing many analyses of individual-level criminal behavior – unobserved heterogeneity. Specifically, I utilize discontinuities in sentencing that arise in the unique juvenile sentencing guidelines of Washington State, first implemented in 1977 and greatly amended in July 1998. The current guidelines are such that an individual's sanction is determined by his placement on a sentencing grid, where

[3] A distinction is often made between two types of deterrent effects: general and specific. The National Research Council (1978) defines general deterrence to be the inhibiting effect of a sanction on the criminal activity of people other than the sanctioned offenders. Note that specific deterrence is also distinct from incapacitation. Incapacitation is the decrease in crime that results from isolating offenders from the larger society, thereby preventing them from committing crimes in that society (National Research Council, 1978).

[4] Bayer, Pintoff, and Pozen (2004) find empirical evidence of such peer effects. Similarly, Chen and Shapiro (2004) find evidence that harsher prison conditions are associated with higher recidivism rates.

the x-axis indicates the individual's criminal history score and the y-axis indicates the severity of his current offense. An individual is sentenced to incarceration in a state facility, for a minimum of 15 weeks, if his placement in the grid falls above a pre-specified cutoff; otherwise, the individual cannot be sentenced to such a facility. Thus, by employing a regression discontinuity design, I can essentially identify the effect of incarceration on recidivism by comparing the behavior of similar individuals on either side of the pre-specified cutoffs, only one group of which was incarcerated. In addition, I use a hazard framework to deal with right censoring of the data and to incorporate information regarding time until recidivism into the analysis.

This study utilizes administrative data from the Washington Juvenile Courts for the years 1981 through 2000. The initial format of the data is at the *case* level. Each case record contains two types of information – demographic and crime-related. Most importantly, it includes a unique youth identification number that allows me to track all interactions an individual has after his first referral to the court system. From this case-level data, I create an individual-level data set that contains more than 20,000 observations.

The results indicate a strong deterrent effect of incarceration. Overall, incarcerated individuals have an approximately 35 percent lower daily hazard rate of recidivating than non-incarcerated individuals. This effect is robust to the inclusion of a large set of demographic, criminal history and current offense type controls. In addition, this effect appears to be heterogeneous across individuals with different criminal histories, where a criminal history can be characterized by the number of previously

adjudicated felonies and misdemeanors.[5] Specifically, there is minimal evidence of a deterrent effect for both individuals with the most minor and the most serious of criminal histories. Rather, the largest deterrent effect occurs for individuals with mid-level criminal histories; incarceration of such youths results in an approximately 60 percent lower daily hazard rate of recidivating. However, with the exception of finding that the estimated deterrent effect is driven completely by males, the treatment effect is fairly homogenous across other demographic and criminal history characteristics.

Lastly, a brief cost-benefit analysis indicates that the social benefits of incarceration do not justify the social costs when (i) the offense committed by the juvenile is a misdemeanor or (ii) the individual has a very minor criminal history. While the Washington State sentencing grid does not prescribe incarceration if a juvenile is charged with a misdemeanor, individuals with very minor histories who are charged with sufficiently serious felonies will be incarcerated. Though my analysis indicates that this incarceration is not justified on the basis of specific deterrence and incapacitation, it could be justified by reasons beyond the scope of this paper, such as general deterrence and retribution.

The remainder of the paper is organized as follows. Section II briefly reviews the previous literature, Section III provides background information on Washington State's juvenile justice laws, and Section IV outlines the empirical methodology. Section V describes the data set and explores the extent of the discontinuities in treatment implied by the guidelines. Section VI presents the results while Section VII conducts a simple cost-benefit analysis. Section VIII concludes.

[5] In the vernacular of the juvenile justice system, an 'adjudication' is equivalent to a conviction.

## II. Literature Review

There is a substantial body of empirical literature that finds evidence of a deterrent effect of sanctions on the criminal activity of adults.[6] Of particular relevance to this project is the deterrent effect of incarceration. In identifying such an effect, one challenge faced by the researcher is whether deterrence can be distinguished from incapacitation. For instance, Levitt (1996) uses prison-overcrowding litigation in a state as an instrument for changes in the prison population; however, his finding of a negative relationship between the prison population and crime rates does not distinguish deterrence from incapacitation. Kessler and Levitt (1999), on the other hand, isolate a significant deterrent effect of incarceration when studying California's Proposition 8; the primary source of identification is that, in the short term, a sentence enhancement should not have an incapacitation effect on the crimes eligible for the enhancement.

In contrast, there is remarkably little academic research that studies the impact of sanctions on juvenile crime. And, some of that which does exist is subject to methodological weaknesses and criticisms. For instance, Murray and Cox (1979) find that juveniles were arrested less frequently after a number of different types of interventions, including incarceration. Assignment, however, to different types of treatment programs in their study is not random and the authors do not control for any characteristics of the individual other than treatment; thus, it is possible that differences

[6] These papers use a wide range of methods and data. For instance, Levitt (1996) and Cornwell and Trumbull (1994) use state and county level panel data while Witte (1980) and Tauchen, Witte, and Griesinger (1994) use individual level data and Corman and Mocan (2000) use monthly time series data. Nagin (1978) provides a review of some of the early deterrence literature.

in behavior across different treatments can be explained by differences in the sample of individuals selected into the programs.[7]

In addition, much of the criminological debate today is concerned with identifying the most effective alternatives to incarceration or outright release (e.g. bootcamps); consequently, most evaluations focus on a particular program or strategy (Greenwood, 1995). Unfortunately, the sample sizes involved in these programs are often too small to detect significant effects.[8] In addition, many of these studies find opposing effects. Using juvenile court data from Utah, Manski and Nagin (1998) show that the assumptions made about the underlying treatment assignment mechanism can explain some of these divergent results. Specifically, they find that a treatment of confinement in residential facilities exacerbates recidivism if they assume that judges assign treatment to minimize recidivism. But, when they assume that the members of a "high risk" group receive treatment, they find a deterrent effect.

Recent research has endeavored to find more generalizable results. For instance, using a large nationally representative individual level data set, Mocan and Rees (1999) find that an increase in violent crime arrests reduces the probability that a male commits an assault or sells drugs. Using state-level panel data for 1978 to 1993, Levitt (1998) finds that harsher punishments for juveniles are strongly associated with lower rates of juvenile offending. He also finds that as a juvenile cohort ages into the jurisdiction of the

[7] Additionally, Maltz (1980) indicates that an alternative explanation of a deterrent effect is a story of selection; for instance, he shows that if judges are more likely to institutionalize a youth with a higher than average frequency of arrests in the recent past than an individual with a more moderate recent arrest record, then effects of the sort found by Murray and Cox (1979) would be created.

[8] Lipsey (1991) conducts a meta-analysis of 400 such juvenile program evaluations; he finds that the mean effect was to reduce the recidivism rate by 5 percent in treatment versus controls groups.

adult criminal courts, there is a larger decrease in crime rates in states in which juvenile punishments are lenient relative to adult punishments.

There is also limited research on whether the effects of sanctions are heterogeneous across different types of juveniles. It is possible that incarceration of an inexperienced criminal yields a greater increase in expected punishment than it does for an experienced criminal; thus, one may expect a greater deterrence effect for inexperienced criminals. On the other hand, punishment of such an inexperienced criminal could significantly increase his self-identity as a deviant, leading to an increased propensity for criminal behavior. Smith and Gartin (1989) consider whether such heterogeneity exists in the effects of arrest. They find a deterrent effect of arrest for all juveniles in their sample, but that novice offenders are more likely to terminate their criminal careers while experienced offenders just have a lower rate of future recidivism.

## III. Background on Washington State's Juvenile Justice System

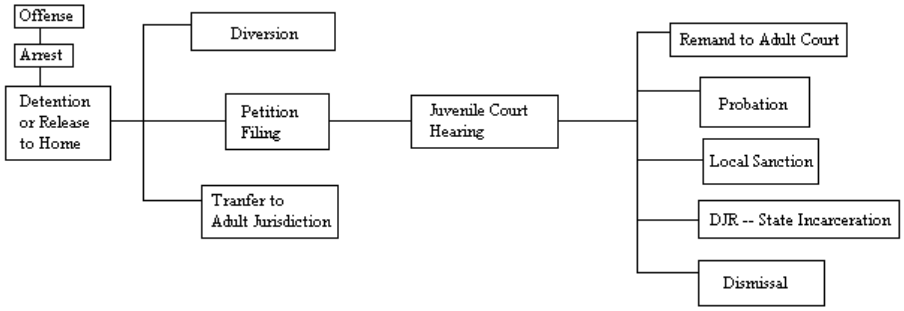
*General Background Information*

The foundation of Washington State's current juvenile sentencing system was established through the Juvenile Justice Act of 1977. To address growing concerns that juveniles arrested for like crimes were being disparately prosecuted and sanctioned within and across jurisdictions, the 1977 legislature adopted a presumptive, determinate sentencing system.[9] A statewide sentencing grid was established that indicated the

[9] Presumptive sentencing is characterized by the following conditions: (1) the appropriate sentence for an offender in a specific case is presumed to fall within a range of sentences authorized by sentencing guidelines that are adopted by a legislatively created sentencing body; (2) sentencing judges are expected to sentence within the range or provide written justification for departure; and (3) the guidelines provide for some review, usually appellate, of the departure. Determinate sentencing implies that an offender sentenced to incarceration is given a fixed term that may be reduced by good time or earned time (National Council on Crime and Delinquency, 1996).

sanction a juvenile offender should receive as a function of the seriousness of the offender's current offense, age, criminal history, and time between offenses. Until recently, Washington was the only state that used sentencing guidelines in the juvenile courts.[10] Implementation of the original grid was quite complicated; however, the Legislature greatly amended and simplified the guidelines in the 1997 Session Laws.

Once a juvenile has been arrested, there are a number of different paths that his case may follow. These paths are depicted in the following diagram.[11]




Upon being arrested, an individual may be either held in detention or released to his home. If the age, current offense, and offense history meet the requirements described in the Revised Code of Washington (RCW) 13.40.110, then the offender will be transferred to the criminal courts. An individual will be diverted from the court system if his current and past offenses satisfy the characteristics outlined in RCW 13.40.070.[12] Having a formal petition filed implies that the juvenile can either plead guilty or proceed with a

[10] Some form of juvenile guidelines were implemented in Utah in 1998, North Carolina in 1999, and Wyoming in 1997. Arkansas, Virginia, and Ohio are currently considering establishing juvenile guidelines.
[11] This diagram is adapted from a diagram of the Youth Corrections System on the Juvenile Rehabilitation Administration website: http://www1.sdhs.wa.gov/jra/Youcorrec.htm.
[12] RCW 13.40.070 explicitly prescribes diversion or petition filing for individuals who meet two sets of criteria, respectively; however, there is a third group of individuals, who fall in between these categories, and whose diversion or filing decision is left up to prosecutorial discretion.

hearing. Individuals who plead guilty or who are adjudicated through a hearing will receive a disposition in accordance with the sentencing guidelines described below.

*Revised Sentencing Guidelines*

The focus of this paper is the sentencing grid that became effective on July 1, 1998. The grid was modified such that punishment is a function of just two factors – the severity of the youth's current offense and his criminal history.[13] Specifically, the x-axis of the grid indicates the individual's prior adjudication score. An individual's prior adjudication score is calculated by assigning one point to every previously adjudicated felony and ¼ point to every previously adjudicated violation, misdemeanor, or gross misdemeanor. The total number of points is rounded down to the nearest whole number; this number indicates the appropriate column of the grid for sentencing. The y-axis of the grid indicates the individual's current offense class, ranging from the least serious gross misdemeanor (class E) to the most serious felony (class A+). Note that crime classes C through A are felonies while D and E are misdemeanors. The cell that corresponds to the intersection between the juvenile's current offense class and rounded adjudication score indicates the punishment. There are two basic types of punishments: local sanctions and incarceration in a state detention facility. Local sanctions can include any combination of: 0-30 days in a local detention facility, 0-12 months of community supervision, 0-150 hours of community service, and $0-$500 fine. On the other hand, the minimum sentence to a state detention facility is fifteen weeks. In addition to indicating that an individual should be incarcerated in a state facility, the cell also denotes the sentencing

[13] In contrast to the original guidelines, all offenders are now subject to the same sentencing grid. Under the previous guidelines, juveniles were classified as either 'serious,' 'middle,' or 'minor' offenders; each type of offender was subject to a different sentencing grid.

range. Excluding category A+ offenses, there are four possible sentencing ranges: 15-36, 52-65, 80-100, and 103-129 weeks. The following sentencing grid is applicable for any offense committed on or after July 1, 1998.

| *Current Offense Class* | 0 | 1 | 2 | 3 | 4 or more |
|---|---|---|---|---|---|
| A+ | 180 weeks to Age 21 for all category A+ offenses | | | | |
| A | 103 - 129 weeks for all category A offenses | | | | |
| A- | 15 - 36 Except 30 - 40 weeks for 15 to 17 year olds. | 52 - 65 | 80 -100 | 103 - 129 | 103 - 129 |
| B+ | 15 - 36 | 15 - 36 | 52 - 65 | 80 - 100 | 103 - 129 |
| B | LS | LS | 15 - 36 | 15 - 36 | 52 - 65 |
| C+ | LS | LS | LS | 15 - 36 | 15 - 36 |
| C | LS | LS | LS | LS | 15 - 36 |
| D+ | LS | LS | LS | LS | LS |
| D | LS | LS | LS | LS | LS |
| E | LS | LS | LS | LS | LS |

*Rounded Adjudication Score*

As seen in the grid, treatment varies discontinuously across the shaded and unshaded cells. For instance, an individual with a rounded adjudication score of zero and a current offense class of B is sentenced to a local sanction while the same individual with a current offense class of B+ is sentenced to 15-36 weeks of incarceration. Similarly, if there are two individuals with a current offense class of C+ and adjudication scores of 2 ¾ and 3, respectively, then only the latter individual will be sentenced to incarceration in a state facility.

A departure from the standard ranges of the guidelines can occur by means of the Chemical Dependency Disposition Alternative (CDDA), the Special Sex Offender Disposition Alternative (SSODA), and a declaration of a manifest injustice. An individual is eligible for CDDA if the current offense class is not A- or B+ and the standard range prescribed by the grid is less than 36 weeks of confinement. An individual is eligible for SSODA if he is found to have committed a non "serious violent" sex offense and has no prior history of sex offenses. Both alternatives also require that the court believes the individual to be amenable to treatment. Lastly, the judge can reduce the sentence and declare a 'manifest injustice downwards' if he believes that the sentencing range indicated by the grid is too harsh; similarly, if he believes the sentence to be too lenient, he can declare a 'manifest injustice upwards' and impose a harsher sentence.[14]

## IV. Empirical Methodology

*Basic Regression Discontinuity Design*

A regression discontinuity design can be implemented when individuals are assigned to a treatment condition based on a known and measured assignment score.[15] In a "sharp" regression discontinuity design, any individual whose assignment score falls on or above a pre-specified cutoff is assigned to the treatment while any individual whose score falls below the cutoff is not. Identification in this type of design is based off of the

[14] While judges have discretion to depart from the guidelines under the "manifest injustice" clause, this does not occur very often. In 2000, judges sentenced offenders within the grid's standards 97 percent of the time (Aos, 2002).

[15] Regression discontinuity designs have been increasingly used throughout economics, especially in the area of education. See Thistlethwaite and Campbell (1960), Seaver and Quarton (1976), Trochim (1984), Angrist and Lavy (1999), Hoxby (2000), van der Klaauw (2001), and Jacob and Lefgren (2002).

idea that the sample of individuals within a very small interval around the cutoff point are very similar to a randomized experiment at the cutoff – they have essentially the same assignment score value. Thus, the comparison of average outcomes of individuals on either side of the cutoff should provide a good estimate of the treatment effect. A so-called "fuzzy" design occurs when the assignment mechanism is not perfect. Specifically, some individuals whose scores are below the cutoff receive treatment while other individuals whose scores are above the cutoff do not. The primary underlying assumptions of the regression discontinuity design are that treatment varies discontinuously at the cutoff while all unobservables vary continuously.

Following is a brief description of the basic empirical specification of the regression discontinuity design in the context of this paper.[16] With the previously described post-July 1, 1998 sentencing guidelines in mind, the most simple specification regresses a dummy variable, $R_i^t$, that is equal to one if individual *i* recidivates in time period *t* on a polynomial of the adjudication score, *f(adj_sc)*, a polynomial of the current offense class, *g(class)*, a vector of observable individual characteristics (*X)* that may also influence recidivism, and a dummy variable indicating whether an individual was in a cell of the sentencing grid that mandates state incarceration (*D_above_cutoff*).

$$(1) \qquad R_i^t = X_i\beta + \lambda_1 f\left(adj\_sc_i\right) + \lambda_2 g\left(class_i\right) + \alpha D\_above\_cutoff_i + \varepsilon_i$$

$\alpha$ would provide an unbiased estimate of the effect of state incarceration on an individual's propensity to recidivate if the assignment mechanism were "sharp." When the design is fuzzy, however, this cannot be interpreted as a treatment effect. Rather, it

[16] A handful of papers that study crime have adopted a regression discontinuity design, including Berk and Rauma (1983), Berk and de Leeuw (1999), and Chen and Shapiro (2004).

simply captures the effect of being above a particular cutoff. As will be seen later, there is evidence that this mechanism is not sharp.

Thus, I consider two similar approaches to obtain an unbiased estimate of the treatment effect. In the first method, I drop those individuals who do not follow the assignment mechanism from the analysis; the remaining sample can be characterized by the sharp discontinuity design. Alternatively, I consider a two-stage procedure. The first stage is depicted by equation (2) and regresses a dummy variable, $T_i$, indicating whether the individual received treatment on the cutoff variable, *D_above_cutoff*. The second stage, depicted by equation (3), replaces *D_above_cutoff* in equation (1) with the predicted values that result from estimating equation (2).

$$(2) \qquad T_i = X_i\pi + \delta_1 f\left(adj\_sc_i\right) + \delta_2 g\left(class_i\right) + \delta_3 D\_above\_cutoff_i + \eta_i$$

$$(3) \qquad R_i^t = X_i\beta + \lambda_1 f\left(adj\_sc_i\right) + \lambda_2 g\left(class_i\right) + \alpha\hat{T}_i + \varepsilon_i$$

This basic design described above is simplified in that I am only identifying the effect of a 15-36 week incarceration sentence. However, the upper portion of the sentencing grid contains additional cutoffs (e.g. between sentences of 15-36 weeks and 52-65 weeks as well as between sentences of 52-65 weeks and 80-100 weeks). In theory, I can expand the above model by including a treatment dummy for each type of cell in the unshaded region of the grid. Unfortunately, it is infeasible to implement this expanded specification. Specifically, as described in the following section, I only have 2 ½ years of data and the sentences above the additional cutoffs are at least a year in length.[17]

[17] I hope to be able to implement this expanded specification when additional data becomes available.

*Hazard Model Specification*

The previous models, however, do not take into account two facts – censoring and the duration of survival (not recidivating). In my data set, censoring can occur for two reasons. First, an individual will age out of the data set when he turns 18. In addition, I only observe offenses that are disposed of on or before December 31, 2000. Thus, using a hazard model specification allows me to easily deal with censored observations and to utilize the survival time information. I use the Cox proportional hazard model, where failure is defined as an adjudicated referral back to the juvenile court system.[18] The Cox model can be specified as follows:

$$(4) \qquad \lambda(t;\mathbf{x}) = \kappa(\mathbf{x})\lambda_0(t) \quad where\ \kappa(\mathbf{x}) = \exp(\mathbf{x}\beta).$$

$\lambda(t;\mathbf{x})$ is the hazard rate of recidivism conditional on covariates **x** while $\lambda_0(t)$ is the baseline hazard. This baseline hazard rate of failure is common to all units in the population; however, individual hazard functions differ proportionately based on the function $\boldsymbol{\kappa}(\mathbf{x})$. Thus, this hazard function can be rewritten to explicitly incorporate the set of covariates included in equation (1).

$$(5) \qquad \lambda(t;\mathbf{x}) = \lambda_0(t)\exp\left(X_i\beta + \lambda_1 f(adj\_sc_i) + \lambda_2 g(class_i) + \alpha D\_above\_cutoff_i\right)$$

[18] As shown in Appendix Table 2, there is virtually no difference in the estimated treatment effect when I explicitly assume that the underlying hazard function has either a Weibull or Exponential distribution.

Given that the assignment mechanism is fuzzy, I can again either limit the analysis to the sample of individuals who strictly follow the assignment rule or use a two-stage procedure, where the first stage is equation (2) and the second stage is as follows:[19]

$$(6) \qquad \lambda(t;\mathbf{x}) = \lambda_0(t)\exp\left(X_i\beta + \lambda_1 f(adj\_sc_i) + \lambda_2 g(class_i) + \alpha\hat{T}_i\right) \quad .$$

## V. Data

*Description of the Data*

This study utilizes administrative data from the Washington Juvenile Courts for the years 1981 through 2000. The initial format of the data is at the *case* level, where a case is defined as a youth processed by the court on a new referral. However, each case does not necessarily refer to one offense; rather, it refers to one referral, which can contain up to three offenses. Unfortunately, if a case contains more than three referral reasons, I only observe the three most serious.[20]

Each case record contains two types of information – demographic and crime-related. The demographic information includes a unique youth identification number, zip code, county of residence, sex, birth date, and ethnicity of the youth. The identification number is essential, as it allows me to track a juvenile's criminal history and recidivism behavior. The crime-related information includes the types of offenses referred as well as the dates of the offense, referral, and disposition. In addition, it indicates whether each

[19] Unfortunately, no asymptotic theory exists for the standard errors of this estimator in the hazard model framework; thus, the standard errors should be bootstrapped when estimating equation (6).
[20] Less than 20 percent of the cases referred to the courts from 1981 to 2000 have three referral reasons.

offense referred is valid for criminal history.[21] It also describes the three most serious dispositions associated with the case.

In order to utilize the discontinuities in the revised guidelines, I transformed the data into an individual-level data set. The base data set consists of all individuals who were adjudicated of at least one offense, through formal court procedures, on or after July 1, 1998; only formally handled offenses are subject to the sentencing grid. I also limit the analysis to those individuals who were either adjudicated of just one offense or who were adjudicated of two offenses, but for which only one offense is punishable by incarceration in a state facility.[22] This resulting sample contains 20,542 individuals.

In addition to a set of demographic variables, for each individual, I create variables related to his current, past, and recidivism offenses; Table 1 provides a list of variable names and definitions. The current offense is the first formally handled offense after July 1, 1998 that was adjudicated. If the individual is adjudicated of two offenses, the current offense is defined to be the more serious of the two offenses. To describe the current offense, I create thirteen dummy variables indicating to which broad offense category (e.g. assault, sex crime, theft, robbery, etc.) the current offense belongs. In addition, I note the class of the offense, ranging from E to A+. I convert this information into a numeric representation by assigning each offense a value ranging from one to ten,

[21] An offense is valid for criminal history if the individual was found guilty at trial, pleads guilty to the offense without a trial, or the offense was diverted.

[22] This step results in the exclusion of approximately 950 individuals. The primary reason for excluding this sample is to reduce the possibility of measurement error. If the individual is adjudicated of multiple offenses, the format of the data set does not allow me to determine which dispositions correspond to which crimes. But, when only one offense is adjudicated, then I know that all punishments are attributable to that crime. Similarly, if two offenses are adjudicated but only one 'worthy' of incarceration, I can deduce to which offense the sentence of incarceration corresponds. However, the exclusion of these individuals does raise the issue of sample selection. Specifically, I am selecting individuals who are slightly less 'serious' criminals; the excluded individuals have more current and past offenses, more sentences to state incarceration, and a higher propensity to receive a manifest injustice upwards. The omitted sample is identical to the retained sample, however, along such observable dimensions as age. While this should not yield a bias in the estimated treatment effects, it may reduce the generalizability of the results.

corresponding to E and A+ respectively. Appendix Table 1 provides a list of offenses and their corresponding classes and categories.[23]

All offenses that were adjudicated prior to the date of the current offense are labeled as past offenses. For each individual, I calculate an adjudication history score using the formula described in the sentencing guidelines (i.e. assigning ¼ point for each prior misdemeanor and 1 point for each prior felony). Thus, the data set contains the actual and rounded scores for each individual, where all scores are rounded down to the nearest whole number. In addition, I create thirteen dummy variables that indicate which offense categories the individual has been adjudicated of in the past.

Using the rounded score and current offense class described above, I assign the individual to a cell in the sentencing grid. Based on this cell, I can determine whether the juvenile ought to be sentenced to incarceration in a state facility and the expected minimum and maximum sentence length. Unfortunately, the data set does not provide me directly with the dates of admission or release.

Lastly, I create a set of variables that describe an individual's recidivism behavior. Specifically, these include whether the individual recidivates, the type of offense with which he recidivates, the time to recidivism, and whether the individual is censored. I consider multiple ways of defining the earliest date (or start date) at which an individual is at risk of recidivating. Specifically, I allow this date to be the disposition date, the disposition date plus the expected minimum sentence, or the disposition date plus the

[23] This list is adapted from the Juvenile Disposition Sentencing Standards manual that was in effect for offenses committed on or after July 1, 1998.

expected maximum sentence. Thus, the time to recidivism is the number of days between this start date and the date of the first adjudicated offense after this start date.[24]

Table 2 provides selected summary statistics for the sample as a whole (20,542 individuals), the sample sentenced to state incarceration (1,147 individuals), and the sample not sentenced to state incarceration (19,395 individuals). From this point forward, state incarceration will be denoted by *DJR* (Department of Juvenile Rehabilitation). For the sample on the whole, Table 2 shows that 76 percent of the individuals are male and that 12, 9.7, and 3.9 percent are Black, Hispanic, and Native American, respectively. There are, however, higher percentages of males, Black, and Hispanics who are sentenced to DJR. In the entire sample, the most common current offense categories are arson, assault, burglary, drugs, and theft with 8.5, 18, 12, 16, and 31 percent of the current offenses, respectively. For the incarcerated sample, however, there are fewer arson and drug offenses but many more sex offenses. As expected, incarcerated individuals have more serious histories; more than 40 percent of the DJR individuals have an adjudication history score greater than or equal to two, while less than 9 percent of the non-DJR individuals have such a score. Lastly, approximately 27 percent of the entire sample recidivates before being censored out; this statistic is the same regardless of whether the start date for being at risk is defined as the disposition date or the disposition date plus the minimum sentence length. In contrast, only 22 percent of the incarcerated sample recidivates when the start date is defined as the disposition date and 19 percent when the start date is defined as the disposition date plus the minimum sentence. The proportion of the sample censored due to reaching the end of

[24] Earlier specifications used the first post-start date offense *referral* as the recidivism offense, yielding similar results.

the sample period is fairly constant across the incarcerated and non-incarcerated samples while the proportion of individuals censored due to reaching age 18 is greater in the incarcerated sample.[25]

*Evidence of Discontinuities in Treatment*

In order for a regression discontinuity approach to be valid, it must be the case that treatment varies discontinuously with the score. An examination of Figure 1 indicates that such discontinuities in treatment exist, but that they are not sharp. Specifically, each graph of Figure 1 holds the rounded adjudication score constant and plots the percent of individuals incarcerated in each cell of that column of the sentencing grid. The vertical lines in each figure indicate where, according to the sentencing grid, a discontinuity in treatment ought to occur. The first graph of Figure 1 considers just those individuals with a rounded adjudication history score of zero; in theory, the percent incarcerated ought to jump from 0 to 100 percent between B and B+ offenses. But, the figure actually shows that 3 percent of the individuals in this column with a B offense are incarcerated in a state facility while 62 percent of those with a B+ offense are incarcerated. Similarly, for individuals with a rounded adjudication score of one, 14 percent of the individuals with a B offense and 85 percent of those with a B+ offense are incarcerated. The discontinuity appears to be weakest for individuals with rounded history scores of two and three, as the percentage incarcerated jumps by just 39 and 32 percentage points, respectively, at the expected point of discontinuity. However, in both

[25]Column (8) of Appendix Table 2 indicates that the estimated treatment effect only changes minimally when excluding individuals who turn 18 before December 31, 2000 from the analysis. In addition, column (10) of Appendix Table 2 indicates little change in the treatment effect when age at the time of offense is allowed to interact with the actual adjudication score.

of these cases, the percentage incarcerated increases by approximately 30 points when moving one more cell above the expected point of discontinuity. One should also note that some of the cells surrounding the discontinuity in these two columns contain relatively few individuals; specifically, 28 individuals have a score of two and a current offense class of C+ while just 16 individuals have a score of three and class of C+. When the adjudication score is greater than or equal to four, 13 percent of the individuals with a D+ offense (immediately below the cutoff) are incarcerated while 76 percent of the individuals with a C offense are incarcerated.

*Sources of a Fuzzy Discontinuity*

Thus, Figure 1 indicates that incarceration can be characterized by a fuzzy rather than sharp discontinuity. There are 738 individuals to whom I assign an 'incorrect' punishment; specifically, I expect 424 individuals to be incarcerated who are not and 314 individuals not to be incarcerated who are. Using a linear probability model, Table 3 explores the correlates of incorrect assignment. The dependent variable in the first three columns is a dummy variable indicating that the individual's expected punishment is harsher than his actual punishment while the dependent variable in the latter three columns indicates if the individual's expected punishment is more lenient than his actual punishment.

Columns (1) and (4) of Table 3 include only demographic and current offense characteristics as regressors. I am significantly more likely to assign males and blacks to an incorrect punishment that is either too harsh or too lenient and older individuals to a punishment that is too lenient. However, the magnitudes of these coefficients are quite

small. The only type of current offense that is significantly correlated with incorrect assignment is a sex offense; these individuals are approximately 37 percent more likely to be assigned to a punishment that is too harsh. One would expect to observe this relationship if sex offenders are being assigned to SSODA (a legitimate departure from the sentencing grid); thus, columns (2) and (5) include non-DJR dispositions, such as SSODA, in the estimation. Yet, sex offenders are still 30 percent more likely to be assigned to a punishment that is too harsh. This indicates that use of SSODA may not be accurately denoted in the data; a potential explanation of this is that the data only includes the three most serious dispositions.[26] Column (2) also indicates that individuals with a manifest injustice downwards are 53 percent more likely to be assigned a punishment that is too harsh while assignment to *DJR_local* (i.e. incarceration of 15 or more weeks in a *local* detention facility) increases the likelihood of incorrect assignment to a punishment that is too harsh by 45 percent. Similarly, Column (5) indicates that individuals with a manifest injustice upwards are 59 percent more likely to be assigned to a punishment that is too lenient.[27]

Columns (3) and (6) of Table 3 include a dummy variable indicating whether an individual is eligible for a declination hearing to an adult court.[28] Such eligibility

[26] There is some evidence of this, as the data indicates that only 67 individuals received a sentence of SSODA while more than 350 individuals were actually eligible. Additionally, there is evidence that either the actual use of SSODA or the reporting of such use in the data varies across counties. 33 counties contain individuals who are eligible for SSODA. In 21 of these counties, SSODA is not reported for any of those eligible while SSODA is reported for all who are eligible in three counties. In nine counties, SSODA is reported for 10 – 55 percent of those who are eligible. Despite these disparities across counties, county dummies are not significantly related to a too harsh or too lenient punishment.

[27] As in the case of SSODA, it is likely that use of manifest injustice is under-reported in the data. The data indicates that less than one percent of my sample received a manifest injustice disposition; however, according to Aos (2002), 3 percent of those sentenced in 2000 received a sentence outside the grid's range.

[28] A hearing for decline of jurisdiction should be held when the respondent is 15, 16, or 17 and information alleges the completion, attempt, solicitation or conspiracy to commit a class A felony or when the respondent is 17 and the information alleges assault 2nd, extortion 1st, indecent liberties, child molestation 2nd, kidnapping 2nd, or robbery 2nd.

increases the likelihood of assignment to a too harsh punishment by approximately 23 percent. In addition, columns (3) and (6) control for whether an individual ever had three referral reasons on the same case; there are 3,334 such individuals. As previously described, if an individual is referred for more than three offenses at a time, I will only observe the three most serious referral reasons. Adjudication history scores may be incorrectly calculated if, at some time in the past, an individual had more than three offenses referred at once *and* those offenses that were not amongst the three most serious were also valid for criminal history.[29] Having a case with three referral reasons in the past only increases the chance of misassignment to a punishment that is either too harsh or too lenient by .65 and 2.1 percent, respectively.

This analysis indicates that much of the 'fuzziness' in the discontinuity can be explained by legitimate departures from the sentencing grid or, potentially, by fundamental flaws of the data. Over and above this, there is little evidence that particular types of individuals are systematically assigned to punishment that is too harsh or lenient.

## VI. Results

*Preliminary Graphical Analysis*

Figures 2 through 6 present Kaplan-Meier survival curves for individuals in the cells of the sentencing grid located immediately above and below the cutoff, for each column of the grid, respectively. Individuals in the cell above the cutoff should be sentenced to DJR while individuals below should not. Since the treatment effect should only be identified off of individuals sentenced according to the grid, I omit individuals to

[29] The extent of this source of error is limited by the relatively high probability that 4th and greater referral reasons are misdemeanors, thereby being worth only ¼ point in the criminal history score (this will only yield a different rounded score if the individual has three other prior misdemeanors).

whom I assigned an 'incorrect' punishment. Thus, Figure 2 plots the survival curve for incarcerated individuals with a rounded adjudication score of zero and current offense class of B+ and that for non-incarcerated individuals with a rounded score of zero and a current offense class of B. In each graph, the dashed curve represents the survival curve for the incarcerated (DJR) individuals while the solid curve represents the survival curve for those who are not incarcerated. The three graphs in each figure correspond to a different start date of being at risk for recidivating; these start dates are the disposition date, the disposition date plus the minimum sentence, and the disposition date plus the maximum sentence.

Allowing the individuals to be at risk of recidivating as of the disposition date does not isolate the deterrence effect from the incapacitation effect. It is clear from looking at the first graph in Figures 2 through 5 that there is an incapacitation effect associated with DJR, as the dashed curve is fairly horizontal (nobody recidivates) for more than the first 100 days that the individuals are supposedly at risk.[30] Much, though not all, of this incapacitation effect disappears when the disposition date plus the minimum sentence is used as the start date. Figures 3 and 4 indicate that incarceration has a deterrent effect on recidivism for individuals with rounded adjudication scores of one and two, respectively. Specifically, a higher proportion of individuals in the treated cell of the grid have survived than in the untreated cell; this deterrent effect is visible regardless of how the start date is defined. In contrast, Figures 2 and 6 show minimal evidence of a deterrent effect for individuals with an adjudication score of zero or four,

[30] This incapacitation effect is less apparent for individuals with a rounded adjudication score of four or greater. A possible explanation is that these individuals were detained since the date of arrest and sentenced to time served; but, recreating the graph using the referral date as the start date does not yield a visible incapacitation effect. Another possibility is that incarcerated individuals are committing crimes while in prison; such crimes are not easily identified in the data.

respectively. Lastly, Figure 5 indicates that incarcerated individuals with a rounded adjudication score of three have a steeper survival curve (recidivate faster) than non-incarcerated individuals with the same score; however, this may be particularly imprecise because there are very few individuals with a C+ offense and a rounded adjudication score of three.

This examination of the survival curves for individuals in the cells that border the cutoff provides the first indication that incarceration has a deterrent effect on recidivism, particularly for individuals with relatively minor criminal histories. However, these survival curves do not condition on any covariates and cannot distinguish a treatment effect from the possibility that individuals with a higher current offense class behave systematically different.

*Estimation of an Overall Treatment Effect*

The first panel of Table 4 presents the results of estimating a Cox proportional hazard model when the only covariate is *DJR*, a dummy indicating that the individual was sentenced to incarceration in a state facility. Estimation in this manner (as if ignorant of the sentencing grid) would *only* yield a consistent estimate of the treatment effect if assignment to DJR were random. In addition, Table 4 presents the basic results of the three different regression discontinuity strategies previously described. The second panel of Table 4, labeled 'Assumes Sharp RD Design,' estimates equation (5) when the entire sample is used. The third panel acknowledges the fuzziness of the discontinuity and estimates equation (5) when the sample to which I assigned an incorrect punishment is omitted. Lastly, the fourth panel utilizes the two-stage procedure described by

equations (2) and (6). In the second and third panels, the primary coefficient of interest is that associated with *D_above_cutoff*. In the fourth panel, the coefficient of interest is that associated with *DJR_hat*, the predicted values resulting from the first stage estimation. In addition to this treatment variable, each specification in the last three panels includes quadratics of both the actual adjudication history score and the current offense class. All coefficients reported in this table, as well as those that follow, are exponentiated such that they have the interpretation of a hazard ratio; thus, values greater and less than one imply exacerbation and deterrent effects, respectively. The first column of each panel uses the disposition date as the start date while the second and third columns add to this the minimum and maximum sentences, respectively.

Since the discontinuity design is not 'sharp', the coefficient on *D_above_cutoff* in the second panel can only be interpreted as the effect of being in a cell above the cutoff. According to column (4), individuals in such a cell have a 38 percent lower daily hazard rate of recidivating than individuals in a cell below the cutoff; this, however, does not exclude any incapacitation effects. When using the disposition date plus the minimum and maximum sentences as the start date, this deterrent effect decreases to approximately 30 and 26 percent, respectively. The third panel omits individuals who were not sentenced according to the grid and yields an increase in the effect associated with *D_above_cutoff*, which can now be interpreted as the treatment effect of incarceration. Depending on the start date, incarcerated individuals have a 48 to 27 percent lower daily hazard rate of recidivating.[31] Similarly, when using the two-stage procedure in the fourth

[31] In addition, this estimate is extremely robust to excluding from the analysis more than an additional 1,000 individuals who were assigned the correct punishment but are characterized by those correlates of fuzziness presented in Table 3. The results of this estimation are presented in column (9) of Appendix Table 2. Specifically, individuals sentenced to jail, DJR_local, SSODA, manifest injustice up, manifest

panel, one finds that incarcerated individuals have a 56 to 39 percent lower daily hazard rate of recidivating than a non-incarcerated individual.[32]

In comparison to the effects estimated by the three regression discontinuity designs, ignorance of the sentencing grid and the assumption of random assignment yield an under-estimate of the treatment effect. Column (2) of Table 4 indicates that, when using the disposition date plus the minimum sentence as the start date, incarcerated individuals have an 18 percent lower daily hazard rate of recidivating; in contrast, the effect sizes estimated with the three regression discontinuity designs range from 30 to 45 percent. Not only is the deterrence effect under-estimated, there is actually no evidence of an effect when the start date is the disposition date plus the maximum sentence, as in column (3).

To streamline the discussion of the remaining results, the methodology used in the third panel (i.e. dropping the incorrectly assigned sample) will be treated as the baseline specification, unless explicitly stated otherwise.[33] These results *can* be interpreted as a treatment effect and are more conservative than those resulting from the two-stage procedure. In addition, the start date used in the rest of the analysis is the disposition date plus the minimum sentence. It is likely that the true treatment effect is between the estimates that result when using the disposition date plus the minimum and maximum sentences, respectively. However, this range is fairly small in each of the three regression

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injustice down, suspended detention, or basic training camp, as well as those who participated in a plea or who were eligible for a declination hearing, were omitted from the analysis.

[32] The coefficient on *D_above_cutoff* in the first stage is .60 with a t-statistic of 81.96; the $R^2$ for the first stage regression is .48.

[33] The baseline specification used throughout the paper includes quadratic functions of both the actual adjudication score and the current offense class. Columns (1) through (5) of Appendix Table 2 show that this deterrent effect remains with the inclusion of third and fourth-order terms of the actual adjudication score as well as third and fourth-order terms of the current offense class. However, the effect does decrease slightly in magnitude and significance with the inclusion of these higher order terms.

discontinuity designs. In addition, using the minimum sentence avoids the loss of almost 600 individuals from the analysis. The qualitative nature of all of the following results, however, is robust to using the disposition date plus the maximum sentence as well as the two-stage procedure.

*Robustness I: Observable Covariates*

An underlying assumption of the regression discontinuity design is that all unobserved correlates of recidivism vary continuously with the score. While I cannot test whether this is true directly, I can examine any *observable* correlates of recidivism. Most importantly, I do not find any systematic variation in a large set of observable characteristics that is correlated with recidivism and that varies discontinuously around the cutoffs. This can be observed by first estimating the Cox proportional hazard model where the only covariates are a subset of $X_i$; one can then regress the resulting estimates of the hazard ratio on *D_above_cutoff* and second-order polynomials of the scores. An insignificant coefficient on *D_above_cutoff* in the latter regression implies that the variation in the observables, which explains an individual's daily hazard rate of recidivating, does not vary discontinuously around the cutoff. Column (1) of Table 5 displays these results when $X$ includes only demographic characteristics (race, gender, and age) while Columns (2) and (3) add to $X$ dummies for past and current experience, respectively, in each of the thirteen broad crime categories. The coefficient on *D_above_cutoff* is insignificant and actually equal to zero to two digits in each of these specifications.

However, despite the fact that any variation in the observables that is correlated with recidivism is not discontinuous around the cutoff, some of the remaining variation in the observables is discontinuous around the cutoff. This can be seen from the last five columns of Table 5. Whether an individual is Hispanic or Native American does not vary significantly around the cutoff but Male, Black, and age at offense do. However, the R-squares in these regressions are very small and the signs of these coefficients are not consistently all positive or negative.[34] It is important to note that much of the variation around the cutoff can be explained by observables that are excluded from these specifications, such as the type of current offense. By definition, certain offense categories are not included in every offense class. For instance, there are no crimes that are classified both as an "Assault/Physical Harm" offense and as a class B offense; but, there are a number of crimes that are classified in this category and as a class C+ offense. Thus, if males or Blacks are significantly more likely to commit a particular category of offense, the current offense class definitions can induce a small discontinuity.

Given that any variation in the observables that is correlated with recidivism does not vary discontinuously around the cutoff, it is not surprising that the estimated treatment effect is robust to the inclusion of this large set of observable covariates. This can be seen in Table 6. The baseline specification is presented in Column (1); it is identical to that in Column (8) of Table 4. Note that *D_above_cutoff* and *DJR* are interchangeable when the sample of correctly assigned individuals is used. Incarcerated individuals have a 35 percent lower daily hazard rate of recidivating than non-incarcerated individuals. Column (2) shows that while males, blacks, Hispanics, Native Americans, and younger individuals have significantly higher daily hazard rates of

[34] Graphical analyses yield comparable results and are available upon request from the author.

recidivating, the inclusion of these variables yields virtually no change in the estimated treatment effect. Similarly, there is little change in the estimated treatment effect when controls for past experience in each of the general crime categories, county of residence dummies, and controls for the type of current offense are included in Columns (3), (4), and (5), respectively.

*Robustness II: Prosecutorial Discretion*

A potential source of concern is that prosecutors are systematically deciding to charge the juvenile with a crime that places him either right above or below the cutoff. [35] It is possible that this occurs on the basis of characteristics of the individual's past that are not captured by the axes of the sentencing grid. While I cannot observe all such characteristics, I can look at the following variables: the age at first referral, the number of previously referred offenses that were *not* valid for criminal history, and whether the individual was ever previously incarcerated in a state facility. I include these variables in the estimation of a Cox proportional hazard model (excluding the cutoff variable and polynomials of the scores) and regress the estimated hazard ratio on *D_above_cutoff* and quadratics of the scores. As depicted in Column (4) of Table 5, the coefficient on *D_above_cutoff* is again insignificant and equal to zero to two digits. Thus, it is not surprising that the inclusion of these variables has no effect on the estimated treatment effect, as seen in Column (6) of Table 6.

[35] Section 13.40.050 of the Revised Code of Washington states that "The prosecutor should file charges which adequately describe the nature of the respondent's conduct" and that "The prosecutor should not overcharge to obtain a guilty plea," where overcharging includes charging a higher degree or additional counts. Lastly, it states that "This standard is intended to direct prosecutors to charge those crimes which demonstrate the nature and seriousness of a respondent's criminal conduct, but to decline to charge crimes which are not necessary to such an indication." Unfortunately, these standards do not preclude the possibility that prosecutors are systematically biased in their charge decisions.

In addition to deciding the crime for which an individual should be charged, prosecutorial discretion may also play a role in whether a juvenile pleads guilty to a charge or goes through a trial. Consistent with national patterns, almost 90 percent of the sample pleads guilty. As seen in Column (7) of Table 6, inclusion of a variable capturing whether or not an individual pleads yields a small reduction in the magnitude of the estimated treatment effect. In addition, the hazard ratio associated with this variable indicates that individuals who plead guilty have a 67 percent greater daily hazard rate of recidivating than individuals who go to trial. In addition, as seen in Rows (18) and (19) of Table 10, the estimated treatment effect varies across the samples of individuals who do and do not plead. For the sample that pleads, incarcerated individuals have a 30 percent lower daily hazard rate of recidivating. But, for the sample that does not plead, incarcerated individuals have a 55 percent lower daily hazard rate of recidivating. To summarize, this analysis of the role of pleading yields the following findings: (1) the treatment effect is slightly overestimated when the *plead* variable is excluded, (2) individuals who plead have higher hazard rates of recidivating, and (3) the estimated treatment effect is greater for the sample of individuals who do not plead. What scenario can explain this pattern of results? One possible explanation is that the trial itself has a significant deterrent effect. An alternative explanation is that there are individuals who go to trial because they are actually innocent. Thus, in this scenario, lower hazard rates of recidivating would be associated with the sample that goes to trial if this 'innocent' sample can be characterized as initially having a lower propensity to recidivate.[36]

[36] Another possibility is that prosecutors somehow select individuals who are more amenable to treatment for trial (this assumes that going to trial increases the chance of a sentence to *DJR*). But, this explanation does not seem particularly plausible since it is hard to believe that prosecutors try to send the relatively better individuals to prison.

*Robustness III: Juvenile Gaming of the System*

Additionally, one may worry about the possibility that juveniles are consciously deciding to commit a crime that places them just below the cutoff rather than just above, i.e. that juveniles are gaming the system. For this to occur, juveniles must be knowledgeable of: when the grid is applicable, the punishment in each cell of the grid, the class of each type of offense, and how to calculate their adjudication score. Given that I am studying only the juveniles' first interaction with this sentencing grid, it is likely that they have minimal, if any, knowledge of the grid prior to committing their current offense.[37] One way that an individual could gain such knowledge is through local media sources. To this end, I conducted a search on Lexis-Nexis for newspaper articles dating from January 1, 1997 to December 31, 1998 that discussed the changes in the juvenile sentencing guidelines. Four major Washington newspapers were searched: The Seattle Times, The Seattle Post-Intelligencer, The Columbian, and the Spokesman-Review. Table 7 presents the number of 'hits' in each paper that resulted from 12 searches, where a hit indicates that the search term was found in the headline, lead paragraphs, or key terms of an article. The number of hits was so small (particularly when searching for what one would think the most relevant phrases) that I could easily look at the contents of each article. While some of the 'hits' indicated that a vote on juvenile justice reforms was about to take place or that changes were passed, *none* of the articles gave a detailed description of the new sentencing grid.[38]

[37] This would be true even if the individual had an extensive criminal history since the sentencing grid was not implemented until July 1, 1998 and is vastly different than the previous sentencing guidelines.
[38] The only aspect of the reforms described in relative detail was the rules governing when juveniles were eligible for transfer to the criminal courts.

Table 8 provides additional indirect evidence that juveniles are not gaming the system. Specifically, Table 8a tests whether individuals systematically choose their current offense such that it is right below the cutoff. Consider two groups of individuals – those with actual scores of 2.0 and 1.75, respectively. The 2.0 group is in the third column of the sentencing grid; thus, for this group, an offense classified as a C+ would result in placement in a cell immediately below the cutoff. If individuals are gaming the system, then one would expect that the probability of committing a C+ offense for the 2.0 group is significantly higher than the probability of committing a C+ offense for the 1.75 group, for whom C+ is not immediately below the cutoff. But, as seen in the first row of Table 8a, both groups have a 2.4 percent chance of being referred for a C+ offense. Similarly, the differences between the probabilities that individuals with scores of 3.0 and 2.75 are referred for a C offense and the probabilities that individuals with scores of 4.0 and 3.75 are referred for a D+ offense are not significantly different from zero.

Table 8b tests whether individuals systematically choose their current offense with their future placement on the sentencing grid in mind. Let us consider two groups of individuals, both currently in the second column of the sentencing grid. For individuals with a history score of 1.75, a current offense of either a misdemeanor *or* a felony will result in the individual being in the third column of the grid if he recidivates. On the other hand, an individual with a score of 1.5 will only be in the third column of the grid next period if he commits a felony this period; he will remain in the second column next period if he is adjudicated of a misdemeanor this period. Thus, if individuals 'game' the system, then one would expect those with a score of 1.5 to have a higher probability of committing a misdemeanor than individuals with a score of 1.75. This is because the

expected punishment associated with being in the third column of the grid is greater than that associated with the second column. However, as seen in Table 8b, the probability of committing a misdemeanor does not significantly differ for those with a score of 1.75 as compared to those with a score of 1.5; I likewise find no significant differences when comparing individuals with scores of 2.75 and 2.5 as well as 3.75 and 3.5.

*Heterogeneity of the Treatment Effect Across Various Adjudication Scores*

As mentioned previously, it is possible that the effect of incarceration varies across individuals of different levels of criminal experience. In Table 9, I estimate equation (5) when holding the rounded adjudication score constant, thereby comparing individuals in just two vertically adjacent cells. Each panel of Table 9 corresponds to a column of the sentencing grid; thus, the first and last panels, respectively, examine individuals with rounded scores of zero and four. Each specification includes a second-order polynomial of the actual adjudication score, demographic controls and criminal history controls. The first column of each panel includes only those individuals in the two cells that border the cutoff (as in the Kaplan-Meier survival curves); these individuals have the most similar current offense class. These estimates indicate a deterrent effect for individuals with each of the five rounded adjudication scores, though it is only significant when the rounded score is less than or equal to two. For individuals with a score of one or two (i.e. columns (4) and (7) of Table 9), the effect size is particularly large; incarcerated individuals have a daily hazard rate of recidivating that is at least 75 percent lower than that of non-incarcerated individuals.[39]

[39] Since the border cells when the score equals two or three have relatively few individuals, I also did the estimation using individuals in the two cells on either side of the cutoff; the results are qualitatively similar.

However, when comparing just two vertically adjacent cells, I cannot separate out the effect of having a higher current offense class (e.g. B+ versus B for individuals with a score of zero or one) from the treatment effect of incarceration. In such a specification, the current offense class is perfectly correlated with the treatment. Thus, the second specification of each panel of Table 9 includes individuals in all of the cells of the corresponding column of the sentencing grid and a quadratic function of the current offense class, thereby controlling for the effect of having a higher current offense class. Now, incarceration only significantly deters individuals with scores of one or two; incarcerated individuals with these scores have an approximately 65 percent lower daily hazard rate of recidivating. Finally, the last specification of each panel includes controls for the broad current offense categories. For individuals with a rounded score of one or two, this has little impact on the magnitude of the deterrence.[40]

Thus, the final specifications of Table 9 indicate a large and significant deterrent effect of incarceration on individuals with a rounded adjudication score of one or two, but little to no deterrent effect on individuals with a score of zero, three, or four. A potential explanation for this heterogeneous pattern of results lies in the possible underlying mechanisms. In theory, there will be a deterrent effect if incarceration increases an individual's expected probability of punishment and an exacerbating effect if incarceration increases an individual's self-identification as a delinquent. Thus, incarceration having no effect can either imply that incarceration did not change the juvenile's expected punishment and had no effect on his self-identification as a criminal

[40] As an alternative to Table 9, I can hold the current offense class constant and compare individuals in horizontally adjacent cells. This method only allows me to estimate a treatment effect for individuals surrounding the scores of two, three, and four. As in Table 9, this approach provides evidence of a large deterrent effect for those with a score of two and no such evidence for those with a score of three. But, in contrast to Table 9, there is also evidence of a deterrent effect for those surrounding the score of four.

*or* that it changed both of these beliefs in a proportionate manner. It seems reasonable that the former interpretation would apply to the most serious offenders, as they have already identified themselves as delinquents and updated their beliefs regarding punishment as a result of their previous interactions with the justice system. First time offenders, however, are likely to have large changes in both their expected punishment and self-identification. Under this scenario, the finding of a deterrent effect for individuals with scores of one and two implies that the change in their expected punishment dominates the change in their self-identification as a criminal.

At this point in the discussion, it is important to distinguish between 'specific' and 'general' deterrence. The above findings indicate that incarceration does not have a specific deterrence effect on individuals with rounded history scores of zero, three, and four. However, this analysis does not preclude the possibility that incarceration of some first-time offenders, for instance, has a general deterrent effect on the population of non-incarcerated juveniles.

*Heterogeneity Across Demographic and Other Criminal History Characteristics*

Given that there is evidence of heterogeneity in the treatment effect across rounded adjudication scores, it is reasonable to ask whether heterogeneity exists across other demographic and criminal history characteristics. Table 10 explores this by estimating equation (5) for different sub-samples of the data; each row of the table presents the estimated hazard ratio associated with *DJR*. Every specification includes second-order polynomials of the actual score and class as well as the set of current offense type dummies. The first row presents the baseline result obtained when using the

entire sample, that incarcerated individuals have a 34 percent lower daily hazard rate of recidivating than non-incarcerated individuals. Rows (2) and (3) of Table 10 indicate that the treatment effect is entirely driven by the sample of males; there is no evidence of a deterrent effect for an incarcerated female. In contrast, the treatment effect is fairly homogeneous across individuals of varying ethnicities and ages.

Rows (10) through (17) cut the sample in accordance with a variety of criminal history characteristics. Specifically, rows (10) and (11) indicate that the deterrent effect of incarceration is virtually identical across individuals who have and have not been previously sentenced to DJR. In addition, the treatment effect is fairly homogeneous across individuals with histories of varying types of offenses; rows (12) through (17) of Table 10 restrict the analysis to the sample of individuals with experience in assault, firearms, sex offenses, burglary, theft, and drug offenses, respectively. The largest deterrent effects are found for individuals with a history of violent crimes such as assault or firearms offenses; incarceration of these individuals yields a 47 percent lower daily hazard rate of recidivating. But, there is also a large deterrent effect for property crimes; incarceration of individuals with a history of burglary or theft yields a 35 and 40 percent lower daily hazard rate of recidivating, respectively. The outlier is for individuals with a history of drug offenses; the magnitude of the deterrent effect is much smaller and insignificant.

Lastly, I considered whether the treatment effect is heterogeneous across any of these dimensions, when conditioning on the rounded adjudication score. Even though Table 9 finds that incarceration does not have a deterrent effect on individuals with a rounded score of zero, i.e. minor offenders, it would be important to know whether a

*subset* of these individuals could be deterred. However, I find that the treatment effect is fairly homogeneous within each column of the sentencing grid. For instance, incarceration has a large deterrent effect on individuals with a rounded score of one; this deterrent effect exists regardless of the *types* of offenses committed by the individual. In addition, it does not matter whether the individual is in the second column of the grid because they have previously been adjudicated of one felony or six misdemeanors.

*Recidivism Offense Type*

Table 11 considers whether incarceration deters individuals from committing just *any* crime or whether it has larger deterrent effects for specific crime categories. Thus, rather than defining failure as recidivating with any offense, I allow there to be three different types of failures: recidivating with a drug offense, violent offense, or property and other offenses.[41] For each type of offense, I estimate equation (5) for the entire sample and then separately for individuals in each column of the sentencing grid. Each specification includes quadratics of the actual adjudication score and current offense class, demographic controls, and past and current offense crime category controls.

For the entire sample, incarceration has a deterrent effect on recidivating with each of the three types of offenses, though this effect is only significant for violent offenses and property and other offenses. However, this overall deterrence effect is heterogeneous across individuals of different criminal histories. As seen in columns (2),

[41] Note that if individuals recidivate with more than one offense on the same case, then they will be classified as recidivating in more than one category (i.e. recidivism in each of the three categories is not mutually exclusive). Violent offenses include the categories of assault, firearm, homicide, kidnapping, and sex offenses while property and other offenses include arson, burglary, and theft as well as motor-vehicle related, obstruction, public disturbance, and other. Note that the pattern of results is identical when property and other offenses are separated into two categories.

(8), and (14), incarcerated individuals with a score of zero are only deterred from recidivating with drug offenses and actually have a higher propensity to recidivate with a violent crime, though neither of these effects is statistically significant. Individuals with rounded scores of one or two, on the other hand, are deterred from recidivating with each of the three categories of offenses, though the largest and most significant deterrent effect occurs for violent offenses. Though not significant, more serious offenders (those with scores of three or four) are also deterred from violent offenses; however, incarceration of these individuals actually yields an increased propensity for drug offenses. It is important to note that the samples of individuals with scores of three and four are quite small, resulting in very imprecise estimates.

## VII. Cost-Benefit Analysis

This paper provides evidence that incarceration has a short-term deterrent effect on juvenile offenders with moderate criminal histories. However, from a policy perspective, it is important to ascertain not just whether such an effect exists but also whether the short and long-term social benefits justify the social costs of incarcerating these juveniles. Specifically, I will try to answer the following questions. In each cell of the grid, are the social benefits of specific deterrence and incapacitation of a large enough magnitude to justify incarceration? Does the 1998 sentencing grid prescribe incarceration in accordance with these findings; i.e. when the benefit to cost ratio is greater than one?

Given that the deterrent effect of incarceration is heterogeneous across individuals of varying histories, I conduct the cost-benefit analysis separately for individuals in each

cell of the grid. As this paper only identifies the specific deterrence effect of a 15-week sentence, I restrict the analysis to the benefits and costs of such a sentence. To conduct such an analysis, however, I must make many assumptions and rely on a significant amount of information from sources other than this paper. In doing so, I generally try to err on the conservative side; i.e. overestimate the costs and underestimate the benefits. Following is a brief overview of the primary assumptions and methodology used in the cost-benefit analysis; a more detailed description can be found in an Appendix.

According to the Washington State Institute of Public Policy (2001), the operating and capital costs of incarcerating a juvenile for one year (in 2000) in a state facility are $30,300 and $5,690, respectively. Thus, as seen in Table 12, a 15-week incarceration sentence costs just over $10,000.[42] To calculate the social benefits of incarceration, knowledge of the following is necessary: the expected social cost of a crime, the expected number of crimes deterred, and the expected number of crimes avoided through incapacitation. Three components of the social cost of a crime are considered: costs to the taxpayers, tangible out-of-pocket victim costs, and intangible quality of life costs to the victims.[43] Since the social cost of an offense greatly varies across different types of offenses, I calculate the expected cost of one offense, assuming that the distribution of recidivism offense types is the same as the distribution of current offense types. However, I allow this offense type distribution to differ both across and within the

[42]There are also a number of private costs associated with incarcerating a juvenile. For instance, Freeman (1991) finds that juveniles sentenced to jail have significantly lower probabilities of being employed in both the short and long runs. Similarly, Pintoff (2004) finds that over and above the effects of being arrested, charged and convicted of a crime, juvenile incarceration has negative effects on education outcomes.

[43] While not in the scope of this analysis, there are of course additional social benefits and costs associated with incarceration. For instance, social benefits of incarceration also include the 'values' of retribution and rehabilitation as well as any general deterrence effects. In contrast, the social costs of incarceration also include the loss to society due to reduced education and employment induced by incarceration as well as any utility loss to the criminal's family and friends.

columns of the sentencing grid. Specifically, if the current offense denoted by a cell of the grid is a misdemeanor, I use the offense type distribution of all misdemeanor offenses in that column of the sentencing grid. But, if the current offense is a felony, the offense type distribution used is that for all felony offenses in that column of the grid. The first four rows of Table 12 indicate that the expected total social cost of an offense is between $7,000 and $9,000 when the current offense is a class E misdemeanor and between $15,000 and $24,000 when the current offense is a class B felony. The primary factor that yields such a difference between misdemeanor and felony offenses is the fact that taxpayer costs (e.g. the cost for police and courts) are significantly smaller for misdemeanor offenses.

I then estimate the probability of deterring an offender in each cell of the sentencing grid (refer to point (3) of the Appendix for a description); for instance, Table 12 indicates that the probability of deterring an offender with a rounded score of one or two is greater than 20 percent, while it is about three percent for the rest of the sample. These probabilities are then multiplied by the expected number of *adjudicated* recidivism offenses per individual to find the expected number of crimes deterred for each type of offender. I assume that the number of crimes avoided through incapacitation is equal to the average number of offenses, in each column of the grid, *adjudicated* in the 12 months prior to the current offense multiplied by the sentence length. Table 12 indicates that the average number of offenses adjudicated in the past year ranges from 0.23 offenses for those with a score of zero to 1.16 for those with a score of four. The latter two steps are

quite conservative, given that the number of crimes committed per crime adjudicated is probably greater than one.[44]

The basic results of the analysis are presented in Table 13; each cell of this table corresponds to a cell of the sentencing grid and contains both the short and long-term total social benefit to cost ratios. Under the above-described assumptions, society would never break even from incarcerating an individual with a rounded adjudication score of zero for 15 weeks; even for individuals in cells above the cutoff, the maximum benefit per dollar spent is $0.32. Similarly, society would come far from breaking even if individuals who committed a misdemeanor offense were incarcerated for 15 weeks. In accordance with this finding, the 1998 sentencing grid does not any incarcerate, in a state facility, any individuals who are charged with a misdemeanor offense.

Let us now consider individuals with rounded scores of three or four and current offenses classified as felonies (C to A-). According to Table 13, incarceration of a felony offender with a score of three or four yields a benefit to cost ratio ranging from 0.54 to 0.66. Thus, specific deterrence and incapacitation do not appear to justify the incarceration of these offenders. But, at this stage in the discussion, it is important to consider one of the more conservative assumptions made in this analysis – that there is a one to one ratio between the number of offenses an individual commits and the number for which he is adjudicated. If I relax this assumption just a little, and let there be *two* offenses per conviction, then incarceration of individuals with scores of three or four and a current offense that is a felony will yield benefit to cost ratios that are greater than 1.00.

[44] For instance, this can be seen through an examination of the 1998 survey round of the National Longitudinal Survey of Youth 1997. When considering the crimes of assault, destruction of property, other property crimes, selling drugs, and theft and when restricting the analysis to individuals who report committing 50 or less such offenses since the date of the 1997 interview, I find that, on average, juveniles commit less than seven offenses per every conviction.

With one exception, the sentencing scheme in the 1998 sentencing grid is in accordance with these results. According to the 1998 guidelines, individuals with a rounded score of three and current offense class of C are *not* incarcerated; however, on the basis of specific deterrence and incapacitation, the benefits of a 15-week incarceration sentence could justify the costs.

Lastly, consider those individuals with rounded adjudication scores of one or two and felony current offenses. For cells below the actual cutoff in the guidelines (i.e. B, C+, or C when the score is one and C+ or C when the score is two), a 15-week incarceration sentence would yield benefit to cost ratios that range from 0.84 to 1.35. Thus, looking at the *long-term* benefit to cost ratios, incarceration of these individuals would be justified on the basis of specific deterrence and incapacitation. Similarly, incarceration of 15-weeks of individuals in cells above the cutoffs in these columns yields benefit to cost ratios between 0.87 in the short-term and 1.43 in the long-term. It should be noted that the A- cells, for instance, actually prescribe sentences of 52 and 80 weeks; however, given that my regression discontinuity design does not identify whether deterrence increases with sentence length, I cannot address whether these longer sentences are justified.

## VIII. Conclusion

This paper utilizes the unique juvenile sentencing guidelines of Washington State to analyze the impact of incarceration on juvenile recidivism behavior. The current guidelines are such that an individual is sentenced to incarceration in a state facility, for a minimum of 15 weeks, if he is placed in a cell of the sentencing grid that falls above a

pre-specified cutoff. Thus, I use a regression discontinuity design to capitalize on these discontinuities in treatment that occur around the cutoffs in the grid; in doing so, identification is based off of a sample of individuals within a very small interval around the cutoff who are very similar but receive differential treatment.

My analysis provides evidence that there is a strong deterrent effect of incarceration on recidivism behavior. Overall, incarcerated individuals have an approximately 35 percent lower daily hazard rate of recidivating than non-incarcerated individuals. This effect, however, is heterogeneous across individuals with varying levels of criminal history. Specifically, individuals who have an adjudication history score of either one or two have at least a 60 percent lower daily hazard rate of recidivating. While these individuals are significantly deterred from recidivating with all types of crimes, the largest and most significant effects appear to occur with respect to violent crimes. For individuals with an adjudication history score of zero and those with scores greater than or equal to 3, there is minimal evidence of a specific deterrent effect; this finding, however, does not preclude the possibility that incarceration of these individuals 'generally' deters the rest of the juvenile population. In addition, I find that the estimated treatment effect is being driven completely by males. However, the effect is homogenous across a number of other dimensions; specifically, there is little variation in the estimated treatment effect across ethnicity, age, criminal history, and previous incarceration.

I also conduct a brief cost-benefit analysis in an attempt to determine whether the benefits associated with incarceration justify the costs and whether the cutoffs prescribed in the sentencing guidelines are appropriately placed. The results of this analysis indicate that the social benefits of a 15-week incarceration sentence never justify the costs when

the current offense is a misdemeanor; in accordance with this, the Washington State sentencing grid does not incarcerate such offenders. The cost-benefit analysis also finds that, on the basis of specific deterrence and incapacitation, incarceration of individuals with rounded scores of zero is never justified. In contrast, the guidelines do prescribe incarceration for such offenders with current offense classes of B+ or higher; of course, it is possible that incarceration of such individuals can be justified by reasons other than those addressed in this analysis, such as general deterrence and retribution.

Since a number of questions are beyond the scope of this paper, further study is necessary to fully understand the consequences of juvenile incarceration. For instance, are longer sentence lengths associated with greater deterrent effects? Utilizing the discontinuities in the upper portion of the sentencing grid and a similar design, I ought to be able to address this question when additional years of data become available. Additional data would also enable me to look closer at whether there is a long-term deterrent effect (this effect, however, would still be restricted to offenses committed when the individual is a 'juvenile'). In addition, this paper is limited to identifying the effect of incarceration on future juvenile criminal activity. But, what is the effect of juvenile incarceration on adult criminal activity, education outcomes, and employment outcomes? Depending on the availability of data (i.e. whether it is actually possible to match juveniles in this data set to employment, education, and adult criminal records and whether Washington State would be willing to provide such data), these questions could also be answered utilizing the discontinuities in Washington State's juvenile sentencing guidelines.

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**Appendix to Cost-Benefit Analysis**

1. **Social Costs of a Crime:** Three types of social costs are considered: taxpayer costs, tangible victim costs, and intangible victim costs. Each type of cost varies in magnitude across the different crime categories. Taxpayer costs include the costs of police, courts and prosecutors but do not include the cost of punishment, and thus are underestimated. Statistics for taxpayer costs, in 2000 dollars, are taken from Aos et. al. (2001). In accordance with Aos et. al. (2001), the taxpayer costs of all misdemeanors, regardless of offense type, are restricted to be the same. Values for the monetary tangible and intangible costs of crime, in 1993 dollars, are taken from Miller, Cohen, and Wisersema (1996). All values are converted to 1999 dollars using a Washington state price index. The calculated expected cost of a crime is also likely to be underestimated since I assign a value of zero to offenses that fall in the following categories of the Washington sentencing guidelines: Obstruction, Public Disturbance, and Other.

2. **Offense Type Distribution:** The offense type distribution is the proportion of offenses that are an assault, burglary, drug offense, theft, etc. I assume that the distribution of recidivism offense types is the same as the distribution of current offense types. However, I allow this distribution to differ both across and within the columns of the sentencing grid. Specifically, for individuals whose current offense is a misdemeanor, I use the offense type distribution of all misdemeanor offenses in that column of the sentencing grid. Likewise, for individuals whose current offense is a felony, the offense type distribution is that of all felony offenses in that column of the sentencing grid. Note that I have excluded the categories of homicide and kidnapping, as they are such rare events; however, including them yields no difference in the results.

3. **Probability of Deterring an Individual:** I estimate three hazard models; each model: (1) sets the start date equal to the disposition date plus the minimum sentence length, (2) omits the sample of 'incorrectly' assigned individuals, (3) and includes *D_above_cutoff* as well as second-order polynomials of the actual adjudication score and current offense class. In addition, the first model restricts the sample to individuals in the first column of the grid; i.e. with a rounded adjudication score of zero. The second model restricts the sample to those with scores of one and two while the third model restricts the sample to those with scores of three and four. Rather than using the Cox proportional hazard model, I use the Weibull distribution since it is much easier to extract the cumulative survivor functions (and the results with both models are virtually identical). For each cell, I then calculate the difference between the estimated proportions of the incarcerated and non-incarcerated samples surviving after 365 days, using the estimates from the appropriate hazard model. Note that I can only consider the deterrent effects of a 15-week sentence, as my analysis yields no information with regards to whether deterrence is increasing with sentence length.

4. **Short term expected number of recidivism offenses:** This is equal to the product of the probability of deterring an individual and the average number of offenses adjudicated at the time of the first recidivism offense. The average number of adjudicated offenses is allowed to differ across individuals with different rounded history scores; however, it turns out to be quite similar across columns of the sentencing grid.

5. **Long term expected number of recidivism offenses:** As my analysis lends no insight into long term deterrence, i.e. whether or not the estimated deterrent effects persist, I still assume that an individual is deterred with the same probability as described in bullet (3) above. But, I now multiply this by 2.44 adjudicated offenses. This value is also taken from Aos et. al. (2001) and corresponds to the average number of recidivism offenses in a 7-year follow-up study of juvenile offenders placed on probation.

6. **Average number of offenses in the 12-months prior to the current offense:** This is the average number of offenses, for individuals in each of the five columns of the sentencing grid, that were adjudicated in the twelve months prior to the date of the current offense. Note that this does differ across individuals with different histories; the average is .23 offenses for individuals with a rounded score of zero and 1.16 for individuals with a rounded score of four.

*Table 1. Variable Definitions*

| Variable Name | Definition |
|---|---|
| D_above_cutoff | Dummy variable indicating whether the individual is in an unshaded cell of the sentencing grid; i.e. above the cutoff. |
| DJR | Dummy variable equal to one if the individual is sentenced to the Department of Juvenile Rehabilitation; this is a sentence of incarceration for at least 15 weeks to a state juvenile detention facility. DJR and D_above_cutoff are equivalent when the sample of misassigned individuals is dropped. |
| DJR_hat | The estimated value that results from regressing DJR on D_above_cutoff. |
| Act_score | The individual's actual prior adjudication score. |
| Rnd_score | The rounded prior adjudication score. The actual score is rounded down to the nearest whole number. |
| Class | This is a numeric representation of the individual's current offense class. It ranges from 1 to 10 where 1 is a class E offense and 10 is an A+ offense. |
| Male | Dummy variable equal to one if the youth is male. |
| Black | Dummy variable equal to one if the youth is Black. |
| Hispanic | Dummy variable equal to one if the youth is Hispanic. |
| Native | Dummy variable equal to one if the youth is Native American. |
| Age_off | The individual's age at the time of the offense. |
| Arson | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Arson and Malicious Mischief." |
| Assault | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Assault Other Crimes Involving Physical Harm" |
| Burglary | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Burglary and Trespass." |
| Drugs | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Drugs." |
| Firearm | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Firearms and Weapons." |
| Homicide | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Homicide." |
| Motor | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Motor Vehicle-Related Crimes." This does not include auto theft. |
| Kidnap | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Kidnapping." |
| Obstruction | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Obstructing Governmental Operation." |
| Public | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Public Disturbance." |
| Theft | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Theft, Robbery, Extortion, and Forgery." |
| Sex | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Sex Crimes." |
| Other | Dummy variable equal to one if the guidelines categorize the individual's current offense as "Other." |
| Pany_arson | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Arson and Malicious Mischief." |
| Pany_ass | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Assault Other Crimes Involving Physical Harm" |
| Pany_burg | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Burglary and Trespass." |
| Pany_drug | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Drugs." |
| Pany_frarm | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Firearms and Weapons." |
| Pany_hom | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Homicide." |
| Pany_motor | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Motor Vehicle-Related Crimes." This does not include auto theft. |
| Pany_kid | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Kidnapping." |
| Pany_obstr | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Obstructing Governmental Operation." |
| Pany_public | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Public Disturbance." |
| Pany_theft | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Theft, Robbery, Extortion, and Forgery." |
| Pany_sex | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Sex Crimes." |
| Pany_other | Dummy variable equal to one if the guidelines categorize *any* of the individual's past offenses as "Other." |
| SSODA | Dummy variable equal to one if the data set indicates that the individual was disposed under the Special Sex Offender Disposition Alternative. |
| Manifest up | Dummy variable equal to one if the data set indicates that the individual received an upwards manifest injustice. |
| Manifest down | Dummy variable equal to one if the data set indicates that the individual received a downwards manifest injustice. |
| Drug treatment | Dummy variable equal to one if the data set indicates that the individual's disposition included drug treatment. |
| DJR_local | Dummy variable equal to one if the data set indicates that the individual was sentenced to state incarceration (at least 15 weeks) but served this sentence in a local facility. |
| Plead | Dummy variable equal to one if the individual plead guilty to the offense charged. |
| Decline eligible | Dummy variable equal to one if I determine, in accordance with the Revised Code of Washington, that an individual was eligible for a declination hearing (transfer to criminal court). |
| 3ref_past | Dummy variable equal to one if the individual has any past cases that included three referral reasons. |
| Any past DJR? | Dummy variable equal to one if the individual was ever sentenced to state incarceration prior to the date of the current offense. |
| # invalid for history past referrals | The number of referral reasons, prior to the date of the current offense, which are invalid for criminal history. |
| Age at first referral | The age at which the juvenile was first referred to the court system, regardless of whether the referral was valid or invalid for criminal history. |

*Table 2. Summary Statistics*

| | Entire Sample | | DJR = 1 (Sentenced to State Incarceration) | | DJR = 0 (Not Sentenced to State Incarceration) | |
|---|---|---|---|---|---|---|
| | **Mean** | **Std. Dev.** | **Mean** | **Std. Dev.** | **Mean** | **Std. Dev.** |
| ***Demographic*** | | | | | | |
| Male | .76 | .43 | .88 | .32 | .75 | .43 |
| Black | .12 | .33 | .18 | .39 | .12 | .32 |
| Hispanic | .097 | .30 | .13 | .34 | 9.5 | .29 |
| Native | .039 | .19 | .036 | .19 | 3.9 | .19 |
| Age_off | 15.57 | 1.56 | 15.82 | 1.41 | 15.6 | 1.6 |
| ***Current Offense*** | | | | | | |
| Arson | .085 | .28 | .037 | .19 | .088 | .28 |
| Assault | .18 | .39 | .19 | .39 | .18 | .39 |
| Burglary | .12 | .32 | .15 | .36 | .11 | .32 |
| Drugs | .16 | .36 | .088 | .28 | .16 | .37 |
| Firearm | .023 | .15 | .028 | .16 | .022 | .15 |
| Homicide | .00049 | .022 | .0070 | .083 | .00010 | .010 |
| Motor | .016 | .12 | .012 | .11 | .016 | .12 |
| Kidnap | .00054 | .023 | .0017 | .042 | .00046 | .022 |
| Obstruction | .016 | .13 | .0061 | .078 | .017 | .13 |
| Public | .011 | .11 | .00087 | .030 | .012 | .11 |
| Theft | .31 | .46 | .28 | .45 | .31 | .46 |
| Sex | .021 | .14 | .13 | .34 | .014 | .12 |
| Other | .060 | .24 | .061 | .24 | .060 | .24 |
| A+ | .000049 | .0070 | .00087 | .030 | 0 | 0 |
| A | .0019 | .044 | .024 | .15 | .00067 | .026 |
| A- | .011 | .11 | .093 | .29 | .0066 | .081 |
| B+ | .029 | .17 | .35 | .48 | .010 | .099 |
| B | .095 | .29 | .20 | .40 | .089 | .28 |
| C+ | .027 | .16 | .050 | .22 | .025 | .16 |
| C | .16 | .36 | .19 | .39 | .15 | .36 |
| D+ | .16 | .36 | .035 | .18 | .16 | .37 |
| D | .33 | .47 | .049 | .22 | .35 | .48 |
| E | .19 | .39 | .011 | .11 | .20 | .40 |
| ***Past Offense*** | | | | | | |
| Pany_arson | .12 | .33 | .24 | .43 | .11 | .32 |
| Pany_ass | .17 | .38 | .30 | .46 | .16 | .37 |
| Pany_burg | .13 | .34 | .34 | .47 | .12 | .32 |
| Pany_drug | .13 | .33 | .17 | .38 | .12 | .33 |
| Pany_frarm | .032 | .18 | .076 | .26 | .030 | .17 |
| Pany_hom | .00015 | .012 | .0017 | .042 | .000052 | .0072 |
| Pany_motor | .031 | .17 | .064 | .24 | .029 | .17 |
| Pany_kid | .00058 | .024 | .00087 | .030 | .00057 | .024 |
| Pany_obstr | .022 | .15 | .056 | .23 | .020 | .14 |
| Pany_public | .013 | .11 | .022 | .15 | .013 | .11 |
| Pany_theft | .34 | .47 | .52 | .50 | .33 | .47 |
| Pany_sex | .013 | .11 | .042 | .20 | .011 | .11 |
| Pany_other | .057 | .23 | .13 | .34 | .052 | .22 |
| Rnd_score = 0 | .78 | .41 | .46 | .50 | .80 | .40 |
| Rnd_score = 1 | .11 | .32 | .13 | .34 | .11 | .32 |
| Rnd_score = 2 | .046 | .21 | .11 | .31 | .042 | .20 |
| Rnd_score = 3 | .026 | .16 | .10 | .30 | .022 | .15 |
| Rnd_score = 4 | .031 | .17 | .20 | .40 | .021 | .14 |
| ***Recidivism Offense*** | | | | | | |
| Recidivate (Disp. Date) | .27 | .44 | .22 | .41 | .27 | .44 |
| Censor 18 (Disp. Date) | .28 | .45 | .35 | .48 | .27 | .45 |
| Censor end (Disp. Date) | .45 | .50 | .43 | .50 | .45 | .50 |
| Recid. Drug (Disp. Date) | .056 | .23 | .038 | .19 | .057 | .23 |
| Recid. Viol. (Disp. Date) | .061 | .24 | .059 | .24 | .061 | .24 |
| Recid. Prop. (Disp. Date) | .17 | .38 | .14 | .34 | .17 | .38 |
| Recidivate (+ Min Sent.) | .27 | .44 | .19 | .39 | .27 | .44 |
| Censor 18 (+ Min Sent.) | .28 | .45 | .37 | .48 | .27 | .45 |
| Censor end (+ Min Sent.) | .45 | .50 | .44 | .50 | .46 | .50 |
| Recid. Drug (+ Min Sent.) | .056 | .23 | .037 | .19 | .057 | .23 |
| Recid. Viol. (+ Min Sent.) | .060 | .24 | .047 | .21 | .061 | .24 |
| Recid. Prop. (+ Min Sent.) | .17 | .37 | .12 | .33 | .17 | .38 |
| # Observations | 20,542 | | 1,147 | | 19,395 | |

Note that approximately 1,250 individuals are missing information concerning their race; so as to not lose these observations, I include a dummy variable indicating that this information is missing.

*Table 3. Correlates of Assignment to Too Harsh or Too Lenient Punishments*

| | (1) Too Harsh | (2) Too Harsh | (3) Too Harsh | (4) Too Lenient | (5) Too Lenient | (6) Too Lenient |
|---|---|---|---|---|---|---|
| Male | 0.0094*** | 0.0077*** | 0.0062*** | 0.0080*** | 0.0076*** | 0.0065*** |
| | (4.28) | (3.59) | (2.91) | (3.91) | (3.95) | (3.39) |
| Black | 0.0090*** | 0.0102*** | 0.0097*** | 0.0102*** | 0.0098*** | 0.0098*** |
| | (3.00) | (3.51) | (3.38) | (3.69) | (3.79) | (3.77) |
| Hispanic | 0.0029 | 0.0026 | 0.0018 | 0.0013 | -0.0001 | -0.0018 |
| | (0.90) | (0.81) | (0.55) | (0.42) | (0.02) | (0.63) |
| Native | -0.0014 | -0.0021 | -0.0029 | 0.0057 | 0.0059 | 0.0041 |
| | (0.29) | (0.43) | (0.61) | (1.24) | (1.36) | (0.95) |
| Age_off | -0.0003 | -0.0000 | -0.0015** | 0.0025*** | 0.0022*** | 0.0017*** |
| | (0.55) | (0.01) | (2.47) | (4.50) | (4.22) | (3.20) |
| Arson | 0.0062 | 0.0051 | 0.0017 | 0.0178 | 0.0162 | 0.0123 |
| | (0.05) | (0.04) | (0.01) | (0.15) | (0.14) | (0.11) |
| Assault | 0.0164 | 0.0148 | 0.0090 | 0.0188 | 0.0154 | 0.0119 |
| | (0.12) | (0.12) | (0.07) | (0.15) | (0.13) | (0.10) |
| Burg | 0.0141 | 0.0129 | 0.0106 | 0.0275 | 0.0255 | 0.0216 |
| | (0.11) | (0.10) | (0.08) | (0.22) | (0.22) | (0.19) |
| Drugs | 0.0134 | 0.0132 | 0.0115 | 0.0080 | 0.0078 | 0.0031 |
| | (0.10) | (0.10) | (0.09) | (0.07) | (0.07) | (0.03) |
| Firearm | 0.0136 | 0.0128 | 0.0106 | 0.0267 | 0.0247 | 0.0197 |
| | (0.10) | (0.10) | (0.08) | (0.22) | (0.21) | (0.17) |
| Hom | 0.1982 | 0.1991 | 0.1992 | 0.0005 | 0.0021 | 0.0016 |
| | (1.42) | (1.47) | (1.49) | (0.00) | (0.02) | (0.01) |
| Kidnap | -0.0016 | -0.0014 | -0.0241 | 0.0011 | 0.0020 | 0.0032 |
| | (0.01) | (0.01) | (0.18) | (0.01) | (0.02) | (0.03) |
| Motor | 0.0001 | 0.0003 | -0.0022 | 0.0122 | 0.0086 | 0.0041 |
| | (0.00) | (0.00) | (0.02) | (0.10) | (0.07) | (0.04) |
| Obstruct | 0.0121 | 0.0103 | 0.0081 | 0.0013 | 0.0019 | -0.0040 |
| | (0.09) | (0.08) | (0.06) | (0.01) | (0.02) | (0.03) |
| Other | 0.0102 | 0.0084 | 0.0059 | 0.0294 | 0.0238 | 0.0197 |
| | (0.08) | (0.06) | (0.05) | (0.24) | (0.21) | (0.17) |
| Public | 0.0006 | 0.0007 | -0.0014 | 0.0071 | 0.0049 | 0.0005 |
| | (0.00) | (0.01) | (0.01) | (0.06) | (0.04) | (0.00) |
| Sex | 0.3663*** | 0.3005** | 0.2605** | 0.0397 | 0.0221 | 0.0259 |
| | (2.76) | (2.33) | (2.04) | (0.32) | (0.19) | (0.22) |
| Theft | 0.0149 | 0.0143 | 0.0102 | 0.0171 | 0.0149 | 0.0112 |
| | (0.11) | (0.11) | (0.08) | (0.14) | (0.13) | (0.10) |
| SSODA | | 0.4139*** | 0.4292*** | | -0.0339** | -0.0349** |
| | | (24.29) | (25.47) | | (2.23) | (2.30) |
| Manifest Up | | -0.0412*** | -0.0540*** | | 0.5957*** | 0.5918*** |
| | | (3.17) | (4.20) | | (51.44) | (51.13) |
| Manifest Down | | 0.5306*** | 0.5207*** | | 0.1014*** | 0.1018*** |
| | | (16.94) | (16.82) | | (3.62) | (3.65) |
| Drug Treatment | | 0.0003 | 0.0009 | | -0.0092 | -0.0101 |
| | | (0.02) | (0.06) | | (0.71) | (0.79) |

| | | | | | | |
|---|---|---|---|---|---|---|
| DJR_local | | 0.4475*** | 0.4458*** | | -0.0053 | -0.0088 |
| | | (18.64) | (18.79) | | (0.25) | (0.41) |
| Plead | | 0.0026 | 0.0025 | | 0.0052** | 0.0034 |
| | | (0.90) | (0.88) | | (1.99) | (1.31) |
| Decline eligible | | | 0.2260*** | | | -0.0415*** |
| | | | (22.18) | | | (4.52) |
| 3ref_past | | | 0.0063** | | | 0.0209*** |
| | | | (2.56) | | | (9.33) |
| Constant | -0.0039 | -0.0102 | 0.0155 | -0.0496 | -0.0496 | -0.0383 |
| | (0.03) | (0.08) | (0.12) | (0.40) | (0.43) | (0.33) |
| Demographics | YES | YES | YES | YES | YES | YES |
| Current Offense Type | YES | YES | YES | YES | YES | YES |
| Non-DJR Disposition Reasons | NO | YES | YES | NO | YES | YES |
| Eligible for Declination Hearing | NO | NO | YES | NO | NO | YES |
| 3 Referral Reasons in Past | NO | NO | YES | NO | NO | YES |
| Observations | 20542 | 20542 | 20542 | 20542 | 20542 | 20542 |
| R-squared | 0.13 | 0.18 | 0.20 | 0.01 | 0.12 | 0.12 |

Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable for the specifications in the first three columns of the above table is a dummy variable denoted 'Too Harsh'. This variable is equal to one when my placement of the individual on the sentencing grid indicates that he is above the cutoff and should be sentenced to DJR but the data indicates that he did not receive a sentence of DJR. Similarly, the dependent variable in the latter three columns, 'Too Lenient', is equal to one when the individual is actually sentenced to DJR but my placement of the individual on the grid indicates that he should not be.

*Table 4. Cox Proportional Hazard Estimates -- Introducing Different Estimation Methods and Start Dates*

| | **As if DJR random and Ignorant of Sentencing Grid** | | | **Assumes Sharp RD Design** | | | **Fuzzy RD Design Drop Incorrectly Assigned Sample** | | | **Fuzzy RD Design Two-Stage Approach** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| DJR | 0.6533*** | 0.8194*** | 0.9538 | | | | | | | | | |
| | (6.56) | (2.87) | (0.60) | | | | | | | | | |
| D_above_cutoff | | | | 0.6147*** | 0.7001*** | 0.7440*** | 0.5152*** | 0.6451*** | 0.7261*** | | | |
| | | | | (5.48) | (3.87) | (2.94) | (6.68) | (4.26) | (2.80) | | | |
| DJR_hat | | | | | | | | | | 0.4439*** | 0.5516*** | 0.6106*** |
| | | | | | | | | | | (5.50) | (4.03) | (2.72) |
| Act_score | | | | 1.4625*** | 1.4860*** | 1.4955*** | 1.4796*** | 1.4906*** | 1.4926*** | 1.5001*** | 1.5138*** | 1.5188*** |
| | | | | (15.19) | (15.51) | (15.15) | (15.20) | (15.23) | (14.73) | (13.82) | (14.70) | (13.80) |
| Act_score$^2$ | | | | 0.9565*** | 0.9543*** | 0.9545*** | 0.9576*** | 0.9558*** | 0.9563*** | 0.9557*** | 0.9537*** | 0.9540*** |
| | | | | (9.06) | (9.19) | (8.70) | (8.60) | (8.70) | (8.18) | (7.59) | (7.97) | (7.05) |
| Class | | | | 1.1735*** | 1.1650*** | 1.1631*** | 1.1674*** | 1.1447*** | 1.1336*** | 1.1982*** | 1.1829*** | 1.1779*** |
| | | | | (4.44) | (4.16) | (3.99) | (4.11) | (3.51) | (3.15) | (5.25) | (4.69) | (4.47) |
| Class$^2$ | | | | 0.9758*** | 0.9775*** | 0.9783*** | 0.9776*** | 0.9808*** | 0.9827*** | 0.9740*** | 0.9762*** | 0.9772*** |
| | | | | (4.79) | (4.34) | (4.04) | (4.19) | (3.50) | (3.04) | (5.41) | (4.74) | (4.35) |
| Start Date | Disp. | Disp. + Min | Disp. + Max | Disp. | Disp. + Min | Disp. + Max | Disp. | Disp. + Min | Disp. + Max | Disp. | Disp. + Min | Disp. + Max |
| Observations | 19495 | 19217 | 18587 | 19495 | 19217 | 18587 | 18809 | 18615 | 18082 | 19495 | 19217 | 18587 |

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each column presents the hazard ratios that result from estimating a Cox proportional hazard model with the covariates noted in the table; a value greater than one indicates an exacerbation effect and a value less than one indicates a deterrent effect. The start date, or date at which the individual becomes at risk of recidivating, varies across the specifications: "Disp" indicates that the disposition date is the start date, "Disp. + Min" indicates that the disposition date plus the minimum sentence is the start date, and "Disp. + Max" indicates that the disposition date plus the maximum sentence is the start date. The first stage used in columns (10), (11), and (12) is estimated by regressing *DJR* on *D_above_cutoff* and the second order polynomials of Act_score and Class. In this specification, the coefficient *on D_above_cutoff* is .5993 with a t-statistic of 81.96; the $R^2$ for the first stage regression is .48. Note that the z-statistics in these columns are based on bootstrapped standard errors with 500 replications.

*Table 5. Examination of Whether Observable Characteristics Vary Discontinuously At the Cutoff*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | $\hat{\lambda}$ **($x_1$)** | $\hat{\lambda}$ **($x_1$, $x_2$ )** | $\hat{\lambda}$ **($x_1$, $x_2$, $x_3$ )** | $\hat{\lambda}$ **($x_1$, $x_2$, $x_3$, $x_4$)** | **Male** | **Black** | **Hispanic** | **Native** | **Age_off** |
| D_above_cutoff | -0.00 | 0.00 | -0.00 | -0.00 | -0.13*** | 0.13*** | -0.00 | -0.01 | -0.19** |
| | (0.28) | (0.18) | (0.69) | (1.22) | (6.48) | (8.14) | (0.00) | (0.86) | (2.51) |
| Act Score | -0.00 | 0.07*** | 0.07*** | 0.07*** | 0.08*** | 0.01 | 0.02*** | 0.01** | 0.58*** |
| | (0.55) | (67.99) | (65.16) | (61.17) | (13.98) | (1.53) | (4.82) | (2.24) | (29.59) |
| Act Score$^2$ | 0.00** | -0.01*** | -0.01*** | -0.00*** | -0.00*** | -0.00 | -0.00** | -0.00 | -0.05*** |
| | (2.26) | (27.81) | (26.69) | (21.86) | (5.11) | (1.05) | (2.40) | (1.55) | (16.28) |
| Class | 0.00 | 0.00** | 0.02*** | 0.02*** | -0.06*** | 0.05*** | -0.01** | -0.01* | -0.33*** |
| | (1.39) | (2.17) | (14.70) | (13.66) | (8.25) | (8.85) | (2.46) | (1.67) | (11.63) |
| Class$^2$ | 0.00* | -0.00 | -0.00*** | -0.00*** | 0.01*** | -0.01*** | 0.00*** | 0.00 | 0.04*** |
| | (1.65) | (0.20) | (12.62) | (11.56) | (11.48) | (9.04) | (3.12) | (1.25) | (9.30) |
| Constant | 0.41*** | 0.20*** | 0.17*** | 0.15*** | 0.77*** | 0.04*** | 0.10*** | 0.05*** | 15.84*** |
| | (126.52) | (85.12) | (70.01) | (66.63) | (63.81) | (4.27) | (11.53) | (8.33) | (369.76) |
| Observations | 18615 | 18615 | 18615 | 18615 | 19798 | 18604 | 18604 | 18604 | 19803 |
| R-squared | 0.01 | 0.33 | 0.31 | 0.31 | 0.03 | 0.01 | 0.00 | 0.00 | 0.07 |

Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each column corresponds to the estimation of a linear probability model, where the dependent variable is indicated in the second row of the table and all independent variables are listed in the table. The dependent variable in the first four columns is obtained by estimating a Cox proportional hazard model when the only covariates are a subset of $X_i$. The resulting estimate of the hazard ratio, $\hat{\lambda}$, is then used as the dependent variable. $\mathbf{x_1}$ includes race, gender, and age variables; $\mathbf{x_2}$ includes past offense type dummy variables; $\mathbf{x_3}$ includes current offense type dummy variables; and $\mathbf{x_4}$ includes whether the individual was sentenced to DJR in the past, the number of past invalid for history referrals, and the age at first referral.

*Table 6. Robustness of Estimated Treatment Effect to Controls for Covariates*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| DJR | 0.6451*** | 0.6342*** | 0.6384*** | 0.6389*** | 0.6609*** | 0.6623*** | 0.6814*** |
| | (4.26) | (4.41) | (4.33) | (4.30) | (3.90) | (3.87) | (3.60) |
| Act_score | 1.4906*** | 1.5395*** | 1.2267*** | 1.2485*** | 1.2506*** | 1.1975*** | 1.1758*** |
| | (15.23) | (15.72) | (4.95) | (5.33) | (5.35) | (4.22) | (3.82) |
| $Act\_score^2$ | 0.9558*** | 0.9509*** | 0.9730*** | 0.9717*** | 0.9713*** | 0.9718*** | 0.9741*** |
| | (8.70) | (9.34) | (4.67) | (4.83) | (4.88) | (4.75) | (4.41) |
| Class | 1.1447*** | 1.1267*** | 1.1375*** | 1.1468*** | 1.1121* | 1.1118* | 1.0913 |
| | (3.51) | (3.06) | (3.28) | (3.46) | (1.91) | (1.90) | (1.57) |
| $Class^2$ | 0.9808*** | 0.9808*** | 0.9799*** | 0.9791*** | 0.9827** | 0.9827** | 0.9847** |
| | (3.50) | (3.46) | (3.60) | (3.72) | (2.25) | (2.24) | (1.99) |
| Male | | 1.4972*** | 1.4935*** | 1.5013*** | 1.5154*** | 1.5248*** | 1.5083*** |
| | | (11.27) | (11.10) | (11.23) | (11.40) | (11.56) | (11.26) |
| Black | | 1.2022*** | 1.2120*** | 1.2489*** | 1.2443*** | 1.2392*** | 1.2391*** |
| | | (4.41) | (4.57) | (5.00) | (4.91) | (4.81) | (4.81) |
| Hispanic | | 1.1719*** | 1.1789*** | 1.2704*** | 1.2712*** | 1.2580*** | 1.2546*** |
| | | (3.39) | (3.50) | (4.63) | (4.63) | (4.42) | (4.37) |
| Native | | 1.1978*** | 1.1999*** | 1.1981** | 1.2002** | 1.1635** | 1.1721** |
| | | (2.66) | (2.68) | (2.53) | (2.55) | (2.11) | (2.22) |
| Age_off | | 0.8793*** | 0.8735*** | 0.8714*** | 0.8707*** | 0.8738*** | 0.8717*** |
| | | (13.28) | (13.72) | (13.91) | (13.79) | (11.27) | (11.47) |
| Pany_arson | | | 1.1886*** | 1.1880*** | 1.1905*** | 1.1618*** | 1.1633*** |
| | | | (4.00) | (3.97) | (4.01) | (3.42) | (3.45) |
| Pany_ass | | | 1.2142*** | 1.2056*** | 1.2139*** | 1.1776*** | 1.1669*** |
| | | | (5.16) | (4.94) | (5.09) | (4.22) | (3.99) |
| Pany_burg | | | 1.1315*** | 1.1075** | 1.0994** | 1.0740 | 1.0736 |
| | | | (2.66) | (2.19) | (2.03) | (1.52) | (1.52) |
| Pany_drug | | | 1.0946** | 1.0792* | 1.0792* | 1.0545 | 1.0627 |
| | | | (2.03) | (1.70) | (1.69) | (1.17) | (1.34) |
| Pany_frarm | | | 1.1177 | 1.1266* | 1.1309* | 1.0993 | 1.0942 |
| | | | (1.58) | (1.69) | (1.74) | (1.33) | (1.27) |
| Pany_kid | | | 0.2336 | 0.2467 | 0.2441 | 0.2242 | 0.2558 |
| | | | (1.45) | (1.40) | (1.41) | (1.49) | (1.36) |
| Pany _motor | | | 1.0401 | 1.0335 | 1.0267 | 1.0325 | 1.0206 |
| | | | (0.48) | (0.40) | (0.32) | (0.39) | (0.25) |
| Pany _obstr | | | 1.0382 | 1.0361 | 1.0288 | 0.9986 | 0.9954 |
| | | | (0.42) | (0.40) | (0.32) | (0.02) | (0.05) |
| Pany _other | | | 1.1023* | 1.0770 | 1.0771 | 1.0447 | 1.0499 |
| | | | (1.70) | (1.29) | (1.29) | (0.75) | (0.84) |
| Pany _public | | | 1.0568 | 1.0879 | 1.0781 | 1.0596 | 1.0562 |
| | | | (0.51) | (0.77) | (0.69) | (0.53) | (0.50) |
| Pany _sex | | | 0.9755 | 0.9511 | 0.9946 | 1.0185 | 1.0182 |
| | | | (0.20) | (0.40) | (0.04) | (0.14) | (0.14) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pany _theft | | | 1.2143*** | 1.2041*** | 1.1957*** | 1.1771*** | 1.1571*** |
| | | | (5.48) | (5.19) | (4.99) | (4.46) | (3.99) |
| Arson | | | | | 1.7935 | 1.7761 | 1.7972 |
| | | | | | (0.58) | (0.57) | (0.58) |
| Assault | | | | | 1.9758 | 1.9514 | 1.9933 |
| | | | | | (0.68) | (0.67) | (0.69) |
| Burg | | | | | 2.1296 | 2.1089 | 2.1307 |
| | | | | | (0.75) | (0.74) | (0.75) |
| Drugs | | | | | 1.8755 | 1.8600 | 1.8677 |
| | | | | | (0.63) | (0.62) | (0.62) |
| Firearm | | | | | 2.0889 | 2.0573 | 2.0989 |
| | | | | | (0.73) | (0.72) | (0.74) |
| Motor | | | | | 1.8884 | 1.8694 | 1.8524 |
| | | | | | (0.63) | (0.62) | (0.61) |
| Obstruct | | | | | 2.2008 | 2.1324 | 2.1291 |
| | | | | | (0.78) | (0.75) | (0.75) |
| Other | | | | | 1.8851 | 1.8692 | 1.8778 |
| | | | | | (0.63) | (0.62) | (0.63) |
| Public | | | | | 2.6375 | 2.5847 | 2.5912 |
| | | | | | (0.96) | (0.94) | (0.94) |
| Sex | | | | | 1.1299 | 1.1144 | 1.0954 |
| | | | | | (0.12) | (0.11) | (0.09) |
| Theft | | | | | 2.1298 | 2.1028 | 2.1283 |
| | | | | | (0.76) | (0.74) | (0.75) |
| Any Past DJR? | | | | | | 1.0144 | 1.0109 |
| | | | | | | (0.17) | (0.13) |
| # invalid for history past referrals | | | | | | 1.0299*** | 1.0317*** |
| | | | | | | (6.62) | (6.99) |
| Age at first referral | | | | | | 0.9946 | 0.9962 |
| | | | | | | (0.65) | (0.46) |
| Plead? | | | | | | | 1.6715*** |
| | | | | | | | (8.42) |
| County Dummies | NO | NO | NO | YES | YES | YES | YES |
| Observations | 18615 | 18615 | 18615 | 18615 | 18615 | 18615 | 18615 |

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each column presents the hazard ratios that result from estimating a Cox proportional hazard model with the covariates noted in the table; thus, a value greater than one indicates an exacerbation effect and a value less than one indicates a deterrent effect. All specifications assume that the start date is the disposition date plus the minimum sentence. Individuals for whom I assigned the wrong punishment are omitted from the analysis.

*Table 7. Number of 'Hits' in the Headlines, Lead Paragraph(s), and Key Terms of Washington State's Main Newspapers*

| Search Terms | The Seattle Times | Seattle Post-Intelligencer | The Columbian and The Spokesman-Review |
|---|---|---|---|
| Sentencing Guidelines | 6 | 7 | 15 |
| Juvenile Sentencing Guidelines | 0 | 0 | 0 |
| Juvenile Justice Reform | 2 | 1 | 4 |
| Juvenile Justice Act | 0 | 1 | 0 |
| Juvenile Justice AND Reform | 4 | 15 | 16 |
| Disposition Standards | 0 | 0 | 0 |
| Juvenile AND Disposition | 0 | 0 | 0 |
| Juvenile Justice System | 3 | 11 | 3 |
| Juvenile Courts | 30 | 30 | 54 |
| Juvenile Detention | 26 | 14 | 86 |
| Juvenile AND Sentencing AND Laws | 12 | 15 | 34 |
| Juvenile AND Justice AND Laws | 31 | 72 | 100 |

Using Lexis-Nexis, all articles from January 1, 1997 to December 31, 1998 were searched in the above newspapers. Note that The Spokesman-Review only includes articles dating from February 12, 1997. 'AND' indicates that the listed terms were searched for separately rather than as part of the same phrase. The number of hits in each search is not mutually exclusive; i.e. some articles found when searching under 'Juvenile Courts' are the same as some articles found when searching under 'Juvenile Detention.' It is also the case that some of the searches yielded multiple hits on the same article. Any references to the actual reform are primarily concerned with the changes in which juveniles can be transferred to criminal court. Most hits are actually for articles describing a particular juvenile's case, with headlines such as: "14-Year Old Charged in Injury of Jogger," "Two Accused of Blowing Up Cat Remanded to Juvenile Court," "Student Accused of Threats," "Boy Sentenced in Friend's Death," Etc.

*Table 8a. Informal Test of Whether Individuals Game the System – Do individuals systematically choose their current offense such that it is right below the cutoff?*

| Actual Score of Group 1 ($Act\_Sc_1$) | Offense Class Right Below Cutoff for Group 1 (Z) | Pr (Z\| $Act\_Sc_1$) | Actual Score of Group 2 ($Act\_Sc_2$) | Pr (Z\| $Act\_Sc_2$) | Pr (Z\| $Act\_Sc_1$) – Pr (Z\| $Act\_Sc_2$) | t-statistic |
|---|---|---|---|---|---|---|
| 2.0 | C+ | 0.024 | 1.75 | 0.024 | 0.000 | 0.00 |
| 3.0 | C | 0.223 | 2.75 | 0.266 | -0.042 | 0.90 |
| 4.0 | D+ | 0.129 | 3.75 | 0.104 | 0.025 | 0.53 |

Group 1 is the sample of individuals with an actual score right on the horizontal cutoff (e.g. 2.0, 3.0, or 4.0) while group 2 is the sample of individuals whose actual score is right below the horizontal cutoff (e.g. 1.75, 2.75, 3.75). Thus, this table tests whether individuals immediately to the left of the horizontal cutoff have the same probability of committing an offense with a class that places the Group 1 individuals in a cell immediately below the vertical cutoff. If individuals are gaming the system, then one would expect that Pr (Z| $Act\_Sc_1$) > Pr (Z| $Act\_Sc_2$).

*Table 8b. Informal Test of Whether Individuals Game the System – Do individuals systematically choose their current offense with their future placement on the sentencing grid in mind?*

| Actual Score of Group 1 ($Act\_Sc_1$) | Pr (Misdemeanor \| $Act\_Sc_1$) | Actual Score of Group 2 ($Act\_Sc_2$) | Pr (Misdemeanor \| $Act\_Sc_2$) | Pr (Misd.\| $Act\_Sc_1$) – Pr (Misd.\| $Act\_Sc_2$) | t-statistic |
|---|---|---|---|---|---|
| 1.75 | 0.701 | 1.5 | 0.706 | -0.005 | 0.15 |
| 2.75 | 0.633 | 2.5 | 0.639 | -0.006 | 0.11 |
| 3.75 | 0.573 | 3.5 | 0.606 | -0.033 | 0.50 |

Group 1 is the sample of individuals one step to the left of horizontal cutoff (e.g. 1.75) while Group 2 is the sample of individuals two steps to the left of this cutoff (e.g. 1.5). For Group 1 individuals, committing either a misdemeanor worth ¼ point or a felony worth 1 point this period will result in the individual being in the next column of the sentencing grid if he recidivates. On the other hand, if a Group 2 individual commits a misdemeanor this period, he will remain in the current column of the grid if he recidivates. Thus, if individuals are gaming the system, then one would expect that Group 2 individuals have a higher probability of committing a misdemeanor or Pr (Misd.| $Act\_Sc_1$) – Pr (Misd.| $Act\_Sc_2$) < 0.

*Table 9. Heterogeneity of Treatment Effect Across Individuals of Varying Adjudication Scores*

| | (1) Sc = 0 | (2) Sc = 0 | (3) Sc = 0 | (4) Sc = 1 | (5) Sc = 1 | (6) Sc = 1 | (7) Sc = 2 | (8) Sc = 2 | (9) Sc = 2 | (10) Sc = 3 | (11) Sc = 3 | (12) Sc = 3 | (13) Sc = 4 | (14) Sc = 4 | (15) Sc = 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DJR | 0.7555* | 0.8275 | 0.9244 | 0.2482*** | 0.3473*** | 0.3806** | 0.0907** | 0.3610* | 0.3011** | 0.8485 | 1.5550 | 1.8621 | 0.7456 | 0.6000 | 0.9086 |
| | (1.69) | (1.06) | (0.40) | (3.51) | (2.89) | (2.37) | (2.55) | (1.88) | (2.07) | (0.19) | (0.64) | (0.79) | (0.98) | (1.59) | (0.21) |
| Act_score | 6.6658 | 4.7806*** | 4.8334*** | 1.5e07** | 5.4223 | 6.2867 | 0.0000 | 2.5472 | 2.6796 | 0.0000** | 0.0001 | 0.0001 | 0.5870 | 0.7838 | 0.7720 |
| | (1.52) | (4.38) | (4.40) | (2.48) | (1.05) | (1.14) | (0.83) | (0.22) | (0.23) | (2.06) | (1.15) | (1.14) | (0.93) | (0.94) | (0.99) |
| Act_score$^2$ | 0.3065 | 0.3392*** | 0.3369*** | 0.0021** | 0.6036 | 0.5728 | 4.3 e2 | 0.8414 | 0.8354 | 3.6 e3 ** | 4.2886 | 4.2698 | 1.0433 | 1.0161 | 1.0171 |
| | (0.96) | (3.13) | (3.14) | (2.41) | (0.85) | (0.93) | (0.91) | (0.19) | (0.20) | (2.04) | (1.14) | (1.14) | (1.02) | (0.86) | (0.91) |
| Class | | 1.2603*** | 1.1728** | | 0.9473 | 1.0010 | | 0.8168 | 0.8440 | | 1.4908 | 1.9406 | | 0.9010 | 0.5448 |
| | | (4.62) | (2.19) | | (0.52) | (0.01) | | (1.08) | (0.72) | | (1.24) | (1.40) | | (0.44) | (1.52) |
| Class$^2$ | | 0.9670*** | 0.9757** | | 1.0052 | 0.9970 | | 1.0301 | 1.0295 | | 0.9132 | 0.8774 | | 1.0252 | 1.0699 |
| | | (4.72) | (2.41) | | (0.33) | (0.13) | | (0.89) | (0.75) | | (1.49) | (1.56) | | (0.64) | (1.29) |
| Cells | Border | All | All | Border | All | All | Border | All | All | Border | All | All | Border | All | All |
| Demog. | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Criminal History | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Current Offense Categ. | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| Obs. | 1667 | 14831 | 14831 | 216 | 2096 | 2096 | 55 | 788 | 788 | 90 | 439 | 439 | 167 | 461 | 461 |

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each column presents the hazard ratios that result from estimating a Cox proportional hazard model with the covariates noted in the lower panel of the table; thus, a value greater than one indicates an exacerbation effect and a value less than one indicates a deterrent effect. All specifications assume that the start date is the disposition date plus the minimum sentence. Individuals for whom I assigned the wrong punishment are omitted from the analysis. In addition, the first panel (i.e. columns (1) –(3)) restricts the analysis to the sample of individuals with a rounded adjudication score of zero, the second panel restricts the analysis to those with a rounded adjudication score of one, etc.

*Table 10. Heterogeneity in the Treatment Effect Across Demographic and Criminal History Characteristics*

| Row Number | Sample Restrictions | Hazard Ratio | z-statistic | Observations |
|---|---|---|---|---|
| *Baseline* | | | | |
| 1 | Entire Sample | 0.6598*** | (3.95) | 18615 |
| *Demographic Characteristics* | | | | |
| 2 | Males | 0.6587*** | (3.81) | 13998 |
| 3 | Females | 1.0310 | (0.08) | 4613 |
| 4 | Blacks | 0.5890* | (1.95) | 2091 |
| 5 | Hispanics | 0.6240* | (1.67) | 1628 |
| 6 | Native Americans | 0.8360 | (0.29) | 689 |
| 7 | Age at Offense <= 14 | 0.6483 | (1.45) | 3415 |
| 8 | Age at Offense > 14 and <= 16 | 0.6840** | (2.57) | 7387 |
| 9 | Age at Offense > 16 | 0.5896*** | (2.90) | 7813 |
| *Criminal History and Other Characteristics* | | | | |
| 10 | No Previous Sentences to DJR | 0.6868*** | (2.87) | 17964 |
| 11 | At Least One Previous Sentence to DJR | 0.6782 | (1.50) | 651 |
| 12 | Any Past Assault Referrals | 0.5300*** | (3.35 | 3125 |
| 13 | Any Past Firearms Referrals | 0.5359* | (1.81) | 569 |
| 14 | Any Past Sex Offense Referrals | 0.4931 | (0.74) | 221 |
| 15 | Any Past Burglary Referrals | 0.6524** | (2.56) | 2285 |
| 16 | Any Past Theft Referrals | 0.5954*** | (3.87) | 6141 |
| 17 | Any Past Drug Referrals | 0.7737 | (1.13) | 2244 |
| 18 | Plead to Current Offense | 0.6998*** | (3.29) | 16,640 |
| 19 | Don't Plead to Current Offense | 0.4484* | (1.67) | 1,975 |

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each row of the above table represents a separate specification; the specifications only differ by the sub-samples included in them. For example, the first row uses the entire sample while the second and third rows use just the sample of males and females, respectively. In addition to the sample restriction noted in the second column of the table, each specification is restricted to just the sample of individuals with 'correct' assignment. The hazard ratio presented in the third column of the table is that associated with *DJR*; in addition, each specification includes second-order polynomials of the actual score and class as well as the set of current offense type dummy variables. Note that a hazard ratio greater than one implies and exacerbation effect and a hazard ratio less than one implies a deterrence effect. The disposition date plus the minimum sentence is used as the start date in each specification.

*Table 11. Estimated Hazard Ratio when Recidivism is Defined as Drug, Violent, or Property*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rec. Offense Type = | | | **Drug Offense** | | | | | | **Violent Offense** | | | | | | **Property and Other Offense** | | | |
| Score = | All | 0 | 1 | 2 | 3 | 4 | All | 0 | 1 | 2 | 3 | 4 | All | 0 | 1 | 2 | 3 | 4 |
| DJR | 0.74 | 0.76 | 0.27 | 0.65 | 3.06 | 6.34* | 0.68* | 1.55 | 0.20** | 0.07* | 0.49 | 0.28 | 0.65*** | 0.94 | 0.39* | 0.30 | 3.52 | 0.78 |
| | (1.28) | (0.51) | (1.44) | (0.40) | (0.64) | (1.79) | (1.66) | (1.15) | (2.18) | (1.81) | (0.34) | (1.02) | (3.27) | (0.26) | (1.71) | (1.58) | (1.34) | (0.44) |
| Act_score | 1.08 | 5.86** | 19.97 | 0.02 | 7.3 e4 | 0.37 | 1.26*** | 1.74 | 0.60 | 0.00 | 0.00 | 0.70 | 1.26*** | 5.36*** | 6.48 | 31.55 | 0.00** | 1.12 |
| | (0.88) | (2.36) | (0.91) | (0.45) | (0.62) | (1.54) | (2.62) | (0.74) | (0.15) | (0.80) | (0.39) | (0.71) | (4.53) | (3.64) | (0.90) | (0.62) | (2.02) | (0.29) |
| Act_score$^2$ | 0.98* | 0.18** | 0.39 | 2.46 | 0.20 | 1.06 | 0.97** | 1.25 | 1.27 | 4.38 | 3.04 | 1.03 | 0.97*** | 0.29*** | 0.57 | 0.51 | 27.16** | 0.99 |
| | (1.76) | (2.38) | (0.77) | (0.47) | (0.60) | (1.26) | (2.46) | (0.31) | (0.19) | (0.76) | (0.35) | (0.73) | (3.78) | (2.75) | (0.74) | (0.57) | (2.03) | (0.30) |
| Class | 1.12 | 1.35* | 0.98 | 0.44** | 1.93 | 0.12** | 0.90 | 0.96 | 0.61 | 1.19 | 2.13 | 1.89 | 1.11 | 1.20** | 1.06 | 0.95 | 2.51 | 0.50 |
| | (0.94) | (1.95) | (0.05) | (2.38) | (0.67) | (2.49) | (0.88) | (0.25) | (1.52) | (0.30) | (0.60) | (0.63) | (1.52) | (2.00) | (0.27) | (0.16) | (1.59) | (1.36) |
| Class$^2$ | 0.98 | 0.95** | 1.00 | 1.11* | 0.85 | 1.25* | 1.01 | 0.99 | 1.07 | 1.00 | 0.91 | 0.91 | 0.98 | 0.98* | 0.99 | 1.01 | 0.84* | 1.10 |
| | (1.44) | (2.27) | (0.06) | (1.92) | (0.89) | (1.90) | (0.52) | (0.22) | (1.54) | (0.00) | (0.41) | (0.61) | (1.58) | (1.91) | (0.43) | (0.16) | (1.73) | (1.43) |
| Observations | 18615 | 14831 | 2096 | 788 | 439 | 461 | 18615 | 14831 | 2096 | 788 | 439 | 461 | 18615 | 14831 | 2096 | 788 | 439 | 461 |

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each column presents the hazard ratios that result from estimating a Cox proportional hazard model; thus, a value greater than one indicates an exacerbation effect and a value less than one indicates a deterrent effect. All specifications include those covariates listed in the table as well as demographic controls, a vector of crime category crime history controls and a vector of current offense category controls. The start date is the disposition date plus the minimum sentence date, and all specifications exclude from the analysis the sample of individuals for whom I assigned the 'wrong' punishment. In the first panel (i.e. columns (1) –(6)), failure or recidivism is defined as adjudication for a drug offense while the second and third panels define failure as an adjudication for a violent offense and a property and other offense, respectively. Note that an individual can recidivate in more than one category at a time (i.e. recidivism across crime type is not mutually exclusive).

*Table 12. Assumptions and Statistics Used in the Cost-Benefit Analysis for Selected Cells of the Sentencing Grid*

| Rounded Score = | 0 | 1 | 2 | 3 | 4 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| Class = | E | E | E | E | E | B | B | B | B | B |
| *Assumptions and Background Data*[a] | | | | | | | | | | |
| Expected total social costs for one offense[b] | $7,856 | $7,077 | $8,442 | $7,898 | $8,803 | $24,293 | $19,794 | $15,723 | $16,685 | $15,298 |
| Tax payer costs for one offense | $1,073 | $1,073 | $1,073 | $1,073 | $1,073 | $11,542 | $10,815 | $9,836 | $9,441 | $10,201 |
| Tangible victim costs for one offense | $2,408 | $2,222 | $2,639 | $2,469 | $2,757 | $3,489 | $3,141 | $2,254 | $2,686 | $2,489 |
| Intangible victim costs for one offense | $4,375 | $3,782 | $4,730 | $4,355 | $4,972 | $9,262 | $5,837 | $3,633 | $4,558 | $2,609 |
| Cost of Incarceration[c] | $10,130 | $10,130 | $10,130 | $10,130 | $10,130 | $10,130 | $10,130 | $10,130 | $10,130 | $10,130 |
| Estimated probability of deterring an offender | 0.032 | 0.219 | 0.254 | 0.031 | 0.031 | 0.031 | 0.213 | 0.249 | 0.026 | 0.025 |
| Expected # of adjudicated short-term recidivism offenses[d] | 1.20 | 1.24 | 1.23 | 1.24 | 1.25 | 1.20 | 1.24 | 1.23 | 1.24 | 1.25 |
| Expected # of adjudicated long-term recidivism offenses[e] | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 |
| Avg. # of adj. offenses in year prior to current offense | 0.23 | 0.59 | 0.93 | 1.15 | 1.16 | 0.23 | 0.59 | 0.93 | 1.15 | 1.16 |
| # of Offenses per Adjudication | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

[a] All dollar values are in 1999 dollars.

[b] Derived from estimates of the social costs of crime in Miller (1996) and weighted by the current offense type distribution for the entire sample to find the expected social cost of one crime. Note that homicide and kidnapping are excluded from the current offense type distribution due to the rarity of the offenses for juveniles.

[c] Includes both operating and capital costs. It is not the incremental cost of state incarceration relative to an alternative punishment, and thus is likely to overestimate the cost. Sentence length is assumed to be 15-weeks in all cells.

[d] Conditional on recidivating, this is the average number of offenses committed on the same date and adjudicated.

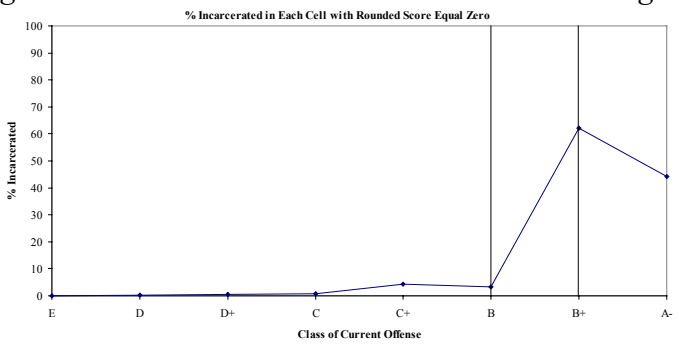
[e] This value is based on the WSIPP study of juvenile offenders place on probation and followed for 7 years.

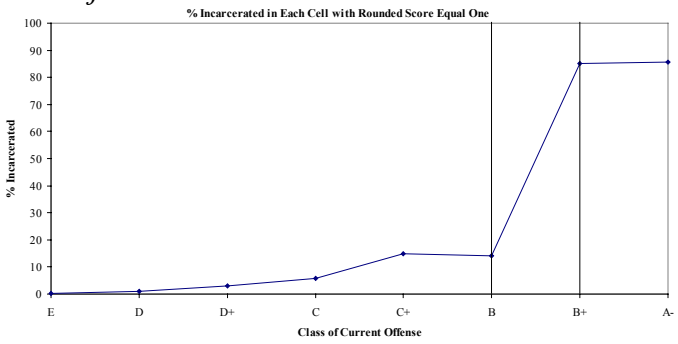
*Table 13. Short-term and Long-term Total Social Benefit to Social Cost Ratios*

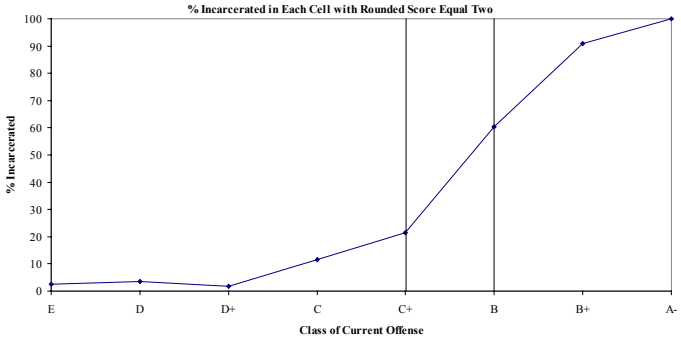
| | | | | | |
|---|---|---|---|---|---|
| A- | .22-.28 | .89-1.43 | .91-1.39 | .59-.63 | .54-.58 |
| B+ | .24-.32 | .87-1.38 | .90-1.38 | .59-.64 | .55-.59 |
| B | .25-.34 | .85-1.35 | .89-1.36 | .60-.65 | .55-.60 |
| C+ | .26-.36 | .84-1.34 | .88-1.34 | .60-.66 | .56-.60 |
| C | .26-.37 | .84-1.33 | .88-1.34 | .61-.66 | .56-.61 |
| D+ | .08-.12 | .30-.48 | .47-.72 | .29-.32 | .32-.35 |
| D | .08-.12 | .30-.48 | .48-.73 | .29-.32 | .32-.36 |
| E | .08 -.11 | .31 - .49 | .48-.74 | .29-.32 | .32-.36 |
| | 0 | 1 | 2 | 3 | 4 or more |

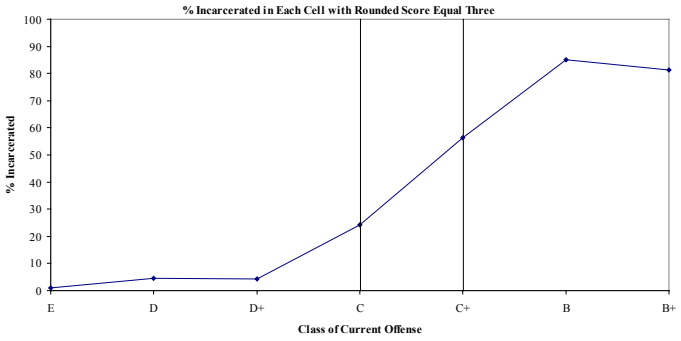
The two numbers in each cell of the above grid correspond to the short and long-term, respectively, total social benefit to cost ratios of an incarceration sentence of 15-weeks in a state facility. Table 12 and the Appendix provide detailed information about the underlying assumptions and methodology used in arriving at these benefit to cost ratios.

*Figure 1. Discontinuities in Treatment when Holding Rounded Adjudication Score Constant*



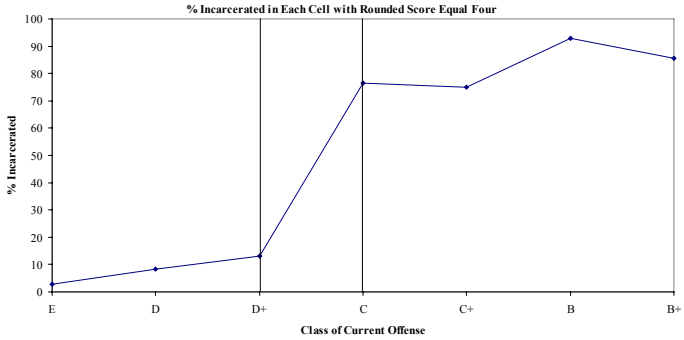



*Figure 2. Kaplan-Meier Survival Curves for Individuals who Have a Rounded Adjudication Score = 0, Are in Cells Immediately Above and Below the Cutoff, and Are Assigned the Correct Punishment*

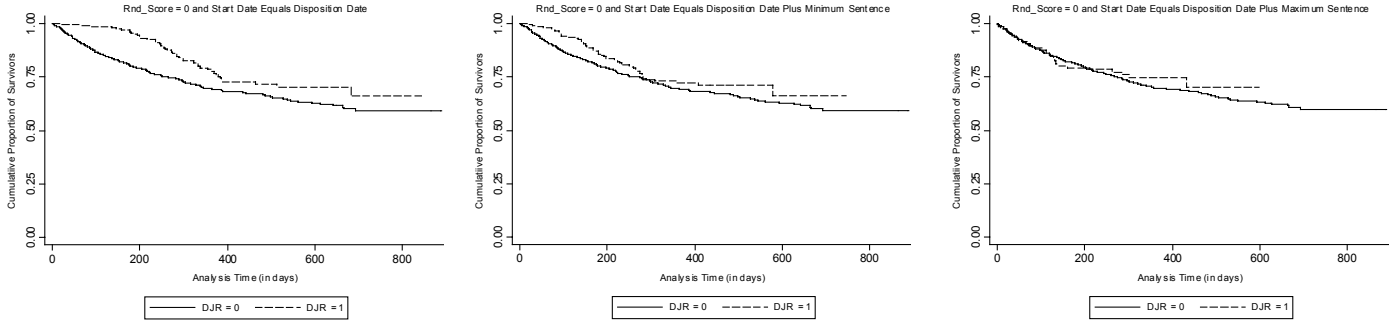



*Figure 3. Kaplan-Meier Survival Curves for Individuals who Have a Rounded Adjudication Score = 1, Are in Cells Immediately Above and Below the Cutoff, and Are Assigned the Correct Punishment*

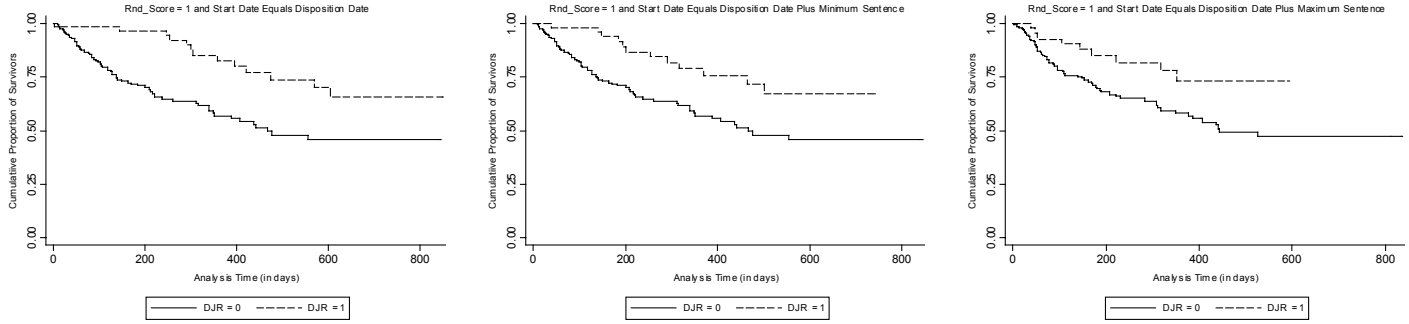



*Figure 4. Kaplan-Meier Survival Curves for Individuals who Have a Rounded Adjudication Score = 2, Are in Cells Immediately Above and Below the Cutoff, and Are Assigned the Correct Punishment*

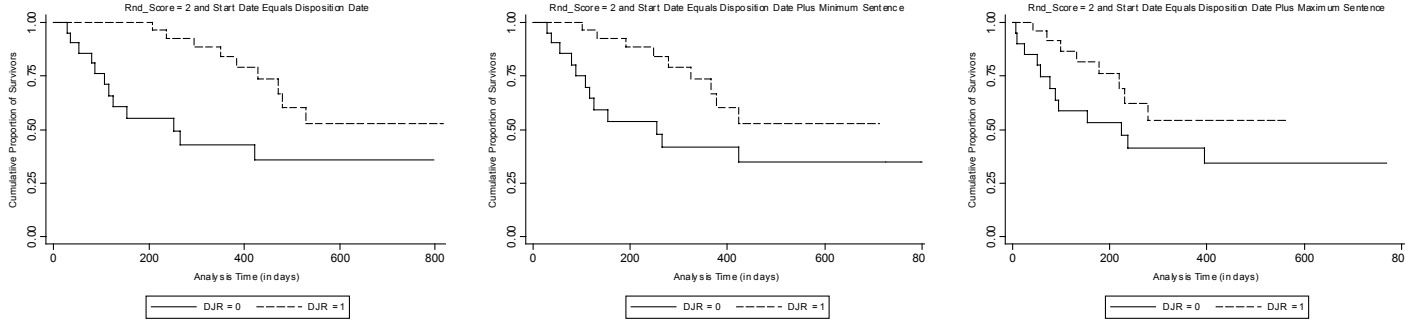


*Figure 5. Kaplan-Meier Survival Curves for Individuals who Have a Rounded Adjudication Score = 3, Are in Cells Immediately Above and Below the Cutoff, and Are Assigned the Correct Punishment*

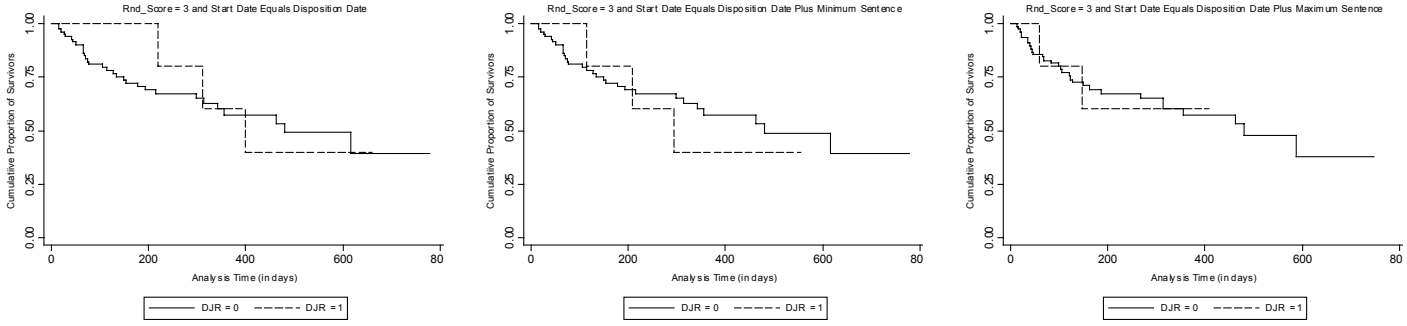
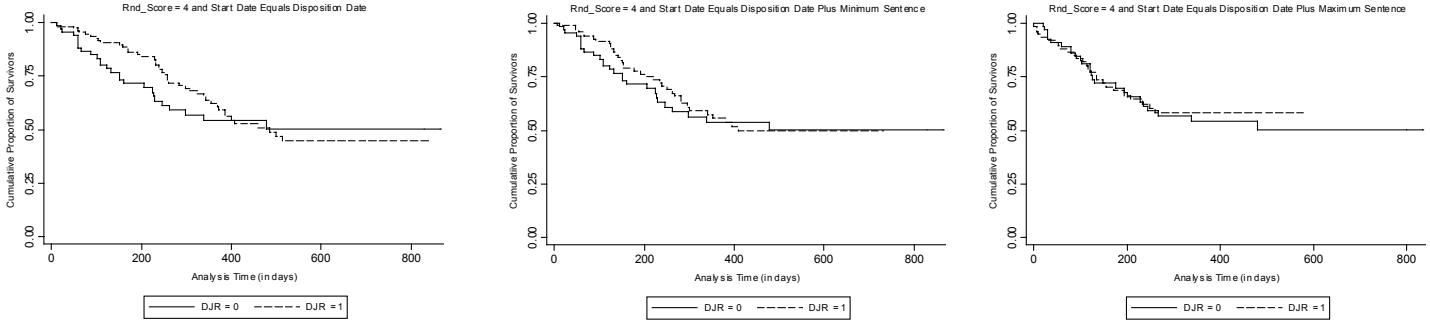



*Figure 6. Kaplan-Meier Survival Curves for Individuals who Have a Rounded Adjudication Score = 4, Are in Cells Immediately Above and Below the Cutoff, and Are Assigned the Correct Punishment*



*Appendix Table 1. Offense Descriptions and Associated Classes and Categories, as of July 1, 1998*

| Class | Category | Offense Description | Anticipatory Class |
|---|---|---|---|
| A+ | Homicide | Murder 1 | A |
| A+ | Homicide | Murder 2 | B+ |
| A | Arson/Mischief | Arson 1 | B+ |
| A | Arson/Mischief | Possession of Incendiary Device | B+ |
| A | Arson/Mischief | Possession of Explosive Devices | B |
| A | Assault/Physical Harm | Assault 1 | B+ |
| A | Kidnapping | Kidnap 1 | B+ |
| A | Sex crimes | Rape 1 | B+ |
| A | Theft/robbery | Robbery 1 | B+ |
| A | Other | Other Offense Equivalent to an Adult Class A Felony | B+ |
| A- | Sex crimes | Rape 2 | B+ |
| A- | Sex crimes | Rape of a Child 1 | B+ |
| A- | Sex crimes | Child Molestation 1 | B+ |
| B+ | Assault/Physical Harm | Assault 2 | C+ |
| B+ | Assault/Physical Harm | Drive-By Shooting | C+ |
| B+ | Burglary/Trespass | Burglary 1 | C+ |
| B+ | Drugs | Violation of Uniform Controlled Substances Act-Non-Narcotic, Methamphetamine, or Flunitrazepam Sale | B+ |
| B+ | Homicide | Manslaughter 1 | C+ |
| B+ | Homicide | Vehicular Homicide | C+ |
| B+ | Kidnapping | Kidnap 2 | C+ |
| B+ | Obstruction | Intimidating a Public Servant | C+ |
| B+ | Obstruction | Intimidating a Witness | C+ |
| B+ | Sex crimes | Rape of a Child 2 | C+ |
| B+ | Sex crimes | Promoting Prostitution 1 | C+ |
| B+ | Sex crimes | Indecent Liberties with Forcible Compulsion | C+ |
| B+ | Sex crimes | Indecent Liberties without Forcible Compulsion | C+ |
| B+ | Theft/robbery | Robbery 2 | C+ |
| B+ | Theft/robbery | Extortion 1 | C+ |
| B | Arson/Mischief | Arson 2 | C |
| B | Arson/Mischief | Malicious Mischief 1 | C |
| B | Burglary/Trespass | Residential Burglary | C |
| B | Burglary/Trespass | Burglary 2 | C |
| B | Drugs | Violation of Uniform Controlled Substances Act-Narcotic, Methamphetamine, or Flunitrazepam Counterfeit Substances | B |
| B | Firearms/weapons | Theft of Firearm | C |
| B | Firearms/weapons | Possession of a Stolen Firearm | C |
| B | Firearms/weapons | Unlawful Possession of a Firearm 1 | C |
| B | Obstruction | Introducing Contraband 1 | C |
| B | Sex crimes | Incest 1 | C |
| B | Sex crimes | Child Molestation 2 | C+ |
| B | Theft/robbery | Theft 1 | C |
| B | Theft/robbery | Theft of Firearm | C |
| B | Theft/robbery | Theft of Livestock | C |
| B | Theft/robbery | Possession of Stolen Property 1 | C |
| B | Theft/robbery | Trafficking in Stolen Property 1 | C |
| B | Other | Bomb Threat | C |
| B | Other | Other Offense Equivalent to an Adult Class B Felony | C |
| C+ | Assault/Physical Harm | Assault 3 | D+ |
| C+ | Assault/Physical Harm | Promoting Suicide Attempt | D+ |
| C+ | Assault/Physical Harm | Custodial Assault | D+ |
| C+ | Drugs | Sale, Delivery, Possession of Legend Drug with Intent to Sell | D+ |
| C+ | Drugs | Sale of Controlled Substance for Profit | C+ |
| C+ | Homicide | Manslaughter 2 | D+ |
| C+ | Kidnapping | Unlawful Imprisonment | D+ |
| C+ | Public disturbance | Riot with Weapon | D+ |
| C+ | Sex crimes | Rape 3 | D+ |
| C+ | Sex crimes | Promoting Prostitution 2 | D+ |
| C+ | Theft/robbery | Extortion 2 | D+ |
| C | Arson/Mischief | Reckless Burning 1 | D |
| C | Arson/Mischief | Malicious Mischief 2 | D |
| C | Burglary/Trespass | Vehicle Prowling 1 | D |
| C | Drugs | Illegally Obtaining Legend Drugs | D |
| C | Drugs | Violation of Uniform Controlled Substances Act-Non-Narcotic Sale | C |
| C | Drugs | Fraudulently Obtaining Controlled Substance | C |
| C | Drugs | Violation of Uniform Controlled Substances Act-Nonnarcotic Counterfeit Substances | C |
| C | Drugs | Violation of Uniform Controlled Substances Act-Sale of Substitute Substance | C |

| | | | |
|---|---|---|---|
| C | Drugs | Violation of Uniform Controlled Substances Act-Possession of a Controlled Substance | C |
| C | Firearms/weapons | Unlawful Possession of a Firearm 2 | D |
| C | Kidnapping | Failure to Register as a Kidnapper | D |
| C | Obstruction | Introducing Contraband 2 | D |
| C | Sex crimes | Communicating with a Minor for Immoral Purposes - Subsequent Sex | D |
| C | Sex crimes | Incest 2 | D |
| C | Sex crimes | Failure to Register as a Sex Offender | D |
| C | Theft/robbery | Theft 2 | D |
| C | Theft/robbery | Forgery | D |
| C | Theft/robbery | Possession of Stolen Property 2 | D |
| C | Theft/robbery | Taking Motor Vehicle without Owner's Permission | D |
| C | Motor-vehicle related | Hit And Run-Injury | D |
| C | Motor-vehicle related | Vehicular Assault | D |
| C | Motor-vehicle related | Attempting to Elude Pursuing Police Vehicle | D |
| C | Other | Animal Cruelty 1 | D |
| C | Other | Escape 1 | C |
| C | Other | Escape 2 | C |
| C | Other | Rendering Criminal Assistance 1 | D |
| C | Other | Failure to Appear in Court | D |
| C | Other | Stalking (Repeat) | D |
| C | Other | Harassment (Repeat) | D |
| C | Other | Other Offense Equivalent to an Adult Class C Felony | D |
| D+ | Assault/Physical Harm | Assault 4 | E |
| D+ | Assault/Physical Harm | Reckless Endangerment | E |
| D+ | Assault/Physical Harm | Coercion | E |
| D+ | Firearms/weapons | Possession of Dangerous Weapon | E |
| D+ | Public disturbance | Riot without Weapon | E |
| D+ | Sex crimes | Indecent Exposure (Victim <14) | E |
| D | Arson/Mischief | Reckless Burning 2 | E |
| D | Arson/Mischief | Malicious Mischief 3 (<$50 is Class E) | E |
| D | Burglary/Trespass | Burglary Tools (Possession of) | E |
| D | Burglary/Trespass | Criminal Trespass 1 | E |
| D | Burglary/Trespass | Vehicle Prowling 2 | E |
| D | Firearms/weapons | Intimidating Another Person by Use of a Weapon | E |
| D | Firearms/weapons | Carrying Weapon to School | E |
| D | Obstruction | Obstructing a Law Enforcement Officer | E |
| D | Sex crimes | Communicating with a Minor for Immoral Purposes | E |
| D | Theft/robbery | Theft 3 | E |
| D | Theft/robbery | Possession of Stolen Property 3 | E |
| D | Motor-vehicle related | Hit And Run-Attended | E |
| D | Motor-vehicle related | Driving While Under the Influence | E |
| D | Other | Escape 3 | E |
| D | Other | Stalking | E |
| D | Other | Harassment | E |
| D | Other | Other Offense Equivalent to an Adult Gross Misdemeanor | E |
| E | Arson/Mischief | Tampering with Fire Alarm Apparatus | E |
| E | Arson/Mischief | Possession of Illegal Fireworks | E |
| E | Burglary/Trespass | Criminal Trespass 2 | E |
| E | Drugs | Possession/Consumption of Alcohol | E |
| E | Drugs | Possession of Legend Drug | E |
| E | Drugs | Possession of Marijuana <40 Grams | E |
| E | Drugs | Unlawful Inhalation | E |
| E | Drugs | Drug Paraphernalia | E |
| E | Firearms/weapons | Carrying Loaded Pistol without Permit | E |
| E | Obstruction | Resisting Arrest | E |
| E | Obstruction | Introducing Contraband 3 | E |
| E | Public disturbance | Failure to Disperse | E |
| E | Public disturbance | Disorderly Conduct | E |
| E | Sex crimes | Indecent Exposure (Victim 14+) | E |
| E | Sex crimes | O & A (Prostitution) | E |
| E | Motor-vehicle related | Driving without a License | E |
| E | Motor-vehicle related | Hit And Run-Unattended | E |
| E | Motor-vehicle related | Reckless Driving | E |
| E | Other | Animal Cruelty 2 | E |
| E | Other | Obscene, Harassing, Etc., Phone Calls | E |
| E | Other | Other Offense Equivalent to an Adult Misdemeanor | E |
| V | Other | Violation of Order of Restitution, Community Supervision, or Confinement | V |
| V | Other | Violation of Special Sex offender Disposition Alternative (SSODA) Conditions | V |

The source of this table is the State of Washington Sentencing Guidelines Commission, "Juvenile Disposition Sentencing Standards, Effective for Offenses Committed on or After July 1, 1998." Anticipatory offenses may include any attempts, conspiracies, or solicitations to commit any felony or misdemeanor offenses.

*Appendix Table 2. Robustness to Functional Form, Distribution Assumptions, and Censoring*

| Model | (1) Cox | (2) Cox | (3) Cox | (4) Cox | (5) Cox | (6) Weibull | (7) Exp | (8) Cox | (9) Cox | (10) Cox |
|---|---|---|---|---|---|---|---|---|---|---|
| DJR | 0.6543*** | 0.6806*** | 0.6818*** | 0.7229*** | 0.7145*** | 0.6652*** | 0.6664*** | 0.6893*** | 0.6592*** | 0.6514*** |
| | (4.00) | (3.59) | (3.57) | (2.88) | (2.91) | (3.84) | (3.83) | (2.79) | (3.54) | (4.03) |
| Act_score | 1.2291*** | 1.4575*** | 1.7336*** | 1.7363*** | 1.7337*** | 1.2094*** | 1.1914*** | 1.3440*** | 1.2295*** | 3.6159*** |
| | (4.99) | (6.75) | (6.68) | (6.70) | (6.67) | (4.61) | (4.27) | (5.27) | (4.75) | (3.95) |
| $Act\_score^2$ | 0.9727*** | 0.9164*** | 0.8307*** | 0.8296*** | 0.8301*** | 0.9749*** | 0.9769*** | 0.9582*** | 0.9711*** | 0.8110*** |
| | (4.71) | (6.14) | (4.93) | (4.96) | (4.94) | (4.36) | (4.03) | (4.86) | (4.64) | (3.01) |
| Class | 1.0880 | 1.0979* | 1.1006* | 0.8725 | 0.7693 | 1.0844 | 1.0813 | 1.0522 | 1.0864 | 1.0919 |
| | (1.52) | (1.68) | (1.73) | (0.86) | (0.81) | (1.46) | (1.41) | (0.76) | (1.43) | (1.59) |
| $Class^2$ | 0.9852* | 0.9838** | 0.9835** | 1.0550 | 1.1225 | 0.9853* | 0.9852* | 0.9896 | 0.9851* | 0.9848** |
| | (1.93) | (2.11) | (2.15) | (1.18) | (0.79) | (1.91) | (1.92) | (1.11) | (1.84) | (1.98) |
| $Act\_score^3$ | | 1.0050*** | 1.0224*** | 1.0225*** | 1.0224*** | | | | | |
| | | (5.12) | (3.52) | (3.54) | (3.53) | | | | | |
| $Act\_score^4$ | | | 0.9992*** | 0.9992*** | 0.9992*** | | | | | |
| | | | (2.63) | (2.63) | (2.62) | | | | | |
| $Class^3$ | | | | 0.9938 | 0.9820 | | | | | |
| | | | | (1.56) | (0.67) | | | | | |
| $Class^4$ | | | | | 1.0008 | | | | | |
| | | | | | (0.45) | | | | | |
| Age_off * Act_score | | | | | | | | | | 0.9336*** |
| | | | | | | | | | | (3.36) |
| Age_off * $Act\_score^2$ | | | | | | | | | | 1.0116*** |
| | | | | | | | | | | (2.67) |
| Sample | Whole | Whole | Whole | Whole | Whole | Whole | Whole | Turn 18 after 12/31/00 | Omit sample described in note | Whole |
| Observations | 18615 | 18615 | 18615 | 18615 | 18615 | 18615 | 18615 | 12727 | 17451 | 18615 |

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All coefficients are exponentiated such that values greater and less than one imply exacerbation and deterrent effects, respectively. Individuals for whom I assigned the wrong punishment are omitted in all specifications. The start date is the disposition date plus the minimum sentence. All specifications include a vector of demographic controls as well as past and current offense category dummies. The specification presented in column (9) omits from the analysis the sample of individuals with characteristics that were correlated with an incorrect punishment assignment, including: those sentenced to jail, DJR_local, SSODA, manifest injustice up, manifest injustice down, suspended detention, or basic training camp, as well as those who participated in a plea or who were eligible for a declination hearing. Column (10) includes interactions between age at offense and a polynomial of the adjudication score.