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IMPACT OF SENTENCING REFORMS ON PRISON POPULATION

By

Yan Zhang

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ABSTRACT

IMPACT OF SENTENCING REFORMS ON PRISON POPULATION

By

Yan Zhang

The United States prison population began to increase rapidly in the early 1970s. While research has failed to show that changes in demographics factor or crime rates influenced the growth of prison population, other factors such as 'get tough' sentencing reforms are believed to be related to increased prison populations. This thesis tests hypotheses derived from the formal legal perspectives of sentencing reforms: the implementation of sentencing reforms should increase the sentencing severity which in turn should account for the increased prison population. To test these hypotheses, the rate of new court commitment, average time served in prison, and prison populations rates in all fifty states and the District of Columbia, from 1973 to 1996 are examined using hierarchical multivariate linear models (HMLM). The research results show that sentencing reforms are not directly related with the change in state prison populations. Only two sentencing reforms, three-strikes laws and sentencing commission's consideration of prison capacity, are indirectly related to prison population changes. Each of these factors, however, has opposite influences on the two mechanisms (admissions and time served) of total prison populations. These outcomes do not consistently support the formal legal rationality argument, but to some extent support the substantive rationality perspective of sentencing reforms.

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INTRODUCTION

The United States criminal justice system has undergone numerous reforms over the past several decades to minimize police officers', judges', and correction officials' discretion while making decisions about individual cases (Walker 1993; Gottfredson and Gottfredson 1988). These reforms have occurred at nearly every decision point in the system, including recommending or mandating arrest at the scene of every domestic violence incident (Sherman and Cohen 1989) and partial release decision that are based upon empirical measures of risk rather than a judges intuition (Maxwell 1999). While these and other similar reforms represent substantial policy changes, the one set of reforms that has likely had the widest effect in terms of the number of cases applied to as well as in the nature of the outcome is in the area of sentencing reform. In general, these sentencing reforms were enacted to reduce sentencing disparity or increase sentencing fairness, to control prison populations, and to increase the deterrent value of criminal sanctions (BJA 1998).

While many of the penal changes have come under serious investigation as to their impact on system discretion or other planned changes (Miethe 1987; Savelsberg 1992; Cohen and Canela-Cacho 1994; Levitt 1996; Marvell and Moody 1996; Engen and Steen 2000), most studies are methodologically limited in several ways that prevent a national assessment of how these changes have affected penal policies and outcomes specifically. To address some questions left by the earlier research this paper will assess whether the changes in sentence policies have changed penal outcomes across the entire nation. More specifically, this thesis tests whether the various sentencing reforms have

influenced the aggregate of decisions to imprison and for how long. To test these hypotheses, the rate of new court commitment, average time served in prison, and prison populations rates in all fifty states and the District of Columbia, from 1973 to 1996, are examined using hierarchical multivariate linear models.

LITERATURE REVIEW

For nearly 100 years (1870 to 1970), the dominant sentencing model in the United States was generally one based upon indeterminate and back-end sentencing decisions that featured broad judicial and parole discretion, and case-by-case decision-making. Under the indeterminate sentencing model, most sentences were individualized so that the punishment fit the offender's needs rather than his or her crime. This model was chosen over other possible models because, in part, the main goal of imprisonment was to rehabilitate the offender, which seemed to require that the exact sentence length be determined long after adjudication and reflect the offender's dynamic rehabilitation needs. However, by the early 1970s there were a growing number of negative accusations about this sentencing model and its attached rehabilitation goals. For instance, the American Friends Service Committee published a report stating that indeterminate sentences were used to repress inmates (AFSC 1971). In addition, the idea that the prison system could rehabilitate offenders was also seriously questioned after Martinson (1974) wrote that "with few and isolated experience, the rehabilitative efforts that have been reported so far have had no appreciable effect on recidivisms". This

report was hailed subsequently and strongly by both politicians and academicians as the final word on the lack of rehabilitation efficiencies of the U.S. prison system.

With the increased cynicism directed toward the rehabilitative model, increased pessimism concerning prison officials' and judicial discretion, and the perception of rising violent crime rates, the stage was set for sentencing reform in the spirit of more rational and predictable punishments. Andrew von Hirsch, for instance, argued that punishment should be based primarily upon the seriousness of the crime and prior criminal record, not upon the perceived amenability of the offender rehabilitation (von Hirsh 1976). This argument, unlike many other suggested changes, appealed to both conservatives and liberals who had voiced reservations over the current state of imprisonment and punishment in the United State. This argument was accepted by many in part because von Hirsh did not exclude the idea of trying to rehabilitate people while they were sanctioned. What von Hirsh and other similar scholars did reject was the idea that the type and length of a sanction should be determined by rehabilitation needs, or for that matter, by any other utilitarian rationales such as deterrence.

By the end of the 1970s, many state legislatures and the U.S. Congress began passing various versions of von Hirsh's model, and in theory, judges and other practitioners began implementing and experimenting with these diverse, and far reaching sentencing reforms. By the end of 1990s, the twenty years of penal code and policies changes resulted in no single American sentencing system. Some states replaced indeterminate sentencing with structured sentencing schemes, and others retained indeterminate sentencing. About 20 percent of the states moved to presumptive sentencing guideline systems, another 18 percent passed voluntary guidelines, and one

state enacted mandatory guidelines. All of the states were also affected in diverse ways by three or two strikes rules, mandatory minimum sanctions, or truth-in-sentencing requirements. Most states retained some form of good time but some states did abolished parole altogether (Tonry 1999). Even as states claimed to have indeterminate sentencing structures, these laws have been integrating determinate characters by use of mandatory minimums, truth in sentencing provisions, and reduction in the amount of good time credits (BJA 1998). While these changes are numerous and diverse in how and where they are implemented, their goals are quite common: increasing sentencing fairness, reducing unwarranted disparities in the decision to imprison and in sentence length, and institutionalizing principles of just deserts and deterrence (BJA 1998; Engen and Steen 2000).

A general assessment of von Hirsh's and other similar sentencing models is one that has attempted to "reverse the substantive rationalization of criminal law and to return to law based on a neoclassical formal rationality" (Savelsberg 1992; Engen and Steen 2000). As Weber (Weber 1968) described, formally rational law is law "guided by norms intrinsic to the legal system, bound by objectively verifiable and legally relevant facts, and comprising a gapless set of rules from which decisions in concrete cases can be deduced" (Savelsberg 1992). Substantively rational law, in contrast, "takes into account economic, sociological, and ethical criteria and represents a desire for substantive expedience, a concern with impact, effect, and ends served by legal action, and adaptation to the concrete case" (Savelsberg 1992). Under the neoclassical formal rationality model, the expected goals of sentencing reform require sentencing decisions to be based solely on legally relevant facts, which are characteristics of offenses, and

disregard the substantive characteristics of the offender. In addition, while many of the models do not explicitly call for more severe sentences, the belief among many was that a return to the formal rationality would increase the severity of sentencing decisions (i.e., people would no longer be released early due to good behavior while in prison or upon successful completion of a treatment program). In turn, many have argued that a primary outcome of these sentencing policies would be a substantial change or growth of the U.S. prison population following implementation of the reform. However, the formal legal rationality hypothesis of sentencing reform has been questioned by the alternative substantive rationale supposition. The substantive hypothesis argues that the criminal justice system in the United States is firmly entrenched in substantive concerns (Savelsberg 1992). Sentencing reform such as sentencing guidelines have to be implemented through networks of decision makers in complex administrative environments and by actors within those organizations (Savelsberg 1992). Several dilemmas of substantivation policies such as due process and sentencing discretions continue to be stressed by the criminal justice profession and public and thus circumventing many of the sentencing reforms. In arriving at appropriate dispositions, concerns related to social inequality, social justice, perceived causes of criminal behavior, and the anticipated consequences of sentencing will still be taken into account (Savelsberg 1992). Furthermore, some have argued that a hydraulic displacement of discretion exists in the sentencing process (Alschuler 1978; Tonry and Zimring 1983). According to the hydraulic displacement hypothesis, gains in sentencing neutrality and uniformity would be eroded by greater disparities in the use of prosecutorial discretion in charging and plea bargaining practices, and the ability to achieve the reform goals would

be impeded (Miethe 1987). Thus, sentencing outcomes will remain substantively rational and not change according to sentencing reform. However, by 2000, it is not clear whether either of these two hypotheses is supported by research, particularly in regard to understanding prison populations.

U.S. Prison Population

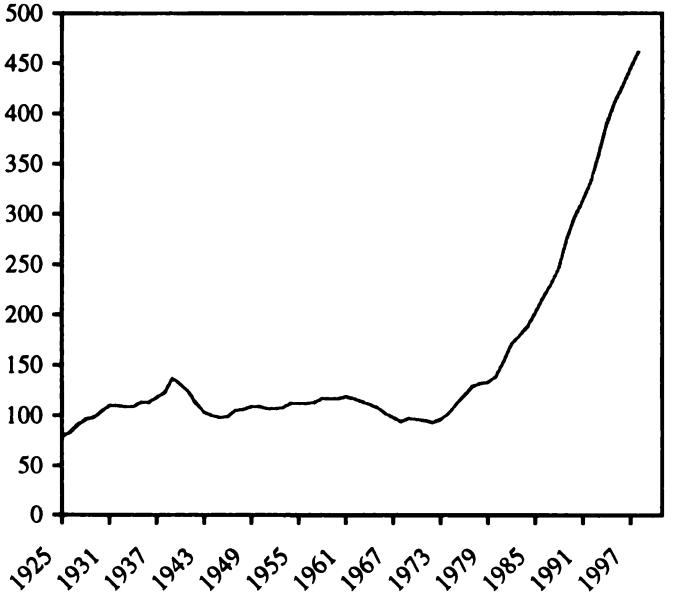
The Federal Government began keeping annual records about the United States prison population in 1926 (Langan 1991). During the period of 1926 to 1970, the prison population rate was reasonably constant. Research on the imprisonment rate for the period 1930 to 1970 found that the average prison population was about 110 prisoners per 100,000 U.S. residents, with only a standard deviation of nine (Blumstein and Cohen 1973). Because of this rather stable trend, Blumstein and Cohen (1973) theorized that while there have been substantial changes in society, the imprisonment system adopted to these changes to keep a fairly stable number of citizens incarcerated. However, this theory seems to have had a relatively short life span. Since 1973, the U.S. aggregate prison population has experienced almost constant growth. The average annual increase of the prison population from 1973 to 1979 was about 7%. During the 1980s, the average annual rate grew to almost 12% per year. After the 1980s, the rate of the annual increase began to decrease, but still increased at an averaging of about 8% annually (figure 1)[1]. By midyear 1998, 1,277,866 prisoners were under Federal and State jurisdiction, more than four times the number incarcerated in 1980s (315,974) and six times the number incarcerated in 1973s (204,211) (Gilliard 1999). Certainly, some of this increase is due to general population growth over this period (Cohen and Canela-Cacho 1994),

[1] Criminal Justice Source Book, 1998.

nevertheless, the annual inmate rate adjusted for total population rose from the rate of 96 per 100,000 residents in 1973 to 452 per 100,000 residents as of June 1998, an annual average increase of over 22 persons per 100,000 residents.

There is little doubt that the increased incarceration rate had some impact on crime reduction and had some deterrent effect (Blumstein and Beck 1999). However, the rapid growth of the prison population also led to the problem of prison overcrowding. As of 1997, the average state prison system was operating at 115% of capacity and the Federal system was running at 119% of capacity (Gilliard and Beck 1998). Three states (California, Pennsylvania, and Virginia) were operating in excess of 150% of capacity (Gilliard and Beck 1998). The effects deriving from overcrowding are many: a rise in correctional costs, delays before imprisonment, inequality in the treatment of inmates, a greater likelihood of violence and victimization, and especially the deterioration in living and working conditions for inmates and prison officers.

Figure 1. U.S Prison Population Rates (per 100,000 resident populations)



The growth of the prison population has attracted a considerable amount of research into why, after 50 years of stability, has the population grew more than 10 times in size in just 25 years. Besides the sentencing reform, factors proposed by criminologists include changes in crime and arrests rates (Langan 1991; Cohen and Canela-Cacho 1994; Greenfeld and Beck 1996); demographic effects (Langan 1991; Mackenzie and Tracy 1988); the war on drugs (Langan 1991); and prosecutorial policies (BJS 1996). While empirical evidence has failed to show that changes in population demographics and in crime rates since the 1970s has a direct and significant impact on prison population, a common strain of thinking emerged that stated that sentencing reforms are the principal cause of the vastly increased numbers of people in prison (Furniss 1996; Sabol and Lynch 1997; Wicharaya 1995).

Research Explaining Prison Population Growth

Two basic forces drive prison population growth: the admissions to prison and the length of time served for those offenders committed to prison. Thus, the increase of prison population could be the result of an increase in certainty, while the length of time served remains stable or decrease, an increase in the length of time served while the certainty of committed to prison remains stable or decrease, or a simultaneous increase in certainty and the length of time served. As argued later these three situations have very different insinuations when it comes to assessing sentencing policies (Kensey and Tournier 1999).

The proposed sentencing practices that potentially effect the length of prison terms include: mandatory minimum sentences, determinate sentencing laws, and truth in

sentencing laws. The mandatory minimum sentences are generally directed at certain violent offenses such as crime involving weapons, crimes committed by repeat offenders or habitual criminals, and certain drug crimes. The minimum sentences require inmates to serve a fixed amount of prison time before becoming eligible for discretionary release or for release without the approval of a parole board (depending on within an indeterminate sentencing structure or a determinate sentence). It was believed that the mandatory minimum laws would result in more offenders going to prison for longer periods and deterring other potential offenders from committing crime. By the year 1996, 40 states applied mandatory sentencing for repeat or habitual offenders; 38 states and the District of Columbia sanctioned crimes committed using a deadly weapon; 36 states and the District of Columbia used it for drug possession/trafficking; and 31 states for drunk driving. As a means of mandatory sentencing enhancement, three-strikes laws impose longer prison terms than earlier mandatory minimum sentencing laws. A study about California's three-strikes law indicated that through long-term incarceration, the three-strikes law would triple California's prison population over the next 25 years (Parent and Dunworth 1996).

Another sentencing change that involves removing correctional discretion is the implementation of determinate sentencing policies. Under determinate sentencing structures, sentence length is determined mainly by the judge, with no discretionary release by a parole board (Reitz and Reitz 1993). Since determinate sentencing laws remove the power of parole boards to reduce large numbers of sentences at the end of the offenders' prison terms (Zimring and Hawkins 1991), the determinate sentencing laws (DSL) affect prisons because of sentence length. For example, under Illinois determinate

sentencing law, an inmate must serve 50% of his or her sentence prior to being eligible for release (Joyce 1992). The Illinois DSL also increased the length of time served for all serious crimes. An analysis of Illinois UCR index crime offenses population and admission data from 1984 to 1991 showed that the State experienced a large increase in the average daily prison population because the long-term offenders were crowding in prison (Joyce 1992).

A recent version of the determinate sentence that has won wide approval from politicians and the public at large are the Truth-in-Sentencing requirements. Like the earliest determinate sentencing laws, these new versions similarly reduce discrepancy between the sentences imposed and actual time served in prison and are considered a major reason for more recent inmate growth problems. The first truth-in-sentencing law was enacted by the State of Washington in 1984. By 1998, 27 states and the District of Columbia met the Federal Truth-in-Sentencing Incentive Grants program criteria, which require persons convicted of a Part 1[2] violent crime to serve not less than 85% of the prison sentence (Ditton and Wilson 1999). As a result of truth-in-sentencing practices, some believe state prison populations should continue to increase well into the future because new offenders will continue to arrive, while older offenders who would normally be released because of good behavior must now serve sentences that may exceed 50% more of the current expected length.

These simple predictions are supported by several studies that modeled state prisoners population data from 1990 to 1997. Ditton and Wilson (1999) found that while the number of inmates held in state prisons increased 60% since 1990, the number admitted to prison increased only 17%; the number of admissions relative to the number

[2] UCR part 1 violent crimes, including: murder, rape, robberies, and aggravated assault.

of inmates in prison dropped from 73 per 100 State prisoners in 1990 to 52 per 100 in 1997. These longer sentencing explanations are also backed by other research. Wooldrege (1996) studied the relationships between state level sentencing policies and inmate crowding, and found that sentencing practices with longer minimum sentences, mandatory prison terms, and parole guidelines were significantly related with a higher prison population of long-term inmates. Marvell's (1995) time series analysis of nine states that maintain presumptive sentencing guidelines also suggested that the sentencing guidelines have little impact on the number of defendants sentenced to prison, changes in prison population growth are due mainly to changes in prison term length.

However, the lengthening prison stay explanation is questioned by prison population trend studies. These trend studies indicate that growth of the state prison populations are not the result of longer sentences and there has not been any significant change in the time served by offenders (Langan, 1991; Greenfeld and Beck 1996). Compared with the pre-1973 period, persons admitted since 1973 were less likely to have a life sentence, had a shorter median sentence length, and were less likely to have sentences 10 to 19 years in length (Langan 1991). Between 1985 an 1992, the average maximum sentence of prisoners actually declined from 78 months to 67 months (Perkins 1994). The median sentence length of prisoners admitted from court remained constant at 48 months. Moreover, despite the increasing use of mandatory minimums and sentencing enhancements during the period, the proportion of inmates who received a maximum sentence of 10 years or longer actually declined from 19.7 percent in 1985 to 17.7 percent in 1992 (Greenfeld and Beck 1996). Instead, these trend studies suggest that rise in prison population since the middle 1970s has been driven by increases in prison

admissions. A national survey on the impact of sentencing guidelines pointed out that dispositional policies (i.e., rules specifying which offenders should or should not be imprisoned) generally have had a greater impact on prison population levels than policies about the amount of time to be served. The reason is that sentencing commissions have generally chosen to change the categories of offenders who are to be imprisoned instead of changing the current average duration of imprisonment (Parent and Dunworth 1997).

While sentencing reforms are criticized as the key reason for prison crowding, one of the goals of these reforms in some states has also been to moderate the rapid growing trend. In fact, several guideline commissions were required to consider the impact of changing guidelines on the need for additional correctional resources (BJA 1998). For instance, Minnesota's guidelines, which took effect on May 1, 1980, require that sentencing practices stay within the state's correctional resources, especially available prison capacity. As a result, Minnesota's state prison population increased very slowly in the early 1980s and stayed well below their capacity. Between 1980 and 1984, the prison population increased only by 8%, while the total national prisoners increased 41%. However, by the later 1980s, the slow rate of increase began to change. Minnesota's prison population rose by 29% from 1984 to 1988 and then increased by another 37% from 1988 to 1992. Nevertheless, by the end of 1992 Minnesota still had the second-lowest per-resident imprisonment rate in the country (Tonry 1997).

Marvell's (1995) work also supports the notion that sentencing guidelines can control increases in prison populations. He found that presumptive sentencing guidelines were associated with declines in prison population growth in six states (Delaware, Florida, Minnesota, Oregon, Tennessee, and Washington) where legislators decreed that

guideline framers consider prison capacity when establishing recommended prison sentence lengths, at least in relation to nation-wide trends. Marvell estimated that prison populations were approximately fifteen to thirty-five percent lower than would be expected in the six states. Other evaluations conducted by individual state sentencing guideline commissions have similarly revealed positive evidence concerning the effectiveness of presumptive sentencing guidelines on controlling increases of prison populations (Tonry 1997). The State of Washington's enacted presumptive guidelines linked the correctional resources in 1984 and found that between 1984 and 1988, their incarceration rate declined from 156 per 100,000 populations to 124 per 100,000 populations (Tonry 1997). Similarly, Oregon as well as Louisiana and Tennessee have passed guidelines that include consideration of capacity. Oregon's found that after the law was enforced incarceration rates decreased from 235 per 100,000 residents to 166 per 100,000 residents (Tonry, 1997).

Besides changes in sentencing policies, there are other factors that scholars have argued may account for some of the prison population growth. The first of these explanations is the one centered on changes in population demographic characteristics, which is often referred to as the "demographic change hypothesis" (MacKenzie and Tracy 1988). According to this hypothesis, populations can be classified into subgroups, some of which are more apt to be incarcerated than other groups. As Langan (1991) figured out "relative to their representation in the general population, males (48% of the population and 95% of all prisoners), blacks (11% of the population and 48% of prisoners), and persons in their twenties (24% of the population but 50% of prisoners) are highly over-represented in prisons." Such subgroups form the "prison-prone" population.

A change in the population demographics can be expected to result in a change in the incarceration rate. Around 1986 the numbers of persons ages 20 to 29, both black and white, climbed to their highest levels ever (42 million altogether) and the largest birth cohort from the baby boom, those born in 1961, reached a peak age of imprisonment, age 25. The demographic shifts that occurred between 1974 and 1986 were significant, and account for about 20% of prison population admission growth (Langan, 1991). This demographic change hypothesis was questioned by other researchers as well. Observations of time series data of males in their twenties from 1970 to 1990 did not show the variance in population concentration a major influence on the increase of prisoners (Zimring and Hawkins 1991).

A second alternative explanation for the changes in the prison population is that crime and arrest may be two important factors impacting the imprisonment process. This model proposes that increases in crime and arrest, especially for violent crimes that are more likely to result in sentences to prison following conviction, may cause the prison population to rise (Cohen and Canela-Cacho 1994). Researchers studying UCR index crimes from 1980 to 1996, however, have found no evidence that adult offending rates for murder, robbery, burglary and sex assault except aggravated assault showed a clear upward trend (Blumstein and Beck 1999). Furthermore, estimates from the National Crime Victimization Surveys show that crime declined slightly between 1973 and 1991, from 35.7 to 34.7 million (Marvell and Moody 1994. The UCR arrest rates for all the crime types mentioned above are also stable between 1980 and 1996 (Blumstein and Beck 1999). Indeed, one researcher estimated that changes in crime and arrest rates explained only 9% of admission growth (Langan 1991). Thus, there is little evidence

that at the national level aggregate demographic changes or changes in crime patterns affected the growth of national prison population rate. However, prior research has not yet systematically asked the question of whether demographic changes or changing crime patterns at the state level may jointly affect state level prison population changes.

RESEARCH PURPOSE

Many policymakers and advocates, as well as some criminologists, consider the increases in the prison population a direct result of sentencing reforms, such as mandatory penalties, determinant sentencing, and guideline-based sentences (see, for example, Sabol and Lynch 1997; Furniss 1996; Langan, 1991). With this presupposition in mind, prior research about the impact of sentencing reform on prison population has typically been based on time trend statistics, before and after the reform became effective. The usual interpretation is that the observed post-reform changes are credited to the sentencing reforms enacted contemporaneously (Wicharaya 1995). Actually, three types of relationships could exist between sentencing policy reforms and the change of prison populations, which are causal, contributory, and coincidental (Zimring and Hawkins, 1991). This overly simple deduction may result in a false relationship or at least an exaggerated correlation. Some other research have either examined bivariate relationships between specific sentencing practices and inmate growth with short post-law periods or just checked a specific time (Langan, 1991; Wooldredge, 1996). These research designs suffered from limitation of short post-reform observation periods, which

does not allow for exploration of evolutionary or delayed types of reform effects, and limited control variables.

Recently, some multiple time series designs have been used to estimate the impact of presumptive sentencing guideline, and determinate sentencing laws on imprisonment rates (Marvell and Moody 1996). These research designs provide a large sample size and allow one to consider a greater breadth of control variables. The assessment of individual state laws, however, is still based upon a comparison of one state to all other states combined. This aggregation ignores the heterogeneous nature of American society and the fact that these other states are similarly experimenting with penal changes as well.

Besides the methodological limitations mentioned above, many researchers also ignore the theoretical sides of sentencing reforms. The purpose of this study is to test the hypotheses derived from the formal legal perspectives of sentencing reforms: sentencing policies reform should impact the aggregate sentencing outcomes. Specifically, this thesis examines three hypotheses: (1) changes in sentencing policies impact the annual change in the rate of new court commitments; (2) changes in sentencing policies impact annual change in the average time served among incarcerated prisoners; and, (3) changes in sentencing policies impact the total annual change in prison population rates. At the same time, this thesis also examines several alternative hypotheses that are consistent with the substantive factors theories, such as political and social diversity will circumvent the influence of sentencing reforms on sentencing outcomes. In sum, by jointly testing these theories, this thesis seeks to improve our current understanding of how changes in penal policies can impact penal practices within the context of a changing social context.

RESEARCH DESIGN

Methods

This analysis uses a quasi-experimental design to examine changes of prison population status and sentencing practices from 1973 to 1996 for 50 states and the District of Columbia. Nineteen seventy three is the first year that prison population in United States began to increase following a decade of declining prison populations. The sentencing reforms also began in the middle of 1970s. So, the starting point of observing was selected as 1973. Time series data of prison populations, new court commitments, and total prison admissions from 1973 to 1996 for each state and the District of Columbia, which were collected by BJS, are used to reflect the sentencing outcomes companying with sentencing reforms. Changes in crime rates, demographic components, and economic situations at the same periods for each state and the District of Columbia are also tested for the purpose of increasing the fitness of research models. Hierarchical linear modeling is employed in this analysis. Hierarchical linear models (HLM) can be used for data that have a multi-level, nested structure (Bryk and Raudenbush 1992). With hierarchical linear models, each level in this structure is formally represented by its own sub-model. These sub-models express relationships among variables within a given level, and specify how variables at one level influence relations occurring at another (Bryk and Raudenbush 1992). One application of hierarchical models involves repeated observations nested within individuals. Since the time series data of imprisonment status including prison population, year's new court commitments, and year's admission of inmates from 1973 to 1996 are available on a

series repeated observing time points (the end of every year), it makes it possible to utilize hierarchical modeling in this analysis. Under HLM, the multiple observations of each state can be considered as nested within the individual state rather than as the same fixed set for all states. The treatment of multiple observations as nested allows proceeding even when the number and spacing of time points vary across states. This characteristic becomes more important when there is missing data, which is a barrier to use time series design and some other multivariate repeated measures (Bryk and Raudenbush 1992). Another advantage that is much stronger than those used in the earlier research is, by using hierarchical design one can include specific characteristics of each state, and examine not only the effects between states but also within states, which is not able to be obtained in a simple multiple regression model or time-series design. Furthermore, in this study, as the number of observing points are the same for each state, which is 24 (1973-1996), and the spacing between time points are equal for every state, it is actually a fixed data set, and the analysis can be reconceived as a multivariate repeated measures analysis. Consequently, instead of using HLM2, hierarchical multivariate linear model (HMLM) is used to accomplish this multivariate analysis. HMLM is flexible in allowing a wide variety of assumptions about the variation and co-variation of the repeated measures, and allows some missing data points. Within the framework of HMLM, it is possible to estimate models with first-order auto-regressive errors, which is likely to happen when there exists 24 repeated observing points.

As discussed earlier in this paper, imprisonment sanctions can be distinguished in terms of the certainty of going to prison following arrest and the length of time served for those offenders who are committed to prison. The observation level (level1) outcome

variables are identified as every year's new court commitments to prison, which is used to reflect the certainty of going to prison, estimated average time served by each committed offender, and the state prison population rates.

Each of these dependent variables is assumed a function of a systematic growth trajectory. Besides the time predictor, there are six time-varying independent variables used to describe the sentencing practice status of each state, and three other control variables reflecting the crime, economic, and demographic situation distinctly for each state. Another 24 indicator variables are also included. The observation level individual state growth parameters become the dependent variables in the state level (level 2) models. The level-2 predictors are identified as regional variables (Table 1), which are used to present diversities of the political and social difference for each state.

Variables

Prison population rates are counted as the number of adult inmates[3], who have been sentenced to prison terms of more than one year under the jurisdiction of state correctional authorities, divided by state population and multiplied by 100,000. The new court commitments[4] variable is the number of prisoners with sentences of one year or more who have entered prison in a given year, divided by state population and multiplied by 100,000. The third level 1 dependent variable, the average time served per commitment is not available directly, it is calculated as the ratio of the total number of

[3] BJS. Prisoners under State or Federal jurisdiction, Federal and State-by-State, 1977-96. [online] Available http://www.ojp.usdoj.gov/bjs/prisons.htm.
[4]BJS. New court commitments admitted to State or Federal jurisdiction, 1977-96. [online] Available http://www.ojp.usdoj.gov/bjs/prisons.htm.

Table 1. Measures and Variables

	Variables	Measures	Source
Level-1 dependent variables	Prison population	LN[(prison population/total population)*100,000]	BJS
	New court commitments	LN[(new court commitments/total population)*100,000]	BJS
	Time served in prison	(prison population/admission of prisoners at that year)*12 (months)	BJS
Level-1 independent variables	Voluntary sentencing guidelines	0 – before the enactive of this policy 1 – after enactive of this policy	BJA
	Presumptive sentencing guidelines		
	Parole abolishment		
	Truth in sentencing law		
	Three strikes law		
	Considering prison capacity		
	Crime rate	LN[(UCR index crime report total/UCR population)*100000]	UCR
	Unemployment rate	(Unemployed population/civil labor forces)*100	Department of Commerce
	Male at age 20 to 29	(male 20-29/total population) *100	US Census Bureau
Level-2 independent variables	East region	Dummy variables 0 – state not in this region 1 – state in this region	
	Middle West region		
	West region		

inmates at end of a year and the year's total admissions[5] (Cohen and Canela-cacho 1994), and this ratio multiplied by 12 as the number of months.

The time variable in level1 model is the number of years from the first analyzed year. At the first year, the time variable is set as zero. Since the visual examination of the dependent variables' curves indicated some nonlinear patterns, the quadratic and cubic time variables are also included in the case (Figure 3, Figure 4).

The six independent sentencing practice variables are identified as (1) voluntary sentencing guidelines, (2) presumptive sentencing guidelines, (3) two or three strikes laws, (4) abolishment of discretionary release by parole board, (5) legislative direction regarding consideration of prison capacity, and (6) truth in sentencing laws. Because the criteria used to identify determinate sentencing practices are "explicit standards specify the amount of punishment and a set release date with no review by an administrative agency (parole board)" (BJS, 1998), the "abolishment of discretionary release by parole board" is used in this analysis instead of determinate sentencing policy. Another reason for not using the determinate sentencing variable is the lack of information about when it was enacted in each determinate sentencing state is available. Definitions of these six sentencing practices are listed in Table 2. According to the 1996 national survey of state sentencing structure (BJS, 1998), there are seven voluntary sentencing guideline states, and ten presumptive sentencing guideline states. Twenty-four states have two or three strike laws. Twelve states have abolished discretionary parole release. Fourteen State legislatures direct their sentencing commissions to consider prison capacity as they develop guidelines. According to a 1998 General Accounting Office report about the

[5] BJS. Sentenced prisoners admitted to State or Federal jurisdiction, 1977-1996. [online] Available http://www.ojp.usdoj.gov/bjs/prisons.htm.

Table 2. Definition of sentencing policies

Voluntary sentencing guidelines	Recommended sentencing policies that are not required by law. Usually based on past sentencing practices, they serve as a guide to judges. The legislature has not mandated their use. Voluntary guidelines may employ determinate or indeterminate sentencing structures.
Presumptive sentencing guidelines	Sentencing that meets 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, usually a sentencing commission; (2) sentencing judges are expected to sentence within the range or provide written justification for departure; (3) the guidelines provide for some review, usually appellate, of the departure. Presumptive guidelines may employ determinate or indeterminate sentencing structures.
Parole abolishment	States abolished the parole board that adjusts actual time served in prison.
Truth in sentencing law	Truth-in-sentencing laws requiring violent offenders to serve at least 85 percent of their imposed sentences.
Three strikes law	Some states enacted the two or three strikes laws, which are intended to increase the prison sentences of persons convicted of specific crimes that have been previously convicted o a violent or serious felony offense.
Considering prison capacity	State legislatures direct their sentencing commissions to consider prison capacity as they develop guidelines.

Note: these definitions are obtained from "BJA, 1996. National Assessment of Structured Sentencing," and "BJA, 1998. 1996 National Survey of State Sentencing Structures."

Availability of Federal Grants Influenced Truth in Sentencing Laws in Some States (GAO, 1998), there is twenty-seven states who have enacted truth in sentencing law conforming to the federal TIS eligibility requirements. The years that these sentencing policies enacted are not consistent through different sources. They are identified based on the 1996 and 1994 BJS national sentencing structure survey, Tonry's (1997) Sentencing reform in overcrowded times, a recent report about the truth in sentencing in state prisons (Ditton and Wilson 1999), and the GAO report (1998). Each type of sentencing policy is represented by a dummy variable: the variable is equal to zero before the policy went into effect; it is equal to one after the policy went into effect in a state (Table 3).

Besides the sentencing variables, other level1 control variables include several factors that are considered as associated with sentencing outcomes. The first one is crime rates. The crime rate data used in this study is the UCR index crime reports total[6] per 100,000 UCR populations[7]. The reason in choosing this crime report data is simply the difficulty in obtaining the crime arrest total data by state, by year, through the whole study period[8]. An important limitation in using the UCR index crime report data is the lack of drug offenses, which are considered one major driving force of the rapid growth of prison populations. Despite its limitations, UCR index crime report data are useful as indicators of crime data, especially the violent crime data over time. The second control variable is demographic changes. The selected demographic variable is the percent of

[6] Data are available in UCR crime reports datasets 1977-1996. Data from 1973 to 1976 data are obtained from Moody's crime rate datasets.
[7] The population from UCR reports is not the total population of state, but the population of the relative jurisdiction that reports the crime data to FBI.
[8] The UCR crime arrests data are only available after 1980.

Table 3. Sentencing Practices (1)

State name	Determinate sentencing	Indeterminate sentencing	Voluntary sentencing	Presumptive sentencing	Guideline year	Truth in sentencing	Three strikes law	Parole release abolish	Consideration of prison capacity
Alabama	0	1	0	0	0	0	0	0	0
Alaska	0	1	0	0	0	0	0	0	0
Arizona	1	0	0	0	0	1994	0	1994	0
Arkansas	0	1	1	0	1994	0	1995	0	1994
California	1	0	0	0	0	1994	1994	0	0
Colorado	0	1	0	0	0	0	1994	0	0
Connecticut	0	1	0	0	0	1995	1994	0	0
Delaware	1	0	0	1	1987	1990	0	1990	1987
District o	0	1	0	0	0	0	0	0	0
Florida	1	0	0	1	1983	1995	1995	1983	1993
Georgia	0	1	0	0	0	1995	1995	0	0
Hawaii	0	1	0	0	0	0	0	0	0
Idaho	0	1	0	0	0	0	0	0	0
Illinois	1	0	0	0	0	0	0	1978	0
Indiana	0	1	0	0	0	0	1994	0	0
Iowa	0	1	0	0	0	1996	0	0	0
Kansas	0	1	0	1	1993	1993	1994	0	1993
Kentucky	0	1	0	0	0	0	0	0	0
Louisiana	0	1	1	0	1992	0	1994	0	1987
Maine	1	0	0	0	0	1995	0	1976	0
Maryland	0	1	1	0	1983	0	1994	0	0
Massachuse	0	1	0	0	0	0	0	0	1994
Michigan	0	1	0	0	0	1994	0	0	0
Minnesota	1	0	0	1	1980	1993	0	1982	1978
Mississipp	1	0	0	0	0	1995	0	1995	0
Missouri	0	1	1	0	0	1994	0	0	0

Table 3. (Continued) Sentencing Practices

State name	Determinate sentencing	Indeterminate sentencing	Voluntary sentencing	Presumptive sentencing	Guideline year	Truth in sentencing	Three strikes law	Parole release abolish	Consideration of prison capacity
Montana	0	1	0	0	0	0	1995	0	0
Nebraska	0	1	0	0	0	0	0	0	0
Nevada	0	1	0	0	0	0	1995	0	0
New Ham	0	1	0	0	0	0	0	0	0
New Jersey	0	1	0	0	0	0	1995	0	0
New Mexico	1	0	0	0	0	0	1994	0	0
New York	0	1	0	0	0	1995	0	0	0
North Caro	1	0	0	1	1994	1994	1994	1994	1995
North Dako	0	1	0	0	0	1995	1995	0	0
Ohio	1	0	0	1	0	1996	0	1996	1996
Oklahoma	0	1	1	0	0	0	0	0	0
Oregon	1	0	0	1	1989	1995	0	1989	1989
Pennsylvan	0	1	0	1	1982	1991	1995	0	0
Rhode Isla	0	1	0	0	0	0	0	0	0
South Caro	0	1	0	0	0	0	1995	0	0
South Dako	0	1	0	0	0	1996	0	0	0
Tennessee	0	1	0	1	1989	1995	1995	0	1986
Texas	0	1	0	0	0	0	0	0	0
Utah	0	1	1	0	1993	1985	1995	0	1993
Vermont	0	1	0	0	0	0	1995	0	0
Virginia	1	0	1	0	1991	1995	1994	1995	0
Washington	1	0	0	1	1983	1984	1993	1984	1981
West Virgi	0	1	0	0	0	0	0	0	0
Wisconsin	0	1	1	0	1985	0	1994	0	0
Wyoming	0	1	0	0	0	0	0	0	0
Total	14	37	8	10	15	24	24	12	13

male youth aged twenty to twenty-nine years[9], who are deemed the prison-prone subgroup populations. One economic variable is the unemployment rate, which is the unemployed civil labor force[10] divided by the total civil labor force, then multiplied by one hundred.

Since the prison populations measure and new court commitment measure are both taken at the end of the year, and usually on average, there exists a half-year distance between the commission of a crime and sentencing (Marvell and Moody 1996), so the sentencing practices variables are lagged for one year. The mean of estimated average time served variable is about twenty-two months, which implies a two-year lag of sentencing practices variables. All level1 continuous variables will be expressed as natural logs of per capita data to moderate the impact of outliers.

Indicator variables are created to facilitate use of HMLM. Each indicator variable is the indicator for the measure at each observing time point. For example, indicator one is indicator at the first time point. If a state's outcome data is available at this point, it is coded one, otherwise zero. In the year's new court commitments model and the prisoner rate model, there are 23 indicator variables (because of a lag of one year, the examined series is from 1974 to 1996). In the time served model, there are 22 indicator variables (two years lag).

At the second level, predictors, which represent state characteristics, should be stable across the study period. The measure is identified as geographical regional

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[9] U.S. Census Bureau, Population Division, Population Distribution Branch. http://www.census.gov/population/www/estimates/statepop.html. The 1980's population data only include by sex by age combination, the by race by sex by age group is estimated through using the total race percentage multiply the relative sex age group population.

[10] Unemployment data and civil labor force data was obtained from the Department of Commerce from 1975 to 1986, and from 1988 to 1996. Parts data from 1973 to 1974 are gotten from Moody's datasets.

variables. States may be clustered into regional groups, which reflect the social and cultural diversity across different regions and simulation within the same region. A former (Zimring and Hawkins, 1991) research indicated that such grouping is merited on imprisonment policies as well. The states within a region tend to have similar prison population policies, but different policies from states in other regions. The ranks of 1980's prison population showed that sixty-five percent of all southern states were found in the top third of the national prison population distribution, while seventy-eight percent of the northeastern states were clustered in the bottom third of the national distribution (Zimring and Hawkins 1991). In this study, the regional patterns are classified as Northeast; Middle West; South; and West, symbolized by dummy variables separately. The sentencing practices are not included directly in the state level models because of the difficulties of factorizing these sentencing policies variables. For example, all states have some form of mandatory minimum sentencing laws, but there exists enormous diversity in types of offenses and time of enacting. To code this variable, further studies are needed on each mandatory sentencing provision.

Modeling

As noted above, hierarchical multivariate linear models are used to examine the effects of sentencing practices, which change among the observing period, on individual state prison population increase rates, and they examine the effects of state level variables on individual prisoner change curve outcomes. To demonstrate the certainty of using hierarchical models, the one-way ANOVA models with random effects were examined primarily.

Level-1 model

$$Y_j = \beta_{0j} + r_j$$

Level-2 model

$$\beta_{0j} = r_{00} + \mu_{0j}$$

Three outcome variables were new court commitments, time served in prison, and prison populations separately. The results of ANOVA models are provided in Table 4.

The state level variance for new court commitments, time served in prison, and prison population are 58.97%, 29.03%, and 52.17% respectively, which means that substantial differences did exist among states.

Figure 2. U.S state prisons new court commitments rates

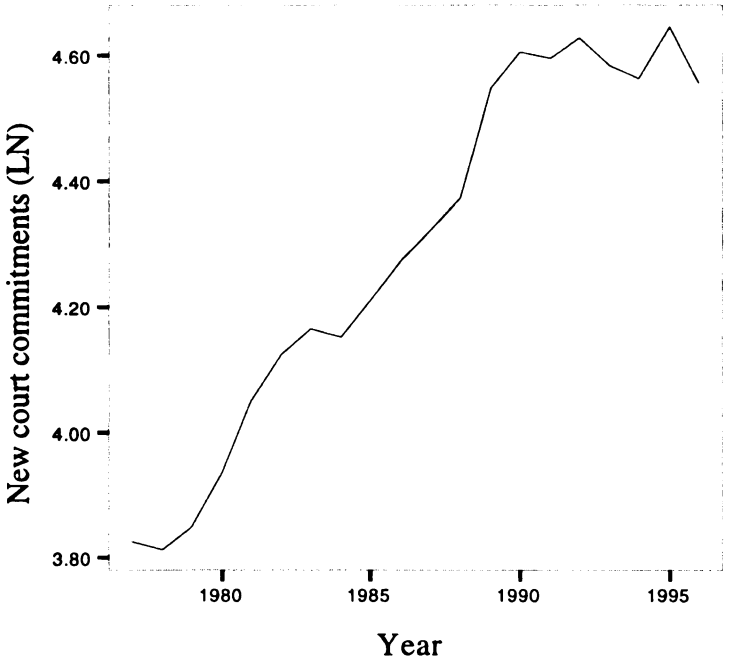


Table 4. ANOVA for New Court Commitment, Time Served in Prison, and Prison Populations

	Estimated Coefficients and Errors		
Parameters	Coefficient	SE	t-Value
New Court Commitment	4.22	0.07	62.13***
Average state mean, r_{00}			
Error Variance Components	Variance	χ^2	d.f.
Between states μ_{0j}	0.23	1623.49	50
Within states r_j	0.16		

	Estimated Coefficients and Errors		
Parameters	Coefficient	SE	t-Value
Time Served in Prison			
Average state mean, r_{00}	21.69	0.54	39.86***
Error Variance Components	Variance	χ^2	d.f.
Between states μ_{0j}	13.59	496.72	50
Within states r_j	33.22		

	Estimated Coefficients and Errors		
Parameters	Coefficient	SE	t-Value
Prison Population			
Average state mean, r_{00}	5.08	0.07	72.92***
Error Variance Components	Variance	χ^2	d.f.
Between states μ_{0j}	0.24	1288.20	50
Within states r_j	0.22		

Note: *p<0.1 **p<0.05 ***p<0.01

Four full models are set up to explain the relationship between sentencing policies and prison population. The first model is the new court commitments model. A visual examination of the grand mean of new court commitments curve (Figure 2) and each state's new court commitments curve as well indicated a nonlinear growth pattern. It suggested an approximate quadratic change model.

Level-1 Model

$$Y = ind1(Y1^*)+ ind2(Y2^*)+ ind3(Y3^*)+ ind4(Y4^*)+ ind5(Y5^*)+ ind6(Y6^*)+ ind7(Y7^*)+ ind8(Y8^*)+ ind9(Y9^*)+ ind10(Y10^*)+ ind11(Y11^*)+ ind12(Y12^*)+ ind13(Y13^*)+ ind14(Y14^*)+ ind15(Y15^*)+ ind16(Y16^*)+ ind17(Y17^*)+ ind18(Y18^*)+ ind19(Y19^*)+ ind20(Y20^*)+ ind21(Y21^*)+ ind22(Y22^*)+ ind23(Y23^*)$$

$$Y^* = \beta_0+\beta_1(\text{time})+\beta_2(\text{time})^2+\beta_3(\text{voluntary sentencing guidelines})+ +\beta_4(\text{presumptive sentencing guidelines}) +\beta_5(\text{parole release abolish}) +\beta_6(\text{truth in sentencing laws }) +\beta_7(\text{three strikes law}) +\beta_8(\text{consideration of prison capacity}) +\beta_9(\text{crime rates}) +\beta_{10}(\text{male at age 20-29}) +\beta_{11}(\text{unemployment rates}) + r$$

Level-2 Model

$$\beta_0=G_{00}+ G_{01}(\text{northeast})+ G_{02}(\text{middle west})+ G_{03}(\text{west})+\mu_0$$

$$\beta_1= G_{10}+ G_{11}(\text{northeast})+ G_{12}(\text{middle west})+ G_{13}(\text{west})+\mu_1$$

$$\beta_2= G_{20}+ G_{21}(\text{northeast})+ G_{22}(\text{middle west})+ G_{23}(\text{west})+\mu_2$$

$\beta_3= G_{30}$ $\beta_4= G_{40}$

$\beta_5= G_{50}$ $\beta_6= G_{60}$

$\beta_7= G_{70}$ $\beta_8= G_{80}$

$\beta_9= G_{90}$ $\beta_{10}= G_{100}$

$\beta_{11}= G_{110}$ $\beta_{12}= G_{120}$.

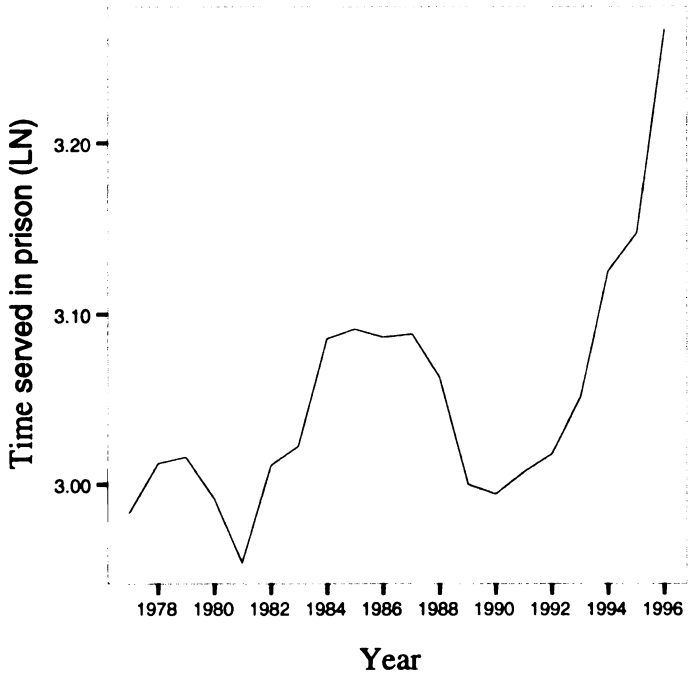
The most frequent assumption in the standard HLM is that the within-state residuals r's are independent with a constant variance, σ^2. Considering there were 23 repeated observing occasions, it is likely that the variances are different at each occasion, σ_t^2; or there exist first-order auto-regressive level-1 errors, which means a level-1 residual is a function of the immediately preceding level-1 residual. The model for the residuals is:

$r_{tj}=\rho e_{t-1\,j}+(1-\rho)e_{tj}$ $\quad e_{tj}$ _ independently $N(0, \sigma^2)$

At state level (level-2), the intercept, which measures the first occasion (1974) new court commitments; time parameter (slope), which measures the increased rate of each year's new court commitment; and time squared parameter, which measures the acceleration of each year's new court commitments, are random and influenced by the regional variables. The μ_j is an error assumed normally distributed with mean zero and variance τ_j. All the other level-1 control variables coefficients are considered having fix effects at level-2.

The second model is the time served in prison model. The estimated average time served in prison curve displayed a complex trend (Figure 3). The average time served in state prisons kept increasing before 1979, and then decreased to the lowest point at 1981 (during the study periods). From 1981 to 1984, the length of time served in state prisons has again been increasing. After a short stable period, it began to decrease until 1990. Since 1990, the average length of time served has been increasing once more. Thus, a cubic growth model is used in level-1. Since the sentencing variables were lagged two years in predicting the time served in prison, there were twenty-two observing occasions.

Figure 3. Estimated time served in state prisons



Level-1 Model

$Y = ind1(Y1^*)+ ind2(Y2^*)+ ind3(Y3^*)+ ind4(Y4^*)+ ind5(Y5^*)+ ind6(Y6^*)+ ind7(Y7^*)+ ind8(Y8^*)+ ind9(Y9^*)+ ind10(Y10^*)+ ind11(Y11^*)+ ind12(Y12^*)+ ind13(Y13^*)+ ind14(Y14^*)+ ind15(Y15^*)+ ind16(Y16^*)+ ind17(Y17^*)+ ind18(Y18^*)+ ind19(Y19^*)+ ind20(Y20^*)+ ind21(Y21^*)+ ind22(Y22^*)$

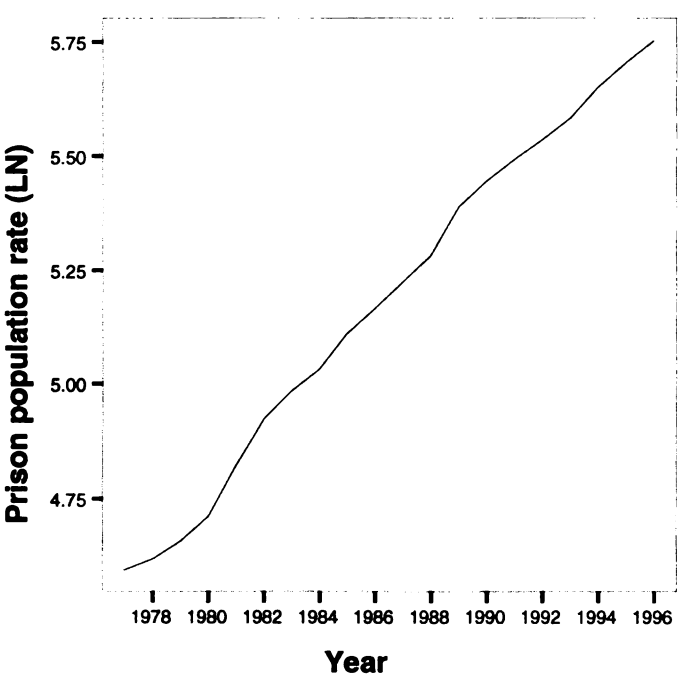
$Y^* = \beta_0+\beta_1(\text{time})+\beta_2(\text{time})^2+\beta_3(\text{time})^3+\beta_4(\text{voluntary sentencing guidelines})+ +\beta_5(\text{presumptive sentencing guidelines}) +\beta_6(\text{parole release abolish}) +\beta_7(\text{truth in sentencing laws}) +\beta_8(\text{three strikes law}) +\beta_9(\text{consideration of prison capacity}) +\beta_{10}(\text{crime rates}) +\beta_{11}(\text{male at age 20-29}) +\beta_{12}(\text{unemployment rates}) + r$

The level-2 model will be the same as in the new court commitment model.

The third model is the prison population model. A visual examination of the grand mean of prison population change curve, displayed in Figure 4, indicated a linear growth pattern. There is a one-year lag for control variables, so there are twenty-three indicator variables. The level-1 model and level-2 model are the same as in the new court commitment model, except the level-1 model is a linear model.

Considering the influence of sentencing policies on the total prison population may effect through the direct influence on the two components, the last model is set up to examine the relationship between total prison populations at the end of a year with this year's new court commitments and time served in prison. This model includes twenty-four years observations, which are from 1973 to 1996.

Figure 4. U.S states prison population rate



Level-1 Model

$Y = ind1(Y1^*)+ ind2(Y2^*)+ ind3(Y3^*)+ ind4(Y4^*)+ ind5(Y5^*)+ ind6(Y6^*)+ ind7(Y7^*)+ ind8(Y8^*)+ ind9(Y9^*)+ ind10(Y10^*)+ ind11(Y11^*)+ ind12(Y12^*)+ ind13(Y13^*)+ ind14(Y14^*)+ ind15(Y15^*)+ ind16(Y16^*)+ ind17(Y17^*)+ ind18(Y18^*)+ ind19(Y19^*)+ ind20(Y20^*)+ ind21(Y21^*)+ ind22(Y22^*)+ ind23(Y23^*)+ind24(Y24^*)$

$Y^* = \beta_0+\beta_1(\text{time})+\beta_2(\text{new court commitments})+\beta_3(\text{time served in prison})+r$

Level-2 Model

$\beta_0=G_{00}+ G_{01}(\text{northeast})+ G_{02}(\text{middle west})+ G_{03}(\text{west})+\mu_0$

$\beta_1= G_{10}+ G_{11}(\text{northeast})+ G_{12}(\text{middle west})+ G_{13}(\text{west})+\mu_1$

$\beta_2= G_{20}$

$\beta_3= G_{30}$

RESULTS

The results of the HMLM analyses for each of the outcome measures—new court commitments, time served in prison, prison population, and the relations between these three variables—are given in tables 5, 6, 7, and 8 respectively.

Each table contains two models. Model-1 assumes a homogenous level-1 variance, and model-2 addresses possible first-order auto-regressive level-1 variance. The model deviances are employed to evaluate the fits of the two models. The results show that the first-order auto-regressive models fit better than do the homogeneous models. As in the new court commitments model, the first-order auto-regressive model

fits better than does the homogeneous sigma squared model, $\chi^2 = 410.89$, d.f. = 1. The maximum-likelihood estimate of correlation ρ in the first-order auto-regressive model equals 0.775; its standard error is 0.044, which suggests a significantly positive auto-correlation. This phenomenon happens in the three other models. Therefore, the reported results use data from models with first-order auto-regressive level-1 variance.

Examination of the model indicates that state's average new court commitment at 1974 was 38.86 ($e^{3.66}$) per 100,000 populations. States in the Eastern region had significantly less new court commitments than as in the South region at that time. States in the Middle West and West region had the same propensity as comparing with Southern states. The mean increase rate of new court commitments is 0.07. Nevertheless, the region does not make any differences for the increase rates. The mean acceleration of the new court commitments is negative 0.001, which means that with the time passed, the change of increase rate slowed down. There is no significant difference between different regions. Only the acceleration of Eastern states is a little slower than that of Southern states and significant at 0.1 levels. Sentencing policies do not influence the new court commitments directly and significantly, except sentencing commissions who are required by legislative direction to consider about the prison capacity. As a state has sentencing commission, and it is required by legislatures to consider prison capacity as they develop guidelines, the new court commitments reduced by 1.17 ($e^{0.16}$) per 100,000 populations comparing with no prison capacity consideration. Another sentencing practice that may influence the new court commitments is the three strikes law. The three strikes law has a coefficient as negative 0.068, and a p-value as 0.098. Crime rates,

unemployment rates, and percent of male at age twenty to twenty-nine populations are not direct factors that account for the shifts of new court commitments.

The findings in the time served in prison model indicate some different relationships both within and between states. The average time served in prison at 1975 was 17.3 months. No significant difference was found between Eastern and Southern, Middle- West and Southern, or Western and Southern. Time, time squared, and time cubical are significant covariates. Similarly, the regional variables at state level do not make any difference for the increased rate of time served in prison, slope of time squared, and slope of time cubical. The three strikes law is the only sentencing practice that is significantly associated with time served in prison. When three strikes laws are enacted, the state prison stays for inmates increase 3.98 months. The unemployment rates also significantly correlate with the time served in prison. As unemployment rates increased by one unit (1 person per 100 labor force), the time served in prison increased 0.17 months. No other sentencing policies are found significantly covariate with length of time served in prison.

None of the sentencing practice variables shows any direct and significant effects on the total prison populations. Crime rates, unemployment rates, and demographic shifts do not have an obvious and significant impact on total prison population either. Although the 1974's prison populations in the East area states and in the Middle West area states are significantly less than prison populations in Southern states, the increase rates of prison populations do not significantly differ from each region. The average increase rate of prison population was 0.07.

The prison population as an effect of new court commitments and length of stay in prisons model shows some expected results. Both new court commitments and the length of stay in prisons significantly correlate with total prison populations. As new court commitments increase by one unit, the prison populations increase by 0.24 units (approximately one person increase in new court commitments results in 0.47 increase in total prison population). A One-month increase of the length of a stay in prison results in 0.01 units increase of prison populations (approximately 1.01 prison populations). Therefore, changes in the length of stay in prisons may have more effects on the total prison population than changes of new court commitments. Even though the evidence does not show that sentencing reforms have the expected strong influences on the aggregate imprisonment outcomes, one may think likely that sentencing reforms focused on the prison terms drive the growth of prison population more powerfully than sentencing reforms focused on prison admissions.

DISCUSSION

The research results obtained from the new court commitment model and the time served in prison model do not strongly support the hypotheses that sentencing practices change new court commitment and the time served in prison. As noted above, sentencing practices, such as truth in sentencing laws, which were considered as the major reason that drove the rapid growth of prison population through the influence on the length of stays in prison, does not show the same effects in this modeling. Presumptive sentencing guidelines do not moderate or increase the prison population either. No apparent

relationships between the determinate sentencing laws with abolishment of parole and the prison status were been found. Among the six sentencing practices examined, only the sentencing commission's requirements of considering prison capacity and the three strikes laws correlated with new court commitments and time served in prisons. When prison capacity is required to be taken into consideration by the state's sentencing commission, the new court commitment decreases significantly. The three strikes laws have some moderately negative influence on new court commitments as well. Three strikes laws influence the length of time served in prison significantly and positively, and the consideration of prison capacity by sentencing commission has some moderately positive influence on the length of time served. However, one phenomenon should be taken seriously is that these two sentencing practices have reversed influence direction to these two outcome variables. As three strikes laws increase time served in prisons, it decreases new court commitments moderately. At the same time as requirements of sentencing commission's considering about prison capacity decrease new court commitments, it increased time served in prison moderately as well. As result, the combined effects will disappear. This research outcome is consistent with the research results of prison population model, which suggests that the aggregate measurement of severity of sentencing outcomes, the prison populations do not change in accordance with the sentencing reforms. These findings, which reject the formal legal rationality hypothesis of sentencing reforms, did support the substantive rationality perspective of sentencing reforms in some extent. While the actual substantive circumvent factors are not clearly identified in this thesis, there are evidences showing that the sentencing system itself has a trend to balance the influences of sentencing practices. When policies

increase one component of prison populations, it may decrease another component of prison populations. Although the "hydraulic displacement of discretion" is not examined, the principle behind this theory is verified by the evidence from this study, which could be described as a sentencing system that is a self controlled system, and changes in one segment will result in an opposite changes in another segment, thus the sentencing outcomes keep at a constant level.

It is difficult to tell exactly how many changes there are of time served in prison, and how many changes there are in new court commitments when analyzing the component of growth of prison populations. The research results do tell, however, that a one month increase of time served in prison will have more impact on total prison population than that of a one person increase of new court commitment. This result is consistent with other early research (Marvell, 1995; Wooldredge 1996).

The regional differences did exist significantly at the research starting point, which is a year before major sentencing reforms were enacted, but it does not make apparent difference in the imprisonment developing processes. This indicates that imprisonment differences between states in different regions existed before the sentencing reform periods. We get an impression here that future research will seek answers about the imprisonment diversities that should focus on the social, economical, political, governmental, and criminal justice characteristics of each state before 1974.

While the evidence presented here appears to be strong, there are several limitations to this study. The first is the exclusion of drug factors, which is considered as one of the major factors that increases the incarceration rate (Sabol and Lynch 1997; Blumstein and Beck, 1999; Caplow and Simon 1999). As Blumstein (1998) noted, in

1980, 6.8% of all new court commitments to prison were drug offenders; by 1992, however, the drug offenders comprised 30.5% of persons admitted to state prisons. Due to the difficulty of obtaining drug arrests data before 1985, it was not included in the control variables.

The second limitation is the use of regional variables as the representation of diversity of social, political, and criminal justice policies. Even the regional variables can reflect a few features in some degree, they may be too simple to reflect the individual influences on imprisonment, especially when the influences have reversed effects, the aggregate effects may disappeared as result.

Since this thesis tests the formal rationality hypotheses of sentencing reforms at an aggregate level, the possible substantive factors are not examined in this study. This makes the explanation of which factors, and how the factors influence the sentencing outcomes impossible. The fact of the rapid growth of prison populations indicates that there must be some causations that drive the hasty increase, however, sentencing reforms are not this kind of drivers.

Table 5: Sentencing Policies Effects on New Court Commitments[11]

	Estimated Coefficients and Errors					
	Model 1 with homogeneous level-1 variance			Model 2 with first-order auto-regressive level-1 variance		
Parameters	Coefficient	SE	t-Value	Coefficient	SE	t-Value
Average state mean	**3.69*** **	0.07	56.84	**3.66*** **	0.06	58.97
east [12]	**-0.91*** **	0.19	-4.79	**-0.89*** **	0.18	-4.97
mid-west	**-0.68*** **	0.17	-3.92	**-0.70*** **	0.16	-4.26
West	**-0.61*** **	0.17	-3.56	**-0.59*** **	0.16	-3.67
Time (increase rate)	**0.049*** **	0.01	5.26	**0.07*** **	0.01	6.60
East	0.03	0.02	1.10	0.04	0.02	1.58
mid-west	0.00	0.02	0.21	0.01	0.02	0.58
West	0.03	0.02	1.58	0.03	0.02	1.37
$Time^2$ (accelerate)	0.00	0.00	0.25	**-0.00***	0.00	-1.92
East	-0.00	0.00	-1.18	**-0.00***	0.00	-1.85
Mid-west	0.00	0.00	0.37	0.00	0.00	0.05
West	-0.00	0.00	-0.98	-0.00	0.00	-0.71
Voluntary sentencing	0.05	0.07	0.72	0.03	0.07	0.46
Presumptive sentencing	**0.24*** **	0.06	3.76	0.04	0.07	0.58
Parole abolishment	-0.08	0.06	-1.29	-0.07	0.06	-1.08
Truth in sentencing	**-0.17*** **	0.05	-3.66	-0.06	0.05	-1.30
3-strikes law	**-0.21*** **	0.04	-4.75	**-0.07***	0.04	-1.68
Considering prison capacity	**-0.30*** **	0.05	-5.60	**-0.16** **	0.06	-2.87
Crime rates	0.02	0.04	0.60	-0.01	0.03	-0.40
Unemployment rate	-0.00	0.00	-0.39	0.00	0.00	0.09
Male at age 20 to 29	0.01	0.02	0.44	-0.02	0.03	-0.56
#Parameters	28			29		
Deviance	-189.91			-600.81		
Comparison	χ^2			df		
Model 1 vs. Model 2	410.89***			1		

[11] Three kinds of parameter estimates are available in hierarchical linear model: empirical Bayes estimates of randomly varying level-1 coefficients; generalized least squares estimates of the level-2 coefficients; and maximum-likelihood estimates of the variance and covariance components.

[12] All these regional variables are vs. southern.

Table 6: Sentencing Policies Effects on Time Served in Prisons

	Estimated Coefficients and Errors					
	Model with homogeneous level-1 variance			Model with first-order auto-regressive level-1 variance		
Parameters	Coefficient	SE	t-Value	Coefficient	SE	t-Value
Average state mean	**16.83*** **	0.78	21.70	**17.30*** **	0.87	19.88
East	**-4.66** **	2.09	-2.24	-3.62	2.37	-1.53
Mid-west	-0.60	1.91	-0.32	-1.24	2.17	-0.57
West	-0.21	1.88	-0.11	-0.64	2.15	-0.30
Time	**1.70*** **	0.32	5.28	**1.74*** **	0.36	4.81
East	0.89	0.76	1.17	0.40	0.84	0.48
Mid-west	-0.62	0.70	-0.89	-0.48	0.77	-0.62
West	-0.37	0.68	-0.55	-0.39	0.76	-0.51
$Time^2$	**-0.16*** **	0.04	-4.34	**-0.19*** **	0.04	-4.50
East	-0.10	0.10	-0.97	-0.06	0.11	-0.54
Mid-west	0.10	0.09	1.08	0.09	0.10	0.88
West	0.07	0.09	0.74	0.07	0.10	0.71
$Time^3$	**0.00*** **	0.00	3.58	**0.01*** **	0.00	4.18
East	0.00	0.00	1.03	0.00	0.00	0.78
Mid-west	-0.00	0.00	-1.13	-0.00	0.00	-0.97
West	-0.00	0.00	-0.92	-0.00	0.00	-086
Voluntary sentencing	1.84	1.18	1.56	0.75	1.26	0.60
Presumptive sentencing	-1.06	1.11	-0.96	-1.46	1.16	-1.26
Parole abolishment	**-1.98***	1.13	-1.76	-1.12	1.19	-0.94
Truth in sentencing	0.97	1.17	0.83	1.17	1.17	1.01
3-strikes law	**6.63*** **	1.26	5.25	**3.98*** **	1.15	3.45
Considering prison capacity	**2.32** **	1.02	2.26	**1.85***	1.09	1.71
Crime rates	**-3.52*** **	0.73	-4.86	-0.93	0.62	-1.50
Unemployment rate	**0.29*** **	0.07	4.14	**0.17** **	0.08	2.22
Male at age 20 to 29	-0.75	0.55	-1.37	-0.54	0.66	-0.82
Number of Parameters	36			37		
Deviance	6149.88			5847.19		
Comparison	χ^2			df		
Model 1 vs. Model 2	**302.68*** **			1		

Table 7: Sentencing Policies Effects on Prison Population

	Estimated Coefficients and Errors					
	Model with homogeneous level-1 variance			Model with first-order auto-regressive level-1 variance		
Parameters	Coefficient	SE	t-Value	Coefficient	SE	t-Value
Average state mean	**4.33*** **	0.05	82.23	**4.32*** **	0.13	34.24
East	**-0.95*** **	0.15	-6.17	**-0.88** **	0.37	-2.37
Mid-west	**-0.70*** **	0.14	-4.96	**-0.78** **	0.34	-2.29
West	**-0.52*** **	0.14	-3.76	-0.54	0.33	-1.62
Time	**0.07*** **	0.00	32.73	**0.07*** **	0.00	25.86
East	**0.01** **	0.01	2.29	0.01	0.01	0.83
Mid-west	0.01	0.01	1.00	0.01	0.01	1.26
West	0.01	0.01	1.76	0.01	0.01	1.15
Voluntary sentencing	-0.00	0.04	-0.05	-0.03	0.04	-0.75
Presumptive sentencing	-0.02	0.03	-0.45	-0.03	0.03	-0.19
Parole abolishment	**-0.11*** **	0.03	-3.55	-0.02	0.03	-0.61
Truth in sentencing	0.00	0.02	0.14	-0.00	0.02	-0.05
Three strikes law	0.01	0.02	0.30	-0.02	0.02	-1.10
Considering prison capacity	**-0.08** **	0.03	-2.83	-0.02	0.03	-0.72
Crime rates	-0.00	0.02	-0.16	0.01	0.01	0.79
Unemployment rate	0.00	0.00	0.08	0.00	0.00	1.43
Male at age 20 to 29	**0.04*** **	0.01	6.03	0.02	0.01	1.63
Number of Parameters	21			22		
Deviance	-1427.70			-2358.66		
Comparison	χ^2			df		
Model 1 vs. Model 2	**930.96*** **			1		

Table 8: Admission and Length of Stay Effects on Prison Population

	Estimated Coefficients and Errors					
	Model with homogeneous level-1 variance			Model with first-order auto-regressive level-1 variance		
Parameters	Coefficient	SE	t-Value	Coefficient	SE	t-Value
Average state mean	**4.56*** **	0.05	90.32	**4.42*** **	0.11	39.97
East	**-0.89*** **	0.15	-6.15	**-0.82** **	0.32	-2.53
Mid-west	**-0.68*** **	0.13	-5.10	**-0.74** **	0.30	-2.51
West	**-0.47*** **	0.13	-3.64	**-0.52***	0.29	-1.79
Time(increase rate)	**0.04*** **	0.00	22.66	**0.05*** **	0.00	31.36
East	**0.01***	0.00	1.72	0.00	0.00	0.55
Mid-west	0.00	0.00	0.56	0.01	0.00	1.49
West	0.00	0.00	1.12	0.01	0.00	1.5
New court commitments	**0.42*** **	0.02	24.10	**0.24*** **	0.01	25.77
Time served in prisons	**0.02*** **	0.00	22.76	**0.01*** **	0.00	20.75
Number of Parameters	14			15		
Deviance	-1842.31			-2140.75		
Comparison	χ^2			df		
Model 1 vs. Model 2	**298.44*** **			1		

REFERENCES

American Friends Service Committee. *Struggle for Justice.* New York: Hill and Wang, 1971.

Blumstein, Alfred, and Jacqueline Cohen. "A theory of the stability of punishment." *Journal of Criminal Law and Criminology* 64 (1973): 198-207.

Blumstein, Alfred. "Criminal Justice Conundrum: Rising Prison Populations and Stable Crime Rates." *Crime & Delinquency* 44 no.1 (January 1998): 127-135.

Blumstein, Alfred, and Alfred Beck. "Population Growth in U.S. Prison, 1980-1996." In *Prisons*, edited by Michael Tonry and Joan Petersilia, 17-61. Crime and Justice: A Review of Research 26. Chicago: University of Chicago Press, 1999.

Bryk, Anthony S., and Stephen W. Raudenbush. *Hiearchical Linear Models: Applications and Data Analysis Methods.* Advanced Quantitative Techniques in the Social Sciences 1. Newbury Park, CA: Sage Publications, 1992.

Bureau of Justice Assistance. *1996 National Survey of State Sentencing Structures.* Department of Justice, Office of Justice Program, BJA. Washington, DC: BJA, September 1998.

—. *National Assessment of Structured Sentencing.* Washington, DC: BJA, 1996.

Cohen, J., and J. A. Canela-Cacho. "Incarceration and Violent Crime: 1965-1988." In *Understanding and Preventing Violence*, edited by A. J. Reiss and J. A. Roth. Washington D.C.: National Academy Press, 1994.

Ditton, P. M., and D. J. Wilson. *Truth in Sentencing in State Prisons.* US Department of Justice, Bureau of Justice Statistics. 1999.

Engen, R. L., and S. Steen. "The Power to Punish: Discretion and Sentencing Reform in the War on Drugs." *America Journal of Sociology* 105, no. 5 (2000): 1357-95.

Furniss, J. R. "The Population Boom." *Corrections Today* 58, no. 2 (1996): 38-43.

Gottfredson, Michael R., and Don M. Gottfredson. *Decision Making in Criminal Justice: Toward the Rational Exercise of Discretion.* Edited by Joel Feinber, et al. 2nd ed. Law, Society and Policy 3. New York: Plenum Press, 1988.

Greenfeld, W.A., A Beck, and D. Gilliard. "Prisons: Population Trends and Key Issues for Management." *Criminal Justice Review* 21, no. 1 (1996): 4-20.

Kensey, A., and P. Tournier. "Prison Population Inflation, Overcrowding and Recidivism: The Situation in France." *European Journal on Criminal Policy and Research* 7 (1999): 97-119.

Langan, P.A. "America's Soaring Prison Population." *Science* 251 (1991): 1568-73.

Levitt, Steven D. "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation." *Quarterly Journal of Economics* 3, no. 2 (1996): 319-51.

MacKenzie, D. L., G. S. Tracy, and G. W. Willianms. "Incarceration Rates and Demographic Changes: A Test of the Demographic Change Hypothesis." *Journal of Criminal Justice* 16, no. 3 (1988): 241-53.

Martinson, Robert. "What Works? -- Questions and Answers About Prison Reform." *The Public Interest* 35, no. 22 (1974).

Marvell, T. B., and C. E. Moody. "Determinate Sentencing and Abolishing Parole: The Long-Term Impactes on Prisons and Crime." *Criminology* 34, no. 1 (1996): 107-20.

Maxwell, Sheila Royo. "Examining the Congruence Between ROR and Failures-to-Appear." *Journal of Criminal Justice* 27, no. 2 (1999): 127-42.

Miethe, Terance D. "Charging and Plea Bargaining Practices Under Determinate Sentencing: An Investigation of the Hydraulic Displacement of Discretion." *Criminology* 78, no. 1 (1987): 155-76.

Reitz, K. R., and C. R. Reitz. "The American Bar Association's New Sentencing Standards." In *Federal Sentencing Reporter*, vol. 6, 170-71, 1993.

Sabol, William J., and James P. Lynch. "Crime Policy Report: Did Getting Tough on Crime Pay?" Www.urban.org/crime/crime.htm. The Urban Institute, August, 1997. 24/09/97.

Savelsberg, J. J. "Law That Does not Fit Society: Sentencing Guidelines as a Neoclassical Reaction to the Dilemmas of Substnativized Law." *America Journal of Sociology* 97, no. 5 (1992): 1346-81.

Sherman, Lawrence W., and Ellen G. Cohen. "The Impact of Research on Legal Policy; the Minneapolis Domestic Violence Experiments." *Law & Society Review* 23, no. 1 (1989): 117-44.

Tonry, Michael. "Building Better Policies on Better Knowledge." In *The Challenge of Crime in a Free Society: Looking Back; Looking Forward.* www.ojp.usdoj.gov/guide/lblf/panel4c.htm. Symposium on the 30th Anniversary

of the President's Commission on Law Enforcement's and Administration of Justice. Washington, D.C.: Office of Justice Programs, U.S. Department of Justice, 19-21 June, 1997.

U. S. General Accounting Office, *Truth in Sentencing: Availability of federal grants influenced laws in some states* (1998).

M Tonry, National Institute of Justice/Corrections Program Office, U.S. Department of Justice, *The fragmentation of sentencing and corrections in America.* (1999).

D. Parent, et al., Office of Justice Programs, National Institute of Justice, U.S. Department of Justice, *Key legislative issus in criminal justice: The impact of sentencing guidelines.* (1996).

D. K. Gilliard, Bureau of Justice Statistics, US Department of Justice, *Prison and jail inmates at midyear 1998* (1999).

Walker, S. *Taming the System.* New York: Oxford University Press, 1993.

Wicharaya, T. *Simple Theory, Hard Reality: The Impact of Sentencing Reforms on Courts, Prisons, and Crime.* Albany: State Universtiy of New York Press, 1995.

Wooldredge, John. "Research Note: A State-Level Analysis of Sentencing Policies and Inmate Crowding in State Prisons." *Crime and Delinquency* 42, no. 3 (1996): 456-66.

Zimring, F, and G. Hawkins. *The Scale of Imprisonment.* Chicago: University of Chicago Press, 1991.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