Do You Receive a Lighter Prison Sentence Because You are a Woman or a White? An Economic Analysis of Federal Criminal Sentencing Guidelines*

Supriya Sarnikar, Westfield State College

Todd Sorensen, University of California - Riverside

Ronald L. Oaxaca, University of Arizona and IZA

June 27, 2010

*We gratefully acknowledge the helpful comments of WPEG Conference participants at the University of Kent, seminar participants at IZA, ERMES and University of Paris II, Syracuse University, and Jonah Gelbach. Any remaining errors are the responsibility of the authors.

Abstract

The Federal criminal sentencing guidelines struck down by the U.S. Supreme Court in 2005 intended that individuals who commit the same crime and have the same prior criminal record receive equal sentences. Using data obtained from the United States Sentencing Commission's records, we examine the extent to which the sentencing guidelines curbed judicial sentencing preferences based on gender and race. Our utility maximization model of judicial sentencing preferences leads to a partially censored Tobit model in order to account for the frequent outcomes of no prison time, guideline limits, and departures from guideline sentencing thresholds. A new decomposition methodology is employed. Our results indicate that white women and white men receive more lenient sentences even after controlling for circumstances such as the severity of the offense and past criminal history. In the absence of the sentencing guidelines, the gender sentencing gap would be little changed but the racial gap would actually shrink.

INTRODUCTION

In determining the appropriate sentence for a crime, society may be trying to achieve separate competing goals such as: (1) retribution for harm done; (2) deterrence of future crime; and (3) rehabilitation of erring members of society. The three goals imply different considerations when determining sentences for crimes committed. This paper seeks to shed light on the extent to which the Federal Sentencing Guidelines succeeded in curbing judicial sentencing preferences along the dimensions of race and gender. Our conceptual framework posits a judicial random utility function over sentences that is subject to costs of departures from the guidelines. The full extent of racial/ethnic and gender discrimination in the criminal justice system is not a question that we propose to answer here. This issue would have to consider the entire process starting with decisions governing arrests, charges, prosecution, acquittal vs. convictions, and prison sentences. Rather, we address the question of whether or not the Federal sentencing guidelines impeded judicial proclivities to steer prison sentences in favor or against convicted defendants on the basis of their race or gender. The answer to this question is important because it identifies the limits to what a much heralded reform can accomplish in terms of attenuating gender and racial disparities in sentencing outcomes.

Our analysis considers outcomes from the sentencing process for a sample of whites and black males who entered guilty pleas in Federal courts while the mandatory sentencing guidelines were still in effect. Ideally, one might want to take into account the fact that defendants must choose whether to plea bargain or to take their chances in a trial. Given that we work with a sample of convicted individuals (we do not have data on acquittals), and the vast majority of the convictions are guilty pleas, our analysis does not extend to the relatively few cases in which convictions were by trial.

In our data set 13% of all criminal sentences involve no prison time. Additionally, 21% of the cases occur at guideline lower bounds and 6% occur at guideline upper bounds. Because of these mass points, it is inappropriate to consider the distribution of sentencing outcomes to be continuous. Accordingly, we treat the sentencing outcome variable from utility maximization as a mixed discrete continuous variable. The econometric model implied by our random utility model is what might be termed a partially censored Tobit model and is estimated by full information maximum likelihood (FIML).

An assessment of the efficacy of sentencing guidelines in attenuating judicial sentencing preferences based on race or gender requires three distinct analytic steps. The first step is to identify how much of the sentencing gap between men and women and between whites and blacks can be attributed to judicial preferences and how much of the gap can be accounted for by group differences in case circumstances. For this step we develop a new decomposition methodology that is appropriate to the estimated econometric model of sentencing outcomes. This decomposition builds upon the generalized decomposition developed in Neumark (1988) and Oaxaca and Ransom (1988, 1994). The second step is to identify the counterfactual of the absence of guidelines. The estimated econometric model under the guidelines can be used to supply this counterfactual. The third step involves a "difference-in-difference" comparison between the decomposition with guidelines and the decomposition without guidelines.

Brief History of the Federal Criminal Sentencing Guidelines

Until the mid-1980s, federal judges enjoyed wide discretion in the determination of criminal sentences. The establishment of the parole board in 1910 had decreased that discretion somewhat and made sentences partially indeterminate. The discretion vested with parole boards was supported by those who believed in rehabilitation of prison inmates until it became apparent that parole was not achieving the rehabilitative purpose. Those who believed in rehabilitation became increasingly unhappy with the perceived disparities in sentencing of like crimes and with the perceived abuses of discretion by judges. Believers in deterrence as a goal of sentencing were also equally disenchanted by the perceived leniency of judges. The legislative stage was set to strip judges of their wide discretion and provide more determinate sentencing. See Stith and Koh (1993) for a detailed legislative history of the guidelines. The passage of the Sentencing Reform Act (SRA) in 1984 created the United States Sentencing Commission (USSC) which was vested with the power to develop mandatory guidelines that would reduce "unwarranted" disparities in sentencing. Congress did not define what "unwarranted" meant. It was up to the sentencing commission to determine which disparities were unwarranted. The federal sentencing guidelines formulated by the commission essentially determined that disparities based on race, gender, age, income, number of dependents, etc., were unwarranted. The core of the guidelines is a matrix called the sentencing table (Appendix I) containing a range of allowable sentences for each level of offense severity and criminal history category. In calculating the offense severity, judges were often required to consider facts that were not determined at trial by a jury. This ultimately led to the guidelines failing the test of constitutionality in United States v. Booker, 125 S. Ct. 738 (2005). Booker turned the guidelines into advisory rules instead of mandatory. Judges were allowed to depart from the mandatory guideline range only for reasons that were not adequately considered by the sentencing commission when it formulated them. Judges were also required to provide a written rationale for departures that were not requested by the prosecutor. Prior to the guidelines there was virtually no appellate review of a trial judge's sentencing decision. After the guidelines, upward departures could be appealed by the defendant and downward departures could be appealed by the government. The calculation of offense level was also made reviewable by a higher court.

Even though the guidelines removed much of the judicial discretion in sentencing, judges still enjoyed some leeway in the determination of offense levels. While the base offense level is determined by the charge of conviction, judges could adjust the base level up or down based on a number of fact driven characteristics. For example, the base offense level may be adjusted upwards by 2 to 3 points based on the victim's characteristics, by 2 to 4 points if the defendant played an aggravating role in the crime. The calculation of offense level is generally accorded deferential treatment by higher courts while departures are scrutinized more closely. Schazenbach and Tiller(2007) find that judges strategically use the ability to adjust offense levels and departures to achieve the sentence outcomes that are more in line with their political beliefs. They also find that the use of departures to achieve desired sentence is influenced by the degree of political alignment between the sentencing judge and the circuit court while the use of adjustments is not so influenced.

Literature Review

The economics literature on sentencing disparity and the federal sentencing guidelines is relatively sparse. Miceli(2008), Shavell (2005) and Reinganum (2000) examine the optimality of judicial discretion under various assumptions. Miceli (2008) and Shavell (2005) assume that the goals of the sentencing judges are different from the goals of society while Reinganum(2000) assumes that they are the same. Miceli (2008) assumes that legislatures pursue deterrence as a goal of sentencing while judges pursue fairness as a goal. To the extent that society places a greater weight on deterrence than on fairness, it would prefer to limit judicial discretion. Shavell (2005) constructs a more general model in which the adjudicator's goals vary from societal goals but accommodates any goal that is different from societal goals. The model suggests that rules, such as the sentencing guidelines, are necessarily based only on some subset of observable variables. So, to the extent that it is socially desirable to base decisions on variables not included in the rules, giving discretion to adjudicators may be socially optimal. Reinganum (2000) developed a game theoretic model of plea bargaining that shows how sentencing decisions can vary due to timing and informational differences even when judges have the same goals as the sentencing commission. Because the expected sentence at trial affects the plea bargain offers and trials may not always provide perfect information on the true severity of a crime, a sentencing commission can better achieve its objective by setting the expected sentence to be higher than what a judge would choose if the case went to trial. In other words, the high expected sentence of the guidelines will prevent the defendant from gambling on the chance that trial may not reveal the true severity of the crime (s)he committed. Even though the judges and the commission agree on the goals of sentencing, the timing inconsistency between the judge's decision and the sentencing commission's decision causes the differences in sentences chosen by each. The guidelines then, are an indirect way of limiting prosecutorial discretion by limiting judicial discretion. Reinganum (1988) also concludes that limiting prosecutorial discretion may be beneficial because it allows prosecutors to commit to a definite sentence in plea bargaining. Bar-Gill and Gazal Ayal (2006) argue that the guidelines also limit the probability of innocent defendants being forced to plead guilty by ambitious prosecutors. As long as probability of conviction is positively correlated with the probability of guilt, they argue that guidelines achieve this purpose by restricting the allowable sentence reduction under plea bargaining.

We do not ask whether discretion is optimal but simply focus on properly estimating whether discretion of any level leads to "unwarranted" disparities in sentencing. Since one of the primary goals of sentencing in the last few decades has been to avoid such disparities, it is important to properly estimate whether the guidelines actually reduced these unwarranted disparities. Empirical papers that have attempted to do this take different approaches to measuring the variation in sentencing. Waldfogel (1998) distinguishes between "good sentencing variation" and "bad variation" and asks whether the guidelines reduced the "bad variation" that occurs due to "capricious or malicious" behavior of judges (p. 304). His results, based on an analysis of federal criminal cases decided in California between 1984 and 1987, suggested that the guidelines would not be effective at reducing only the bad variation. They would reduce fairness enhancing "good variation" as well. Lacasse and Payne(1999) analyze cases that arose in the federal district courts of New York during 1981 – 1995, and find that the amount of variation attributable to judges increased after the guidelines went into effect. These results are based on a regression of the prison term on a set of dummy variables for the judge assigned to the case, a dummy variable for post-reforms cases, dummy variables for offense type and a selection term indicating the regime choice of plea or trial. In contrast, Anderson, Kling, and Stith (1999) examine the inter-judge disparity in average length of prison sentences and find that the disparity in sentences declined after the guidelines went into effect. Using data on a sample of cases that were assigned to judges deemed to be "active", the disparity in sentencing was measured as the dispersion of a random effect in a negative binomial model. To account for variation in the mean prison term that might come about from differences in the type of offenses pre- and post-guidelines, the authors used a set of weights based on the shares of offenses from 1986-87 in both periods. Mustard(2001) used sentencing data from the USSC on cases resolved between 1991-1994 and found that blacks, males, and offenders with low levels of income received substantially longer sentences. He also finds that departures from guidelines produced much of the disparity. The largest black-white disparities occur in drug cases. Mustard(2001) derives much of these interpretations based on regressions of prison term on dummy variables for race, gender, and offense and criminal history categories. Schazenbach (2005) used the political, racial and gender composition of the bench at the district level to estimate the effect of judicial characteristics on sentencing disparities. This study also infers race and gender bias based on coefficients estimated on dummy variable indicators of race and gender.

DATA

The data used in this study are obtained from the United States Sentencing Commission's data collection efforts and pertain to cases that terminated in convictions over the period 1996-2002. The data set is available from the Federal Justice Resource Statistics Center. The vast majority of the sentencing cases were the result of guilty pleas (95%) as opposed to conviction by trial (jury or bench). Consequently, we focus only on the guilty plea cases. We confine our attention to comparisons of white females and black males with convicted white males.[1] There were a total of 67,774 sentencing cases in our sample: 35,020 cases for white males, 7,690 cases for white females, and 25,064 cases for black males.

The variables reported in Tables 1-3 are the ones we have constructed for use in our sentence determination model. These variables are defined in the appendix. The two critical variables for the sentencing guide lines are captured by indicators for past criminal history (CRIMHIS_) and a cubic polynomial measure of severity of the final/current offense (XFOLSOR). Both variables are constructed from measures set according to fixed formulas established by the U.S. Sentencing Commission. To calculate the offense level, the case is assigned a base level for offense and then adjusted for various aggravating circumstances such as the use of a firearm in the crime or obstruction of justice, or for mitigating circumstances such as acceptance of responsibility. The criminal history measure is a function of both the length of

[1] Hispanics are not included in our analysis because of 75% of the Hispanic cases were noncitizens. This requires a separate analysis and will be left to future research.

prior imprisonments and how recently these sentences were given.[2]. While white men on average are awarded longer prison sentences (36 months) than white women (15 months) and shorter sentences than black men (66 months), the severity of their offenses as measured by the final offense level scores are greater on average than those of white women and less on average than those of black men. Also, white men on average exhibit a higher past criminal history score than white women but have on average a lower score than black men. White men are more likely to have private defense counsel than white women and black men. In terms of age and education, white men are older on average (38 yrs) than white women (36 yrs) and black men (32 yrs) and are more educated (12% are college graduates) than white women (7% are college graduates) and black men (4% are college graduates).

Although our data span both cases and years, it is not treated as a panel. The data are available as separate cross-sections by case for each year. Each case corresponds to all prosecutions ending in convictions of an individual in the given year and the total prison time awarded. While it is theoretically possible for an individual to appear in more than one year's cross-section, we suspect that this is not very common. Over a seven year period the average prison sentences are 3 years, 1.3 years, and 5.5 years for white males, white females, and black males. With the possible exception of white females, these average sentences do not leave much time for multiple year convictions unless offenses are committed while the individual is in prison. While the relatively short sentences for white females would allow for multiple year convictions, their crime rate and recidivism are still fairly low, Langan and Levin (2002), Deschenes, et.al (2006). Female cases account for about 11% of the total number of cases in our

[2] For details on their construction of these variables, please see the following documents on the USSC's website:

http://www.ussc.gov/training/sent_ex_rob.pdf

http://www.ussc.gov/training/material.htm data set.

ECONOMIC MODEL

Our model of judicial sentencing preferences holds that the judge seeks to maximize their utility over the ideal sentence for a convicted defendant subject to costs from departures from the sentencing guidelines. We specify a quadratic utility function

$$U_i = \frac{-1}{2}\left(S_i - S_i^*\right)^2 - \theta_h(S_i - G_i^h)(D_i^+) - \theta_l\left(G_i^l - S_i\right)(D_i^-)$$

where for the ith convicted defendant, U_i is the sentencing judge's utility, S_i is the sentence awarded, S_i^* is the ideal sentence in the absence of costs from departures from the sentencing guidelines (sentencing bliss point), G_i^h is the maximum sentence specified by the guidelines, G_i^l is the minimum sentence specified by the guidelines, $0 \leq G_i^l \leq G_i^h$, D_i^+ and D_i^- are indicator variables for upward and downward departures from the guidelines and are defined by $D_i^+ = 1\left[S_i > G_i^h\right]$ and $D_i^- = 1\left[S_i < G_i^l\right]$. The parameter restrictions are $\theta_h, \theta_l > 0$.

Utility maximization implies the FOC:

$$\frac{\partial U_i}{\partial S_i} = -\left(S_i - S_i^*\right) - \theta_h D_i^+ + \theta_l D_i^- = 0$$

which yields the sentencing function

$$\dot{S}_i = S_i^* - \theta_h\ D_i^+ + \theta_l D_i^-,$$

where $\dot{S}_i$ is the constrained utility maximizing sentence. Note that for a judge for whom $D_i^+ = 1$ for a defendant, it is the case that $\dot{S}_i - S_i^* = -\theta_h < 0$. In other words, the utility maximizing sentence is below the ideal sentence. The judge would depart upwards from the guidelines but not as much as would have been preferred. Similarly for a judge for whom $D_i^- = 1$ for a defendant, it is the case that $\dot{S}_i - S_i^* = \theta_l > 0$. In other words, the constrained utility maximizing sentence is above the ideal sentence.

The judge would depart downwards from the guidelines but not as much as would have been preferred. Actual sentences deviate from ideal sentences whenever the guidelines are binding.

Econometric Model

Assume that the ideal sentence is specified by the stochastic function

$$S_i^* = X_i'\beta + \varepsilon_i \tag{1}$$

where X_i' is a vector of the defendant's characteristics and facts of the case that determines the judge's preferences for the ideal sentence, β is a vector of parameters, and ε_i represents random utility and is $i.i.d.N(0, \sigma_\varepsilon^2)$.

Given the threshold nature of the guidelines, the actual sentence awarded is based on a utility maximization problem which spans 6 regions: $S_i = 0, 0 < S_i < G_i^l, S_i = G_i^l, G_i^l < S_i < G_i^h, S_i = G_i^h$, and $G_i^h < S_i$. Cox and Oaxaca (1982) derive a simple Tobit model of the median legislator's preference for a minimum wage based on utility maximization. Generalizing the utility model, we obtain a partially censored Tobit model that allows for mass points at G_i^l and G_i^h as well as at 0. The first set of boundary constraints on S_i arises from a downward departure from the guidelines:

$$\begin{aligned} U'(S_i \quad | \quad -\infty < \dot{S}_i < G_i^l) &\leq 0 \\ S_i \cdot U'(S_i \quad | \quad -\infty < \dot{S}_i < G_i^l) &= 0 \end{aligned}$$

It follows that if the constrained utility maximizing value $\dot{S}_i \; \epsilon(-\infty, G_i^l)$, the actual sentence awarded is determined according to

$$\begin{aligned} S_i &= \max\left[0, \; \dot{S}_i = S_i^* + \theta_l \;\right] \\ &= \max\left[0, \; X_i'\beta + \theta_l + \varepsilon_i\right]. \end{aligned}$$

Thus, the empirical sentencing function is described by:

$$\begin{aligned} S_i &= X_i'\beta + \theta_l + \varepsilon_i \text{ if } 0 < RHS < G_i^l \\ &= 0 \text{ if } RHS \leq 0. \end{aligned}$$

The next set of boundary constraints occur in the interior region that encompasses non-departures from the guidelines.

$$U'(S_i \mid G_i^l < \dot{S}_i < G_i^h) = 0.$$

If the utility maximizing value $\dot{S}_i \ \epsilon (G_i^l, \ G_i^h \ )$, the empirical sentencing function is described by

$$\begin{aligned} S_i &= \dot{S}_i \\ &= S_i^* \\ &= X_i'\beta + \varepsilon_i \end{aligned}$$

Consider now the case for upward departures from the guidelines. If the utility maximizing value $\dot{S}_i > G_i^h$, it follows that

$$U'(S_i \mid G_i^h < \dot{S}_i \ < \infty) = 0.$$

In this case the empirical sentencing function is given by

$$\begin{aligned} S_i &= \dot{S}_i \\ &= S_i^* - \theta_h \\ &= X_i'\beta - \theta_h + \varepsilon_i. \end{aligned}$$

In order to accommodate mass points at G_i^l and G_i^h, we first need to determine the probabilities that the utility maximizing values $\dot{S}_i$ yield sentences that fall in the six regions already considered. From the assumption of a normal distribution on random utilities, it is easily shown that

$$\begin{aligned} prob(S_i &= 0) = prob(\varepsilon_i < -(X_i'\beta + \theta_l)) \\ &= 1 - \Phi\left(\frac{X_i'\beta + \theta_l}{\sigma_\varepsilon}\right) \end{aligned}$$

$$\begin{aligned} prob(0 &< S_i < G_i^l) = prob(S_i < G_i^l) - prob(S_i < 0) \\ &= \Phi\left(\frac{G_i^l - X_i'\beta - \theta_l}{\sigma_\varepsilon}\right) - \left[1 - \Phi\left(\frac{X_i'\beta + \theta_l}{\sigma_\varepsilon}\right)\right] \end{aligned}$$

$$\begin{aligned} prob(G_i^l &< S_i < G_i^h) = prob(S_i^* < G_i^h) - prob(S_i^* < G_i^l) \\ &= \Phi\left(\frac{G_i^h - X_i'\beta}{\sigma_\varepsilon}\right) - \Phi\left(\frac{G_i^l - X_i'\beta}{\sigma_\varepsilon}\right) \end{aligned}$$

$$\begin{aligned} prob(S_i &> G_i^h) = prob(\varepsilon_i > G_i^h - X_i'\beta + \theta_h) \\ &= 1 - \Phi\left(\frac{G_i^h - X_i'\beta + \theta_h}{\sigma_\varepsilon}\right). \end{aligned}$$

To determine the probability of a mass point at $S_i = G_i^l$, note

$$\begin{aligned} prob(S_i &= G_i^l) = prob(S_i^* < G_i^l) - prob(S_i < G_i^l) \\ &= \Phi\left(\frac{G_i^l - X_i'\beta}{\sigma_\varepsilon}\right) - \Phi\left(\frac{G_i^l - X_i'\beta - \theta_l}{\sigma_\varepsilon}\right). \end{aligned}$$

Similarly, the probability of a mass point at $S_i = G_i^h$ is determined according to

$$\begin{aligned} prob(S_i &= G_i^h) = prob(S_i^* > G_i^h) - prob(S_i > G_i^h) \\ &= \left[1 - prob(S_i^* < G_i^h\right] - \left[1 - prob(S_i < G_i^h)\right] \\ &= prob(S_i < G_i^h) - prob(S_i^* < G_i^h) \\ &= \Phi\left(\frac{G_i^h - X_i'\beta + \theta_h}{\sigma_\varepsilon}\right) - \Phi\left(\frac{G_i^h - X_i'\beta}{\sigma_\varepsilon}\right). \end{aligned}$$

It is readily verified that the probabilities over all regions sum to 1. We can summarize the six regions according to

$$
\begin{array}{ll}
\text{Region 1:} & S_i = 0 \\
\text{Region 2:} & 0 < S_i < G_i^l \\
\text{Region 3:} & S_i = G_i^l \\
\text{Region 4:} & G_i^l < S_i < G_i^h \\
\text{Region 5:} & S_i = G_i^h \\
\text{Region 6:} & G_i^h < S_i.
\end{array}
$$

The corresponding log likelihood function for the sentencing model is specified by

$$
\begin{aligned}
ln(L) = & \sum_{S_i=0} ln\left[1-\Phi\left(\frac{X_i'\beta+\theta_l}{\sigma_\varepsilon}\right)\right] \\
& + \sum_{S_i=G_i^l} ln\left[\Phi\left(\frac{G_i^l - X_i'\beta}{\sigma_\varepsilon}\right) - \Phi\left(\frac{G_i^l - X_i'\beta-\theta_l}{\sigma_\varepsilon}\right)\right] \\
& + \sum_{S_i=G_i^h} ln\left[\Phi\left(\frac{G_i^h - X_i'\beta+\theta_h}{\sigma_\varepsilon}\right) - \Phi\left(\frac{G_i^h - X_i'\beta}{\sigma_\varepsilon}\right)\right] \\
& + \sum_{0<S_i<G_i^l} ln\left[\phi\left(\frac{S_i - X_i'\beta-\theta_l}{\sigma_\varepsilon}\right)\right] + \sum_{G_i^l<S_i<G_i^h} ln\left[\phi\left(\frac{S_i - X_i'\beta}{\sigma_\varepsilon}\right)\right] \\
& + \sum_{G_i^h<S_i} ln\left[\phi\left(\frac{S_i - X_i'\beta+\theta_h}{\sigma_\varepsilon}\right)\right] - n \cdot ln(\sigma_\varepsilon)
\end{aligned}
\tag{2}
$$

where n = the number of observations for which $0 < S_i < G_i^l, G_i^l < S_i < G_i^h$, or $G_i^h < S_i$. We term this model a partially censored Tobit model. It bears some resemblance to an ordered probit model.

For each sentencing case there are six conditional sentences corresponding to each possible sentencing region:

$$
\begin{aligned}
E(S_i \quad | \quad & S_i = 0) = 0 \\
E(S_i \quad | \quad & 0 < S_i < G_i^l) = X_i'\beta + \theta_l + \sigma_\varepsilon \left[\frac{\phi\left(\frac{-X_i'\beta - \theta_l}{\sigma_\varepsilon}\right) - \phi\left(\frac{G_i^l - X_i'\beta - \theta_l}{\sigma_\varepsilon}\right)}{\Phi\left(\frac{G_i^l - X_i'\beta - \theta_l}{\sigma_\varepsilon}\right) - \Phi\left(\frac{-X_i'\beta - \theta_l}{\sigma_\varepsilon}\right)} \right] \\
E(S_i \quad | \quad & S_i = G_i^l) = G_i^l \\
E(S_i \quad | \quad & G_i^l < S_i < G_i^h) = X_i'\beta + \sigma_\varepsilon \left[\frac{\phi\left(\frac{G_i^l - X_i'\beta}{\sigma_\varepsilon}\right) - \phi\left(\frac{G_i^h - X_i'\beta}{\sigma_\varepsilon}\right)}{\Phi\left(\frac{G_i^h - X_i'\beta}{\sigma_\varepsilon}\right) - \Phi\left(\frac{G_i^l - X_i'\beta}{\sigma_\varepsilon}\right)} \right] \\
E(S_i \quad | \quad & S_i = G_i^h) = G_i^h \\
E(S_i \quad | \quad & S_i > G_i^h) = X_i'\beta + \frac{\sigma_\varepsilon \phi\left(\frac{G_i^h - X_i'\beta + \phi_h}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{G_i^h - X_i'\beta + \phi_h}{\sigma_\varepsilon}\right)} - \phi_h .
\end{aligned}
$$

The expected sentence for the *ith* case is calculated as

$$
\begin{aligned}
E(S_i) &= prob(S_i = 0) \cdot E(S_i \mid S_i = 0) + prob(0 < S_i < G_i^l) \cdot E(S_i \mid 0 < S_i < G_i^l) \\
+prob(S_i &= G_i^l) \cdot E(S_i \mid S_i = G_i^l) + prob(G_i^l < S_i < G_i^h) \cdot E(S_i \mid G_i^l < S_i < G_i^h) \\
+prob(S_i &= G_i^h) \cdot E(S_i \mid S_i = G_i^h) + prob(S_i > G_i^h) \cdot E(S_i \mid S_i > G_i^h) \\
&= prob(0 < S_i < G_i^l) \cdot E(S_i \mid 0 < S_i < G_i^l) + prob(S_i = G_i^l) \cdot \ G_i^l \\
+prob(G_i^l &< S_i < G_i^h) \cdot E(S_i \mid G_i^l < S_i < G_i^h) + prob(S_i = G_i^h) \cdot G_i^h \\
+prob(S_i &> G_i^h) \cdot E(S_i \mid S_i > G_i^h). \qquad (3)
\end{aligned}
$$

The estimated sentence for the *ith* individual ($\hat{S}_i$) is calculated be evaluating eq(3) at the estimated parameter values.

Decomposition Methodology

To examine how much of the gender/race differences in sentences can be ascribed to leniency toward one group or the other, we apply empirical methods developed in the labor economics literature to estimate gender/race preferences in criminal sentencing outcomes. These methods have the advantage of decomposing group differences in sentencing outcomes into three different components – one due to differences in the observable circumstances of the convictions and the other two pertaining to judicial preferences for each group in a binary comparison.

Judicial sentencing preferences tied to gender and race can be identified from decomposition analysis. The basic idea is to determine how much of a sentencing gap between any two demographic groups can be explained by differences in the circumstances of their cases. Judicial sentencing preferences are identified as a residual from the remainder of the sentencing gap. Conventional decompositions adopt the outcome model of one group as the norm and predict the outcome of the other group from this norm, e.g. Oaxaca (1973). This approach attributes all of the unexplained outcome gap between two groups as the result of the second group's outcome deviating from that predicted on the basis of the outcome model for the first group. A generalized decomposition methodology exists that permits one to apportion the unexplained outcome gap to a positive preference for one group and a negative preference for the other group, e.g. Neumark (1988), Oaxaca and Ransom (1988,1994). A natural norm for the generalized decomposition is the estimated model obtained from pooling the two groups being compared. In the present case of the partially censored Tobit model, we estimate the model with the pooled samples and also separately for each demographic group. The predicted mean sentences are obtained from

$$\hat{S}^0_{wm} = \frac{\sum_{i=1}^{N_{wm}} \hat{S}^0_{wm_i}}{N_{wm}}, \text{ (pooled model)}$$

$$\hat{S}_{wm} = \frac{\sum_{i=1}^{N_{wm}} \hat{S}_{wm_i}}{N_{wm}}, \text{ (own model)}$$

$$\hat{S}^0_{j} = \frac{\sum_{i=1}^{N_{j}} \hat{S}^0_{j_i}}{N_{j}}, \text{ (pooled model)}$$

$$\hat{S}_{j} = \frac{\sum_{i=1}^{N_{f}} \hat{S}_{j_i}}{N_{j}}, \text{ (own model).}$$

where $\bar{S}_{wm} = \frac{\sum_{i=1}^{N_{wm}} S_{wm_i}}{N_{wm}}$, $\bar{S}_j = \frac{\sum_{i=1}^{N_j} S_{j_i}}{N_j}$, wm represents white males, and $j = wf, bm$ for white females and black males.

The decomposition of observed sample mean sentences proceeds according to

$$\begin{aligned} \bar{S}_{wm} - \bar{S}_j &= \left(\hat{S}_{wm} - \hat{S}^0_{wm\_j}\right) + \left(\hat{S}^0_j - \hat{S}_j\right) + \left(\hat{S}^0_{wm\_j} - \hat{S}^0_j\right) + \hat{\delta}_{wm\_j} \\ &= \left(\hat{S}_{wm\_j} - \hat{S}_j\right) + \hat{\delta}_{wm\_j} \end{aligned} \quad (4)$$

where $\hat{\delta}_{wm\_j}$ is the difference between the sample mean sentencing gap $\bar{S}_{wm} - \bar{S}_j$ and the predicted mean sentencing gap $\hat{S}_{wm\_j} - \hat{S}_j = \left(\hat{S}_{wm} - \hat{S}^0_{wm\_j}\right) + \left(\hat{S}^0_j - \hat{S}_j\right) + \left(\hat{S}^0_{wm\_j} - \hat{S}^0_j\right)$. With respect to eq(4), the term $\hat{S}_{wm} - \hat{S}^0_{wm\_j}$ is an estimate judges' sentencing preferences toward white males (when compared with group j), the term $\left(\hat{S}^0_j - \hat{S}_j\right)$ measures sentencing preferences toward group j (when compared with group wm), and the term $\left(\hat{S}^0_{wm\_j} - \hat{S}^0_j\right)$ estimates the portion of the predicted sentencing gap attributable to differences in the case circumstances.

Absence of Guidelines

In order to determine the extent to which the U.S. Federal sentencing guidelines curbed judicial sentencing preferences based on gender and race, one needs to construct a counterfactual. The judicial utility maximization model corresponding to the counterfactual absence of the sentencing guidelines (ignoring statutory sentencing limits) would simply be

$$U_i = \frac{-1}{2}\left(S_i - S_i^{*}\right)^2$$

with the FOC given by

$$\begin{aligned} U'(S_i) &\leq 0 \\ S_i \cdot U' &= 0. \end{aligned}$$

As with Cox and Oaxaca (1982), the FOC lead to the classic Tobit model

$$\begin{aligned} S_i &= \max(0, S_i^*) \\ &= \max(0, X_i'\beta + \varepsilon_i). \end{aligned}$$

Expected sentences in each of the two regimes are given by

$$\begin{aligned} &E(S_i \mid S_i = 0) = 0 \\ &E(S_i \mid 0 < S_i) = X_i'\beta + \sigma_\varepsilon \left[\frac{\phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right)}{\Phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right)}\right] . \end{aligned}$$

The overall expected sentence for the *ith* case is accordingly

$$\begin{aligned} E(S_i) &= prob(S_i = 0) \cdot E(S_i \mid S_i = 0) + prob(S_i > 0) \cdot E(S_i \mid 0 < S_i) \\ &= \Phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right) \cdot \left\{ X_i'\beta + \sigma_\varepsilon \left[\frac{\phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right)}{\Phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right)}\right] \right\} \\ &= \Phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right) \cdot X_i'\beta + \sigma_\varepsilon \cdot \phi\left(\frac{X_i'\beta}{\sigma_\varepsilon}\right). \end{aligned}$$

The estimated parameters from the partially censored Tobit model would be used to obtain the generalized decomposition of the predicted sentence difference in the absence of the guidelines:

$$\tilde{S}_{wm} - \tilde{S}_j = \left(\tilde{S}_{wm} - \tilde{S}^0_{wm\_j}\right) + \left(\tilde{S}^0_j - \tilde{S}_j\right) + \left(\tilde{S}^0_{wm\_j} - \tilde{S}^0_j\right),$$

where

$$\begin{aligned}
\tilde{S}_j &= \frac{\sum_{i=1}^{N_j} \hat{S}_{ji}}{N_j}, \ j = wm, wf, bm \\
\tilde{S}_{ji} &= \Phi\left(\frac{X'_{ji}\hat{\beta}_j}{\hat{\sigma}_{\varepsilon j}}\right) \cdot \left\{ X'_{ji}\hat{\beta}_j + \hat{\sigma}_{\varepsilon j}\left[\frac{\phi\left(\frac{X'_{ji}\hat{\beta}_j}{\hat{\sigma}_{\varepsilon j}}\right)}{\Phi\left(\frac{X'_{ji}\hat{\beta}_j}{\hat{\sigma}_{\varepsilon j}}\right)}\right]\right\} \\
\tilde{S}^0_j &= \frac{\sum_{i=1}^{N_j} \hat{S}^0_{ji}}{N_j} \\
\tilde{S}^0_{ji} &= \Phi\left(\frac{X'_{ji}\hat{\beta}}{\hat{\sigma}_{\varepsilon}}\right) \cdot \left\{ X'_{ji}\hat{\beta} + \hat{\sigma}_{\varepsilon}\left[\frac{\phi\left(\frac{X'_{ji}\hat{\beta}}{\hat{\sigma}_{\varepsilon}}\right)}{\Phi\left(\frac{X'_{ji}\hat{\beta}}{\hat{\sigma}_{\varepsilon}}\right)}\right]\right\}.
\end{aligned}$$

Because there are no actual observed sample means in the absence of the sentencing guidelines, comparisons between the decompositions with and without the guidelines are in terms of predicted differences. The appropriate "difference-in-difference" comparison is given by

$$\begin{aligned}
\left(\hat{S}_{wm} - \hat{S}_j\right) - \left(\tilde{S}_{wm} - \tilde{S}_j\right) &= \left[\left(\hat{S}_{wm} - \hat{S}^0_{wm_j}\right) - \left(\tilde{S}_{wm} - \tilde{S}^0_{wm_j}\right)\right] \\
&+ \left[\left(\hat{S}^0_j - \hat{S}_j\right) - \left(\tilde{S}^0_j - \tilde{S}_j\right)\right] \\
&+ \left[\left(\hat{S}^0_{wm} - \hat{S}^0_j\right) - \left(\tilde{S}^0_{wm_j} - \tilde{S}^0_j\right)\right].
\end{aligned}$$

The term $\left(\hat{S}_{wm} - \hat{S}_j\right) - \left(\tilde{S}_{wm} - \tilde{S}_j\right)$ measures the predicted mean differences in sentences with and without the guidelines. The term $\left(\hat{S}_{wm} - \hat{S}^0_{wm\_j}\right) - \left(\tilde{S}_{wm} - \tilde{S}^0_{wm\_j}\right)$

measures the predicted mean differences in judicial preferences for white male sentences with and without the guidelines. The term $\left(\hat{S}_j^0 - \hat{S}_j\right) - \left(\tilde{S}_j^0 - \tilde{S}_j\right)$ measures the predicted mean differences in judicial preferences for group j sentences with and without the guidelines. Finally, the term $\left(\hat{S}_{wm}^0 - \hat{S}_j^0\right) - \left(\tilde{S}_{wm\_j}^0 - \tilde{S}_j^0\right)$ measures the predicted mean differences in sentencing based on the observed circumstances of the cases with and without the guidelines. Note that some of the observed circumstances are based on the guideline scores for past criminal activity and severity of the current offense.

EMPIRICAL RESULTS

By design the sentencing guidelines largely confined federal court judges to considering only current offense level and criminal history when passing sentence. Specifically, the guidelines excluded race, sex, national origin, creed, religion, and socioeconomic status. Furthermore, employment and family ties and responsibilities were also not to be considered in awarding criminal sentences. With only limited exception, age and education were not supposed to be relevant for sentencing decisions. Nevertheless, a defendant's characteristics and the facts of the case plausibly shape a judge's preferences for the ideal sentence. These are the factors that comprise the covariates in the ideal sentencing function eq.(1) and the associated log likelihood function eq. (2). We also included year and judicial circuit indicator variables. The MLE results are reported in appendix tables that correspond to white males, white females, pooled white males/white females, black males, and pooled white males/black males. Strictly speaking, the estimated parameters represent only the marginal effects for the latent variable S_i^* (ideal sentences). The marginal effects for the actual sentences are far more complicated as they reflect the effects of the covariates on the probabilities of being in each sentencing region and the expected sentences conditional upon being in each of the regions. Generally speaking, the estimated marginal effects on the ideal sentence are what one might expect. A judge's ideal sentence is generally increasing in the extent of past criminal history and the severity of the current offense and decreasing with the presence of a private defense counsel, U.S. citizenship, and with the number of dependents. Being married or cohabiting lowers the ideal sentence for males but has a positive but statistically insignificant effect for females.

Figure 1 displays the distributions of downward departures from the guidelines $(S_i - G_i^l)$ and upward departures from the guidelines $(S_i - G_i^h)$ for the entire sample. It is quite evident that downward departures are unconditionally more prevalent than upward departures. It turns out that 21% of the cases were at the lower guideline with another 45% below the lower guideline. This is in stark contrast with only 6% of the cases that were at the upper guideline. In fact a large mass point occurs just below the upper guideline.

Table 4 reports the estimated marginal utility costs of downward departures (θ_l) and upward departures (θ_h) from the guidelines corresponding to each of our three demographic groups as well as for the two pooled samples with white males. Constrained utility maximization insures that the deviation of the constrained sentence from the ideal sentence is equated to the fixed marginal utility cost of guideline departures: $\dot{S}_i - S_i^* = \theta_l$ and $S_i^* - \dot{S}_i = \theta_h$. Consequently, in the upward departure region, the actual sentence will exceed the guideline but not by as much as would have been preferred in the absence of guideline departure costs. Similarly in the downward departure region the actual sentence will be less than the guideline but not by as much as would have been preferred in the absence of guideline departure costs. For example with white males the utility cost of upward departures is estimated at 25 months, i.e. the constrained sentence exceeds the ideal sentence by 25 months. Also for white males the utility cost of upward departures is estimated at 43 months, i.e. the constrained sentence exceeds the ideal sentence by 43 months. Boundary conditions rule out negative sentences but in the utility framework negative desired sentences could be interpreted as a measure of the extent to which the judge would desire compensation for the convicted defendant. When looking at all three groups we see that the estimated departure costs are uniformly higher for downward departures than for upward departures. The utility costs of departures from the guidelines in either direction are the smallest for white females and the highest for black males. One might have expected that upward departures would be more costly in the cases of white females and white males. However, there are relatively fewer upward departures for white females in any event and the upward departure costs for white males and black males are fairly close.

Tables 5 - 11 report the actual and predicted mean sentences in each of the six sentencing regions as well as the corresponding probabilities of being in each sentencing region. White females have the highest percentage of 0 prison time (Region 1) with 24% of the cases culminating in no prison time followed by white males with 15% receiving 0 prison time and 7% of black male cases culminating in 0 prison time. Compared with the predicted distributions across sentencing regimes from the own estimated models, the predicted distributions from the uniform sentencing process, as reflected in the pooled estimations, are largely unchanged. The same holds true when comparing the predicted conditional mean sentences in each regime. The one exception to this generalization is for white females. The pooled estimation with white males predicts that the probability of a white female receiving a sentence in the highest region doubles to 0.8 percentage points compared with the own estimated model for white females. At the same time the predicted conditional mean sentence in the highest sentencing region increases to 54 months from 45 months when comparing the results from the pooled estimation with those of the own estimation for white females. Furthermore, for white females the predicted overall mean sentence rises to 25 months from 19 months.

Table 12 reports the sentencing decompositions under the guidelines and the counterfactual decompositions in the absence of the guidelines. The first two rows of Table 12 pertain to the white male/white female comparisons and the bottom two rows correspond to the white male/black male comparisons. In the presence of the guidelines, the actual and predicted sentencing gaps between white males and white females are virtually identical at about 20 months. Of the 20 month gap favoring white women, judicial sentencing gender preferences account for about 6 months with the remaining 14 months explained by gender differences in case circumstances. Nearly 1 month of the gap attributable to judicial gender preferences stems from preferences against males and a little over 5 months reflects judicial preferences in favor of females. In the absence of the guidelines, the sentencing gap between white males and white females would be reduced to 19 months, only a reduction of 1 month. The absence of the guidelines would generate a small increase in sentencing preferences against white males versus a nearly 2 month increase in judicial preferences favoring white females. The explained component of the gap would shrink by nearly 3 months. In the case of white males vs. black males, the actual and predicted sentences under the guidelines are virtually identical at -30 months. Of the 30 month gap favoring white males vis á vis black males, judicial sentencing racial preferences account for about 2 months with nearly 28 months of the gap explained by racial differences in the circumstances of the cases. About 1 month of the gap attributable to judicial racial preferences arises from preferences favoring white males and about 1 month stems from preferences against black males. In the absence of the guidelines, judicial preferences toward white males and black males would change very little. The major effect of the absence of the deadline is to reduce the unexplained sentencing gap by nearly 5 months which translates directly into a shrinkage of the racial gap by nearly 5 months.

Figure 2 shows the actual and counterfactual sentencing distributions for white males, white females, and black males. The distributions show that in the absence of the guidelines, the sentencing distributions are shifted to the left. This response reflects the fact that the costs to downward departures from the guidelines are high, so their repeal would result in lower sentences.

CONCLUSION

In determining how much the U.S. Federal Sentencing guidelines impinged on judicial sentencing preferences along gender and racial lines, it is necessary to determine how much of the male-female and white-black sentencing gaps can be explained by circumstances of the sentencing cases other than race and sex. Unlike any studies in the literature so far, our study separates observed gender and race differences in sentencing into two different components – one attributable to differences in case circumstances, and the second attributable to differences in attitudes of sentencing judges towards defendants. The latter is further subdivided into judicial preferences toward each group within a binary comparison. Judicial preferences are captured by a quadratic utility function of the deviation between actual and ideal sentences. Depending on judicial preferences, the presence of sentencing guidelines along with the implicit costs of departures from the guidelines stand in the way of attaining the bliss point of the ideal sentence.

Our econometric model is estimated by FIML and follows directly from the stochastic specification of the utility maximization model in which sentences can depart from the guidelines and in which sentencing mass points exist at 0, at the lower guidelines $\left(G_i^l\right)$ and at the upper guidelines $\left(G_i^h\right)$. Separate estimation for each of our demographic groups and with pooled samples of whites (males and females) and males (whites and blacks) permit us to use a unique decomposition methodology to sort out preferences from circumstances. Such decomposition provides a better insight into the decision-making process of sentencing judges. Knowing whether judges consider extralegal circumstances in their decision making is important, but knowing how they consider extralegal circumstances is useful to policy makers in deciding how to reform sentencing guidelines to ensure equal treatment. This study not only examines whether judges consider extralegal circumstances but if they do, it asks whether they attach the same weight to circumstances of males and females or whites and blacks.

Judges do take into account extralegal factors when passing sentence. We also find that, among whites, women receive prison sentences that average a little over 20 months less than those awarded to men. Even after controlling for circumstances such as the severity of the offense and past criminal history, women receive more lenient sentences. Fourteen months of the 20 month gap are explained by gender differences in case circumstances. Of the remaining 6 month unexplained gap, about 1 month is attributed to sentencing preferences against males and 5 months is attributed to preferences for lighter sentences for females. Among males, whites received prison sentences that averaged about 30 months less than those awarded to blacks. Most of this gap is explained by racial differences in case circumstances (28 months). What little remains as unexplained stems from approximately equal favoritism toward white defendants and preferences against black defendants.

Our results imply that the guidelines actually increased the gender gap slightly, by 1 month. However, the guidelines did increase the explained gender gap by about 3 months with the remainder representing reductions in both the preferences against males and the preferences favoring females with lighter sentences. Racial sentencing gaps were noticeably higher with the guidelines by about 5 months. Virtually all of this increase stems from an increase in the explained gap arising from the circumstances of the cases. Preferences for whites diminished slightly under the guidelines but preferences against blacks rose slightly with virtually no change in total racial bias.

One should bear in mind that our data permit us to examine only the end stage of the criminal justice system. A more comprehensive treatment would take account of the fact that before arriving at the judge for sentencing, a defendant must also pass through a jury or possible plea bargain with a prosecutor. Before reaching this stage, other groups, such as the police and the prosecution, have the potential to create bias in the criminal justice system. Even in light of the Supreme Court's decision in 2005 to strike down the Federal Sentencing Guidelines, our results may offer some guidance as to what to expect now that judges are less constrained in imposing sentences.

REFERENCES

Anderson, James M., Jeffrey R. Kling; and Kate Stith (1999). "Measuring Inter-judge Sentencing Disparity: Before and after the Federal Sentencing Guidelines." *Journal of Law & Economics,* 42: 271 - 298.

Bar-Gill, Oren and Oren Gazal Ayal (2006), "Plea Bargains only for the Guilty," *Journal of Law and Economics*, 49: 353-364.

Cox, James and Ronald L. Oaxaca (1982)."The Political Economy of Minimum Wage Legislation", *Economic Inquiry*, Vol.20, No.4 (October): 533-555.

Deschenes,Elizabeth Piper, Barbara Owen, and Jason Crow (2006). "Recidivism among Female Prisoners: Secondary Analysis of the 1994 BJS Recidivism Data Set", Final Report, National Institute of Justice, U.S. Department of Justice.

Fairly, Robert W. (2005)."An Extension of the Blinder-Oaxaca Decomposition Technique to Logit and Probit Models". *Journal of Economic and Social Measurement.* 30(4): 305-316.

Lacasse, Chantal and A. Abigail Payne (1999). "Federal Sentencing Guidelines and Mandatory Minimum Sentences: Do Defendants Bargain in the Shadow of the Judge?" *Journal of Law and Economics*, 42(1), Part 2: 245-269.

Langan, Patricia A. and David J. (2002). "Recidivism of Prisoners Released in 1994". Special Report. Bureau of Justice Statistics, U.S. Department of Justice.

Miceli, Thomas, J. (2008). "Criminal sentencing Guidelines and Judicial Discretion," *Contemporary Economic Policy*, 26(2): 207-215.

Mustard, D.B. (2001) "Racial, Ethnic, and Gender Disparities in Sentencing: Evidence from the U.S. Federal Courts." *Journal of Law and Economics*, 44: 285-314.

Neumark, David (1988). "Employers' Discriminatory Behavior and the Estimation of Wage Discrimination," *Journal of Human Resources* 23: 279-295.

Oaxaca, Ronald L. (1973). "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review,* 14(3): 693-709.

Oaxaca, Ronald L. and Michael R. Ransom. (1988). "Searching for the Effect of Unionism on the Wages of Union and Nonunion Workers," *Journal of Labor Research,* 9: 139-148.

Oaxaca, Ronald L. and Ransom, Michael R. (1994) "On Discrimination and the Decomposition of Wage Differentials", *Journal of Econometrics*, 61(1), (March): 5-21.

Reinganum, Jennifer (1998), "Plea Bargaining and Prosecutorial Discretion," *American Economic Review*,78: 713-728.

_________(2000). "Sentencing Guidelines, Judicial Discretion, and Plea Bargaining," *RAND Journal of Economics*,31(1): 62-81.

Schanzenbach, M.(2005). "Racial and Sex Disparities in Prison Sentences: The Effect of District-Level Judicial Demographics", *Journal of Legal Studies,* 34: 57-92.

Schazenbach, M., and Emerson Tiller (2007). "Strategic Judging Under the United States sentencing Guidelines: Positive Political Theory and Evidence," *Journal of Law, Economics and Organization*, 23: 24-56.

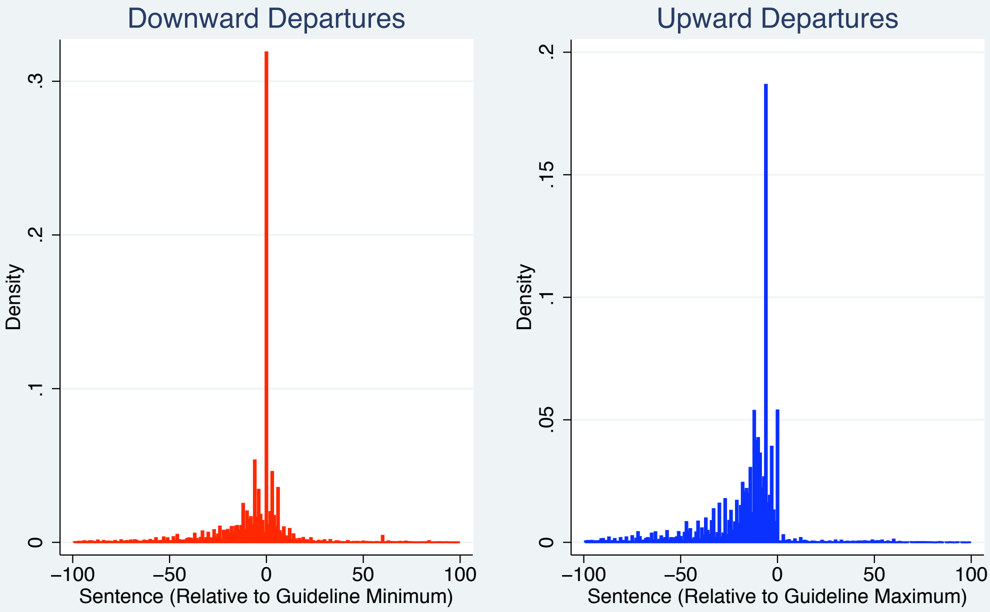
Shavell, Steven (2005). "Optimal Discretion in the Application of Rules," *The Harvard John M. Olin Discussion Paper* No. 509.

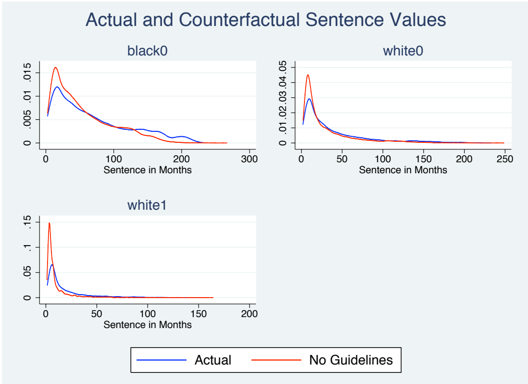
Stith, Kate, and Steve Y. Koh (1993). "The Politics of Sentencing Reform: The Legislative History of the Federal Sentencing Guidelines," *Wake Forest Law Review*, 28: 223-290.

Waldfogel, Joel (1998). "Does inter-Judge Disparity Justify Empirically Based sentencing Guidelines?" *International Review of Law and Economics*,18: 293-304.

Figure 1

Mass Points





Actual and Counterfactual Sentence Values
black0
0
.005
.01
.015
0
100
200
300
Sentence in Months
white0
0
.01
.02
.03
.04
.05
0
50
100
150
200
250
Sentence in Months
white1
0
.05
.1
.15
0
50
100
150
200
Sentence in Months
Actual
No Guidelines

Figure 2

Table 1: **Summary Stats for White Males**

variable	mean	sd	min	max	N
TOTALMON	35.54	50.98	0.00	783.00	35020.00
HISCHOOL	0.46	0.50	0.00	1.00	35020.00
GED	0.14	0.34	0.00	1.00	35020.00
SOMECOLL	0.24	0.43	0.00	1.00	35020.00
COLLGRAD	0.12	0.33	0.00	1.00	35020.00
CITIZN	0.95	0.22	0.00	1.00	35020.00
MARRD	0.26	0.44	0.00	1.00	35020.00
NUMDEPEN	1.13	1.43	0.00	12.00	35020.00
DEFENSEP	0.37	0.48	0.00	1.00	35020.00
CRIMHIS2	0.12	0.33	0.00	1.00	35020.00
CRIMHIS3	0.13	0.34	0.00	1.00	35020.00
CRIMHIS4	0.07	0.26	0.00	1.00	35020.00
CRIMHIS5	0.04	0.20	0.00	1.00	35020.00
CRIMHIS6	0.09	0.29	0.00	1.00	35020.00
XFOLSOR	17.00	8.12	0.00	50.00	35020.00
XFOLSOR2	354.92	313.93	0.00	2500.00	35020.00
XFOLSOR3	8505.91	10852.87	0.00	125000.00	35020.00
AGE	37.82	11.19	18.00	65.00	35020.00
AGE2	1555.46	894.82	324.00	4225.00	35020.00
CIRC2	0.12	0.32	0.00	1.00	35020.00
CIRC3	0.05	0.21	0.00	1.00	35020.00
CIRC4	0.05	0.21	0.00	1.00	35020.00
CIRC5	0.10	0.30	0.00	1.00	35020.00
CIRC6	0.08	0.27	0.00	1.00	35020.00
CIRC7	0.04	0.20	0.00	1.00	35020.00
CIRC8	0.08	0.27	0.00	1.00	35020.00
CIRC9	0.27	0.44	0.00	1.00	35020.00
CIRC10	0.05	0.23	0.00	1.00	35020.00
CIRC11	0.14	0.34	0.00	1.00	35020.00
y1	0.12	0.33	0.00	1.00	35020.00
y2	0.13	0.34	0.00	1.00	35020.00
y3	0.13	0.34	0.00	1.00	35020.00
y4	0.14	0.34	0.00	1.00	35020.00
y5	0.14	0.35	0.00	1.00	35020.00
y6	0.16	0.36	0.00	1.00	35020.00

Source: /Groups/CourtSentences/data/finaldata/data13June2010.dta

Table 2: **Summary Stats for White Females**

variable	**mean**	**sd**	**min**	**max**	**N**
TOTALMON	15.25	28.18	0.00	384.00	7690.00
HISCHOOL	0.50	0.50	0.00	1.00	7690.00
GED	0.12	0.32	0.00	1.00	7690.00
SOMECOLL	0.28	0.45	0.00	1.00	7690.00
COLLGRAD	0.07	0.25	0.00	1.00	7690.00
CITIZN	0.97	0.16	0.00	1.00	7690.00
MARRD	0.25	0.43	0.00	1.00	7690.00
NUMDEPEN	1.09	1.30	0.00	10.00	7690.00
DEFENSEP	0.30	0.46	0.00	1.00	7690.00
CRIMHIS2	0.09	0.29	0.00	1.00	7690.00
CRIMHIS3	0.10	0.30	0.00	1.00	7690.00
CRIMHIS4	0.03	0.17	0.00	1.00	7690.00
CRIMHIS5	0.02	0.13	0.00	1.00	7690.00
CRIMHIS6	0.03	0.16	0.00	1.00	7690.00
XFOLSOR	13.93	7.37	0.00	42.00	7690.00
XFOLSOR2	248.40	259.94	0.00	1764.00	7690.00
XFOLSOR3	5311.95	8351.60	0.00	74088.00	7690.00
AGE	35.92	10.51	18.00	65.00	7690.00
AGE2	1400.84	811.21	324.00	4225.00	7690.00
CIRC2	0.08	0.27	0.00	1.00	7690.00
CIRC3	0.04	0.19	0.00	1.00	7690.00
CIRC4	0.05	0.21	0.00	1.00	7690.00
CIRC5	0.12	0.32	0.00	1.00	7690.00
CIRC6	0.09	0.29	0.00	1.00	7690.00
CIRC7	0.04	0.20	0.00	1.00	7690.00
CIRC8	0.09	0.29	0.00	1.00	7690.00
CIRC9	0.28	0.45	0.00	1.00	7690.00
CIRC10	0.06	0.24	0.00	1.00	7690.00
CIRC11	0.13	0.34	0.00	1.00	7690.00
y1	0.12	0.32	0.00	1.00	7690.00
y2	0.13	0.33	0.00	1.00	7690.00
y3	0.14	0.35	0.00	1.00	7690.00
y4	0.15	0.36	0.00	1.00	7690.00
y5	0.15	0.35	0.00	1.00	7690.00
y6	0.15	0.36	0.00	1.00	7690.00

Source: /Groups/CourtSentences/data/finaldata/data13June2010.dta

Table 3: **Summary Stats for Black Males**

variable	mean	sd	min	max	N
TOTALMON	65.64	69.00	0.00	894.00	25064.00
HISCHOOL	0.58	0.49	0.00	1.00	25064.00
GED	0.12	0.33	0.00	1.00	25064.00
SOMECOLL	0.19	0.40	0.00	1.00	25064.00
COLLGRAD	0.04	0.19	0.00	1.00	25064.00
CITIZN	0.91	0.28	0.00	1.00	25064.00
MARRD	0.22	0.41	0.00	1.00	25064.00
NUMDEPEN	1.62	1.81	0.00	22.00	25064.00
DEFENSEP	0.20	0.40	0.00	1.00	25064.00
CRIMHIS2	0.12	0.32	0.00	1.00	25064.00
CRIMHIS3	0.19	0.39	0.00	1.00	25064.00
CRIMHIS4	0.12	0.33	0.00	1.00	25064.00
CRIMHIS5	0.08	0.26	0.00	1.00	25064.00
CRIMHIS6	0.17	0.37	0.00	1.00	25064.00
XFOLSOR	20.83	9.25	0.00	49.00	25064.00
XFOLSOR2	519.47	389.89	0.00	2401.00	25064.00
XFOLSOR3	14338.05	14416.13	0.00	117649.00	25064.00
AGE	31.65	9.06	18.00	65.00	25064.00
AGE2	1083.75	659.57	324.00	4225.00	25064.00
CIRC2	0.12	0.33	0.00	1.00	25064.00
CIRC3	0.06	0.24	0.00	1.00	25064.00
CIRC4	0.11	0.32	0.00	1.00	25064.00
CIRC5	0.11	0.31	0.00	1.00	25064.00
CIRC6	0.13	0.33	0.00	1.00	25064.00
CIRC7	0.04	0.20	0.00	1.00	25064.00
CIRC8	0.07	0.25	0.00	1.00	25064.00
CIRC9	0.11	0.32	0.00	1.00	25064.00
CIRC10	0.03	0.16	0.00	1.00	25064.00
CIRC11	0.21	0.41	0.00	1.00	25064.00
y1	0.12	0.33	0.00	1.00	25064.00
y2	0.13	0.34	0.00	1.00	25064.00
y3	0.13	0.34	0.00	1.00	25064.00
y4	0.14	0.35	0.00	1.00	25064.00
y5	0.15	0.36	0.00	1.00	25064.00
y6	0.16	0.37	0.00	1.00	25064.00

Source: /Groups/CourtSentences/data/finaldata/data13June2010.dta

Table 4: Key Parameter Estimates by Group

Group	θ_l	θ_h
White Males	43.00	25.16
White Females	32.45	17.25
Black Males	52.49	27.97
Males	47.35	26.67
Whites	42.17	24.12

Table 5: Sentencing Outcomes for White Males with Own Weights

Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.15	0.00	0.24
2	36.18	0.31	29.62	0.21
3	47.08	0.19	43.18	0.31
4	31.62	0.24	47.68	0.06
5	48.31	0.06	56.72	0.10
6	119.37	0.04	75.54	0.09
Total	35.54	.	39.69	.

Table 6: Sentencing Outcomes for White Males with Pooled (White) Male/Female Weights

Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.15	0.00	0.25
2	36.18	0.31	29.54	0.22
3	47.08	0.19	43.18	0.31
4	31.62	0.24	47.62	0.05
5	48.31	0.06	56.72	0.09
6	119.37	0.04	75.33	0.08
Total	35.54	.	38.73	.

Table 7: Sentencing Outcomes for White Males with Pooled (Male) Black/Whites Weights

Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.15	0.00	0.24
2	36.18	0.31	29.30	0.19
3	47.08	0.19	43.18	0.31
4	31.62	0.24	47.78	0.05
5	48.31	0.06	56.72	0.10
6	119.37	0.04	78.30	0.09
Total	35.54	.	40.62	.

Table 8: Sentencing Outcomes for Black Males with Own Weights

Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.07	0.00	0.14
2	64.63	0.32	52.27	0.26
3	76.32	0.25	76.13	0.31
4	59.19	0.25	82.80	0.07
5	59.43	0.06	100.66	0.10
6	143.51	0.05	118.50	0.11
Total	65.64	.	69.37	.

Table 9: Sentencing Outcomes for Black Males with Pooled (Male) Black/White Weights

Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.15	0.00	0.14
2	64.63	0.32	53.02	0.28
3	76.32	0.25	76.13	0.31
4	59.19	0.25	82.60	0.07
5	59.43	0.06	100.66	0.10
6	143.51	0.05	115.34	0.10
Total	65.64	.	68.15	.

Table 10: Sentencing Outcomes for White Females with Own Weights

Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.24	0.00	0.32
2	21.18	0.31	17.03	0.23
3	33.55	0.13	25.02	0.31
4	9.03	0.28	28.23	0.04
5	27.05	0.03	34.53	0.07
6	74.37	0.01	44.77	0.04
Total	15.25	.	19.48	.

Table 11: Sentencing Outcomes for White Females with Pooled (White)

Male/Female Weights				
Region	$\bar{S}$	$\bar{P}$	$\hat{S}$	$\hat{P}$
1	0.00	0.24	0.00	0.32
2	21.18	0.31	17.99	0.15
3	33.55	0.13	25.02	0.31
4	9.03	0.28	28.60	0.05
5	27.05	0.03	34.53	0.10
6	74.37	0.01	54.04	0.08
Total	15.25	.	25.00	.

Table 12: Decomposition of Sentencing Gap

	Total Gap	Predicted Gap	Preference Towards White Males	Preference Towards Other Group	Explained Gap
Actual (wm/wf)	20.29	20.21	0.96	5.52	13.73
No Guidlines	.	19.14	1.48	6.96	10.69
Actual (wm/bm)	-30.10	-29.68	-0.93	-1.22	-27.53
No Guidelines	.	-25.07	-1.06	-0.93	-23.07

Appendix Tables

Table 1: White Males

Variable	Coefficient	(Std. Err.)
Equation 1 : eq1		
HISCHOOL	-1.381	(1.412)
GED	2.354	(1.547)
SOMECOLL	-3.567	(1.472)
COLLGRAD	-2.366	(1.606)
CITIZN	-6.897	(1.264)
MARRD	-4.229	(0.761)
NUMDEPEN	-0.996	(0.209)
DEFENSEP	-9.100	(0.624)
CRIMHIS2	6.137	(0.882)
CRIMHIS3	16.237	(0.856)
CRIMHIS4	28.290	(1.113)
CRIMHIS5	35.493	(1.402)
CRIMHIS6	53.698	(1.036)
XFOLSOR	-4.010	(0.349)
XFOLSOR2	0.278	(0.019)
XFOLSOR3	-0.002	(0.000)
AGE	0.551	(0.169)
AGE2	-0.006	(0.002)
CIRC2	-10.144	(1.840)
CIRC3	-0.489	(2.091)
CIRC4	15.937	(2.058)
CIRC5	12.849	(1.855)
CIRC6	6.605	(1.901)
CIRC7	19.859	(2.118)
CIRC8	-2.746	(1.914)
CIRC9	-4.762	(1.730)
CIRC10	1.922	(2.027)
CIRC11	8.464	(1.800)
y1	1.123	(1.064)
y2	0.524	(1.046)
y3	1.520	(1.044)
y4	0.480	(0.983)
y5	0.095	(0.971)
y6	-0.353	(0.947)
Intercept	-21.254	(4.324)
Equation 2 : sigma		
Intercept	49.285	(0.289)
Equation 3 : beta_L		
Intercept	42.995	(0.476)
Equation 4 : beta_H		
Intercept	25.163	(0.540)

Table 2: White Females

Variable	Coefficient	(Std. Err.)
Equation 1 : eq1		
HISCHOOL	0.962	(2.075)
GED	2.421	(2.302)
SOMECOLL	1.392	(2.135)
COLLGRAD	0.719	(2.547)
CITIZN	-8.135	(2.396)
MARRD	0.270	(1.028)
NUMDEPEN	-0.323	(0.313)
DEFENSEP	-0.249	(0.891)
CRIMHIS2	5.223	(1.330)
CRIMHIS3	10.923	(1.320)
CRIMHIS4	17.953	(2.189)
CRIMHIS5	28.504	(2.899)
CRIMHIS6	32.897	(2.354)
XFOLSOR	-3.547	(0.491)
XFOLSOR2	0.187	(0.030)
XFOLSOR3	0.000	(0.001)
AGE	0.544	(0.246)
AGE2	-0.007	(0.003)
CIRC2	-4.724	(3.078)
CIRC3	6.306	(3.408)
CIRC4	13.846	(3.255)
CIRC5	22.150	(2.962)
CIRC6	13.284	(3.028)
CIRC7	23.784	(3.322)
CIRC8	1.728	(3.024)
CIRC9	6.255	(2.834)
CIRC10	8.606	(3.146)
CIRC11	12.051	(2.934)
y1	0.080	(1.542)
y2	1.587	(1.502)
y3	1.917	(1.456)
y4	-0.359	(1.371)
y5	0.948	(1.389)
y6	0.540	(1.368)
Intercept	-24.100	(6.387)
Equation 2 : sigma		
Intercept	31.802	(0.432)
Equation 3 : beta_L		
Intercept	32.455	(0.775)
Equation 4 : beta_H		
Intercept	17.246	(1.055)

Table 3: White Males and White Females (Pooled)

Variable	**Coefficient**	**(Std. Err.)**
Equation 1 : eq1		
HISCHOOL	-1.223	(1.245)
GED	2.194	(1.368)
SOMECOLL	-2.949	(1.294)
COLLGRAD	-1.309	(1.428)
CITIZN	-8.003	(1.150)
MARRD	-3.076	(0.660)
NUMDEPEN	-0.920	(0.184)
DEFENSEP	-6.757	(0.546)
CRIMHIS2	7.087	(0.778)
CRIMHIS3	17.033	(0.756)
CRIMHIS4	29.480	(1.011)
CRIMHIS5	37.529	(1.282)
CRIMHIS6	55.647	(0.945)
XFOLSOR	-4.434	(0.302)
XFOLSOR2	0.291	(0.017)
XFOLSOR3	-0.002	(0.000)
AGE	0.464	(0.148)
AGE2	-0.005	(0.002)
CIRC2	-9.161	(1.653)
CIRC3	0.920	(1.872)
CIRC4	15.776	(1.832)
CIRC5	14.401	(1.652)
CIRC6	8.010	(1.694)
CIRC7	20.957	(1.883)
CIRC8	-2.836	(1.701)
CIRC9	-3.065	(1.549)
CIRC10	2.689	(1.797)
CIRC11	9.084	(1.611)
y1	1.208	(0.936)
y2	0.836	(0.919)
y3	1.486	(0.913)
y4	0.052	(0.859)
y5	0.082	(0.853)
y6	-0.453	(0.833)
Intercept	-19.487	(3.785)
Equation 2 : sigma		
Intercept	47.511	(0.256)
Equation 3 : beta_L		
Intercept	42.172	(0.423)
Equation 4 : beta_H		
Intercept	24.118	(0.488)

Table 4: Black Males

Variable	**Coefficient**	**(Std. Err.)**
Equation 1 : eq1		
HISCHOOL	2.140	(1.594)
GED	4.576	(1.875)
SOMECOLL	-0.630	(1.764)
COLLGRAD	-2.102	(2.561)
CITIZN	-8.427	(1.446)
MARRD	-4.899	(1.060)
NUMDEPEN	-0.746	(0.227)
DEFENSEP	-3.909	(0.991)
CRIMHIS2	9.256	(1.308)
CRIMHIS3	21.113	(1.135)
CRIMHIS4	33.965	(1.323)
CRIMHIS5	41.446	(1.579)
CRIMHIS6	58.640	(1.256)
XFOLSOR	-0.418	(0.523)
XFOLSOR2	0.140	(0.027)
XFOLSOR3	0.000	(0.000)
AGE	-0.731	(0.283)
AGE2	0.006	(0.004)
CIRC2	-4.943	(3.131)
CIRC3	10.589	(3.317)
CIRC4	25.956	(3.137)
CIRC5	18.366	(3.157)
CIRC6	16.433	(3.122)
CIRC7	32.489	(3.475)
CIRC8	14.490	(3.268)
CIRC9	8.197	(3.138)
CIRC10	5.090	(3.783)
CIRC11	18.203	(3.043)
y1	-1.681	(1.484)
y2	-1.844	(1.454)
y3	-2.525	(1.459)
y4	-2.278	(1.383)
y5	-2.906	(1.360)
y6	-0.310	(1.340)
Intercept	-31.940	(6.737)
Equation 2 : sigma		
Intercept	59.237	(0.383)
Equation 3 : beta_L		
Intercept	52.490	(0.662)
Equation 4 : beta_H		
Intercept	27.969	(0.688)

Table 5: Black Males and White Males (Pooled)

Variable	Coefficient	(Std. Err.)
Equation 1 : eq1		
HISCHOOL	0.248	(1.060)
GED	2.884	(1.195)
SOMECOLL	-2.321	(1.132)
COLLGRAD	-1.511	(1.325)
CITIZN	-7.855	(0.942)
MARRD	-4.887	(0.629)
NUMDEPEN	-0.593	(0.151)
DEFENSEP	-7.761	(0.538)
CRIMHIS2	7.736	(0.750)
CRIMHIS3	19.128	(0.689)
CRIMHIS4	32.186	(0.847)
CRIMHIS5	39.519	(1.039)
CRIMHIS6	56.727	(0.792)
XFOLSOR	-3.163	(0.294)
XFOLSOR2	0.256	(0.016)
XFOLSOR3	-0.002	(0.000)
AGE	-0.271	(0.144)
AGE2	0.002	(0.002)
CIRC2	-8.558	(1.643)
CIRC3	4.032	(1.804)
CIRC4	20.291	(1.710)
CIRC5	14.753	(1.656)
CIRC6	10.507	(1.660)
CIRC7	24.687	(1.865)
CIRC8	3.343	(1.713)
CIRC9	-1.565	(1.579)
CIRC10	3.073	(1.866)
CIRC11	12.156	(1.597)
y1	-0.060	(0.882)
y2	-0.558	(0.867)
y3	-0.176	(0.867)
y4	-0.593	(0.819)
y5	-0.929	(0.808)
y6	-0.336	(0.792)
Intercept	-16.929	(3.646)
Equation 2 : sigma		
Intercept	54.119	(0.235)
Equation 3 : beta_L		
Intercept	47.352	(0.393)
Equation 4 : beta_H		
Intercept	26.667	(0.431)