Decomposition of Racial Differences in Sentencing: Application of an Econometric Technique to Cocaine Possession Cases

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This article applies an econometric decomposition technique to analysis of racial group differences in incarceration and sentencing of cocaine possession offenders. The standard 2-stage modeling approach is used to analyze the incarceration decision first and then, for offenders who are incarcerated, the length of the sentence. About a third of the difference in incarceration rates between Blacks and others can be attributed to the endowments, or characteristics, of the offenders' cases. This means that it is not possible to reject the hypothesis that there is racial bias in incarceration decisions. In contrast, for those who are incarcerated, the differences in sentence length across racial groups are attributed entirely to endowments.

KEYTERMS   Race, sentencing, decomposition of group differences

INTRODUCTION

Drawing on data gathered by the U.S. Census Bureau for the 2000 census, Human Rights Watch documented racial disparities in the incarceration of offenders in each state.[1] The figures reveal that, out of a total population of about 1,976,000 incarcerated in adult facilities, 63% are African American or Hispanic. In Kentucky, the rate of incarceration per 100,000 state residents is 466 for Whites, 3,375 for African Americans, and 2,059 for Hispanics. While 1.3% of White adult men (age 18 to 64) are incarcerated in Kentucky, 10.3% of African American adult men are behind bars in the state. As of the 2000

census, African Americans represented 7.7% of Kentucky residents, 19.5% of the population of Jefferson County, which is the focus of this study, and 35.3% of the incarcerated population.[2] Among other public policy concerns, the high rate of incarceration is having a severe adverse impact on the socioeconomic status of Black men (Raphael, 2006).

These statistics raise serious questions about how African Americans and Hispanics are treated at various stages of the justice administration process. This article focuses on fairness in incarceration and length of sentence decisions for African American cocaine possession offenders.[3] It does not assess fairness in detecting, arresting, or charging individuals with crimes or in regard to what happens after sentencing, such as parole decisions. The data include cocaine possession convictions that took place in Jefferson County between early 1999 and late 2002. Kentucky law does not distinguish between crack, powder, and other forms of cocaine (Kentucky Revised Statutes § 218A.1415), meaning that the same penalties apply to possession of different types of cocaine. Jefferson County is the most populous in Kentucky and merged with the City of Louisville in 2003 to become Louisville Metro.

Although this article provides some new empirical evidence about racial bias in sentencing, its primary contribution is methodological. Specifically, it applies a decomposition technique from the econometrics literature to analyze racial differences in sentencing decisions. First developed in the field of labor economics in the early 1970s by Blinder (1973) and Oaxaca (1973), this technique decomposes the differences between two groups (in this case, the differences in incarceration rates and sentence lengths) into what is referred to as "endowment" and "residual" effects. Endowment effects are due to the characteristics of the two groups (such as criminal histories), while residual effects refer to the ways those characteristics are translated by the criminal justice system into sentencing decisions (plus the impacts of relevant factors not accounted for in the sentencing model). To the extent that racial differences in sentencing are due entirely to differences in endowments, then the justice system is treating both groups the same, at least with respect to sentencing. Otherwise, there is likely some bias in the system. This decomposition technique provides a much more precise means for analyzing group differences in sentencing than has previously been employed in the criminal justice literature. A review of the literature suggests that this technique has been used only to a very limited extent in criminology—in a recent comparison of charge bargaining in Maryland and Washington by Piehl and Bushway (2007).

PREVIOUS STUDIES OF RACIAL AND ETHNIC DISPARITIES

In an effort to discover an explanation for the disproportionate representation of racial and ethnic minorities in U.S. correctional institutions, numerous

empirical studies have examined the impact of race on the sentencing of criminal offenders. As Pratt (1998) notes, empirical research has given support to the arguments that race does not play a role, plays a direct role, or has an indirect role in the sentencing process. Early reviews of race-sentencing studies (Hagan, 1974; Kleck, 1981) concluded that the effect of race on sentencing was largely inflated in those studies and that, when other factors were properly controlled for, the race effect was eliminated. Methodological inconsistencies—different definitions of race, differing structural contexts across jurisdictions, the absence of formal models for comparing different case dispositions, single versus multiple jurisdiction studies, or differing levels of aggregation of data—contributed to differences in research outcomes (Pratt, 1998).

In a review of 38 state-court race and sentencing studies published between 1975 and 1991, Chiricos and Crawford (1995) examined racial differences in incarceration and sentence length decisions. The authors concluded that Blacks are consistently at a disadvantage in incarceration outcomes, but no consistent Black disadvantage was found with respect to sentence length. More recent studies examining the influence of race on sentencing decisions in state and federal courts appear to support the conclusion of African American disadvantage and White advantage in incarceration decisions (Albonetti, 1997; Steffensmeier & Demuth, 2000). For example, using data on sentencing practices in Pennsylvania from 1991 to 1994 and comparing sentence outcomes for White, African American, and Hispanic defendants, Steffensmeier and Demuth (2001) found that Hispanic defendants are most at risk to receive the harshest penalties, while White defendants have the lowest risk. In a meta-analysis of over 300 studies of race and sentencing, Mitchell (2005) concluded that racial bias persists even when researchers do a more thorough job of controlling for relevant factors, such as criminal history. Moreover, the bias is greater with respect to incarceration decisions (as opposed to sentence-length decisions) and drug offenses.

In their summary of relevant sociological research, Steffensmeier and Demuth (2000) suggest three reasons for harsher sentencing of members of minority groups: "(1) they lack the resources to resist the imposition of negative labels . . ., (2) their behavior threatens the economic and moral interests of more powerful groups . . ., and (3) because crime is feared more and the sanctions will be harsher when criminals are perceived to be racially or culturally dissimilar and hence more 'dangerous' and 'unpredictable'" (p. 708)

Other researchers have focused on the role of the bureaucratic and political environment in an attempt to explain both disparities across locations within the United States and between the United States and other countries. It has been suggested by, for example, Hagan and Bumiller (1983) that racial discrimination is least likely to occur in large urban

jurisdictions because "these court settings may be too important symbolically and too bureaucratic organizationally to allow overt discrimination as a frequent occurrence" (p. 32). Helms and Jacobs (2002) suggest that the differences between rural and urban sentencing practices may have more to do with the likelihood that rural areas have a conservative political environment. Some studies (see the summary in Chiricos & Crawford, 1995) have found that racial bias is more likely to occur in the South, of which Kentucky is a part. Again, this may be due to a more conservative political environment.

In a comparison of the United States and Germany, Savelsberg (1994) emphasizes the political context in explaining differences in incarceration rates. He argues that incarceration rates are not a direct response to crime rates but instead have to do with how knowledge about criminal justice is produced and applied in different countries. Germany has a much more bureaucratized approach to ideas about criminal justice, which has resulted in greater stability in sentencing practice. In contrast, the more public approach to the production of knowledge about criminal sentencing in the United States has allowed a huge increase in incarceration rates to take place.

Helms and Jacobs (2002) argue that, even within the United States, political context helps to explain differences in sentencing. Using county-level data from seven states, they show that support for the Republican candidate in the 1988 presidential election is associated with longer sentences for both African Americans and males. The conservative bias against African Americans may be because that group is perceived as a particular threat to law and order, while the differential treatment of men and women may be based in conservative views that the two sexes should be treated differently. It is not clear exactly how this might play out in Jefferson County, which is probably near the middle of the political spectrum. One could speculate that Jefferson County is not liberal enough to avoid sentencing bias on the basis of either race or gender and that African American male criminals in particular should be more likely to be incarcerated than others in Jefferson County.

Previous research on sentencing in Kentucky has for the most part focused on homicide cases involving both capital and noncapital punishment. Vito and Keil (1988) and Keil and Vito (1989, 1990, 1995, 2006) conclude that capital punishment was more likely in cases in which Blacks killed Whites. Vito and Keil (2000) find that racial bias also exists in sentencing in noncapital murder cases. In a study of a sample of male felons incarcerated in Kentucky in 1980, Crew (1991) concludes that Blacks tended to have longer sentences because they were charged with more serious crimes relative to the severity of the offense than was true for Whites.

THE CRIMINAL JUSTICE PROCESS AND IMPLICATIONS
FOR THE ANALYSIS OF SENTENCING DECISIONS

Racial or ethnic discrimination in sentencing is complicated by the fact that discriminatory treatment can occur at earlier stages in the criminal justice process and that this can bias the conclusions reached from analysis of sentencing alone. Differential treatment can occur at the detection, arrest, bail, charging, and conviction stages of the process. The statistical distortions that result from failure to include all offenders in a sample are known as "sample selection bias" (Berk, 1983; Heckman, 1979). In studies of sentencing, the sample typically includes only those offenders who were convicted of a crime, excluding all offenders who were not convicted, charged, arrested, or detected. Failure to account for the treatment of offenders who were not convicted may distort the results obtained from analysis of those who were convicted. Generally, the impact of sample selection bias is that analyses of sentencing alone are less likely to find evidence of racial or ethnic bias than would be the case if it were possible to undertake a complete analysis of all offenders. For example, White cocaine users may be less likely to be detected and arrested than Black users, suggesting that any bias found at the sentencing stage will understate the overall bias against Blacks.[4]

Recent research on sentencing has introduced controls for sample selection bias that may occur within the sentencing process (e.g., Steffensmeier & Demuth, 2001). This research recognizes that sentencing is a two-stage process involving first an incarceration decision and then a decision about the length of the sentence for those who are incarcerated. Following Heckman (1979), the methodological approach to this is to estimate a two-stage model in which the first stage is a logit (also referred to as logistic) or probit regression equation explaining the likelihood of incarceration, and the second stage is an ordinary least squares (OLS) equation explaining the length of sentence for only those offenders who are incarcerated. The Heckman method uses the results from the first stage to calculate values for a new variable (referred to as an inverse Mills ratio) that is incorporated as an additional independent variable in the second-stage equation. This new variable adds a control for the probability of incarceration in the second-stage equation, thereby eliminating sample selection bias that might result from limiting the second-stage sample to only those offenders who are incarcerated.[5] The Heckman method is applied in the present study.

In addition to sample selection bias, there are a number of other problems that plague sentencing research. For example, racial and ethnic bias in the process that led to prior convictions may affect current sentencing decisions (Hagan & Bumiller, 1983). Kentucky criminal law provides for penalty enhancements for persistent felony offenders (Kentucky Revised Statutes [KRS] § 532.080). African American individuals could be more likely to be

subjected to the persistent felony offender statute due to bias that occurred in the process that led to the prior conviction (or convictions). This is possible even if there were no additional racial bias in the process that led to the current conviction and sentence.

Moreover, racial and ethnic bias is to some extent institutionalized in decisions regarding bail. In Kentucky, eligibility for pretrial release is evaluated using a point system that gives credit for, among other things, economic ties to the community (Kentucky Rules of Criminal Procedure [RCr] 4.06). Points are given for employment, with higher scores for longevity, as well as property ownership in Kentucky. To the extent that African Americans are less likely to have these kinds of ties, they are less likely to be eligible for pretrial release. Bail status is of concern in part because offenders who are in jail at the time of sentencing may be more likely to be further incarcerated. One way to respond to this issue is to determine whether jail time served prior to sentencing does in fact increase the probability of subsequent incarceration. If so, then any bias built into pretrial release decisions is leading to bias in subsequent incarceration decisions.[6]

One problem associated with the analysis of a specific crime as distinct from a set of related crimes is that charges are often amended or dismissed in the process of plea bargaining. Thus, a drug trafficking charge may be amended down to a possession charge. The decision to amend or dismiss charges may itself be subject to racial or ethnic bias. One approach to this problem is to analyze convictions for related types of crimes together in one model. In this approach, cocaine possession and trafficking would be analyzed together, for example. However, this approach leads to other problems due to the implied assumption that the factors affecting sentencing for one type of crime are the same as those affecting sentencing for other types. Although this study does not address the possibility of racial bias in decisions about amending and dismissing charges, it does explore the effects of amended and dismissed charges on sentencing for the resulting conviction.

It perhaps goes without saying that analyses of the sentencing stage of the criminal justice process say nothing about possible racial or ethnic bias that may occur in subsequent stages. Decisions on appeal or about shock probation (a form of suspended sentence that is granted after incarceration; see KRS § 439.265) or parole are also relevant to an overall assessment of racial and ethnic bias.

VARIABLES AFFECTING SENTENCING IN KENTUCKY

Cocaine possession, first offense, is a Class D felony, punishable by 1 to 5 years in prison (KRS § 532.060). Trial judges are authorized to sentence Class D felony offenders to sentences of 1 year or less after guilty pleas.[7]

In addition, courts have the discretion to void conviction for first offenders of the possession of controlled substance statute who enter and successfully complete an approved treatment program (KRS § 218A.275).

Felony penalties are enhanced for persons who were previously convicted of one or more felonies, are older than 21, and meet certain other requirements (KRS § 532.080). A person who was previously convicted of one felony is classified as a persistent felony offender in the second degree, while a person previously convicted of two or more felonies is classified as a persistent felony offender in the first degree. For a persistent felony offender in the second degree currently standing convicted of cocaine possession, the penalty is enhanced to 5 to 10 years in prison, which is the range for a Class C felony. Penalties for persistent felony offenders in the first degree are enhanced to 10 to 20 years, which is the range for a Class B felony. Given the impact that violation of the persistent felony offender statute can have on sentencing (both the likelihood of incarceration and sentence length), this analysis controls for persistent offender status. It further tests for the possible impact of violent criminal history on sentencing, as judges may be more severe with offenders who have a history of violent crime. Judges may also be more likely to incarcerate offenders who were on probation, parole, or conditional discharge at the time of the offense. The analysis controls for the impact of these circumstances.

As already mentioned, bail status is another factor that may play a role in sentencing decisions. Bail is set by judges on the recommendation of the pretrial services agency. As noted previously, a point system is used as the basis for the decision. Points are added for residency in Kentucky and personal and economic ties to the state, and subtracted for previous criminal record. The pretrial services agency also determines whether the defendant is indigent and eligible for publicly funded counsel (RCr 4.09; KRS § 31.120). Previous research has shown that bail status and defense counsel are two ways that the offender's income level can affect sentencing outcomes (Clarke & Koch, 1976). The analysis controls for the impacts of both of these variables on incarceration and sentence length.

The plea bargaining process often involves the dismissal or amendment of charges. For example, a guilty plea on a cocaine possession charge may involve the dismissal of persistent felony offender charges or the amendment down of a cocaine trafficking charge.[8] In cases involving dismissed and amended charges it would seem that the likelihood of incarceration would be greater and/or the length of sentence longer than in other cases. Thus, the analysis tests for the possible impacts of dismissed and amended charges in both the incarceration and sentence length models.

Convictions for other charges in the same case may also affect the likelihood of incarceration and sentence length. The analysis considers the impacts of other felony convictions of any sort as well as other convictions for violent crimes. The number of simultaneous felony convictions was specified

in logarithmic terms based on the assumption that the impact of additional convictions tends to diminish as the number increases.

Previous research has suggested that gender and age both can affect sentencing decisions (e.g., Steffensmeier, Kramer, & Striefel, 1993; Steffens-meier, Kramer, & Ulmer, 1995; Steffensmeier, Ulmer, & Kramer, 1998). In particular, men tend to be sentenced more harshly than women and young adults more harshly than other offenders. Consequently, the analysis controls for the gender and age of the offender in both the incarceration and sentence length models.

There is also a possibility that certain judges sentence more or less harshly than other judges. Some judges may treat African Americans or other minorities more or less favorably than Whites, and judges' race may be a factor in the severity of sentencing (Steffensmeier & Britt, 2001). To control and test for differences across judges, the initial incarceration models included dummy variables for each of the judges who decided a significant number of cases in each sample. The default category includes those judges who each decided only a small number of cases. The models do not control for the race of the judge, because the judges were not identified in the electronic data provided.

DATA

As noted previously, the sentencing decisions occurred between early 1999 and late 2002 in Jefferson County, Kentucky. The study focuses on cocaine possession because of a perception that Blacks convicted of cocaine possession may have been treated unfairly. Complete data were available for 833 of the 1,035 convictions that occurred during the study period. In most cases the missing data had to do with type of attorney (public or private).

Klepper, Nagin, and Tierney (1983) suggest that mixing cases involving plea bargains with those involving trials may lead to incorrect results given that the factors affecting decisions in trials may not be the same as those that affect negotiated plea decisions. Most cases involve plea bargains due in part to the fact that criminal justice systems simply do not have the resources to try more than a small fraction of all cases. With respect to cocaine possession in Jefferson County, only 8 of our sample of 833 cases actually went to trial. Consequently, trial cases were omitted from the sample.

Most of the data used for this study were taken from an electronic database maintained by the Kentucky Administrative Office of the Courts. These data include sentencing details regarding the charge in question as well as all concurrent convictions and charges that were amended or dismissed. The sentencing details include information about the length of the sentence and suspended or conditional sentences. Details about credit for time served were also provided. Some of these details were double-checked in a review

TABLE 1 Sample Means for Incarceration and Sentence Length Models

Variable	Incarceration Model Means			Sentence Length Model Means		
	Black	Other	Pooled	Black	Other	Pooled
Dependent variables:						
Incarcerated	0.32	0.18	0.28	—	—	—
Sentence length (years)	—	—	—	3.34	2.92	3.27
Independent variables:						
Male	0.84	0.75	0.82	0.89	0.76	0.87
Public attorney	0.46	0.22	0.41	—	—	—
Persistent felony offender	0.12	0.12	0.12	—	—	—
Persistent felony offender, first degree	—	—	—	0.07	0.05	0.07
Persistent felony offender, second degree	—	—	—	0.15	0.16	0.15
Prior violent crime conviction	0.03	0.01	0.02	—	—	—
Probation, parole, or conditional discharge (at time of offense)	0.25	0.16	0.23	0.34	0.19	0.31
Dismissed charges	0.18	0.09	0.16	—	—	—
Simultaneous conviction (dummy)	0.40	0.31	0.38	—	—	—
Number of simultaneous convictions	—	—	—	0.09	1.46	0.02
Amended down	—	—	—	0.38	0.30	0.36
Sample size	624	201	825	197	37	234
Percent of sample	75.6%	24.4%	100.0%	84.2%	15.8%	100.0%

The "Other" category includes all racial categories other than African American.

of paper case files. This review also identified those offenders who were on probation, parole, or conditional discharge at the time of the current cocaine possession offense. The review of paper files also identified more persistent felony offenders than were found using the electronic database.

Criminal history data were tabulated from individual reports produced by the Administrative Office of the Courts for each offender. The criminal history reports included the numbers of felony and misdemeanor convictions in Kentucky courts. The criminal history data were double-checked against presentencing investigation reports for each offender. The main benefit of this exercise was the identification of a small number of out-of-state convictions that did not appear in the Kentucky courts' criminal history reports.

The initial incarceration models included a dummy variable for a particular judge only if that judge had decided at least 40 cases with a reasonable split between Black and non-Black offenders. Dummy variables for judges were included only in the incarceration models, as the sample sizes for the sentence length models were too small to permit the judges' coefficients to be estimated accurately.

Table 1 gives the sample means for the data used for both the incarceration and sentence length models. Sample means are given only for

the variables that were included in the final specifications of the models. Incarceration rates for African American offenders are 72% higher than those for other offenders (0.32 vs. 0.18). Table 1 also shows that Black cocaine possession offenders are more likely than White offenders to be male; to use public attorneys; to have prior convictions for violent crimes; to have violated probation, parole, or conditional discharge; to have dismissed charges; and to have simultaneous convictions.

   In the case of sentence length, however, the differences between Blacks and others are not so great (40 months on average vs. 35 months). The sentence lengths are adjusted for any time already served and for suspended and conditionally discharged sentences. Blacks are more likely than others to have been on probation, parole, or conditional discharge at the time of the offense; have fewer simultaneous convictions; and are somewhat more likely to have a charge that has been amended down. The sample size for incarcerated non-Blacks is small (37), making these comparisons somewhat tentative.

METHODS

Binary logit regression analysis, which is particularly suited to phenomena that are dichotomous in nature, is used to model the incarceration decision. OLS regression analysis is used to model the length-of-sentence decision. As noted previously, the Heckman two-stage method controls for sample selection bias in the sentence length model. An inverse Mills' ratio is calculated from the first-stage logit incarceration model and then used as a variable (λ) in the second-stage OLS sentence length model. If this additional variable is statistically significant, then sample selection bias is a problem and the inverse Mills' ratio is correcting that problem.

   A series of statistical tests is used to determine whether the treatment of African Americans differs significantly from the treatment of others. With respect to the incarceration models, a series of likelihood ratio tests and *t* tests is used to assess structural differences in the treatment of Black and other offenders.[9] The first likelihood ratio test compares the log likelihood for a pooled estimation (combining both Black and other offenders) with the sum of the log likelihoods for the separate racial group estimations. If this test yields a significant result, then the intercepts and/or slopes differ between the two racial groups. Given a significant result from the first likelihood ratio test, then a second test can be used to compare the log likelihood for a pooled estimation that includes a race dummy variable with the sum of the log likelihoods for the separate group estimations. This second statistic is used to test the null hypothesis of common slopes. If this test rejects the hypothesis of common slopes, then a model is estimated that includes all of the original variables plus each of those variables interacted with the racial

group dummy variable. Significant *t* statistics on the interacted terms indicate variables for which there are significant differences in treatment between the two groups.

A similar approach is used for the sentence length models; however, because these models are estimated using OLS, the appropriate statistical tests are *F* tests, commonly known as Chow tests (after Chow, 1960).[10] If *F* is statistically significant, then there are significant differences in treatment between the two groups. In that case, a model is estimated that includes all of the original variables plus those variables interacted with the racial group dummy variable. As for the incarceration rate models, significant *t* statistics on the interacted terms indicate variables for which there are significant differences in treatment between the two groups.

The final stage of the analysis involves application of the decomposition technique.[11] Here, group mean differences are decomposed into endowment and residual effects. Endowments are the characteristics of the offenders in each group that are measured and included as independent variables in the model. In the incarceration rate model, endowments include characteristics such as the gender of the offender and his or her criminal history. Variations in criminal histories across groups, for example, should help to explain differences in incarceration rates. Residual effects, on the other hand, refer to how the characteristics are translated by the criminal justice system into incarceration decisions. Thus, if male African Americans are sentenced more severely than other male offenders, holding their endowments constant, that difference contributes to the residual effect. Residual effects may be due to racial bias or they may be due to factors not accounted for in the model. One advantage of this decomposition method is that it provides a means to partition the differences in sentencing outcomes into endowment and residual effects.

The decomposition involves calculating a hypothetical incarceration rate or average sentence length by using the parameters estimated for one group and the characteristics, or endowments, of the other group. An example of this is the hypothetical incarceration rate for Blacks, R_{HB}, assuming that they keep their endowments but have the same parameters as non-Blacks. Given the equality $R_B - R_W = (R_B - R_{HB}) + (R_{HB} - R_W)$, the difference between the incarceration rates of Blacks and others, $R_B - R_W$, can be decomposed into a residual effect, $R_B - R_{HB}$, where the parameters change and the endowments remain the same, and an endowment effect, $R_{HB} - R_W$, where the parameters remain constant and the endowments change. It should be noted that the nonlinearity of a logit model means that the decomposition into endowment and residual effects depends on which group's parameters are used to calculate the hypothetical outcome. The equation shown previously assumes that the non-Black group's parameters are used as the basis for comparison. To deal with this, the hypothetical rate for non-Blacks, R_{HW}, is calculated and substituted for R_{HB} in the equation. The resulting estimates of the

endowment and residual effects are then averaged with those calculated from the equation based on R_{HB}.

Another advantage of the decomposition technique applied here is that it provides the basis for further analysis of the relative contributions of different characteristics to the endowment effect and of different parameters to the residual effect. Decomposition of the endowment effect permits identification of the relative importance of different offender characteristics. The relative impact of a given variable is calculated using the marginal effects of each variable, computed at their group means.[12] Note that the results of the calculations can depend on which group is chosen as the basis for comparison. As for the decomposition into endowment and residual effects, this potential problem is dealt with by also performing the calculations as if the Black group were the basis for comparison and then averaging the two sets of results.

RESULTS

Table 2 gives the results of the incarceration rate regressions for the two racial groups as well as the pooled data. Initial estimations showed that none of the estimated coefficients for the individual judge dummy variables were statistically significant at the 5% level or better. Consequently, the results presented here are for the models estimated without the judge variables. Both degrees of persistent felony offender were combined into a single variable because initial estimations showed that the coefficients for the separate variables were virtually the same. Of Black offenders, those who were male, were persistent felony offenders, had prior convictions for violent crimes, were on probation or parole or condition discharge at the time of the offense, had dismissed charges, or had simultaneous convictions were more likely to be incarcerated. For non-Black offenders, use of a public attorney and persistent felony offender status resulted in greater likelihood of incarceration. The likelihood ratio test statistic for the non-Black estimation is not significant at the 5% level, which is probably a result of the small sample size.

In the pooled models, the independent variables are in most cases statistically significant. The Black categorical variable is statistically significant with a positive coefficient in the model that includes that variable. The likelihood ratio test comparing the pooled equation with the two group equations yields a test statistic that is nearly significant at the 5% level, indicating that the intercepts and/or slopes of the two groups' equations may differ. The test statistic that compares the pooled equation including the Black categorical variable with the two group equations is not statistically significant, suggesting that only the intercepts differ.

Decomposition of these results into endowment and residual effects indicates that some 8.7 percentage points of the 13.2 percentage point difference in incarceration rates is due to residual effects, with the balance

TABLE 2 Results for Logistic Incarceration Regressions

Variable	Black Offenders		Other Offenders		Pooled		Pooled with Dummy	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	−2.114	0.301**	−1.885	0.430**	−2.126	0.246**	−2.420	0.283**
Male	0.588	0.276*	0.050	0.438	0.492	0.230*	0.440	0.232
Public attorney	0.347	0.184	0.897	0.425*	0.480	0.165**	0.405	0.168*
Persistent felony offender	1.233	0.272**	1.131	0.521*	1.165	0.237**	1.184	0.238**
Prior violent crime conviction	1.532	0.566**	2.399	1.286	1.697	0.516**	1.697	0.519**
Probation, parole, or conditional discharge (at time of offense)	0.326	0.211	−0.128	0.508	0.306	0.191	0.278	0.192
Dismissed charges	0.693	0.224**	−0.134	0.689	0.672	0.207**	0.625	0.209**
Simultaneous conviction	0.544	0.186**	−0.237	0.427	0.431	0.167**	0.416	0.168*
Black							0.494	0.216*
Model statistics:								
Log likelihood	−354.3		−90.1		−451.0		−448.2	
χ^2 value	69.632		11.757		82.058		87.562	
$Pr(\chi^2 > value)$	<0.001		0.109		<0.001		<0.001	

The dependent variable is 1 if incarcerated and 0 if not. *Significant at .05 level. **Significant at .01 level.

TABLE 3 Decomposition of Incarceration Rate Endowment and Residual Effects

Variable	Contribution to Endowment Effect (%)	Contribution to Residual Effect (%)
Male	9.2	52.9
Public attorney	64.7	−15.8
Persistent felony offender	−1.3	6.3
Prior violent crime conviction	11.0	−2.0
Probation, parole, or conditional discharge (at time of offense)	2.6	11.2
Dismissed charges	9.4	14.6
Simultaneous conviction	4.3	32.8

Contributions may not sum to 100 due to rounding.

due to endowments. In other words, about 66% of the difference in incarceration rates is due to differences in treatment and 34% is due to differences in endowments. By far, the main contributor to the endowment effect is the use of public attorneys, which Black offenders rely upon to a much greater extent than do other offenders (see Table 3). This is consistent with the theory outlined by Steffensmeier and Demuth (2000), who suggested that one of the causes of differential sentencing of members of minority groups is their lack of resources to defend themselves.

As noted previously, the likelihood ratio tests suggest that the primary contributor to the residual effect is the constant term.[13] This suggests that there are factors not accounted for in the model that are contributing to differences in incarceration rates. These factors could affect either the endowment or residual effects or both. Aside from the constant term, the main contributor to the residual effect is the harsher sentencing of Black males; although the gender coefficients for the Black and non-Black models do not differ in a statistical sense, the difference in coefficients has a substantial quantitative impact. Simultaneous convictions are also important contributors to the residual effect. Generally, it appears that circumstances surrounding the current conviction (simultaneous convictions, dismissed charges, or violations of probation, parole, or conditional discharge) are more important in explaining the harsher treatment of Blacks than is criminal history (previous felony or violent crime convictions). This could be due to unmeasured group differences in the nature of simultaneous convictions, dismissed charges, and so forth. To the extent that is true, the endowment effect would be larger than indicated here and the differential treatment of Black males would be an even more important contributor (in percentage terms) to the residual effect. These results are generally consistent with the theories of Helms and Jacobs (2002), who emphasized the political basis for harsher treatment of Blacks and males in the United States.

The sentence length regression results are reported in Table 4. The main point to note with respect to the pooled sentence length estimations is that

TABLE 4 Results for Ordinary Least Squares Sentence Length Regressions

Variable	Black Offenders		Other Offenders		Pooled		Pooled with Dummy	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	1.678	1.308	1.117	1.449	1.721	0.893	1.772	1.113
Male	0.491	0.520	1.274	0.634	0.640	0.415	0.641	0.421
Persistent felony offender, first degree	5.170	0.689**	7.863	1.180**	5.457	0.581**	5.450	0.598**
Persistent felony offender, second degree	2.606	0.558**	2.083	0.831*	2.364	0.435**	2.355	0.454**
Probation, parole, or conditional discharge (at time of offense)	0.811	0.364*	−0.894	0.639	0.552	0.309	0.551	0.313
Log of number of simultaneous convictions	0.688	0.377	0.248	0.366	0.595	0.261*	0.592	0.268*
Amended down	0.500	0.338	0.966	0.563	0.681	0.293*	0.681	0.299*
λ (inverse Mills' ratio)	−0.309	0.819	−0.109	0.854	−0.402	0.542	−0.421	0.603
Black							−0.032	0.410
Model statistics:								
R-squared	0.44		0.77		0.47		<0.47	
Adjusted R-squared	0.42		0.71		0.45		<0.45	
Pr(β = 0)	<0.001		<0.001		<0.001		<0.001	

The dependent variable is sentence length in years after subtracting suspended and conditional sentences and credit for time served. *Significant at .05 level. **Significant at .01 level.

the Black categorical variable is not statistically significant in the equation that includes that variable. Furthermore, the Chow test of structural stability across the Black and non-Black equations produces an insignificant *F* statistic, indicating that the two equations are essentially the same. These results suggest that all of the difference in average sentence length between Blacks and others is due to endowments. Our results are generally consistent with previous research, which has more often found racial bias in the incarceration decision than in the sentence length decision.

CONCLUSIONS

The article applies a technique from the econometrics literature to analysis of sentencing decisions in Jefferson County, Kentucky. This technique provides a means for decomposing group differences in sentencing outcomes into an effect due to the endowments or characteristics of each group and a residual effect that is due to the way those endowments are translated into sentencing decisions by the criminal justice system. The residual effect may reflect bias in sentencing. This decomposition technique also provides the basis for further decomposition of the endowment and residual effects into their component parts, and for determining the relative importance of those components.

   Applying the decomposition technique to cocaine possession cases in Jefferson County, it appears that 66% of interracial differences in incarceration outcomes is due to undetermined residual factors, while only 34% of these differences is explained by the characteristics of each case (endowments). This means that it is not possible to reject the hypothesis that there is racial bias in sentencing of cocaine possession offenders in Jefferson County. The most important variable contributing to the endowment effect is the use of public attorneys, which is taken as a proxy for indigence. The most important variable contributing to the residual effect is gender: The harsher treatment of Black males, although not significant in a statistical sense, has a larger quantitative impact than any other variable. With respect to sentence lengths for those who were incarcerated for cocaine possession, all of the 5-month difference in average sentences is due to endowments. Consistent with much of the previous research on racial bias in sentencing decisions, bias appears to play a role in the incarceration decision but not the sentence length decision.

   These results are broadly consistent with theories regarding the differential treatment of minorities and males by the criminal justice system. African Americans are more likely to lack the resources to defend themselves against prosecution and thus rely more heavily on public defenders. African American males in particular are viewed as threatening to society by a criminal justice system embedded in a political environment that to a

significant extent emphasizes individual, rather than social, responsibility for crime. Thus incarceration is more likely to be the outcome for Black males than for Black females or non-Blacks. These results may not hold for all crimes, however. Cocaine possession is one of several offenses for which sentencing is perceived by some in the community to be biased. It may be that African American men who commit drug-related offenses are viewed as a particular threat to law and order.

NOTES

1. Available at http://www.hrw.org/backgrounder/usa/race
2. The Kentucky and Jefferson County statistics are from http://factfinder.census.gov
3. The data on ethnicity in the sentencing records are relatively incomplete and identify very few offenders as Hispanic, making it impossible to study that group. The data allow only comparison of African Americans with a single other group that includes all other racial categories.
4. Black cocaine users may be more likely to be caught up in a "crime-and-cocaine street lifestyle" (Lockwood, Pottieger, & Inciardi, 1995, p. 231), while White users may be more likely to abuse drugs privately and less likely to simultaneously commit other crimes (the latter supposition is supported by our sample statistics on simultaneous convictions).
5. See Bushway, Johnson, and Slocum (2007) for a discussion of issues involved in implementing the Heckman procedure.
6. Demuth (2003) finds a bias against Hispanics in pretrial release decisions.
7. Commonwealth v. Doughty, 869 S.W.2d 53 (Ky. App. 1994).
8. In our sample of 825 cocaine possession cases, 285 involved charges that were amended and 133 involved charges that were dismissed. Of the cases with amended charges, 203 involved cocaine trafficking charges amended down to cocaine possession. Of the cases with dismissed charges, 64 involved dismissed persistent felony offender (both first and second degree) charges.
9. See Greene (1997, pp. 161–162) for a discussion of likelihood ratio tests.
10. See Gujarati (1995, pp. 262–265) for a simple explanation of this statistic.
11. A more technical treatment of the decomposition method can be found in, for example, Bourassa and Yin (2006).
12. Note that, in the case of the logit models, the marginal effects are *not* the estimated coefficients (see Greene, 2002).
13. The calculations used to decompose the residual effect exclude the constant term. This is because the marginal effects of the constant terms are relatively large and overwhelm the effects of the other variables without adding any explanatory ability. (In the case of the endowment effect, the constant term has no impact because it is equal to 1 for each group.)

REFERENCES

Albonetti, C. A. (1997). Sentencing under the federal sentencing guidelines: Effects of defendant characteristics, guilty pleas, and departures on sentence outcomes for drug offenses, 1991–1992. *Law & Society Review, 31*, 789–822.

Berk, R. A. (1983). An introduction to sample selection bias in sociological data. *American Sociological Review, 48*, 386–398.

Blinder, A. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of Human Resources, 8*, 9–22.

Bourassa, S. C., & Yin, M. (2006). Housing tenure choice in Australia and the United States: Impacts of alternative subsidy policies. *Real Estate Economics, 34*, 303–328.

Bushway, S., Johnson, B. D., & Slocum, L. A. (2007). Is the magic still there? The use of the Heckman two-step correction for selection bias in criminology. *Journal of Quantitative Criminology*, *23*, 151–178.

Chiricos, T. G., & Crawford, C. (1995). Race and imprisonment: A contextual assessment of the evidence. In D. F. Hawkins (Ed.), *Ethnicity, race, and crime: Perspectives across time and place* (pp. 281–309). Albany: State University of New York Press.

Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, *28*, 591–605.

Clarke, S. H., & Koch, G. G. (1976). The influence of income and other factors on whether criminal defendants go to prison. *Law & Society Review*, *11*, 57–92.

Crew, B. K. (1991). Race differences in felony charging and sentencing: Toward an integration of decision-making and negotiation models. *Journal of Crime and Justice*, *14*, 99–122.

Demuth, S. (2003). Racial and ethnic differences in pretrial release decisions and outcomes: A comparison of Hispanic, black, and while felony arrestees. *Criminology*, *41*, 873–907.

Greene, W. H. (1997). *Econometric analysis* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.

Greene, W. H. (2002). *LIMDEP version 8.0 reference guide*. Plainview, NY: Econometric Software.

Gujarati, D. (1995). *Basic econometrics* (3rd international ed.). New York: McGraw-Hill.

Hagan, J. (1974). Extra-legal attributes and criminal sentencing: An assessment of a sociological viewpoint. *Law & Society Review*, *8*, 357–383.

Hagan, J., & Bumiller, K. (1983). Making sense of sentencing: A review and critique of sentencing research. In A. Blumstein, J. Cohen, S. E. Martin, & M. H. Tonry (Eds.), *Research on sentencing: The search for reform* (Vol. 2, pp. 1–54). Washington, DC: National Academy Press.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, *47*, 153–161.

Helms, R., & Jacobs, D. (2002). The political context of sentencing: An analysis of community and individual determinants. *Social Forces*, *81*, 577–604.

Keil, T. J., & Vito, G. F. (1989). Race, homicide severity, and application of the death penalty: A consideration of the Barnett scale. *Criminology*, *27*, 511–531.

Keil, T. J., & Vito, G. F. (1990). Race and the death penalty in Kentucky murder trials: An analysis of post-*Gregg* outcomes. *Justice Quarterly*, *7*, 189–207.

Keil, T. J., & Vito, G. F. (1995). Race and the death penalty in Kentucky murder trials, 1976–1991. *American Journal of Criminal Justice*, *20*, 17–36.

Keil, T. J., & Vito, G. F. (2006). Capriciousness or fairness? Race and prosecutorial decisions to seek the death penalty in Kentucky. *Journal of Ethnicity in Criminal Justice*, *4*, 27–49.

Kleck, G. (1981). Racial discrimination in criminal sentencing: A critical evaluation of the evidence with additional evidence on the death penalty. *American Sociological Review*, *46*, 783–805.

Klepper, S., Nagin, D., & Tierney, L.-J. (1983). Discrimination in the criminal justice system: A critical appraisal of the literature. In A. Blumstein, J. Cohen,

S. E. Martin, & M. H. Tonry (Eds.), *Research on sentencing: The search for reform* (Vol. 2, pp. 55–128). Washington, DC: National Academy Press.

Lockwood, D., Pottieger, A. E., & Inciardi, J. A. (1995). Crack use, crime by crack users, and ethnicity. In D. F. Hawkins (Ed.), *Ethnicity, race, and crime: Perspectives across time and place* (pp. 212–234). Albany: State University of New York Press.

Mitchell, O. (2005). A meta-analysis of race and sentencing research: Explaining the inconsistencies, *Journal of Quantitative Criminology*, *21*, 439–466.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, *14*, 693–709.

Piehl, A. M., & Bushway, S. D. (2007). Measuring and explaining charge bargaining. *Journal of Quantitative Criminology*, *23*, 105–125.

Pratt, T. C. (1998). Race and sentencing: A meta-analysis of conflicting empirical research results. *Journal of Criminal Justice*, *26*, 513–523.

Raphael, S. (2006). The socioeconomic status of black males: The increasing importance of incarceration. In A. J. Auerbach, D. Card, & J. M. Quigley (Eds.), *Public policy and the income distribution* (pp. 319–358). New York: Russell Sage Foundation.

Savelsberg, J. J. (1994). Knowledge, domination, and criminal punishment. *American Journal of Sociology*, *99*, 911–943.

Steffensmeier, D., & Britt, C. L. (2001). Judges' race and judicial decision making: Do black judges sentence differently? *Social Science Quarterly*, *82*, 749–764.

Steffensmeier, D., & Demuth, S. (2000). Ethnicity and sentencing outcomes in U.S. federal courts: Who is punished more harshly—white, black, white-Hispanic, or black-Hispanic defendants? *American Sociological Review*, *65*, 705–729.

Steffensmeier, D., & Demuth, S. (2001). Ethnicity and judges' sentencing decisions: Hispanic-black-white comparisons. *Criminology*, *39*, 145–178.

Steffensmeier, D., Kramer, J., & Streifel, C. (1993). Gender and imprisonment decisions. *Criminology*, *31*, 411–446.

Steffensmeier, D., Kramer, J., & Ulmer, J. (1995). Age differences in sentencing. *Justice Quarterly*, *12*, 583–601.

Steffensmeier, D., Ulmer, J., & Kramer, J. (1998). The interaction of race, gender, and age in criminal sentencing: The punishment cost of being young, black, and male. *Criminology*, *36*, 763–797.

Vito, G. F., & Keil, T. J. (1988). Capital sentencing in Kentucky: An analysis of the factors influencing decision making in the post-*Gregg* period. *Journal of Criminal Law and Criminology*, *79*, 483–503.

Vito, G. F., & Keil, T. J. (2000). The Powell hypothesis: Race and non-capital sentences for murder in Kentucky, 1976–1991. *American Journal of Criminal Justice*, *24*, 287–300.