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## THE IMPACT OF CERTAINTY AND SEVERITY OF PUNISHMENT ON LEVELS OF CRIME IN AMERICAN STATES: AN EXTENDED ANALYSIS

GEORGE ANTUNES\* AND A. LEE HUNT\*\*

The absence of information can itself both give rise to and ensure the continued dominance of irrational modes of thought and action. For a vacuum created by the absence of data is rapidly filled by the inrush of prejudice, surmise, random speculation and unsupported assumption.<sup>1</sup>

It is generally agreed that a legitimate reason for the existence of governments is to procure for the citizenry the safety and security of their persons and possessions. Unfortunately, governments are never fully successful in this regard, with the result that they have as a major problem the task of reducing dangerous crime. Many public officials in the United States have advocated the use of more severe penal sanctions as a means of deterring crime.<sup>2</sup> Unfortunately, very little research has been conducted to ascertain the deterrent effect of criminal sanctions, or to determine the possible impact of longer prison sentences on levels of serious crime. The preponderance of arguments both for and against punitive sanctions are founded on ethical grounds or "common sense," and generally have been advanced without scientific support.<sup>3</sup> Indeed, implicit in our criminal justice policies are the hypotheses that the certainty and

severity of punishment will deter crime.<sup>4</sup> However, scholars have undertaken relatively little systematic research to discover the extent to which these hypotheses enjoy empirical support.

The relevant research can be covered briefly. First, however, it will be helpful to distinguish two types of deterrence: *special* (the specific deterrence of a given individual), and *general* (the overall reduction in crime due to the inhibitory effect of sanctions on an aggregate of persons). As Packer notes:

These two are quite different although they are often confused in discussion of problems of punishment. For example, it is sometimes said that a high rate of repeat offenses, or recidivism as it is technically known, among persons who have already been once subjected to criminal punishment shows that deterrence does not work. The fact of recidivism may throw some doubt on the efficacy of *special* deterrence, but a moment's reflection will show that it says nothing about the effect of *general* deterrence.<sup>5</sup>

It is general deterrence which we wish to examine in this paper. Thus, we may safely disregard the rather extensive literature indicating that both incarceration and "treatment" intended to reform are often markedly unsuccessful in attaining that goal.<sup>6</sup>

We may also disregard the studies focusing on

<sup>4</sup> For example, over twenty years ago Edwin Sutherland observed the following:

The conventional policy has been to punish those who are convicted of crimes, on the hypothesis that this both reforms those who are punished and deters others from crimes in the future. Also, according to this hypothesis, crime rates can be reduced by increasing the severity, certainty, and speed of punishment.

E. SUTHERLAND, *PRINCIPLES OF CRIMINOLOGY* 613 (4th ed. 1947).

<sup>5</sup> H. PACKER, *THE LIMITS OF THE CRIMINAL SANCTION* 39 (1968).

<sup>6</sup> For a general overview of much of this work, see SUTHERLAND & CRESSEY, *supra* note 2, at 607-36. See also Schur, *The New Penology: Fact or Fiction?* 49 J. CRIM. L.C. & P.S. 331 (1958).

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<sup>1</sup> F. ZIMRING & G. HAWKINS, *DETERRENCE: THE LEGAL THREAT IN CRIME CONTROL* 17 (1973).

<sup>2</sup> Former FBI Chief J. Edgar Hoover once noted: I warn you to stay unswerving to your task—that of standing by the man on the firing line—the practical, hard-headed, experienced honest policemen who have shown by their efforts that they, and they alone, know the answer to the crime problem. That answer can be summed up in one sentence—adequate detection, swift apprehension, and certain, unrelenting punishment. That is what the criminal fears. That is what he understands, and nothing else, and that fear is the only thing which will force him into the ranks of the law-abiding.

E. SUTHERLAND & D. CRESSEY, *CRIMINOLOGY* 347 (8th ed. 1970). For more recent statements by President Richard Nixon on the same theme, see R. HARRIS, *JUSTICE* (1970).

<sup>3</sup> See Levin, *Crime as a Deterrent*, 72 *NEW STATESMAN* 9 (1966). See also Van Den Haag, *On Deterrence and the Death Penalty*, 78 *ETHICS* 280 (1968).

the deterrent effect of capital punishment.<sup>7</sup> We do so because capital punishment, although quite severe, is remarkably uncertain. Murder is the only crime for which execution has been employed enough to be statistically meaningful. However, whatever the findings of research on the deterrent effect of capital punishment may be, they cannot be generalized to crimes other than murder. Further, it should be noted that there are some problems in generalizing the deterrent effect of capital punishment even to the set of all murders. The vast bulk of persons convicted of homicide are incarcerated, not executed. In fact, the death penalty rarely has been imposed in recent years. Even those sentenced to death are able to delay execution through lengthy, and often successful, appeals.<sup>8</sup>

We now turn our attention to other empirical studies of the deterrent impact of sanctions.<sup>9</sup> One major thrust in the empirical literature involving the study of murder is an initial work by Gibbs.<sup>10</sup> He constructed aggregate measures of certainty of punishment based on the number of state prison admissions for homicide in 1960, divided by the mean number of homicides known to police for 1959 and 1960. Severity of punishment was measured as the median number of months served by all persons in prison on December 31, 1960. Although some may take exception to the respective measures of these variables, we find the operations

<sup>7</sup> It should be obvious that the capital punishment literature must, of necessity, focus on the question of general deterrence, since the executed person is incapable of future behavior which would indicate successful individual deterrence. The various studies of capital punishment have revealed no evidence of deterrent impact beyond that obtained from lengthy incarceration. For a good collection of articles and research bearing on this topic, see CAPITAL PUNISHMENT (T. Sellin ed. 1967).

<sup>8</sup> For example, in the state of Maryland, during the period 1936-1961, only 59 percent of those sentenced to death for rape were actually executed. See SUTHERLAND & CRESSEY, *supra* note 2, at 35.

<sup>9</sup> Empirical research on general deterrence falls into three areas: violations of college rules, homicide and other crimes. For a look at the deterrent impact of sanctions on violations of college rules, see Chamblis, *The Deterrent Influence of Punishment*, 12 CRIME AND DELINQUENCY 70 (1966); Salem & Bowers, *Severity of Formal Sanctions as a Deterrent to Deviant Behavior*, 5 LAW AND SOCIETY REV. 21 (1970). However, the validity of generalizing from these particular offenses and sanctions to more serious crimes involving long prison sentences can be questioned. Thus, this literature review shall focus on the remaining two sets of studies.

<sup>10</sup> Gibbs, *Crime, Punishment, and Deterrence*, 48 Soc. Sci. Q. 515 (1968).

adequate. Utilizing data from the Federal Bureau of Investigation's *Uniform Crime Reports*<sup>11</sup> and the *National Prisoner Statistics*,<sup>12</sup> Gibbs computed certainty and severity values for each of the forty-eight states circa 1960.<sup>13</sup> Dichotomizing this data, Gibbs used Chi-square tests and phi correlations to assess the impact of certainty and severity of punishment on rates of homicide known to the police in 1960.

Gibbs reported an inverse relationship between the homicide rate and both independent variables, and concluded that his findings, contrary to common assertion, demonstrated evidence of a relationship between the crime rate and legal reactions to crime.

Following Gibbs, and utilizing the same data, Gray and Martin<sup>14</sup> reported a series of regression models which also demonstrated moderate, inverse associations between the variables. Specifically, the homicide rate correlated  $-.37$  with severity, and  $-.28$  with certainty. The multiple correlation indicating the combined effects of both certainty and severity on homicide was  $.47$ , thus accounting for 22 percent of the variance. Gray and Martin also computed several regression analyses in which the data were subjected to a natural logarithm transformation. This produced no change in the correlation between certainty and homicide, but the correlation of the latter with severity increased to  $-.51$ . The multiple correlation of the transformed data increased to  $.61$ , accounting for 38 percent of the variance.<sup>15</sup> Gray and Martin concluded that the independent variables have a demonstrable, and equally weighted, impact on the homicide rate.

Attempting to clarify methodological issues

<sup>11</sup> FBI, UNIFORM CRIME REPORTS (1960).

<sup>12</sup> BUREAU OF PRISONS, U.S. DEPT. OF JUSTICE, PRISONERS RELEASED FROM STATE AND FEDERAL INSTITUTIONS 1960 (National Prisoner Statistic Series).

<sup>13</sup> Gibbs actually computes values for only 47 states. His certainty and severity values for the New Jersey area are computed as the average of the values obtained for New York and Connecticut. (New Jersey does not cooperate with the Federal Bureau of Prison's statistical reporting effort).

<sup>14</sup> Gray & Martin, *Punishment and Deterrence: Another Analysis of Gibbs' Data*, 50 Soc. Sci. Q. 389 (1969).

<sup>15</sup> It should be noted that because of the log transformation, the form of the regression equation is non-linear. Expressed in terms of the raw variables, the "multiple regression" equation is of the form

$$Y = aX_1^{b_1}X_2^{b_2} + e, \text{ where "a" is a constant,}$$

$X_1$  is certainty,  $X_2$  is severity,  $b_1$  and  $b_2$  are least squares coefficients and "e" is an error term.

raised in these studies, Bean and Cushing<sup>16</sup> performed a second re-analysis of Gibbs' data. They found that the data did not violate assumptions of normality, and therefore did not need to be transformed in order to meet the assumptions for using multiple regression. They also tested the data for departures from linearity. When no significant departures were found, they concluded that the logarithmic transformation models presented by Gray and Martin did not result in a significant increase in prediction and, thus, the models must be ruled out on the grounds of parsimony.

Bean and Cushing extend the Gray and Martin model by incorporating an etiological variable. Examining the residuals of the multiple regression of certainty and severity on homicide rate, they found that "most of the large positive residuals occurred for southern states and most of the large negative residuals for non-southern states."<sup>17</sup> To investigate the hypothesis that the effects of certainty and severity are contingent upon region, a revised regression model incorporating "region" as a variable was tested.<sup>18</sup> This resulted in the squared multiple correlation increasing from .22 to .69. Indeed, the squared correlation between region and homicide rate was a startling .62.

The concept "region" is a surrogate for various unmeasured variables.<sup>19</sup> To demonstrate the theoretical importance of "region," Bean and Cushing replace this variable with a measure of "percent black population."<sup>20</sup> Utilizing this variable and measures of certainty and severity as the independent variables, they observe a squared multiple correlation of .76. Examining the slopes of the certainty and severity variables in this regression,

<sup>16</sup> Bean & Cushing, *Criminal Homicide, Punishment, and Deterrence: Methodological and Substantive Reconsiderations*, 52 Soc. Sci. Q. 277 (1971).

<sup>17</sup> *Id.* at 283.

<sup>18</sup> This was done with standard "dummy variable" techniques. Those unfamiliar with these procedures should refer to Suits, *Use of Dummy Variables in Regression Equations*, 52 J. AMER. STAT. ASS'N. 548 (1957).

<sup>19</sup> See D. CAMPBELL & J. STANLEY, *EXPERIMENTAL AND QUASI-EXPERIMENTAL DESIGNS FOR RESEARCH* (1963), where the authors discuss the fact that including "region" as a variable is an attempt to control for differences in specific history.

<sup>20</sup> Bean and Cushing note that: the findings elsewhere that there is a higher homicide rate among blacks than whites and the fact that the southern states in general have a higher proportion of black population than do the non-southern states, [thus presents] a reasonable hypothesis that the etiological significance of region consists in differences in the proportion black among state populations.

Bean & Cushing, *supra* note 16, at 287.

they conclude that when percent black population is controlled as an etiological variable, "the variable measuring legal reactions to crime retained its association with criminal homicide rate in a direction consistent with the deterrence hypothesis."<sup>21</sup>

These studies of homicide converge on the finding that certainty and severity of punishment exhibit a moderate deterrent impact. One might ask, however, whether this is typical of the relationship between these two independent variables and other types of crimes. A separate set of deterrence studies examines this question, primarily by utilizing the seven FBI Index crime categories.

Tittle<sup>22</sup> analyzed data on the FBI Index crimes, including homicide.<sup>23</sup> Although his operational measures of certainty and severity differed slightly from those employed in previous studies, this work seems generally comparable.<sup>24</sup> All the variables were grouped into rank categories and the ordinal statistic Tau c was employed to assess the impact of certainty and severity on crime rates for each of the seven crime categories. This analysis produced a moderate to weak inverse association between certainty and crime rates for each of the seven crimes. These ranged from a high of  $-.57$  for sex offenses to a low of  $-.08$  for auto theft. The correlation between murder and certainty was  $-.17$ . However, when the severity variable was examined a *negative* association,  $-.45$ , was found *only* between severity and homicide. The relationship between severity and each of the six other crime categories was *positive*, ranging from a high of .26 for sex offenses to a low of .04 for auto theft. These findings are contrary to the commonly proposed deterrence hypothesis.<sup>25</sup>

<sup>21</sup> Bean & Cushing, *supra* note 16, at 289.

<sup>22</sup> Tittle, *Crime Rates and Legal Sanction*, 16 SOCIAL PROBLEMS 409 (1969).

<sup>23</sup> In addition to homicide, the FBI collects data on six other categories of serious crimes: rape, assault, larceny, robbery, burglary and auto theft. FBI reports often combine crimes in all seven categories to obtain an overall index of serious crime, hence the designation of these seven crimes in the scholarly literature as "index" crimes.

<sup>24</sup> Tittle combines data from two time points, 1960-1963. Certainty for each category of crime is as follows: the number admitted to prison for crime "x" in 1960 and 1963 divided by the number of crime "x" known to police in 1959 and 1962. Severity is defined as the mean length of sentence served for crime "x" by those released from state prisons in 1960. Crime rates for each category were obtained by averaging data from 1959 and 1962.

<sup>25</sup> Observing that controls for urbanization all but eliminate the association between severity and crime

Waldo and Chiricos also incorporated the seven FBI Index crimes in an examination of the impact of certainty on crime rates across three time points: 1950, 1960 and 1963.<sup>26</sup> Two time points were utilized in testing the impact of severity: 1960 and 1964. This analysis further sought to assess the impact of changes in levels of certainty and severity on two dependent variables: crime rates and changes in crime rates. All the data were dichotomized, and phi correlations were computed as measures of impact. With respect to certainty, the results for all three time periods generally supported the findings of Tittle and others. All the correlations were negative and low to moderate in magnitude, with the exception of homicide in 1950, which was  $+.02$ .<sup>27</sup>

No pattern emerged from the analysis of changes in levels of certainty and severity on changes in crime rates. Waldo and Chiricos conclude that evidence in support of a deterrent impact for levels of certainty or severity on crime rates is not sufficiently demonstrated in their analysis to justify acceptance of the deterrence hypothesis.<sup>28</sup>

#### *Summary of Conclusions from Empirical Research on Deterrence*

First, it is evident that certainty of punishment has a mild deterrent impact on crime rates. This is demonstrated in all the studies reviewed, in spite of varying measurement operations, time points and methods of analysis. At least in this respect, the theory of deterrence receives some support.

Secondly, severity of punishment exhibits a moderate deterrent impact on homicide rates, but is unrelated to crime rates for other types of crimes.

rate, Tittle remarked:

Severity alone is simply irrelevant to the control of deviance. Severity of punishment may serve other functions, of course, and high degrees of severity might be explained as reactive responses by legislatures and judicial personnel to high offense rates, particularly where the certainty of punishment is likely to be low—as in urban areas (where the association between certainty and urbanization is  $-.52$ ).

Tittle, *supra* note 22, at 416.

<sup>26</sup> Chiricos & Waldo, *Punishment and Crime: An Examination of Some Empirical Evidence*, 18 *SOCIAL PROBLEMS* 200 (1970).

<sup>27</sup> For the time period 1964, Chiricos and Waldo reported negative correlations of severity with homicide ( $-.03$ ), assault ( $-.08$ ) and larceny ( $-.09$ ). Chiricos & Waldo, *supra* note 26.

<sup>28</sup> Chiricos & Waldo, *supra* note 26, at 211-213. This contention is refuted by Bean and Cushing, *supra* note 16, at 279.

If this is the case, what attributes distinguish homicide from the other six crime categories which would account for the differential deterrent impact of severity? Several aspects of homicide can be considered in this regard. From studies of the etiology of crime we know that murder, in contrast to other types of crime, occurs in or near the home. The murderer is usually a member of the family or someone well known to the victim. Finally, in contrast to many other crimes, murder is usually done without reflection in a moment of high passion.<sup>29</sup> From this, the following points can be drawn:

1. All other things being equal, the deterrent impact of certainty and severity should be greater for a rational, economic crime like burglary, than for a spontaneous emotional crime like murder.
2. Since there is frequently a connection between murderer and victim, most murders are "solved." This means that the certainty rate for murders as a category of crime should be much higher than the certainty rate for other types of crime. This is borne out by the data reviewed above.<sup>30</sup>

With respect to the existing research findings, these two points imply the following:

1. Certainty, acting alone, has a deterrent impact on crime rates.
2. Given the impact of severity on murder, severity should have an even greater impact on other crimes. Since it does not, it is plausible to hypothesize that *severity only has a deterrent impact when the certainty level is high enough to make severity salient*. Any deterrent impact from severity depends on the level of certainty.<sup>31</sup>

Severity can be most effectively integrated into a deterrence theory by formulation of a model in which the effects of severity operate interactively with the effects of certainty. The basic hypothesis would be that deterrence, as measured by crime rate, is some function of the product of certainty

<sup>29</sup> See the discussion in an excellent review by Wolfgang, *Homicide*, in 3 *INTERNATIONAL ENCYCLOPEDIA OF THE SOCIAL SCIENCES* 490 (1968).

<sup>30</sup> Tittle found that mean certainty ranged from a high of .47 for homicide to a low of .015 for auto theft. Over half of all offense categories had a mean certainty value below .1. Our analysis yielded similar figures.

<sup>31</sup> How high is "high enough" is an empirical question. It may also be the case that this parameter will differ across types of crime. However, the general functional relationship can be expressed as a function of the product of certainty and severity.

and severity. A more complicated model allows a separate causal link between deterrence and certainty, as well as that between the product of certainty and severity. (These models are described in greater detail, as models 3 and 2 respectively, in Figure 1.)

### Research Design

The dependent variable in the analysis performed in this paper is "crime rate." This is a *per capita* measurement of the number of crimes per 100,000 inhabitants in each of 49 states.<sup>32</sup> Seven categories of crime are examined as dependent variables: homicide, sex crimes, robbery, assault, burglary, larceny and auto theft.

Certainty of imprisonment and severity of sentence are determined for each of these crime categories and are treated as independent variables. The "certainty" variable is calculated by dividing the number of persons admitted to prison for a given crime in year "x" by the number of the type of crime known to police in year "x-1." The measure of "severity of sentence" is the median length of sentence served by all those in prison for a given crime on any specified reporting date.

The number of crimes known to police in 1959 and 1960 and the crime rates for 1960 were collected from the FBI's *Uniform Crime Reports*, 1960. Information about admission to state prisons and median sentence length were obtained from the Federal Bureau of Prisons' *Characteristics of State Prisoners*.<sup>33</sup> Thus, in this analysis, "certainty" will be indicated by the number of persons admitted to state prisons in 1960 divided by the number of crimes known to the state police in 1959. "Severity" is the median sentence served by persons incarcerated on December 31, 1960.

One aim of this study is to extend the analyses of Tittle and of Chiricos and Waldo through the application of interval level statistics to similar data. We thereby avoid the limitations imposed by collapsing data into ordinal or nominal categories, and instead, may retain information about relationships which is frequently lost by the use of the less powerful nonparametric techniques.

Accordingly, we employ the following techniques in our analysis: First, we replicate Tittle's work

by computing the bivariate relationships between certainty and crime rate for each of the seven index crime categories. Then, we make the additional comparison of crime rates and severity. The combined predictive effects of certainty and severity considered simultaneously are then explored through a series of linear multiple regressions.

To examine the hypothesis that severity has a deterrent impact on crime rates only under conditions of high certainty, we compute for each type of index crime a regression model of the following form:<sup>34</sup>

$$y = a + b_1CS + e$$

where: y is a crime rate

a is a constant

b<sub>1</sub> is a least squares regression coefficient

C is certainty of imprisonment

S is severity of sentence

e is the residual error

In this equation, note that severity, whatever its value, will have a predictive impact only when certainty is greater than zero. As certainty approaches one, severity approaches its maximum impact value. The second hypothesis—that certainty has an independent deterrent effect in addition to the effect of its interaction with severity—is explored through a regression equation of the form:

$$y = a + b_1C + b_2CS + e$$

where: y is a crime rate

a is a constant

b<sub>1</sub> and b<sub>2</sub> are least squares regression coefficients

C is certainty of imprisonment

S is severity of sentence

e is the residual error

A listing of the five alternative regression models to be examined is provided in Figure 1. We turn now to an analysis of our data in order to ascertain the empirical viability of the alternative models.

### Analysis of the Data

The first step in the analysis consists of a series of bivariate regressions between certainty and

<sup>32</sup> The list of states examined include the District of Columbia and Hawaii. New Jersey and Alaska are omitted due to lack of information in the data source.

<sup>33</sup> FEDERAL BUREAU OF PRISONS, U.S. DEPT OF JUSTICE, *CHARACTERISTICS OF STATE PRISONERS* (1960).

<sup>34</sup> For an elementary discussion of bivariate and multiple regression, see H. BLALOCK, *SOCIAL STATISTICS* (2d ed. 1972). The use of non-linear regression models is discussed in Hamblin, *Mathematical Experimentation and Sociological Theory: A Critical Analysis*, 34 *SOCIOMETRY* 423 (1971).

severity (as independent variables), and crime rates (as the dependent variable) for the seven index crimes. Table 1 presents the product-moment correlations and the regression slopes from these equations.

Turning to these results, we observe that the correlations on "murder" agree with other findings reported, *i.e.*, certainty and severity demonstrate a slight negative relationship with homicide rates. Furthermore, for all seven categories of index crimes, these results generally agree with those reported by Tittle and also by Waldo and Chiricos. Certainty exhibits a slight to moderate negative relationship with each of the seven types of crime rate, while severity demonstrates a weak positive relationship (with the exception of homicide). In our analysis, we found, unlike Tittle, a negative relationship between the crime rate for larceny and severity. However, the magnitude of the correlation is so slight (-.06) that no inference about the sign is allowable.

On the basis of the findings presented in Table 1 we, too, would be led to reject the hypothesis that both certainty and severity have a deterrent effect on crime. The evidence mustered at this point would suggest a policy direction which aims at increasing the certainty of punishment. The commonly held opinion that severe sentencing will

lead to a reduction in crime rates simply finds no empirical support in these data.

Noting the anomalous results with regard to the relationship between homicide rate and severity, we were led to our original hypothesis that severity would have a deterrent impact on crime rates only under conditions of high certainty. Accordingly, we outlined two possible configurations of this interactive relationship in the regression models presented in Figure 1. These models represent an exploratory attempt to create a viable, parsimonious theory of deterrence in which predictive capabilities are enhanced without the necessity of including additional variables.

The usefulness of these regression models with respect to each of the seven crime categories may be ascertained by examination of Table 2, which offers a summary of the explanatory capabilities (as expressed by R<sup>2</sup>) for each of these models for each type of crime.

In the summary presented in Table 2, models 4 and 5 represent, respectively, the simple linear effects of certainty of punishment and severity of sentence actually served acting alone on actual crime rates. In these models we make observations which are consistent with our initial bivariate observations, that is, severity, acting alone, accounts for very little of the explained variation in crime rates, regardless of type of crime. Furthermore, the regression coefficients for model 5 are almost all positive in sign (the exceptions being homicide and larceny), indicating that higher levels of severity are associated with *higher* levels of crime. The positive nature of this association is worthy of only passing notice, since the strength of association is generally slight. With the single exception of homicide rate, the severity variable consistently

FIGURE 1  
ALTERNATIVE REGRESSION MODELS

- (1)  $y = a + b_1C + b_2S + e$
- (2)  $y = a + b_1C + b_2CS + e$
- (3)  $y = a + b_1CS + e$
- (4)  $y = a + b_1C + e$
- (5)  $y = a + b_1S + e$

TABLE 1  
BIVARIATE REGRESSIONS OF CRIME RATES IN STATES (1960) ON CERTAINTY AND SEVERITY FOR SEVEN CATEGORIES OF CRIME

Crime Category	Certainty			Severity		
	Slope	r	r <sup>2</sup>	Slope	r	r <sup>2</sup>
Murder.....	-4.3	-.19	.04	-.07	-.39	.15
Rape.....	-8.1	-.56	.31	.13	.30	.09
Robbery.....	-75.0	-.32	.10	.48	.10	.01
Assault.....	-118.2	-.27	.07	2.10	.18	.03
Burglary.....	-3639.8	-.40	.13	5.10	.09	.01
Larceny.....	-1441.7	-.36	.13	1.36	-.06	.00
Auto-theft.....	-1807.3	-.30	.09	.49	.03	.00

TABLE 2  
SUMMARY OF PREDICTIVE MODELS  
(R<sup>2</sup>)

Regression Model	1 (C + S)	2 (C + CS)	3 (CS)	4 (C)	5 (S)
Dependent Variable:					
Homicide	.21*	.19	.19*	.04*	.15*
Rape	.31	.31*	.20*	.31*	.09
Robbery	.11*	.16*	.07*	.10*	.01
Assault	.08	.15	.13*	.07*	.03
Burglary	.16	.16	.12*	.13*	.01
Larceny	.14*	.18*	.18*	.13*	.00
Auto-theft	.10	.09	.06*	.09*	.00
Average R <sup>2</sup>	.16	.18	.14	.12	.04

\* Slope(s) of the regression equation negative.

accounts for less than ten percent explained variation, and, in four types of crime, predicts less than one percent. Of the five alternative regression models, the severity model (number 5) is the weakest predictive scheme.

Considering the effects of the certainty variable acting independently, the average variance explained increases to 12 percent. For all seven categories, the slope of the regression equation is negative. Thus, these correlations are interpretable as demonstrating a consistent deterrent effect on levels of crime.

In the simple multiplicative model 3, the average amount of explained variance is fourteen percent. More importantly, every regression slope in this model is negative in direction, supporting a deterrence interpretation.

Model 1 considers the linear, additive effects of certainty and severity. For homicide, burglary and auto theft this model is one of the strongest predictors, with an average R-square of .16. However, only three of the seven equations have the requisite negative regression slopes. Thus, the increased predictive power is of little use because the model cannot provide interpretations to consistently support the deterrence hypothesis.

In model 2, the effects of severity are not only examined in an interactive context with certainty (as in model 3), but allowance is made for an additional, separate link between certainty and crime rates.<sup>35</sup> This model articulates the more

<sup>35</sup> Two related models,  $y = a + b_1C + b_2C^2S + e$  and  $y = a + b_1C + b_2C^2S + e$ , were also computed.

elaborate hypothesis about the conditions under which severity may combine with certainty to influence crime rates. However, from the data analysis, we see that model 2 is not markedly better in predictive power than either the simple additive or simple multiplicative models (models 1 and 3 respectively). Moreover, the regression slopes in model 2 are negative for only three of the seven dependent variables.<sup>36</sup> Thus, model 2, although viable in terms of predictive power, generally does not conform to the requirements of a deterrence model.

#### Summary and Conclusion

In this paper we have attempted to distinguish the independent and interactive effects of certainty of punishment and severity of sentence on the level of crime rates in the American states. We have applied several regression models in a test of the effects of these variables in the general deterrence of crime.

From this analysis we find no support for severity of sentence acting alone as a deterrent to crime. However, we find a consistent, moderate effect for certainty of punishment acting to reduce crime rates. Attempts to improve predictive capability through a theoretically formulated model, in which severity exerts an impact on crime rates only under conditions of high certainty, are partially successful. The more complicated version of this model, which hypothesizes both an effect from certainty and severity combined, and a separate effect from certainty acting alone, is the best predictor of crime rates. Nevertheless, it is theoretically uninterpretable. The simpler model, in which certainty and severity combine to jointly influence crime rates, demonstrates good prediction relative to the alternative arrangements of the independent variables. It is theoretically interpretable. In our judgment, this model plausibly demonstrates that certainty and severity do have a moderate deterrent effect upon rates of crime. However, it should be kept in mind that certainty, considered by itself, has a moderate deterrent effect for all crimes, while severity acting

There proved to be little difference between these and the simpler Model 2. To simplify the presentation, only the results from Model 2 are reported.

<sup>36</sup> Although not reported in Table 2, an inspection of the four non-conforming regression equations for Model 2 indicates that in two equations certainty slopes are positive, while in the other two equations the slopes of the product terms combining certainty and severity are positive.



alone is not associated with lower rates of crime. When certainty and severity are combined, as is the case of our model, then the impact of severity is filtered through the certainty value. This means that increasing severity in a condition of low certainty will have little effect on crime rates.

As Zimring and Hawkins have noted, sentences in the United States are currently quite severe in comparison to those imposed in Western Europe.<sup>37</sup> It is quite likely that spending additional funds to keep convicts in prison for longer periods of time will not result in any meaningful increase in general deterrence. Monies spent in this fashion will simply be wasted. Indeed, increasing the severity of sentences may have the unintended consequence of reducing the level of special deterrence through increased recidivism. There are a number of reasons why more severe sentences might cause higher rates of recidivism. Among them are the increased

social stigmatization associated with longer sentences, the inability of those sanctioned and released to live normally in society after prolonged incarceration and a heightened sense of alienation and injustice caused by lengthy incarceration under a condition of low certainty of imprisonment. In our opinion, the appropriate criminal justice policy is one which attempts to reduce crime by increasing the probability of apprehension and prosecution.<sup>38</sup> This would have the advantage of not only increasing the level of general deterrence, but might also result in an increased sense of the fairness of punishment and lower rates of recidivism.

<sup>38</sup> Such a policy runs contrary to the commonly held opinion that crime can be reduced by dealing more harshly with those convicted of crimes. For a discussion of some of the difficulties involved in attempting to implement a policy of increasing certainty rather than severity see Antunes & Hunt, *The Deterrent Impact of Criminal Sanctions: Some Implications for Criminal Justice Policy*, 51 J. URBAN LAW 145 (1973).

<sup>37</sup> E. ZIMRING & G. HAWKINS, *supra* note 1, at 56.