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Pardons, Executions and Homicide

by

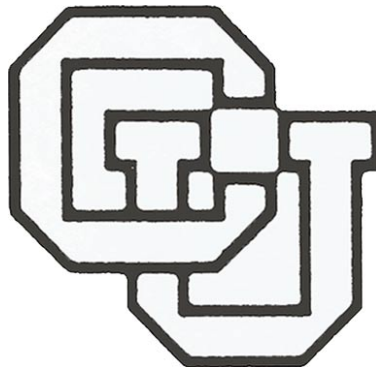
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“I have inquired for most of my adult life about studies that might show that the death penalty is a deterrent, and I have not seen any research that would substantiate that point.”

Former U. S. Attorney General Janet Reno at a Justice Department Press Briefing; January 20, 2000.

I. Introduction

Empirical studies of the economics of crime have established credible evidence regarding the impact of sanctions on criminal activity. In particular, it has been demonstrated that increased arrests and police have deterrent effects on crime (Corman and Mocan 2000, Levitt 1997, Grogger 1991). The analysis of the determinants of homicide is especially important because it poses an interesting test for economic theory. According to the standard economic model of crime, a rational offender would respond to perceived costs and benefits of committing crime. Murder is an important case to test this behavioral hypothesis because murder may be considered a crime which can be committed without regard to costs or benefits of the action. However, empirical tests reveal that even murder responds to costs of crime. For example, Corman and Mocan (2000) show that an increase in murder arrests decreases murders in New York City. Capital punishment is particularly significant in this context, because it represents a very high cost for committing murder (loss of life). Thus, the presence of capital punishment in a state, or the frequency with which it is used should unequivocally deter homicide. Yet, it has been a difficult empirical task to identify the impact of capital punishment on

homicide simply because there is not much variation in the execution rates across states or over time to estimate its impact on homicide with precision.

The statement of former U.S. Attorney General Janet Reno cited above highlights the mixed scientific evidence on the deterrent effect of the death penalty. Ehrlich (1975) and Ehrlich (1977a) found a significant deterrent effect of capital punishment on murder rates using aggregate time series, and cross-sectional data, respectively. Ehrlich's findings were challenged by subsequent work (Leamer 1983; Hoenack and Weiler 1980; Passell and Taylor 1977; Bowers and Pierce 1975) based on the identification of the murder supply equation, functional form of the equations estimated, the sample period investigated and the choice of variables. Ehrlich and others responded to these criticisms (Ehrlich and Liu 1999; Ehrlich and Brower 1987; Ehrlich 1977b). Nevertheless, the issue of whether the death penalty deters murder is still debated in the media,¹ as well as in academia (Sorensen et al. 1999; Cameron 1994; Cover and Thistle 1988; McManus 1985; McFarland 1983; Layson 1983; Forst 1983).

Because of the ethical, moral and religious aspects of capital punishment, executing death row inmates generates repercussions, even from outside the United States. For example, Pope John Paul II appealed to then-Governor George W. Bush to stop an execution scheduled for January, 2000. Recently, state lawmakers have been reacting to the sentiment that there is arbitrariness and possibly a racial bias in the

1 Recent examples are: CNN Live Today, June 27, 2001, "Gallup Poll: Americans and the Death Penalty;" Meet the Press, NBC, June 10, 2001 hosting former New York Governor Mario Cuomo and Oklahoma Governor Frank Keating; The O'Reilly Factor on Fox New Network, June 11, 2001, "Death Penalty as a Deterrent."

implementation of the death penalty by proposing legislation to either abolish it, or instate a moratorium.² Similarly, a bill was introduced in United States Congress recently to abolish the death penalty under Federal law.³

In this paper we investigate whether the death penalty is a deterrent for homicide. An inherent difficulty in uncovering an impact of deterrence on crime is to find appropriate data sets to overcome the issue of simultaneity between criminal activity and deterrence measures. Low-frequency time series data or cross-sectional data are not satisfactory to address the issue (Corman and Mocan 2000, Levitt 1997). We use a state-level panel data set that contains information on homicide and other crimes, deterrence variables, relevant capital punishment measures along with a number of state characteristics. Katz, Levitt and Shustorovich (2001) perform a similar analysis which focuses on the impact of prison conditions on criminal activity. Differences between this paper and theirs are highlighted in Section VI.

An innovation of this paper is the use of a Department of Justice data set, which is new to the literature. This data set contains detailed information on the entire 6,143 deaths sentences between 1977 and 1997 in the United States. For example, the exact month of removal from death row is identified for each prisoner. This information is valuable as it allows us to link executions to criminal activity in the proper time frame.

2 Legislators in at least 21 states have recently proposed legislation to modify their current capital punishment laws. Illinois imposed a moratorium in 2000.

3 Federal Death Penalty Abolition Act of 2001, introduced by Senator Russell Feingold; January 25, 2001, S191.

More specifically, previous studies linked the crime rate in a given year to the number of executions in the same year. However, if an execution takes place towards the end of a year, it cannot considerably effect crime rates in that same year (as the number of crimes for that year have been committed since January). Rather, such an execution is expected to impact the crime rate of *the following year*. This issue is potentially significant because 47.2 percent of all executions and 50.9 percent of all commutations (pardons of the death row inmates by the governor) between 1977 and 1997 took place between the months of July and December. This means that if executions and homicide rates in a state are not linked in the proper time frame, the estimated coefficient of the execution rate may be biased toward zero because of this measurement error.

Another innovation of this paper is to investigate the impact of clemency on homicide. The governor of the state has the power to pardon a prisoner on death row. According to economic theory, such an action represents a decrease in the cost of committing the crime, and should have a positive impact on the homicide rate. The impact of pardons on homicide or other crimes has not been investigated before.

We find a statistically significant relationship between executions, pardons and homicide. Specifically, each additional execution reduces homicides by 5 to 6, and three additional pardons generate 1 to 1.5 additional murders.

Section II gives the background on death penalty in the United States. Sections III and IV describe the methodology and the data, respectively. Section V presents the results. Section VI consists of the extensions, and Section VII is the conclusion.

II. Recent History of Capital Punishment and the Data Set

In the late 1960s 40 states had laws authorizing use of the death penalty in the United States. However, strong pressure by those opposed to capital punishment resulted in few executions. For example, there were 145 executions between 1960 and 1962. In 1963 and 1964 there were 21 and 15 executions, respectively. Between 1965 and 1967 there were a total of 10 executions, and nobody was executed between 1968 and 1972. All executions were halted and hundreds of inmates had their death sentences lifted by a Supreme Court decision in 1972. In *Furman v. Georgia*, 408 U.S. 153 (1972) the Supreme Court struck down federal and state laws that had allowed wide discretion resulting in arbitrary and capricious application of the death penalty. Three of the Supreme Court justices voiced concerns that included an appearance of racial bias against black defendants. Furthermore, laws that imposed a mandatory death penalty and those that allowed no judicial or jury discretion beyond the determination of guilt were declared unconstitutional in 1976 [*Woodson v. North Carolina*, 428 U.S. 280 (1976), *Roberts v. Louisiana*, 428 U.S. 325 (1976)].

Starting in the mid-1970s, many states reacted by adopting new legislation to address the concerns of the Supreme Court, and these new state laws were later upheld by the Supreme Court [e.g. *Gregg v. Georgia*, 428 U.S. 153 (1976), *Jurek v. Texas*, 428 U.S. 262 (1976), and *Proffitt v. Florida*, 428 U.S. 242 (1976)]. New state statutes created two-stage trials for capital cases, where guilt/innocence and the sentence were

determined in two different stages. The first post-Gregg execution took place in 1977 in Utah, and the number of executions has since continued to rise. Currently, only 12 states and the District of Columbia do not have capital punishment, although a number of states consider abolishing death penalty.⁴

Figure 1 displays the murder rate in the United States per 100,000 people between 1977 and 1997, along with the number of executions during the same time period. Also presented in Figure 1 is the murder rate in states where the death penalty was legal. Following the first post-Gregg execution in 1977, the number of executions increased to an average of about 20 per year around mid-1980s. After remaining stable until the early 1990s, the number of executions started rising in 1993, reaching 74 executions in 1997. The homicide rate in the U.S. was 8.8 murders per 100,000 people in 1977. It reached 10.2 in 1980, and then started declining continuously until 1984. When the number of executions was relatively stable in late 1980s, the murder rate rose again, reaching 9.8 murders per 100,000 people in 1991. It began declining after 1991 and went down 6.8 in 1997.

III. Empirical methodology

To investigate the impact of capital punishment and other forms of deterrence on homicide, we estimate regressions of the following form:

⁴ The twelve states are Alaska, Hawaii, Iowa, Maine, Massachusetts, Michigan, Minnesota, North Dakota, Rhode Island, Vermont, West Virginia and Wisconsin.

$$(1) \quad \text{MURDER}_{it} = \text{DETER}_{it-1} \boldsymbol{\beta} + \mathbf{X}_{it} \boldsymbol{\Omega} + \mu_i + \eta_t + \varepsilon_{it},$$

where MURDER_{it} is the homicide rate in state i and year t , and **DETER** stands for the vector of deterrence variables. Following Ehrlich (1975) and the literature that follows, **DETER** consists of the subjective probabilities (for potential offenders) that offenders are apprehended, convicted and executed. The first one of these probabilities is measured by the murder arrest rate (the proportion of murders cleared by an arrest). Following Levitt (1998), and Katz, Levitt and Shustorovich (2001), the second probability is calculated as the number of prisoners per violent crime. As Levitt (1998) notes, the number of individuals in custody as a fraction of population may correspond more closely to the theoretical notion of incapacitation. Thus, as an alternative measure we also employ the number of prisoners per population. The third variable in **DETER** pertains to the probability of execution given conviction. Ehrlich (1975) measured this variable as the ratio of the number of individuals executed in a year to the number of individuals convicted in the previous year, under the assumption that there is a one-year lag between conviction and execution. The data set we employ in this paper (explained below in detail) consists of the universe of persons who were on death row between 1977 and 1997. Since we know the month and year of the imposition of the death sentence for each person and his/her execution date, we can calculate the time spent on death row. The average duration on death row for those who are executed between 1977 and 1997 is 9.31 years. Therefore, using the ratio of executions in year t as a fraction of convictions in year $t-9$ would lose almost half of our sample. We calculate

the probability of execution as the number of *executions per death row inmates*. This measure is more closely linked to the theoretical risk of execution in comparison to some other measures, such as executions per prisoners.

The data set also contains information on death row inmates who are pardoned by state governors. An increase in pardons implies a decrease in the probability of execution, which economic theory predicts should have a positive impact on murder rates. We use the number of pardons per death row inmates as an (inverse) deterrence measure.

Following Katz, Levitt and Shustorovich (2001), Corman and Mocan (2000), and Levitt (1998), deterrence variables are lagged once to minimize the impact of simultaneity between the murder rate and deterrence measures. Because the number of homicides appear in the numerator of the independent variable and in the denominator of the arrest rate, measurement error in homicides generates biased estimates. Unlike other types of crimes, measurement error in the homicide variable is unlikely to be consequential. Nevertheless, lagging the deterrence measures also helps minimize this potential bias (Levitt 1998).

The vector \mathbf{X} contains state characteristics that may be correlated with criminal activity. It includes information on the unemployment rate, real per capita income, the proportion of the state population in the following age groups: 20-34, 35-44, 45-54 and 55 and over, the proportion of the state population in urban areas, the proportion which is black, the infant mortality rate, and per capita beer consumption in the state.

Theoretical and empirical justification for the inclusion of these variables can be found in Levitt (1998), and Lott and Mustard (1997). The variable μ_i represents unobserved state-specific characteristics that impact the murder rate and η_t represents year effects. To control for the impact of the 1995 Oklahoma City bombing, we included a dummy variable, which takes the value of one in Oklahoma in 1995, and zero elsewhere. Most specifications also include state-specific time-trends.

IV. Data

We use data from *Capital Punishment in the United States, 1973-1998*, compiled by the Department of Commerce and the Bureau of Census, and published by Bureau of Justice Statistics of the U.S. Department of Justice. The data set contains information on the exact month and year of the prisoner's sentencing, and the month and year when the prisoner is removed from death row. The removal takes place if the prisoner is executed, commuted (granted clemency by the governor), died on death row, the capital sentence is declared unconstitutional, the conviction is affirmed but the sentence is overturned, the conviction is overturned, or the sentence is overturned for other reasons. These data provide information on the history of 6,143 death sentences between 1977 and 1997 in the United States.⁵ This data set allows us to create

⁵ During this period, three-hundred and forty-six inmates were sentenced twice, 14 inmates were sentenced three times, and one individual was sentenced four times. There may be a variety of reasons for multiple sentencing. For example, a sentence can be overturned on

deterrence constructs that are closely linked to theory. For example, as explained above, economic theory suggests that the murder rate depends on, among other factors, the risk of execution given the death sentence. Most previous studies proxied the risk of execution by the ratio of executions to the number of prisoners or murders committed. A more appropriate measure of execution risk, which we employ in this paper, is the ratio of executions to the number of *death row inmates*.

Second, we analyze, for the first time in this literature, the impact of clemency on the homicide rate. An increase in the number of pardons handed to death row inmates by the governor implies a decrease in the risk of execution. Thus, an increase in the pardon (clemency or commutation) rate is expected to be positively related to murders.

Third, as mentioned earlier, an advantage of our data set is the availability of the exact date of each execution and pardon. This information enables us to create execution and pardon measures that are more consistent with theory. More specifically, if executions or pardons send signals to potential criminals, then the timing of the signal is important. For example, an execution which took place in January of 1980 can have an impact on the homicide rate for the full year. However, if the execution took place in December 1980, it will have a trivial impact on the 1980 homicide rate. Rather, the impact of this December execution on murder will be felt in

appeal and then be upheld at a later trial. It is also possible to be pardoned or have the conviction overturned and then commit murder again and receive a separate death sentence.

1981. The distribution of executions are relatively uniform over the year. An investigation of the 432 executions that took place between 1977 and 1997 shows that approximately 8 percent took place in each month. Given this, we created the following algorithm: If an execution took place within the first three quarters of a year, we attributed that execution to the same year. If the execution took place in the last quarter of a year (October-December) we attributed that execution to the following year under the assumption that the relative impact on murders would be felt in the following year. The same was done for pardons.

As a second measure, we prorated the executions and pardons based on the month in which they occurred. As above, an execution that took place in January 1980 is expected to impact the state homicide rate for the entire twelve months in 1980. Therefore we count this execution as a full execution in 1980. By contrast, if an execution took place in November 1980, it is assumed that its deterrent impact on homicide is felt during the subsequent 12-month period. Thus, this November execution counts as $2/12$ of an execution for 1980 and $10/12$ of an execution for 1981. The same algorithms are applied for pardons. Although these measures are arguably more accurate, we investigate the sensitivity of the results to the use of a more traditional measure of the execution rate later in the paper.

Table 1 presents the descriptive statistics of the data. The top-section of the table presents information on the homicide rate, homicide arrests, two measures of the execution and pardon rates as well as custody rates and prison deaths. The lower-

section of the table summarizes the data that captures state characteristics. These are per capita consumption of malt beverages in the state, the state unemployment rate, real per capita income, the infant mortality rate in the state, percent of population living in urbanized areas, percent black, the age distribution of state population and a dichotomous variable to indicate whether the governor is a republican. The bombing of the Federal Building in Oklahoma City in 1995 is controlled for with the dummy variable Oklahoma City-1995, although its omission from the models has no impact on the empirical results. The sources of these data are described in the Appendix.

Table 1 also displays the means and standard deviation of the variables in the sample along with standard deviations of the variables after removing state fixed-effects and time effects (the middle column) and state fixed-effects, time effects and state-specific time trends (the right-most column). The variation goes down significantly for some variables such as Urbanization, Percent Black and age distribution, but substantial variation remains for most variables.

V. Results

Table 2A displays the regressions where the homicide rate is explained by the probability of arrest (the number of murder arrests divided by the number of murders), the custody rate (the number of prisoners per violent crime, or number of prisoners per population), the risk of execution (the number of executions divided by the number of death-row inmates), and a number of state characteristics. Following the results of

Katz, Levitt and Shustovich (2001) we also included the prison death rate as a measure of prison conditions.

Four specifications are presented in the table, all of which contain state fixed-effects to control for state-specific characteristics that are not captured by the control variables. All models also include time dummies. Thus, these specifications consider within-state changes and eliminate the impact of time-invariant omitted factors that are correlated with deterrence variables across states; while time dummies control for the unobserved time-varying determinants of homicide which impact all states in the same fashion. Columns 2 and 4 include state-specific time trends to capture the factors that impact the time-series behavior of homicide which can be different from state to state.

In columns 1 and 2 of Table 2A we present the models where incapacitation is measured as prisoners per violent crime, and columns 3 and 4 present the models where it is measured by prisoners per population. Deterrence variables are lagged once and the models are estimated with weighted-least squares, where the weights are state's share in the U.S. population. Robust standard errors are reported in parentheses.

In all specifications, the execution rate is negative and statistically significant, indicating that an increase in the risk of execution lowers the homicide rate. The same is true for the custody rates. The prison death rate and the arrest rate have negative coefficients, but they are not significantly different from zero.

Table 2B is organized similarly, but it reports the results of the model with Execution Rate-2, which is the pro-rated execution variable (see Section IV for the

description). The results are similar to those reported in Table 2A, as the execution rate has a negative and statistically significant impact on the homicide rate. Tables 2A and 2B indicate that states with higher infant mortality have higher homicide rates, and an increase in the share of the population which is 20 to 34 years of age has a positive impact on the homicide rate. Controlling for state income, an increase in the unemployment rate is related to a reduction in homicide. This result, which is not intuitive, is consistent with those reported by Katz, Levitt and Shustorovich (2001), and Ruhm (2001, 2000).

Tables 3A and 3B present the results where the risk of execution is replaced by the probability of being pardoned by the governor. Theory suggests that an increase in pardons represents a decrease in deterrence, and therefore should increase the propensity to commit murder. Although there are only 123 pardons between 1977 and 1997, this variable is estimated with surprising precision. The pardon rate is positive and significantly different from zero in both tables, indicating that an increase in pardons generates an increase in the homicide rate. The impact of other variables are consistent with those reported in Tables 2A and 2B.

In tables 4A and 4B we present models where the risk of execution and the probability of pardon are included jointly. The structure of these tables is similar to Tables 2A-3B. Table 4A reports the results with the first measure of the execution and pardon rates, and Table 4B displays the results obtained from the second measure. As before, each table summarizes the results with two different custody rates (prisoners per

violent crime and prisoners per population). The deterrence variables have predicted signs. Custody variables have a negative impact on the homicide rate. Although homicide arrests and prison deaths have negative coefficients, they are not significantly different from zero. Both execution and pardon variables are significant. An increase in executions decreases the murder rate, and an increase in pardons increases it. The magnitude of the impact of an execution is surprisingly similar to that reported by Ehrlich (1975). Each additional execution results in a reduction of murders by 5 to 6. The impact of pardons is smaller. Three additional pardons yield between 1 and 1.5 additional homicides.

In Table 5 we report the results of the models where the deterrence variables enter with three lags to allow richer dynamics. Put differently, the homicide rate in year t is impacted by the execution rate, pardon rate, arrest rate, custody rate and prison death rate in years $t-1$, $t-2$ and $t-3$. The models include state fixed effects, time dummies and state trends. The results are consistent with previous tables. With very few exceptions, the individual coefficients of deterrence variables have expected signs: the coefficients of executions, arrests, custody and prison deaths are negative, and those of pardons are positive. Table 5 also reports the sum of the lags for the deterrence variables along with a test for statistical significance of the sums. For example, the sum of three lags of the execution rate is always significant, ranging from -0.07 to -0.10 . The sum of pardon rate lags is approximately 0.02 and it is significant in all four specifications. The sums of custody lags is negative and significantly different

from zero, while the sum of prison death rate lags and the sum of arrest rate lags are not significant. The signs and significance levels of other control variables are similar to those reported in earlier tables.

To investigate whether the presence of the death penalty has a direct impact on the homicide rate, we added a dichotomous variable to the models which takes the value of one if capital punishment is legal in the state and zero otherwise. The existence of the death penalty in a state is unlikely to be an exogenous event; rather it may be influenced by the murder rate. To avoid this simultaneity, we lagged the dichotomous variable by one year. The result is presented in column I of Table 6. The models include state and year dummies as well as state trends. There is sufficient variation of the dummy variable that measures the legality of the death penalty in a state as seven states legalized the death penalty between 1977 and 1997 (Kansas, New Hampshire, New Jersey, New Mexico, New York, Oregon and South Dakota), and Massachusetts and Rhode Island abolished it during the same time period. The variable (*Death Penalty Legal*) is negative and significantly different from zero indicating that the presence of death penalty has a negative impact on the murder rate. In column two we report the result where *Death Penalty Legal* is interacted with the lagged execution and pardon rates. The coefficients of the execution and pardon rates are negative and positive, respectively; and both are significant with magnitudes similar to those reported earlier. The coefficient of Legal, which is the same as the one reported in column 1 suggests that the presence of death penalty lowers the number of murders by 67.

As an alternative specification, it may be reasonable to assume that the presence of capital punishment in the state is a function of past homicide rates in the state. More specifically, consider the following formulation for the existence of capital punishment.

$$(2) \quad L_t = \alpha \text{MURDER}_{t-1} + \alpha \lambda \text{MURDER}_{t-2} + \alpha \lambda^2 \text{MURDER}_{t-3} + \alpha \lambda^3 \text{MURDER}_{t-4} + \dots,$$

where L_t represents the death penalty indicator in the state in year t , MURDER stands for the homicide rate in the state, and λ is less than one in absolute value. Equation (2) portrays the existence of capital punishment in year t as a function of past homicide rates in the state, where homicide rates in more distant past have smaller impacts. Our main equation of interest, Equation (1), can be expressed more compactly as

$$(3) \quad \text{MURDER}_t = \beta \text{DETER}_{t-1} + \varepsilon_t,$$

where state subscripts and other determinants of homicide are suppressed for ease of exposition. Substituting (3) into (2) gives

$$(4) \quad L_t = \alpha \beta \text{DETER}_{t-2} + \alpha \beta \lambda \text{DETER}_{t-3} + \alpha \beta \lambda^2 \text{DETER}_{t-4} + \alpha \beta \lambda^3 \text{DETER}_{t-5} + \dots,$$

It is straightforward to show that Equation (4) can be re-written as

$$(5) \quad L_t = \alpha \beta \text{DETER}_{t-2} + \lambda L_{t-1}$$

Equation (5) suggests that the presence of capital punishment, although endogenous, can be instrumented with twice-lagged deterrence variables and lagged capital punishment law. The results of the instrumental variables estimation are presented in column 3 of Table 6. Again, the coefficient of the death penalty indicator (*Death Penalty Legal*) is negative and statistically significant. The magnitude of the coefficient implies that the presence of the capital punishment in the state is associated

with a reduction of 95 homicides in this specification. Once again, this effect does not influence the coefficient of the execution rate, which indicates that an additional execution generates a reduction in homicide by a magnitude of 6. The coefficient of the pardon rate gets slightly larger in this specification, indicating that each new pardon generates one new homicide. The coefficients of other deterrence variables are also consistent with those reported in previous tables.

VI. Extensions

To investigate the nonlinear impacts of executions and pardons on homicide, we estimated the models by adding squared terms of the lagged execution and pardon rates. The coefficient of the lagged execution rate was negative and significant at the nine percent level, while its squared term was positive but insignificant. Similarly, the pardon rate was positive and significant at the nine percent level, while its squared term was negative but not significantly different from zero.

We also estimated the models in the logarithms of the murder rate. The results, which are reported in tables APP-1A and APP-1B in the appendix are consistent with the ones reported earlier where the homicide rate was in levels.

Katz, Levitt and Shustorovich (2001) estimated separate models that included region-year and state-decade interactions. As explained in their paper, inclusion of region-year interactions allows the parameters of the model to be identified off of differences across states within a particular region and year. For this exercise we

classified the states into four regions: Northeast, Midwest, South and West. Inclusion of state-decade interactions implies that we exploit the variation within a state around that state's mean value in a particular decade. Since our data starts in 1977, we split the sample into two periods: 1990s and the rest of the sample. These results are reported in APP-2A and APP-2B in the Appendix. Table APP-2A presents the results of the models with the first measure of the execution and pardon rates. Columns I and II are models with state-decade interactions, and columns III and IV are models with region-year interactions. The first and third columns include prisoners per violent crime as a measure of custody, and columns II and IV use prisoners per population as a measure of custody. The results are consistent with earlier tables, but the execution rate is estimated with smaller precision in specifications with region-year interactions. Table APP-2B, which uses our alternative execution and pardon measures (Execution Rate-2, Pardon Rate-2), reports similar results although the execution rate is not significant at conventional levels.

Katz, Levitt and Shustorovich (2001) find that prison deaths have a negative impact on crime rates, while the impact of executions is not significant. Although the methodology of this paper and that of theirs as well as much of the data used are the same, there are some differences that may account for the dissimilarity in the results. First, our data covers the post-Gregg time period 1977-1997 while theirs cover 1950-

1990.⁶ Another difference between the papers is the measurement of the execution rate. While we measure the risk of execution as executions per death row inmates, their measure is executions per prisoners. Finally, their models do not contain murder arrest rate as an explanatory variable and a few other control variables, while ours do.

To understand how these differences may impact the results, we estimated models, where the measurement of variables and model specifications are almost identical to those estimated by Katz, Levitt and Shustorovich (2001). The results are reported in Table 7. Here, the execution rate is measured as the number of executions in a year per 1,000 *prisoners* in the same year. Column I reports the result of the model which is comparable to the benchmark specification of Katz, Levitt and Shustorovich (2001). Following their specification, prisoners per violent crime and prisoners per population are included jointly, and the model does not include the murder arrest rate. In this specification the prison death rate is not statistically significant, whereas the execution rate and prisoners per violent crime are negative and significant.

Column II displays the same model with one change: the specification now includes the murder arrest rate. The coefficients and their statistical significance are the same as in column I. The murder arrest rate has a negative coefficient which is not significantly different from zero. Column III adds the Oklahoma City dummy and the Republican Governor dummy to the specification reported in column II, and column IV

⁶ When Katz, Levitt and Shustorovich (2001) estimated their models between 1971 and 1990 the estimated coefficient of the execution rate was negative and not quite significant with a t-

is similar to our benchmark specification, which includes one custody variable, rather than two. Consistent with the rest of the table, the execution rate and prisoners per violent crime have negative coefficients which are significantly different from zero, while the arrest rate and the prison death rate are not significant. The coefficients of the execution rate per 1000 prisoners range from -0.013 to -0.014 , which indicates that in this specification an additional execution reduces homicide by a magnitude of 5 to 6 as before.

These results suggest that differences in model specification and measurement of variables are not likely reasons for the differences between our results and those reported by Katz, Levitt and Shustorovich (2001). It is likely that the time span analyzed drives the results. In particular, we focus on the period of 1977-1997 which includes a significant number of executions in comparison to earlier periods. More specifically, between 1971 and 1976 there were no executions in the United States because of the actions of the Supreme Court, as described in Section II. There were three executions between 1977 and 1979, and 140 prisoners were executed between 1980 and 1990. Thus, in the 20 years covering 1971 to 1990 there were a total of 143 executions. On the other hand, there were more than twice as many executions (312) in a seven-year time span between 1991 and 1997. Thus, it is possible that the 1990s which is covered by our data has increased the precision of the estimated impact of capital punishment on homicide.

statistics of -1.60 .

To investigate how pardons, executions and other deterrence variables impact crimes other than homicide, we investigated their impact on robberies, burglaries, rapes and motor-vehicle thefts. To the extent that capital punishment is a murder-specific deterrent, they are not expected to have significant impact on these crimes. On the other hand, executions may impact violent crimes such robbery and rape if the offender is aware of the possibility that a robbery or rape may end up as a homicide. Alternatively, an execution may have a negative impact on all crimes if it provides a signal to potential offenders regarding the attitude of the criminal justice system and that of the governor. Along the same lines, a pardon by the governor may be taken as a signal for a more lenient criminal justice environment and therefore may promote criminal activity.

Table App-3 presents the results for robbery, burglary, rape and motor-vehicle theft. For each model, crime-specific arrests are included. An increase in the custody rate, measured by prisoners per population, lowers all four crimes reported in the table. An increase in robbery, burglary arrests and rape arrests reduces these crimes, while the coefficient of motor vehicle arrests is positive. None of these crimes is influenced by the execution rate or the pardon rate.

VII. Conclusion and Discussion

The investigation of whether the death penalty deters homicide is important from an academic as well a public policy point of view. The effectiveness of capital

punishment as a crime control device and its appropriateness in a modern democratic society have both been hotly debated in the United States. This paper uses a data set that consists of the entire history of 6,143 death sentences between 1977 and 1997 in the United States to investigate the impact of capital punishment on homicide. We merge this data set with state panels that include crime and deterrence measures as well as state characteristics. Our data set allows us not only to analyze the impact of executions, but also for the first time in the literature, the impact of pardons by governors on criminal activity. Because we can identify the exact month and year of each execution and pardon, we can match them with criminal activity in the relevant time frame. Controlling for a variety of state characteristics, we investigate the impact of the execution rate, pardon rate, homicide arrest rate, the imprisonment rate and the prison death rate on the rate of homicide. The models are estimated in a number of different forms, controlling for state fixed effects, common time trends, and state-specific time trends. We find a significant relationship between the execution and pardon rates and the rate of homicide. Each additional execution decreases homicides by 5 to 6, while three additional pardons generate one to 1.5 additional homicides. These results are very robust to model specifications and measurement of the variables.

Although these results demonstrate the existence of the deterrent effect of capital punishment, it should be noted that there remains a number of significant issues surrounding the imposition of the death penalty. For example, although the Supreme Court of the United States remains unconvinced that there exists racial discrimination in

the imposition of the death penalty, recent research points to the possibility of such discrimination (Baldus et al. 1998, Pokorak 1998, Kleck 1981). Along the same lines, there is evidence indicating that there is discrimination regarding who gets executed and who gets pardoned once the death penalty is received (Argys and Mocan 2001). Given these concerns, a stand for or against capital punishment should be taken with caution.

Figure 1
The Homicide Rate vs Total Executions in the United States

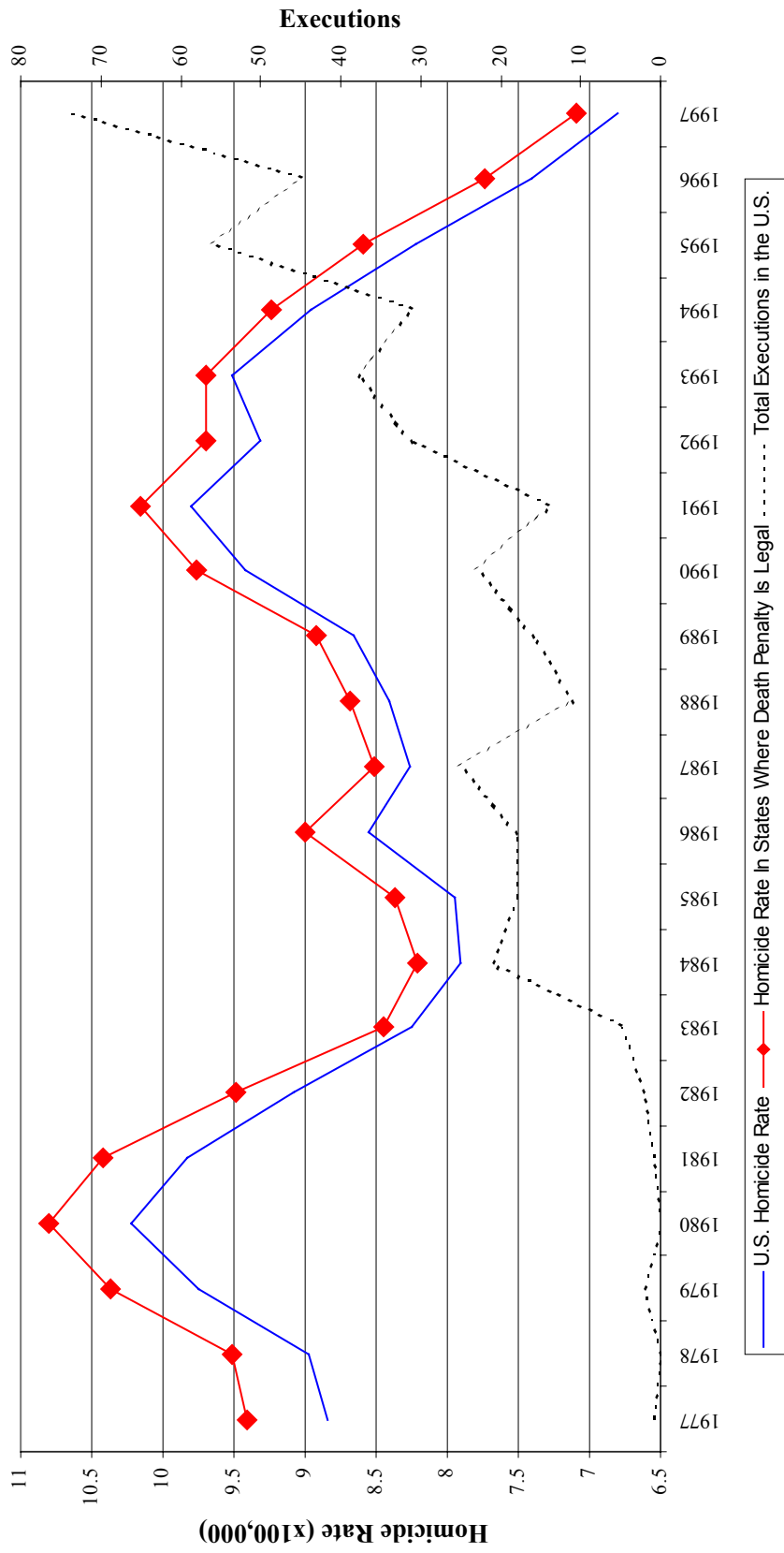


Table 1

Descriptive Statistics of the Data

		Full Sample	Standard Deviation	
Variable	Description	Mean (Std.Dev)	Filtering State and Time Effects	Filtering State, Time and State Trends
Homicide Rate	The number of homicides divided by the population, multiplied by 1000.	0.070 (0.038)	(0.012)	(0.010)
Homicide Arrest Rate	The number of homicide arrests divided by the number of reported homicides.	0.876 (0.312)	(0.243)	(0.219)
Execution Rate	The number of executions in the first three quarters of the current year and the last quarter of the previous year, divided by the number of persons on death row.	0.006 (0.036)	(0.034)	(0.033)
Execution Rate-2	A prorated count of the number of executions in the previous and current year divided by the number of persons on death row.	0.006 (0.035)	(0.033)	(0.032)
Pardon Rate	The number of pardons in the first three quarters of the current year and the last quarter of the previous year, divided by the number of persons on death row.	0.010 (0.175)	(0.168)	(0.159)
Pardon Rate-2	A prorated count of the number of pardons in the previous and current year divided by the number of persons on death row.	0.009 (0.140)	(0.135)	(0.128)
Prisoners Per Population	The number of persons in custody of state correctional authorities divided by the adult population, multiplied by 1000.	2.755 (1.539)	(0.520)	(0.274)
Prisoners Per Violent Crime	The number of persons in custody of state or federal correctional authorities divided by the total number of violent crimes.	0.518 (0.288)	(0.135)	(0.086)
Prison Death Rate	The number of prison deaths other than executions divided by the number of state prisoners, multiplied by 1000.	2.457 (1.872)	(1.700)	(1.589)
Alcohol Consumption	The per capita consumption of malt beverages (gallons) in the current year.	23.649 (4.202)	(1.312)	(0.793)
Unemployment Rate	The state unemployment rate.	6.398 (2.084)	(1.111)	(1.033)
Per Capita Income	Real per capita income in 1982-1984 dollars, divided by 1000.	13.438 (2.322)	(0.638)	(0.354)
Infant Mortality Rate	The number of deaths under 1 year of age per 1000 live births.	10.076 (2.516)	(0.953)	(0.885)
Urbanization	The percent of the state population residing in urbanized areas.	67.781 (14.467)	(0.877)	(0.138)

(Table 1 Concluded)

Republican Governor	Dummy Variable (=1) if the Governor is Republican in that Year.	0.409 (0.492)	(0.408)	(0.351)
Percent Black	The percent of the state population that is Black.	9.388 (9.464)	(1.420)	(1.193)
Percent 20-34	The percent of the state population that is age 20 to 34.	24.675 (2.406)	(0.858)	(0.459)
Percent 35-44	The percent of the state population that is age 35 to 44.	13.866 (2.184)	(0.370)	(0.233)
Percent 45-54	The percent of the state population that is age 45 to 54.	10.319 (1.199)	(0.312)	(0.142)
Percent 55+	The percent of the state population that is age 55 or older.	20.292 (2.977)	(0.539)	(0.297)
Oklahoma City 1995	Dummy variable (=1) for Oklahoma in year 1995.	0.001 (0.031)	(0.030)	(0.028)
		n = 1050 ^Ψ		

^Ψ We have 1047 observations for the Homicide Arrest Rate and 1049 observations for the Prison Death Rate.

Table 2A

**The Determinants of the Homicide Rate
(Models with First Execution Rate Measure)**

Variable	(I)	(II)	(III)	(IV)
Execution Rate (-1)	-0.046* (0.025)	-0.041* (0.022)	-0.041* (0.024)	-0.039* (0.022)
Homicide Arrest Rate (-1)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.03*** (0.008)	-0.045*** (0.006)	—	—
Prisoners Per Population (-1)	—	—	-0.007*** (0.001)	-0.007*** (0.001)
Prison Death Rate (-1)	-0.0002 (0.0003)	-0.0002 (0.0003)	-0.0001 (0.0003)	0.0003 (0.0003)
Percent Black	-0.0006 (0.0004)	-0.0003 (0.0003)	-0.0004 (0.0004)	-0.0003 (0.0003)
Republican Governor	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002** (0.001)
Unemployment Rate	-0.001*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002** (0.001)
Per Capita Income	0.001 (0.001)	0.002 (0.002)	-0.0003 (0.001)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001 (0.001)
Urbanization	0.002*** (0.001)	-0.011* (0.006)	0.002*** (0.001)	-0.013** (0.006)
Alcohol Consumption	-0.001** (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Percent 20-34	0.005*** (0.001)	0.003*** (0.001)	0.006*** (0.001)	0.004*** (0.001)
Percent 35-44	0.004*** (0.002)	-0.001 (0.002)	0.002 (0.002)	-0.0003 (0.002)
Percent 45-54	0.006*** (0.002)	-0.002 (0.003)	0.003* (0.002)	-0.003 (0.003)
Percent 55+	0.004*** (0.001)	-0.002 (0.002)	0.002* (0.001)	-0.002 (0.002)
Oklahoma City 1995	0.053*** (0.004)	0.05*** (0.005)	0.054*** (0.004)	0.052*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.905	0.944	0.908	0.942
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	No	Yes	No	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

Table 2B

**The Determinants of the Homicide Rate
(Models with Second Execution Rate Measure)**

Variable	(I)	(II)	(III)	(IV)
Execution Rate-2 (-1)	-0.049* (0.026)	-0.032* (0.019)	-0.042* (0.023)	-0.029 (0.019)
Homicide Arrest Rate (-1)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.029*** (0.008)	-0.045*** (0.006)	—	—
Prisoners Per Population (-1)	—	—	-0.007*** (0.001)	-0.007*** (0.001)
Prison Death Rate (-1)	-0.0003 (0.0003)	0.0002 (0.0003)	-0.0001 (0.0003)	0.0002 (0.0003)
Percent Black	-0.0005 (0.0004)	-0.0003 (0.0003)	-0.0004 (0.0004)	-0.0003 (0.0003)
Republican Governor	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002** (0.001)
Unemployment Rate	-0.001*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002** (0.001)
Per Capita Income	0.001 (0.001)	0.003 (0.002)	-0.0003 (0.001)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001 (0.001)
Urbanization	0.002*** (0.001)	-0.011* (0.006)	0.002*** (0.001)	-0.013** (0.006)
Alcohol Consumption	-0.001** (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Percent 20-34	0.005*** (0.001)	0.003*** (0.001)	0.006*** (0.001)	0.004*** (0.001)
Percent 35-44	0.004*** (0.002)	-0.001 (0.002)	0.002 (0.002)	-0.0003 (0.002)
Percent 45-54	0.006*** (0.002)	-0.002 (0.003)	0.003* (0.002)	-0.003 (0.003)
Percent 55+	0.004*** (0.001)	-0.002 (0.002)	0.002* (0.001)	-0.002 (0.002)
Oklahoma City 1995	0.053*** (0.004)	0.05*** (0.005)	0.054*** (0.004)	0.052*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.905	0.944	0.908	0.942
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	No	Yes	No	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

Table 3A

**The Determinants of the Homicide Rate
(Models with First Pardon Rate Measure)**

Variable	(I)	(II)	(III)	(IV)
Pardon Rate (-1)	0.003*** (0.001)	0.005*** (0.001)	0.003*** (0.001)	0.005*** (0.001)
Homicide Arrest Rate (-1)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.03*** (0.008)	-0.045*** (0.006)	—	—
Prisoners Per Population (-1)	—	—	-0.007*** (0.001)	-0.007*** (0.001)
Prison Death Rate (-1)	-0.0002 (0.0003)	0.0002 (0.0003)	-0.00003 (0.0003)	0.0003 (0.0003)
Percent Black	-0.0006 (0.0004)	-0.0003 (0.0003)	-0.0004 (0.0004)	-0.0003 (0.0003)
Republican Governor	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002** (0.001)
Unemployment Rate	-0.001*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)
Per Capita Income	0.001 (0.001)	0.003 (0.002)	-0.0002 (0.001)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001 (0.001)
Urbanization	0.002*** (0.001)	-0.011* (0.006)	0.002*** (0.001)	-0.013** (0.006)
Alcohol Consumption	-0.001** (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Percent 20-34	0.005*** (0.001)	0.003** (0.001)	0.006*** (0.001)	0.004*** (0.001)
Percent 35-44	0.004** (0.002)	-0.001 (0.002)	0.002 (0.002)	-0.00002 (0.002)
Percent 45-54	0.006*** (0.002)	-0.002 (0.003)	0.003 (0.002)	-0.003 (0.003)
Percent 55+	0.003*** (0.001)	-0.002 (0.002)	0.002* (0.001)	-0.002 (0.002)
Oklahoma City 1995	0.053*** (0.004)	0.05*** (0.005)	0.054*** (0.004)	0.052*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.905	0.944	0.908	0.942
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	No	Yes	No	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1% ; *** indicates statistical significance at the 1% level or better.

Table 3B

**The Determinants of the Homicide Rate
(Models with Second Pardon Rate Measure)**

Variable	(I)	(II)	(III)	(IV)
Pardon Rate-2 (-1)	0.003** (0.002)	0.006*** (0.002)	0.004** (0.002)	0.006*** (0.002)
Homicide Arrest Rate (-1)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.03*** (0.008)	-0.045*** (0.006)	—	—
Prisoners Per Population (-1)	—	—	-0.007*** (0.001)	-0.007*** (0.001)
Prison Death Rate (-1)	-0.0002 (0.0003)	0.0002 (0.0003)	-0.00004 (0.0003)	0.0003 (0.0003)
Percent Black	-0.0006 (0.0008)	-0.0003 (0.0003)	-0.0004 (0.0004)	-0.0003 (0.0003)
Republican Governor	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002** (0.001)
Unemployment Rate	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)
Per Capita Income	0.001 (0.001)	0.003 (0.002)	-0.0003 (0.001)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001 (0.001)
Urbanization	0.002*** (0.001)	-0.011* (0.006)	0.002*** (0.001)	-0.013** (0.006)
Alcohol Consumption	-0.001** (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Percent 20-34	0.005*** (0.001)	0.003*** (0.001)	0.006*** (0.001)	0.004*** (0.001)
Percent 35-44	0.004** (0.002)	-0.001 (0.002)	0.002 (0.002)	0.00006 (0.002)
Percent 45-54	0.006*** (0.002)	-0.002 (0.003)	0.003 (0.002)	-0.002 (0.003)
Percent 55+	0.003** (0.001)	-0.002 (0.002)	0.002* (0.001)	-0.002 (0.002)
Oklahoma City 1995	0.053*** (0.004)	0.05*** (0.005)	0.054*** (0.004)	0.052*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.905	0.946	0.908	0.942
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	No	Yes	No	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

Table 4A

**The Determinants of the Homicide Rate
(Models with First Measure of Execution Rate and Pardon Rate)**

Variable	(I)	(II)	(III)	(IV)
Execution Rate (-1)	-0.045* (0.024)	-0.041* (0.022)	-0.039* (0.023)	-0.039* (0.022)
Pardon Rate (-1)	0.003*** (0.001)	0.005*** (0.001)	0.003*** (0.001)	0.005*** (0.001)
Homicide Arrest Rate (-1)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.029*** (0.008)	-0.045*** (0.006)	—	—
Prisoners Per Population (-1)	—	—	-0.007*** (0.001)	-0.007*** (0.001)
Prison Death Rate (-1)	-0.0002 (0.0003)	0.0002 (0.0003)	-0.00003 (0.0003)	0.0003 (0.0003)
Percent Black	-0.0006 (0.0004)	-0.0003 (0.0003)	-0.0004 (0.0004)	-0.0003 (0.0003)
Republican Governor	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002** (0.001)
Unemployment Rate	-0.001*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)
Per Capita Income	0.001 (0.001)	0.003 (0.002)	-0.0003 (0.001)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001 (0.001)
Urbanization	0.002*** (0.001)	-0.011* (0.006)	0.002*** (0.001)	-0.013** (0.006)
Alcohol Consumption	-0.001** (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Percent 20-34	0.005*** (0.001)	0.003*** (0.001)	0.006*** (0.001)	0.004*** (0.001)
Percent 35-44	0.004*** (0.002)	-0.001 (0.002)	0.002 (0.002)	0.0001 (0.002)
Percent 45-54	0.006*** (0.002)	-0.002 (0.003)	0.003* (0.002)	-0.003 (0.003)
Percent 55+	0.003** (0.001)	-0.002 (0.002)	0.002* (0.001)	-0.002 (0.002)
Oklahoma City 1995	0.053*** (0.004)	0.05*** (0.005)	0.054*** (0.004)	0.052*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.905	0.945	0.908	0.943
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	No	Yes	No	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

Table 4B

**The Determinants of the Homicide Rate
(Models with Second Measure of Execution Rate and Pardon Rate)**

Variable	(I)	(II)	(III)	(IV)
Execution Rate-2 (-1)	-0.048* (0.026)	-0.033* (0.019)	-0.04* (0.023)	-0.03 (0.019)
Pardon Rate-2 (-1)	0.003** (0.002)	0.006*** (0.002)	0.004** (0.002)	0.007*** (0.002)
Homicide Arrest Rate (-1)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.029*** (0.008)	-0.045*** (0.006)	—	—
Prisoners Per Population (-1)	—	—	-0.007*** (0.001)	-0.007*** (0.001)
Prison Death Rate (-1)	-0.0002 (0.0003)	0.0002 (0.0003)	-0.00004 (0.0003)	0.0003 (0.0003)
Percent Black	-0.006 (0.0004)	-0.0003 (0.0003)	-0.0004 (0.0004)	-0.0003 (0.0003)
Republican Governor	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.002** (0.001)
Unemployment Rate	-0.001*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)
Per Capita Income	0.001 (0.001)	0.003 (0.002)	-0.0003 (0.001)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001 (0.001)
Urbanization	0.002*** (0.001)	-0.011* (0.006)	0.002*** (0.001)	-0.013** (0.006)
Alcohol Consumption	-0.001** (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Percent 20-34	0.005*** (0.001)	0.003*** (0.001)	0.006*** (0.001)	0.004*** (0.001)
Percent 35-44	0.004*** (0.002)	-0.001 (0.002)	0.002 (0.002)	0.0002 (0.002)
Percent 45-54	0.006*** (0.002)	-0.002 (0.003)	0.003* (0.002)	-0.003 (0.003)
Percent 55+	0.003** (0.001)	-0.002 (0.002)	0.002* (0.001)	-0.002 (0.002)
Oklahoma City 1995	0.053*** (0.004)	0.05*** (0.005)	0.054*** (0.004)	0.052*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.905	0.945	0.908	0.942
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	No	Yes	No	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

Table 5

Models with Multiple Lags				
Variable	(I)	(II)	(III)	(IV)
Execution Rate (-1)	-0.052** (0.023)	-0.049** (0.024)	—	—
Execution Rate (-2)	-0.018 (0.015)	-0.013 (0.015)	—	—
Execution Rate (-3)	-0.027 (0.018)	-0.026 (0.017)	—	—
Pardon Rate (-1)	0.008*** (0.003)	0.009*** (0.003)	—	—
Pardon Rate (-2)	0.01 (0.01)	0.012 (0.011)	—	—
Pardon Rate (-3)	0.002 (0.001)	0.002 (0.002)	—	—
Execution Rate-2 (-1)	—	—	-0.04* (0.022)	-0.045** (0.022)
Execution Rate-2 (-2)	—	—	-0.006 (0.017)	-0.01 (0.017)
Execution Rate-2 (-3)	—	—	-0.027 (0.017)	-0.028 (0.017)
Pardon Rate-2 (-1)	—	—	0.01*** (0.003)	0.009*** (0.003)
Pardon Rate-2 (-2)	—	—	0.014** (0.007)	0.013** (0.006)
Pardon Rate-2 (-3)	—	—	0.003 (0.002)	0.003 (0.002)
Homicide Arrest Rate (-1)	-0.002 (0.003)	-0.002 (0.003)	-0.001 (0.003)	-0.001 (0.003)
Homicide Arrest Rate (-2)	0.0001 (0.002)	-0.00001 (0.002)	0.0003 (0.002)	0.0004 (0.002)
Homicide Arrest Rate (-3)	0.0005 (0.002)	-0.0002 (0.002)	0.00003 (0.002)	0.001 (0.002)
Prisoners Per Violent Crime (-1)	-0.042*** (0.008)	—	—	-0.042*** (0.009)
Prisoners Per Violent Crime (-2)	0.006 (0.01)	—	—	0.007 (0.01)
Prisoners Per Violent Crime (-3)	-0.018** (0.009)	—	—	-0.018** (0.009)
Prisoners Per Population (-1)	—	-0.006*** (0.002)	-0.006*** (0.002)	—
Prisoners Per Population (-2)	—	0.004 (0.003)	0.004 (0.003)	—
Prisoners Per Population (-3)	—	-0.008** (0.003)	-0.008*** (0.003)	—
Prison Death Rate (-1)	0.0003 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)
Prison Death Rate (-2)	0.0005 (0.0003)	0.0001 (0.0003)	0.0001 (0.0003)	0.000003 (0.0003)
Prison Death Rate (-3)	0.0003 (0.0003)	0.0003 (0.0004)	0.0003 (0.0004)	0.0003 (0.0003)

(Table 5 Concluded)

Percent Black	-0.0003 (0.0004)	-0.0002 (0.0004)	-0.0002 (0.0004)	-0.0002 (0.0004)
Republican Governor	-0.002 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.001 (0.001)
Unemployment Rate	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Per Capita Income	0.003* (0.002)	0.004* (0.002)	0.004* (0.002)	0.003* (0.002)
Infant Mortality Rate	0.002*** (0.001)	0.002*** (0.001)	0.003*** (0.001)	0.002*** (0.001)
Urbanization	-0.027*** (0.01)	-0.026** (0.011)	-0.025** (0.011)	-0.026** (0.01)
Alcohol Consumption	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Percent 20-34	0.002 (0.001)	0.003** (0.001)	0.003** (0.001)	0.002 (0.001)
Percent 35-44	-0.0005 (0.002)	0.001 (0.002)	0.001 (0.002)	0.0001 (0.002)
Percent 45-54	-0.001 (0.003)	-0.003 (0.004)	-0.003 (0.004)	-0.001 (0.003)
Percent 55+	-0.005* (0.003)	-0.005* (0.003)	-0.005* (0.003)	-0.005* (0.003)
Oklahoma City 1995	0.05*** (0.005)	0.054*** (0.005)	0.054*** (0.005)	0.05*** (0.005)
Sum of Execution Equal to 0				
Coefficient	-0.097***	-0.089**	-0.073**	-0.082**
F-Statistic	7.33	6.15	4.47	5.48
P-value	0.007	0.013	0.035	0.020
Sum of Pardon Equal to 0				
Coefficient	0.021*	0.023*	0.027***	0.025***
F-Statistic	3.64	3.66	13.42	12.73
P-value	0.057	0.056	0.0003	0.0004
Sum of Arrest Equal to 0				
Coefficient	-0.0009	-0.002	-0.0009	-0.00009
F-Statistic	0.08	0.28	0.07	0.00
P-value	0.781	0.597	0.796	0.978
Sum of Custody Equal to 0				
Coefficient	-0.054***	-0.010***	-0.010***	-0.053***
F-Statistic	48.70	22.11	22.06	47.10
P-value	0.000	0.000	0.000	0.000
Sum of Deathrate Equal to 0				
Coefficient	0.0006	0.0008	0.0007	0.0006
F-Statistic	1.41	2.04	1.87	1.26
P-value	0.236	0.154	0.172	0.263
Number of Observations	892	892	892	892
R-Squared	0.950	0.948	0.948	0.950

Robust standard errors are in parentheses. All models are estimated with state-fixed effects, time dummies and state trends. * indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1% ; *** indicates statistical significance at the 1% level or better.

Table 6

The Impact of Legalized Death Penalty

Variable	(I)	(II)	(III)
Death Penalty Legal (-1)	-0.014** (0.006)	-0.014** (0.006)	—
Death Penalty Legal (-1) * Execution Rate (-1)	—	-0.04* (0.022)	—
Death Penalty Legal (-1) * Pardon Rate (-1)	—	0.005*** (0.001)	—
Death Penalty Legal	—	—	-0.021*** (0.008)
Death Penalty Legal * Execution Rate (-1)	—	—	-0.046** (0.023)
Death Penalty Legal * Pardon Rate (-1)	—	—	0.008** (0.004)
Homicide Arrest Rate (-1)	-0.002 (0.002)	-0.001 (0.002)	-0.001 (0.002)
Prisoners Per Violent Crime (-1)	-0.046*** (0.006)	-0.046*** (0.006)	-0.046*** (0.006)
Prison Death Rate (-1)	0.0002 (0.0003)	0.0002 (0.0003)	0.0002 (0.0003)
Percent Black	-0.0002 (0.0003)	-0.0003 (0.0003)	-0.016 (0.034)
Republican Governor	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Unemployment Rate	-0.002*** (0.001)	-0.002*** (0.001)	-0.001** (0.001)
Per Capita Income	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
Infant Mortality Rate	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Urbanization	-0.009* (0.005)	-0.009* (0.005)	-1.879** (0.772)
Alcohol Consumption	-0.001 (0.001)	-0.001 (0.001)	-0.0003 (0.001)
Percent 20-34	0.003** (0.001)	0.003** (0.001)	0.219* (0.13)
Percent 35-44	-0.002 (0.002)	-0.001 (0.002)	-0.068 (0.231)
Percent 45-54	-0.001 (0.003)	-0.001 (0.003)	-0.139 (0.306)
Percent 55+	-0.001 (0.002)	-0.002 (0.002)	-0.154 (0.206)
Oklahoma City 1995	0.05*** (0.004)	0.05*** (0.005)	0.049*** (0.004)
Number of Observations	996	996	945
R-Squared	0.946	0.946	0.949

Robust standard errors are in parentheses. All models are estimated with state-fixed effects, time dummies and state trends. * indicates statistical significance between 10% and 5%; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

Table 7

The Determinants of the Homicide Rate
(Alternative Specifications)

Variable	(I)	(II)	(III)	(IV)
Executions/Prisoners (*1000)	-0.014* (0.008)	-0.014* (0.008)	-0.014* (0.008)	-0.013* (0.008)
Homicide Arrest Rate (-1)	—	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Prisoners Per Violent Crime (-1)	-0.046*** (0.009)	-0.046*** (0.009)	-0.044*** (0.009)	-0.046*** (0.006)
Prisoners Per Population (-1)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	—
Prison Death Rate (-1)	0.0002 (0.0003)	0.0002 (0.0003)	0.0002 (0.0003)	0.0002 (0.0003)
Percent Black	-0.0004 (0.0003)	-0.0004 (0.0003)	-0.0003 (0.0003)	-0.0003 (0.0003)
Republican	—	—	-0.002* (0.001)	-0.002* (0.001)
Unemployment Rate	-0.001** (0.001)	-0.001*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)
Per Capita Income	0.003 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
Infant Mortality Rate	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Urbanization	-0.009 (0.006)	-0.009 (0.006)	-0.009* (0.006)	-0.010* (0.006)
Alcohol Consumption	—	—	—	-0.001 (0.001)
Percent 20-34	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)
Percent 35-44	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.002)	-0.002 (0.002)
Percent 45-54	-0.002 (0.003)	-0.003 (0.003)	-0.002 (0.003)	-0.002 (0.003)
Percent 55+	-0.001 (0.002)	-0.001 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Oklahoma City 1995	—	—	0.049*** (0.005)	0.049*** (0.005)
Number of Observations	999	996	996	996
R-Squared	0.943	0.944	0.945	0.945
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	Yes	Yes	Yes	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

APPENDIX

Data Sources

Crimes and Arrests

Crimes: The Bureau of Justice Statistics compiled annual state-by-state crime data using the Federal Bureau of Investigation Uniform Crime Report (UCR) and publishes it as an electronic file.

Arrests: Data was obtained from the National Archive of Criminal Justice Data web site. The data is itself UCR data and was aggregated to the county level at the NACJD and then aggregated to the state level by the authors. Missing state level arrest values were filled in by directly contacting the local UCR state agencies. 1988 was a transitional year for Florida and arrest values are not available. Kansas was unable to produce data for 1995 and 1996 as well. Neither the values for Florida nor Kansas were imputed.

Pardons, Executions and Death Row Information

U.S. Dept. of Justice, Bureau of Justice Statistics. CAPITAL PUNISHMENT IN THE UNITED STATES, 1973-1998 [Computer file]. Compiled by the U.S. Dept. of Commerce, Bureau of the Census. ICPSR ed. Ann Arbor. MI: Inter-university Consortium for Political and Social Research [producer and distributor], 2000.

Prison Deaths and Prison Population

Prison Population: “Prisoners in Custody of State or Federal Correctional Authorities” [electronic file], BJS, National Prisoner Statistics Data Series (NPS-1), version 08/01/2000.

Prison Deaths: Sourcebook of Criminal Justice Statistics. For the year 1985, values were obtained from the BJS website which compiles the same data: “Deaths Among Sentenced Prisoners under State or Federal Jurisdiction” [electronic file], BJS, National Prisoner Statistics data series (NPS-1), version 6/19/2000. Alaska did not report prison deaths in 1994 and we did not impute it.

Other State Data

Total State Population and Age Representation: U.S. Census Bureau, Population Division, Population Distribution Branch [electronic file].

Ethnic Population Representation: Estimated using the March Current Population Survey data.

Income Per Capita: U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, Regional Economic Information System, State Annual Summary Tables (SA1-3, SA51-52), 1969-1999 [electronic file]. The data is given nominally and was converted to 1982-1984 dollars using the Consumer Price Index.

Unemployment Rate: Local Area Unemployment Statistics, Bureau of Labor Statistics [electronic file]. Not Seasonally Adjusted. 1977 data for all states and years 1978 and 1979 for California were completed using The Statistical Abstract of the United States.

Urbanization: “Urban and Rural Population: 1900 to 1990”. U.S. Census Bureau [electronic files]. The files provided percent urbanization data for all states for 1970, 1980 and 1990. Values were linearly interpolated for the 1970s and 1980s. The same change in urbanization for the 1980’s were used to calculate the urbanization numbers for the 1990s.

Infant Mortality Rate: Vital Statistics of the United States.

Governor Data: Gubernatorial Elections (1998).

Per Capita Alcohol Consumption: The Beer Institute publishes The Brewer’s Almanac annually.

APPENDIX

Table APP-1A

The Determinants of the Homicide Rate (Semi-log Estimation)

Variables	(I)	(II)	(III)	(IV)
Execution Rate (-1)	-0.332* (0.197)	-0.296 (0.189)	—	—
Pardon Rate (-1)	0.037*** (0.01)	0.044*** (0.01)	—	—
Execution Rate-2 (-1)	—	—	-0.356* (0.214)	-0.311 (0.193)
Pardon Rate-2 (-1)	—	—	0.044*** (0.014)	0.05*** (0.015)
Homicide Arrest Rate (-1)	-0.018 (0.026)	-0.017 (0.026)	-0.018 (0.026)	-0.017 (0.026)
Prisoners Per Violent Crime (-1)	-0.363*** (0.07)	—	-0.363*** (0.069)	—
Prisoners Per Population (-1)	—	-0.066*** (0.011)	—	-0.066*** (0.011)
Prison Death Rate (-1)	-0.002 (0.003)	-0.0003 (0.003)	-0.002 (0.003)	0.0002 (0.003)
Percent Black	-0.003 (0.004)	-0.001 (0.004)	-0.003 (0.004)	-0.001 (0.004)
Republican Governor	-0.012 (0.012)	-0.012 (0.012)	-0.012 (0.012)	-0.012 (0.012)
Unemployment Rate	-0.013** (0.005)	-0.018*** (0.005)	-0.013** (0.005)	-0.018*** (0.005)
Per Capita Income	-0.005 (0.013)	-0.021 (0.013)	-0.005 (0.013)	-0.021 (0.013)
Infant Mortality Rate	0.029*** (0.008)	0.029*** (0.008)	0.029*** (0.008)	0.029*** (0.008)
Urbanization	0.036*** (0.009)	0.04*** (0.009)	0.036*** (0.009)	0.04*** (0.009)
Alcohol Consumption	-0.011** (0.005)	-0.008 (0.005)	-0.011** (0.005)	-0.009 (0.005)
Percent 20-34	0.067*** (0.011)	0.075*** (0.011)	0.067*** (0.011)	0.076*** (0.011)
Percent 35-44	0.075*** (0.022)	0.048** (0.022)	0.076*** (0.022)	0.048** (0.022)
Percent 45-54	0.062** (0.025)	0.032 (0.025)	0.062** (0.025)	0.032 (0.025)
Percent 55+	0.009 (0.013)	-0.003 (0.013)	0.009 (0.013)	-0.003 (0.013)
Oklahoma City 1995	0.541*** (0.044)	0.556*** (0.043)	0.541*** (0.043)	0.556*** (0.043)
Number of Observations	996	996	996	996
R-Squared	0.936	0.936	0.936	0.936

Robust standard errors are in parentheses. All models include state-fixed effects and time dummies.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

APPENDIX

Table APP-1B

The Determinants of the Homicide Rate (Semi-log Estimation)

Variables	(I)	(II)	(III)	(IV)
Execution Rate (-1)	-0.276 (0.169)	-0.252 (0.169)	—	—
Pardon Rate (-1)	0.054*** (0.013)	0.058*** (0.015)	—	—
Execution Rate-2 (-1)	—	—	-0.189 (0.16)	-0.154 (0.156)
Pardon Rate-2 (-1)	—	—	0.067*** (0.014)	0.073*** (0.016)
Homicide Arrest Rate (-1)	-0.021 (0.021)	-0.023 (0.021)	-0.02 (0.021)	-0.022 (0.021)
Prisoners Per Violent Crime (-1)	-0.464*** (0.063)	—	-0.463*** (0.063)	—
Prisoners Per Population (-1)	—	-0.073*** (0.012)	—	-0.073*** (0.012)
Prison Death Rate (-1)	0.003 (0.003)	0.004 (0.004)	0.003 (0.003)	0.004 (0.004)
Percent Black	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)	-0.003 (0.003)
Republican Governor	-0.019* (0.01)	-0.022** (0.011)	-0.019* (0.01)	-0.022** (0.011)
Unemployment Rate	-0.014** (0.006)	-0.013** (0.006)	-0.014** (0.006)	-0.013** (0.006)
Per Capita Income	0.019 (0.02)	0.026 (0.02)	0.019 (0.02)	0.026 (0.02)
Infant Mortality Rate	0.01* (0.006)	0.01* (0.006)	0.009 (0.006)	0.01* (0.006)
Urbanization	-0.107* (0.061)	-0.126** (0.064)	-0.107* (0.062)	-0.126** (0.064)
Alcohol Consumption	-0.015** (0.007)	-0.016** (0.007)	-0.015** (0.007)	-0.016** (0.007)
Percent 20-34	0.058*** (0.015)	0.064*** (0.015)	0.059*** (0.015)	0.064*** (0.015)
Percent 35-44	0.028 (0.027)	0.04 (0.027)	0.028 (0.027)	0.04 (0.027)
Percent 45-54	-0.022 (0.037)	-0.031 (0.039)	-0.022 (0.037)	-0.031 (0.039)
Percent 55+	-0.052*** (0.018)	-0.051*** (0.019)	-0.052*** (0.018)	-0.051*** (0.019)
Oklahoma City 1995	0.525*** (0.052)	0.543*** (0.055)	0.526*** (0.052)	0.544*** (0.055)
Number of Observations	996	996	996	996
R-Squared	0.959	0.958	0.959	0.958

Robust standard errors are in parentheses. All models include state-fixed effects, time dummies and state trends. * indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

APPENDIX

Table APP-2A

Alternative Specifications (Models with First Execution and Pardon Rate Measures)

Variable	(I)	(II)	(III)	(IV)
Execution Rate (-1)	-0.043** (0.021)	-0.035* (0.021)	-0.025 (0.023)	-0.019 (0.023)
Pardon Rate (-1)	0.003** (0.001)	0.003*** (0.001)	0.002 (0.002)	0.003** (0.001)
Homicide Arrest Rate (-1)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.003)
Prisoners Per Violent Crime (-1)	-0.059*** (0.006)	—	-0.037*** (0.006)	—
Prisoners Per Population (-1)	—	-0.011*** (0.001)	—	-0.007*** (0.001)
Prison Death Rate (-1)	0.00009 (0.0003)	0.0004 (0.0003)	-0.0001 (0.0003)	0.0002 (0.0003)
Percent Black	-0.0004 (0.0004)	-0.001 (0.0004)	0.0001 (0.0004)	0.0003 (0.0004)
Republican Governor	-0.003** (0.001)	-0.002 (0.001)	-0.0004 (0.001)	-0.0004 (0.001)
Unemployment Rate	-0.002*** (0.0005)	-0.002*** (0.001)	-0.001** (0.001)	-0.001** (0.001)
Per Capita Income	-0.003** (0.002)	-0.003** (0.002)	-0.002 (0.001)	-0.001 (0.001)
Infant Mortality Rate	0.002*** (0.001)	0.002*** (0.001)	0.003*** (0.001)	0.002*** (0.001)
Urbanization	0.002 (0.001)	0.002 (0.001)	0.003*** (0.001)	0.002** (0.001)
Alcohol Consumption	0.0004 (0.001)	0.0002 (0.001)	0.001 (0.001)	0.001 (0.001)
Percent 20-34	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.007*** (0.001)
Percent 35-44	0.002 (0.002)	0.004** (0.002)	0.004 (0.002)	0.002 (0.002)
Percent 45-54	0.006*** (0.002)	0.007*** (0.001)	0.007*** (0.002)	0.003 (0.002)
Percent 55+	0.002** (0.001)	0.002* (0.001)	0.003** (0.001)	0.003* (0.001)
Oklahoma City 1995	0.051*** (0.003)	0.054*** (0.004)	0.055*** (0.006)	0.057*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.925	0.925	0.920	0.921
State-Fixed Effects?	Yes	Yes	Yes	Yes
State-Decade Interactions?	Yes	Yes	No	No
Region-Year Interactions?	No	No	Yes	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

APPENDIX

Table APP-2B

Alternative Specifications (Models with Second Execution and Pardon Rate Measures)

Variable	(I)	(II)	(III)	(IV)
Execution Rate-2 (-1)	-0.038 (0.025)	-0.024 (0.024)	-0.022 (0.021)	-0.015 (0.021)
Pardon Rate-2 (-1)	0.005*** (0.002)	0.005*** (0.001)	0.004* (0.002)	0.005*** (0.002)
Homicide Arrest Rate (-1)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.003)
Prisoners Per Violent Crime (-1)	-0.059*** (0.006)	—	-0.037*** (0.006)	—
Prisoners Per Population (-1)	—	-0.011*** (0.001)	—	-0.007*** (0.001)
Prison Death Rate (-1)	0.00009 (0.0003)	0.0004 (0.0003)	-0.0001 (0.0003)	0.0002 (0.0003)
Percent Black	-0.0004 (0.0004)	-0.001 (0.0004)	0.0001 (0.0004)	0.0003 (0.0004)
Republican Governor	-0.003** (0.001)	-0.002 (0.001)	-0.0004 (0.001)	-0.0004 (0.001)
Unemployment Rate	-0.002*** (0.0005)	-0.002*** (0.001)	-0.001** (0.001)	-0.001** (0.001)
Per Capita Income	-0.003** (0.002)	-0.003** (0.002)	-0.002 (0.001)	-0.001 (0.001)
Infant Mortality Rate	0.002*** (0.001)	0.002*** (0.001)	0.003*** (0.001)	0.002*** (0.001)
Urbanization	0.002 (0.001)	0.002 (0.001)	0.003*** (0.001)	0.002** (0.001)
Alcohol Consumption	0.0004 (0.001)	0.0002 (0.001)	0.001 (0.001)	0.001 (0.001)
Percent 20-34	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.007*** (0.001)
Percent 35-44	0.002 (0.002)	0.004** (0.002)	0.004 (0.002)	0.002 (0.002)
Percent 45-54	0.006*** (0.002)	0.007*** (0.001)	0.007*** (0.002)	0.003 (0.002)
Percent 55+	0.002** (0.001)	0.002* (0.001)	0.003** (0.001)	0.003* (0.001)
Oklahoma City 1995	0.051*** (0.003)	0.055*** (0.004)	0.055*** (0.006)	0.057*** (0.005)
Number of Observations	996	996	996	996
R-Squared	0.925	0.925	0.920	0.921
State-Fixed Effects?	Yes	Yes	Yes	Yes
State-Decade Interactions?	Yes	Yes	No	No
Region-Year Interactions?	No	No	Yes	Yes

Robust standard errors are in parentheses. * indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1% ; *** indicates statistical significance at the 1% level or better.

APPENDIX

Table APP-3

The Impact of Capital Punishment on Other Crimes

Variable	Robbery	Burglary	Rape	Motor Vehicle Thefts
Execution Rate	0.628 (0.515)	1.511 (1.84)	0.031 (0.052)	0.447 (0.92)
Pardon Rate	0.03 (0.041)	0.122 (0.192)	-0.001 (0.006)	0.159 (0.103)
Crime Arrest Rate	-0.561** (0.263)	-5.66** (2.814)	-0.016* (0.009)	2.265* (1.302)
Prisoners Per Population	-0.158*** (0.044)	-1.331*** (0.24)	-0.015*** (0.004)	-0.579*** (0.111)
Prison Death Rate	0.004 (0.008)	-0.025 (0.026)	-0.001 (0.001)	0.021 (0.016)
Percent Black	-0.0001 (0.009)	0.028 (0.031)	0.003** (0.001)	-0.051*** (0.018)
Republican Governor	-0.015 (0.038)	0.253** (0.125)	-0.008** (0.004)	-0.093 (0.075)
Unemployment Rate	-0.007 (0.022)	0.237*** (0.053)	-0.002 (0.002)	0.038 (0.038)
Per Capita Income	-0.057 (0.067)	-0.701*** (0.205)	0.009 (0.006)	0.112 (0.123)
Infant Mortality Rate	0.035** (0.015)	-0.009 (0.047)	0.003 (0.002)	0.091*** (0.034)
Urbanization	-0.312 (0.205)	-0.335 (0.566)	-0.018 (0.019)	-1.454*** (0.344)
Alcohol Consumption	-0.014 (0.022)	-0.149* (0.079)	0.003 (0.002)	-0.083* (0.05)
Percent 20-34	0.216*** (0.04)	0.301** (0.12)	-0.011*** (0.004)	0.781*** (0.089)
Percent 35-44	-0.135* (0.073)	0.098 (0.252)	0.008 (0.009)	-0.46*** (0.153)
Percent 45-54	-0.001 (0.121)	0.254 (0.284)	-0.014 (0.011)	-0.259 (0.205)
Percent 55+	-0.094 (0.063)	-0.534** (0.215)	0.018*** (0.006)	-0.521*** (0.148)
Number of Observations	996	996	996	996
R-Squared	0.961	0.958	0.941	0.943
State-Fixed Effects?	Yes	Yes	Yes	Yes
Time Dummies?	Yes	Yes	Yes	Yes
State Trends?	Yes	Yes	Yes	Yes

Robust standard errors are in parentheses.

* indicates statistical significance between 10% and 5% ; ** indicates statistical significance between 5% to 1%; *** indicates statistical significance at the 1% level or better.

References

- Argys, Laura M. and H. Naci Mocan, 2001, "Who Shall Live and Who Shall Die? An Analysis of Prisoners on Death Row in the United States," Manuscript.
- Baldus, D. et al., 1998, "Race Discrimination and the Death Penalty in the Post Furman Era: An Empirical and Legal Overview with Preliminary Findings from Philadelphia," Cornell Law Review, 83: 1638-1770.
- Bowers, William J. and Glenn L. Pierce, 1975, "The Illusion of Deterrence in Isaac Ehrlich's Research on Capital Punishment," Yale Law Journal, 85: 187-208.
- Cameron, Samuel, 1994, "A Review of the Econometric Evidence on the Effects of Capital Punishment," Journal of Socio-Economics, 23(1): 197-214.
- Corman, Hope and H. Naci Mocan, 2000, "A Time-Series Analysis of Crime, Deterrence, and Drug Abuse in New York City," American Economic Review, 90(3): 584-604.
- Cover, James Perry and Paul D. Thistle, 1988, "Time Series, Homicide, and the Deterrent Effect of Capital Punishment," Southern Economic Journal, 54(3): 615-622.
- Ehrlich, Isaac, 1975, "The Deterrent Effect of Capital Punishment: A Question of Life and Death," American Economic Review, 65: 395-417.
- Ehrlich, Isaac, 1977a, "Capital Punishment and Deterrence: Some Further Thoughts and Evidence," Journal of Political Economy, 85: 741-788.
- Ehrlich, Isaac, 1977b, "The Deterrent Effect of Capital Punishment: Reply," American Economic Review, 67(3): 452-458.
- Ehrlich, Isaac and George D. Brower, 1987, "On the Issue of Causality in the Economic Model of Crime and Law Enforcement: Some Theoretical Considerations and Experimental Evidence," American Economic Review, 77(2): 99-106.
- Ehrlich, Isaac and Zhiqiang Liu, 1999, "Sensitivity Analyses of the Deterrence Hypothesis: Let's Keep the Econ in Econometrics," Journal of Law and Economics, 17: 455-488.
- Forst, Brian, 1983, "Capital Punishment and Deterrence: Conflicting Evidence?," Journal of Criminal Law and Criminology, 74(3): 927-942.
- Grogger, Jeffrey, 1991, "Certainty vs. Severity of Punishment," Economic Inquiry, 29(2): 297-309.
- Hoernack, Stephen A. and William C. Weiler, 1980, "A Structural Model of Murder Behavior and the Criminal Justice System," American Economic Review, 70(3): 327-341.
- Katz, Lawrence, Steven D. Levitt and Ellen Shustorovich, 2001, "Prison Conditions, Capital Punishment, and Deterrence," Manuscript.

- Kleck, Gary, 1981, "Racial Discrimination in Criminal Sentencing: A Critical Evaluation of the Evidence with Additional Evidence on the Death Penalty," American Sociological Review, 46(1): 783-804.
- Layson, Stephen K., 1983, "Another View of the Canadian Time-Series Evidence on Homicide and Deterrence," Canadian Journal of Economics, 16(1): 52-73.
- Leamer, Edward, 1983, "Let's Take the Con out of Econometrics," American Economic Review, 73: 31-43.
- Levitt, Steven D., 1997, "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime," American Economic Review, 87(3): 270-290.
- Levitt, Stephen D., 1998, "Juvenile Crime and Punishment," The Journal of Political Economy, 106(6): 1156-1185.
- Lott, John R. Jr. and David B. Mustard, 1997, "Crime, Deterrence, and Right-to-Carry Concealed Handguns", The Journal of Legal Studies, 26(1): 1-68.
- McFarland, Sam G., 1983, "Is Capital Punishment a Short-Term Deterrent to Homicide? A Study of the Effects of Four Recent American Executions," Journal of Criminal Law and Criminology, 74(3): 1014-1032.
- McManus, Walter S., 1985, "Estimates of the Deterrent Effect of Capital Punishment: The Importance of the Researcher's Prior Beliefs," Journal of Political Economy, 93(2): 417-425.
- Passell, Peter and John Taylor, 1977, "The Deterrent Effect of Capital Punishment: Another View," American Economic Review, 67: 445-451.
- Pokorak, J., 1998, "Probing the Capital Prosecutor's Perspective: Race and Gender of the Discretionary Actors," Cornell Law Review, 83(6).
- Ruhm, Christopher, 2000, "Are Recessions Good for Your Health?" Quarterly Journal of Economics, 115(May): 617-650.
- Ruhm, Christopher, 2001, "Economic Expansions Are Unhealthy: Evidence from Microdata," NBER Working Paper No. W8447.
- Sorensen, Jon, Robert Wrinkle, Victoria Brewer, et. al., 1999, "Capital Punishment and Deterrence: Examining the Effect of Executions on Murder in Texas," Crime and Delinquency, 45(4): 481-493.