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Deterrence and the Death Penalty:

A Study of the Effects of Capital Punishment on Homicide

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Honors Research Project

Submitted to

The Honors College

ABSTRACT

The death penalty has received an abundance of criticism within the United States as time has passed, as critics argue it to be cruel and an unjust form of punishment. Currently, about half of the states in the U.S. still implement it, signifying a clear divide in the fundamental justification for its use. As the debate carries on and more states legalize the death penalty, the largest point of contention centers on the question: to what extent does the death penalty can deter homicides from occurring? This analysis is critical to the implementation of the death penalty, as many legal scholars cite its ability to deter to be its strongest argument for persisting as a justifiable form of punishment. Ultimately, any argument that undermines or detracts from this theory provides a greater incentive for states to abolish their use for the death penalty, as itself contains fundamental flaws which have made its use widely controversial. To the contrary, any argument supporting a deterrent effect bolsters a state's implementation of the death policy, as doing so will help prevent future homicides from occurring.

This paper attempts to answer this question of deterrence by providing an overview of the death penalty itself, its theoretical argument, and what previous studies have concluded before.

Thereafter, a separate analysis is conducted using univariate, bivariate, and OLS regression models to demonstrate whether and to what effect the death penalty deters homicide rates in a sample of states over time compared to other underlying factors. Ultimately, it is found that the death penalty does not have a noticeable and substantial impact upon homicide rates, with its relationship to the homicide rate being largely responsive with changes in other variables. While this does not disprove the deterrence theory, it suggests it is weaker in deterring the homicide rate compared to other factors. However, the model used is limited, and thus more research is required for a more conclusive result to be achieved.

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INTRODUCTION

Across the spectrum of political debate in the United States, the discussion surrounding the death penalty and its legitimacy have arguably existed as long as the concept itself has (Bryant and Peck 2009). Nonetheless, many of the same theoretical, constitutional, and economical arguments for and against the death penalty found in our modern debates about its implementation have remained relatively unchanged since the beginning (Ehrlich 1973). This phenomenon is evident by the state-by-state implementation of the death penalty, as despite a modern trend towards ending its use, numerous states have long ridded of capital punishment altogether since the 19th century. (Paternoster 2008). This lasting divide displays a pressing issue embedded within this ongoing debate: to what extent, and in what manner, is the death penalty effective as a form of punishment to deter violent crime, specifically homicide?

Punishment in the criminal justice system of the United States contains overarching goals to explain its nature and justification, including those of retribution, rehabilitation, and deterrence. Although retribution has long justified punishment, philosophical developments of punishment beginning in the 18th century encouraged the United States to take a different approach to implementing punishment: to serve as a utility for society. In doing so, this sparked the modern sentiment (referred to as utilitarianism) that punishment should not merely be utilized for revenge against offenders of the law; rather, punishment should be utilized for a greater public benefit by preventing would-be criminals from committing more crime (Weiner et al. 1997) Deterrence, following these ideals, alerts the public that crimes should not be committed because doing so will result in punishment accordingly, therein instilling fear to not commit them (Donohue 2019). This theoretical basis for deterrence of crime is described by

scholars to be the most popular justification for the death penalty, and as such is central to the debate of whether implementation of the death penalty itself is justified (Bandes 2021).

As Justice Marshall described it, the strongest argument for the theoretical basis of a deterrence effect accompanying the death penalty centers on its level of severity when compared to other forms of punishment, as death itself is ultimate (408 U.S. 238 (1972)). This premise supports the notion that threat of execution by the state in the future is enough to cause a significant amount of people, if not all, to refrain from committing murder against the public out of fear of their own life (Weiner et al. 1997). Marlene Lehiten, a professor within the Department of Sociology at the University of Utah, describes this as creating “greater general deterrence and conformity to law, strengthening of taboos generally, and [placing] emphasis on the value of life,” (Lehiten 2, 1977). Given these premises, it is understandable why many legal scholars have advocated for U.S. states to employ the death penalty (Lehiten 1977). Theoretically, not only does it punish those who commit the greatest atrocities, but it would also serve a greater purpose in preventing future crimes from occurring. However, with this theoretical basis being the death penalty’s main argument for implementation, much controversy has arisen regarding death being a justifiable sanction.

The nature of the death penalty being utilized as a form of punishment has long been regarded as both cruel and unjust for a democratic society, citing that no person has a right to take away another’s life, including the government (Paternoster 2008). Critics argue that its implementation in the United States has long-lasting societal impacts by disproportionately affecting minorities and lower-class citizens, as well as being contrary to present-day ethics and morality (Roberson 2016). Additionally, they argue the procedure itself cannot be performed humanely, as it produces suffering, pain, and the unfortunate reality of botched executions.

Furthermore, the immense cost of the procedure, the number of innocent people who have been executed, and the lack of support for the death penalty by other countries in the world seemingly justifies the death penalty's cessation (Warden and Lennard 2018). Scholars also note that the death penalty serves no public safety benefit, as it needs to be consistent and promptly employed to be effective, yet these inherent flaws prevent this from occurring (Cochran et al. 1994).

Presently, a divide remains among states in implementing the death penalty: twenty-four states implement it, three states have moratorium on the matter, and another twenty-three states, including Washington D.C., have legalized it (Death Penalty Information Center 2021). The issue displayed by this lies in what is pertinent in the argument for its implementation. Although the death penalty incapacitates and supposedly deters violent criminals, critics argue that the alternative to it, life imprisonment, serves the same purpose. As such, many legal scholars and critics note that the entirety of the death penalty's rationale rests on the notion that it serves a deterrence effect due to its other inherent flaws. Because of this, in proving whether a deterrence effect exists, all that needs to be shown is if capital punishment has a demonstrable impact upon the murder rate. If there is no evidence to show the death penalty being necessary to deter homicide, then the main argument for its implementation falls apart.

This research paper serves to address this issue by asking: "to what extent does the death penalty demonstrably deter others from committing homicide?" This will be answered empirically by taking state data and measuring multiple factors against a state's homicide rate over a number of years. In doing so, this will help illuminate the question of whether the death penalty has a deterrence effect, and the extent of its strength. This paper is organized as follows: an overview of the death penalty and how it has reached its current state, a literature review of studies conducted on the subject matter, a discussion and analysis of the data collected, and a

conclusion and discussion of the results from the analysis and what it means for the deterrence effect of the death penalty.

HISTORY OF THE DEATH PENALTY

Since the beginning of history, civilizations have put people to death for many reasons, including redressing social harms and to control criminal behavior. This idea shifted during the Enlightenment Period in 18th century Europe, and especially with the criminologist Cesare Beccaria, who argued that the right to life could not be justly deprived of by the state. This notion, followed with Jeremy Bentham's views of utilitarianism, began an era of using prisons to correct socially unacceptable behavior in the 1800's, a trend which persists to this day. Nonetheless, public executions persisted in both the United States and Europe, and later shifted to a more internalized, private approach (Bryant and Peck 2009). However, while Europe and other countries have since continually abolished their use of capital punishment, the United States came to be the exception to the norm found in Western societies. Currently, it is the only Western country that retains the death penalty, and the reason for this lies with its institutionalization in the criminal justice system (Durrant 2013).

Following its existence as a British colony, the United States adopted the practice of common law as its system of jurisprudence, and along with this and other British law customs came the practice of capital punishment (Bienen 2013). Yet the practice itself was largely employed as a function of the local governments for use of public executions, mostly in the form of hangings, and was thus limited due to its inherent nature as a public spectacle. This began to change with the onset of the Civil War, as the United States saw a transfer of power over executions from the local to the state level of government. Following this, the onset of the Industrial Revolution and new technology spurred new ideas for executing prisoners more

effectively and humanely in comparison to hangings. Inventions such as the electric chair, and more recently the lethal injection, have reformed the system by which it became safer for the state to consistently execute individuals without fear of public scrutiny (Banner 2002). These developments made executions much more efficient and reasonable, especially in use for the justification of deterring violent criminal behavior.

As time passed, the use of capital punishment also flowed with the effects of national and global events, as well as through public will. World War I prompted many states to resume use of the death penalty as a result of public opinion wanting to deter the possibility of traitors to the United States. This public demand for capital punishment was further shown and strengthened through the public lynchings of African Americans in the South during the Jim Crow era at the turn of the 20th century, even though they were not ordered by the state (Banner 2002). The nature of such developments displays capital punishment greatly coincided with public outcry and will; yet, this idea seemingly counters the notion that the deterrence effect serves as the main driver for the death penalty being implemented (Bandes 2021). While advocates for capital punishment within the criminal justice system maintained this sentiment, public opinion quickly swayed to bring a disdainful attitude towards it following World War II and the Civil Rights Movement. The number of executions within the United States dropped dramatically from the beginning of the century, as many scholars, organizations, and people became increasingly wary of the state using the death penalty as a form of punishment (Banner 2002).

Echoing Beccaria's sentiment, the primary concern for the implementation of the death penalty came to center on the notion that any person, especially the government, has no embedded right to take another person's life for any reason (Paternoster 2008). Critics such as the American Civil Liberties Union (ACLU) argued that it violates the Eighth Amendment's

protection against cruel and unusual punishment, as well as the right of Due Process under the Fourteenth Amendment. Notably, these critics emphasized the horrendous consequences that follow where innocent people are wrongfully convicted and executed by the state (Reichert 2011). Additionally, they noted how the death penalty has historically been applied in a disproportionate and unjust manner against people with lower income and who are a minority, non-white race, especially within the context of historical discrimination towards the latter group (Warden and Lennard 2018). Due to these flaws with its implementation, critics honed on the notion that the death penalty served as a tool for brutalizing society, and especially minorities, rather than serving a deterrent use to prevent crime. (Roberson 2016). As the Civil Rights Movement put these issues on notice in the eyes of the public, the issue of the death penalty and its theoretical basis as a deterrent to murder began to receive higher scrutiny from the courts as its constitutionality came into question (Banner 2002).

The debate over the death penalty came to a head with the U.S. Supreme Court case of *Furman v. Georgia* in 1972, where the majority opinion supported the positions held by those opposed to the death penalty. Specifically, they deemed the death penalty to violate the Eighth and Fourteenth Amendments by being cruel and unusual punishment and going against Due Process of the law, therefore being unconstitutional (408 U.S. 238 (1972)). While they did not explicitly rule that racially and geographically based disparities in the death penalty's implementation were key factors, the majority and concurring opinions heavily implied of these being the death penalty's fundamental inconstancy (Bienen 2010). However, arguments were left open for states to implement the death penalty in a way that made it more equitable. As the country and Supreme Court shifted towards a more conservative standing, another Supreme Court case, *Gregg v. Georgia*, along with other cases, reinstated the death penalty as being

constitutional for state use merely four years after *Furman* (428 U.S. 153 (1976)). This decision allowed states to set new parameters for implementing the death penalty to avoid the biases that deemed its prior use unconstitutional in *Furman* by requiring a proportionality review in state and federal statutes (Bienen 2010).

In the years following *Gregg*, states developed their own death penalty jurisprudences, which included states' highest courts responding to empirical evidence of both the deterrence effect the death penalty has as well as whether it created racial and geographical disparities. These developments, along with the changing public perception of crime and race, increased pressure on judicial institutions and polarized debate within the courts on how to correctly address the death penalty (Bienen 2010). In doing so, the Supreme Court, rather than look at the death penalty's legality, focused its implementation. In *Atkins v. Virginia* (2002), they overruled capital punishment being used against mentally disabled persons; they then followed suit in forbidding capital punishment against those who had committed crimes as minors in *Roper v. Simmons* (2005). Furthermore, in *Kennedy v. Louisiana* (2008), they determined the only crime punishable by death is murder or another violent crime involving murder. While these cases limit the death penalty in its capacity, the Supreme Court has also shown that it does not intend to stray away from its ruling in *Gregg*, as seen with the case of *Baze v. Rees* (2008), where the Court upheld the use of lethal injections being used for executions (Bryant and Peck 2009). While the death penalty remains legal in a limited capacity, its theoretical basis has now received more scrutiny than ever following decades of research, public opinion, and court considerations.

In the Supreme Court case *Glossip v. Gross* (2015), a debate highlighting the current state of the deterrence theory of the death penalty ensued between Justice Scalia and Justice Breyer, specifically on the topic of delayed executions. Scalia, in his concurring opinion, cited recent

statistical studies to support a finding of the death penalty having an incremental deterrence effect. Breyer, in his dissenting opinion, argued that this same evidence is insufficient to establish an affirmative conclusion of the death penalty's deterrence effect, and should therefore not be considered in evaluating the death penalty's use. Scalia argued that the people, and not the courts, should determine how much deterrence is appropriate for this determination. Further, Breyer argued that because only 16% of prisoners sentenced to death between 1973 and 2013 had been executed, this provides an offsetting effect on a potential criminal's fear of the death penalty. He emphasized that this rarity of executions occurring makes it difficult to conclude, given the context of the studies cited, that the death penalty can deter murder. Although Scalia noted that this problem was one created by the courts themselves by imposing restrictions on executions, Breyer argued that these delays in executions aggravate the death penalty's cruelty and its rationale as a method of punishment (576 U.S. 863).

Although Breyer's arguments were not a part of the majority's opinion, it is evident that the concerns expressed by him, other critics, and changing attitudes in the public have taken hold in some state jurisdictions and legislatures. Since 1976, thirteen states have abolished their use of the death penalty with another three states placing moratorium on it (Death Penalty Information Center 2022). Nonetheless, as the use of the death penalty is currently split between states, this indicates an almost equal divide between those supporting implementation and those supporting abolition of it. Much of this debate is predicated upon the debate of the death penalty's deterrence effect. To determine this, scholars have conducted studies to find the connection between the deterrence theory with empirical evidence.

LITERATURE REVIEW

As Justice Marshall emphasized in his concurring opinion in *Furman v. Georgia*, the most “hotly contested issue regarding capital punishment whether it is better than life imprisonment as a deterrent to crime,” (428 U.S. 153 (1976), 345). Given the level of severity the death penalty imposes on a person as opposed to life imprisonment, numerous legal minds and scholars wanted to know the difference in deterrent effects between the two types of punishments. This raised a complex problem, however, as determining the efficiency for the deterrence effect of the death penalty presented a seemingly impossible question. In some sense, it could be stated that the death penalty fails as a deterrent when homicide occurs. Yet, while the death penalty’s failures could be counted, its successes appeared implausible to measure, as it would be difficult to predict how many people refrained from murdering another person out of fear of being executed (428 U.S. 153 (1976)). Nonetheless, studies were soon conducted to collect evidentiary support for or against the death penalty.

Following the decision in *Furman*, Isaac Ehrlich conducted a study for the National Bureau of Economic Research in 1973 on the matter of deterrence and the death penalty. He found that by developing a time-series model to produce regression results, a negative correlation is shown between the use of the death penalty and homicide rates from 1932-1969 in the United States (Passel and Taylor, 1977). As Ehrlich describes it, it is “a simple economic model of murder and defense against murder, to derive on the basis of this model a set of specific behavioral implications that could be tested against available data,” (Ehrlich 45, 1973). In essence, Ehrlich used the FBI’s data on homicide rates in states and measured that against other economic factors to determine whether a correlation existed. The results by this study indicated that the “empirical investigation has proved the existence of the deterrent or preventive effect of

capital punishment,” (Ehrlich 46, 1973). Yet, this conclusion was reached despite Ehrlich indicating that there are other factors that could have skewed the results.

Following Ehrlich’s study, many other researchers conducted their own series of studies to test this conclusion. Those researchers used the same methodology as Ehrlich, the time-series regression model testing homicide rates with the death penalty, that generally led to conclusions which supported his findings that a deterrence effect did not exist. The initial primary criticism of Ehrlich’s study was that it relied heavily on his data collected from the FBI. In 1977, Peter Passell and John Taylor produced their own study based on this criticism. After following Ehrlich’s model and reexamining the data from the year 1932-1960 (omitting the years 1961-1969), they found the opposite conclusion that the death penalty did not have a noticeable deterrence effect on homicide rates. They attributed this difference to the upsurge in homicide rates following 1962 to skew Ehrlich’s results in support of a deterrence effect (Passell and Taylor 1977). Nonetheless, many scholars built upon Ehrlich’s claim.

In 1985, Stephen Layson, also skeptical of the FBI data used by Ehrlich, conducted his own study using a similar model that presented new, updated time-series estimates of the U.S. homicide rate. He found that this new set of data overwhelmingly confirmed Ehrlich’s conclusion by using a different measure of the homicide rate (Vital Statistics) compared to the FBI’s data. Layson also finds that deterrence findings are found to be robust with respect to the choice of explanatory variables (Layson, 1985). The findings produced in each of these analyses continued to build upon the Ehrlich’s claim of the death penalty having noticeable deterrence effect when compared to state homicide rates. However, in 1988 James Cover and Paul Thistle found to the contrary in their own analysis. They argued that the use of nonstationary series (such as the U.S. homicide rate) in regression analysis may lead to inconsistent coefficient

estimators, biases, and invalidates standard statistical-inference procedures. To correct for this they difference the homicide rate data to achieve a stationarity and conclude that use of linear trends, including those done by Ehrlich and Layson, was inappropriate. As a result, Cover and Thistle find that stationary data does not provide robust support for a deterrence effect. (Cover and Thistle, 1988).

Other issues arose from Ehrlich's pioneering study; specifically, rather than problems with the data, it was problems with his model. Although many studies used Ehrlich's data, they required different regression specifications, such as different variables or regressors, which produced mixed findings (Dezhbakhsh et al., 2003). In 2003, Hashem Dezhbakhsh, Paul Rubin, and Joanna Shepherd conducted a new study to reexamine this aspect. However, rather than use Ehrlich's model, they employed county-level, post-moratorium panel data and a system of simultaneous equations to overcome aggregation problems, eliminate risks of bias from the unobserved heterogeneity, and update the study to the current time period. They found, like Ehrlich and Layson, that the death penalty has a deterrence effect, and each execution results in, on average, eighteen fewer homicides with a margin of error plus or minus ten. Additionally, they argued their tests showed that results were not driven by tougher sentencing laws and are robust to alternative model specifications (Dezhbakhsh et al., 2003).

This method of data analysis quickly became questioned by researchers. Following Dezhbakhsh et al. and similar studies following it, John Donohue III and Justin Wolfers reexamined the study utilizing the panel data models. They found that there is little evidence to show what potential murderers are dissuaded by and whether the enactment of a death penalty statute has any effect on their decision. Further, they demonstrate that using the execution rate produces various results depending upon how it is measured against other factors and tends to be

a sensitive method for analysis. They emphasized that a lack of a control group made it impossible to tell whether trends of a state lowering or heightening its homicide rates were either caused by implementation or elimination of the death penalty or whether it was merely a general trend (Donohue and Wolfers, 2009). They suggest that to reach the result of finding a deterrence effect, it would have to rely on “poorly measured and theoretically inappropriate pseudo-probabilities that are designed to capture the key deterrence elements of a state’s death penalty” implementation (Donohue and Wolfers, 2, 2009). They added that the instruments to measure such probabilities are of dubious quality and are not reliable to produce conclusive results (Donohue and Wolfers, 2009).

Another study by Aaron Chalfin, Amelia Haviland, and Stephen Raphael in 2012 set to question to use of panel data models to examine the deterrence issue. They presented underlying behavioral models with specifying panel data regressions and concluded that connections between “the theoretical reasoning underlying general deterrence and the regression models typically specified . . . is tenuous,” (Chalfin et al., 36, 2012). Their results displayed inconsistencies like those found by Donohue and Wolford, with methodologies found in papers reporting to have a strong correlation between the death penalty and a deterrence effect having various issues. They highlight that a “lack of variation in the key underlying explanatory variables” coupled with the overbearing “influence exerted in state panel data regressions” is a fundamental problem with this type of methodology (Chalfin et al., 5, 2012). They conclude that use of the panel data model leads to inconclusive, and often uninformative, evidence to resolve whether there is a deterrence effect of the death penalty (Chalfin et al., 2012).

These studies are indicative of the inherent difficulties when it comes to the study of the deterrence effect for the death penalty on homicide rates. Specifically, due to the vast means of

data needed and the differences of methodology used, bias can be created, and researchers may easily manipulate their studies to support a finding for or against a deterrence effect. Another study conducted in 2008 by Ethan Cohen-Cole, Steven Durlauf, Jeffrey Fagan, and Daniel Nagin emphasize this point by stating “no scholarly consensus exists [to the] magnitude,” (Cohen-Cole et al., 1, 2008) in states using capital punishment for deterrence effects. They cite the use of alternative models across studies is a key contributor to this conundrum, as it effectually produces different estimates of the deterrence effect with each different model and use of data (Cohen-Cole et al., 2008). Economists Gerritzen and Kirchgässner later echo this sentiment in their own analysis, finding that the empirical evidence presented within studies of the deterrence effect of the death penalty is too fragile to rely upon (Gerritzen and Kirchgässner, 2013). Because of these uncertainties, Stephen Durlauf later concluded in a subsequent study that in future studies, researchers must acknowledge the presence of model uncertainty in drawing inferences (Durlauf et al., 2012).

Incredibly, despite the debate and research surrounding the deterrence effect of the death penalty lasting for decades, the unfortunate reality is that current data and analytical approaches make answering this question implausible. A committee within the National Research Council (NRC), in considering three decades of research on the matter, describes the problem of studies attempting to find capital punishment having a deterrent effect on homicide rates being fundamentally flawed. The NRC committee found these flaws to be threefold: (1) The studies do not factor in the effect of noncapital punishments that may also be imposed upon those who commit homicide; (2) the studies use incomplete, implausible models of potential murderers’ perceptions of and response to the use of the death penalty; and (3) estimates of the effect of the death penalty are based on statistical models that make non-credible assumptions (Nagin and

Peppers 2012). The NRC committee reiterates the lack of a consistent, credible model and methodology to understand what potential murders think about before deciding to commit homicide, as well as how researchers are limited from drawing believable conclusions about the deterrence effect. Furthermore, they argue that because deterrence stems from the notion of utility and the idea that would-be criminals can make rational decisions to best avoid punishment by the death penalty, this element is a purely theoretical notion, and empirically inconclusive to support its effectiveness (Nagin and Peppers 2012).

The question of the deterrence effect of the death penalty continually receives scrutiny, questioning, and as evidenced by the research above, inconclusion to the ultimate question. These empirical approaches have thus far failed to draw a clear, concise result as a result from the shortcomings of data analysis and the limitations various methodologies impose on researchers. Consequently, this lack of a definite conclusion is a primary reason to the continuous debate surrounding its use. This makes the question clear: to what extent does the deterrence effect have on the death penalty, if any? In answering this question, this paper strives to add to this research through further data analysis and adding to the discussion of where the debate over the implementation of the death penalty should lie as a result.

THEORETICAL DISCUSSION

As deterrence is cited to be one of the key justifications for the implementation of the death penalty, it is necessary to understand how it works in theory. The logic is that where a state uses the death penalty as a form of punishment, would-be murderers will refrain from committing homicide, thus decreasing the overall homicide rate. This is assuming that offenders can rationalize their thoughts and actions before committing homicide and choose not to do so to avoid potential execution as punishment. This assumption, known as rational choice theory, is

often used in criminology to help explain why people decide to commit crimes. This theory relies on offenders' ability to weigh the probability of being caught and arrested, understand what punishments they may receive as a result, and freely choose their actions and behavior. However, this theory relies heavily on a person's capability to make a rational choice, especially during scenarios where rationality is overridden by emotional arousal or impulse (Perera 2022). This explains why many legal scholars have found that while the rational choice theory is significant in explaining the logic for the death penalty deterring crime, it is purely theoretical (Nagin and Peppers 2012). Nonetheless, this theory is significant in explaining the ongoing implementation and use for the death penalty, as logically, it is seemingly sensible to use it.

This issue is indicative of why empirical research is needed to determine the deterrence effect of the death penalty. The deterrence theory relies on the assumption of utility, receiving the greatest benefit for the least cost. Where a criminal can rationalize their choices, the death penalty is an inherent cost to committing homicide; thus, it can be reasoned that where states use the death penalty, it is expected that the homicide rate will decrease. However, if an analysis demonstrates that death penalty use does not noticeably affect the homicide rate, it can be reasoned that having the death penalty is not conclusive in and of itself to a finding of deterrence. Similarly, the deterrence theory should suggest that non-death penalty states would see higher rates of homicide due to a lack of deterring force. Where an analysis demonstrates that this is true, then the deterrent effect theory would be bolstered, with the opposite being true where non-death penalty states have substantially similar or decreased rates of homicide than death penalty states. Where data analysis shows a finding not favoring the deterrent effect, it can be reasoned that having the death penalty is either merely supplementary or inconclusive to deterring

homicide. As studies have demonstrated before, all that needs to be shown to dissuade an argument for deterrence is no finding of the death penalty decreasing the homicide rate.

It is important to keep in mind that the deterrence effect theory of the death penalty relies on the rational choice theory, which has some empirical shortcomings. Because an offender's actions and behavior to commit homicide cannot always be determined by their level of rationality, especially those that are not premeditated, other factors may affect the homicide rate instead. Crime, including levels of homicide, has historically been found to be associated with economic, geographic, and demographic variables, as well as the strength and condition of transportation, education, public services, and familial structures (Hate Crime Statistics 2011). Due to the variety of these factors, it is often difficult to fully decipher what events and circumstances actually cause crime to occur. However, research can demonstrate correlations between variables to see what types of factors tend to cause or prevent crime. Thus, within any analysis of the deterrent effect of the death penalty, it is important to consider some of these additional factors which may correlate with the rate of homicide shown. In doing so, this provides a greater understanding of the scope of the death penalty deterrent effect, as it is possible that a finding which supports deterrence may also correlate with other factors. If there is such correlation, then these other factors may contribute more to increasing or decreasing the rate of violent crime, thereby being a more fundamental explanation for the homicide rate as opposed to the use of the death penalty.

HYPOTHESES

Studies of the deterrence effect of the death penalty often utilize various independent variables to study the homicide rate. This is due to this statistic being predicated upon the result of multiple relevant factors which shape the situations, conditions, lifestyles, behaviors, and

actions of those who commit homicide. Thus, my hypotheses will be based upon some of these factors which have been found to be most associated with increasing or decreasing levels of crime overall, as well as what other studies have analyzed before.

1. Going off the theory of deterrence, it is hypothesized in this paper that states which utilize the death penalty as punishment will see a decrease in the homicide rate. This is because as states use the death penalty, in theory, it will prompt people to refrain from committing homicide.
2. When considering economic circumstances affecting levels of crime, the FBI has found evidence of statistics that general crime levels increase the worse economic conditions a state or area is. (Hate Crime Statistics 2011). In measuring economic factors, the U.S. Department of Commerce has listed a key indicator to be employment figures, and as such the level of employment tends to be indicative of how financially stable an area or region is. Thus, it is hypothesized that as the unemployment rate increases, so will the homicide rate.
3. Additionally, following the FBI's observations, it is also hypothesized that as the median household income level increases, the homicide rate will decrease. In addition to being cited as another key indicator of economic conditions within an area, studies have found that greater inequality among the median household rate between citizens corresponds with homicide rates (Levitt 1999). It can be expected then that a worse median household income level will drive people to commit crime, including homicides, with the opposite being true when the median household income increases.
4. It is also hypothesized that as the poverty rate increases, the homicide rate will increase as well. This again follows from the FBI's observations of crime being affected by the

economy and has been considered by other studies to be an additional indicator of economic status within an area. (Chalfin 2012).

5. Furthermore, it is hypothesized that the demographic and population variables will contribute somewhat to the level of homicides, but not significantly. Again, this evidence comes from the FBI, who found these types of variables suggest a relationship with increased crime, but not significantly cause a change in it (Hate Crime Statistics 2011). Namely, the logic of this centers on the idea that more centralized populations tend to experience more crime due to the closer proximity people experience and thus higher opportunity for crime. Additionally, because metropolitan areas experience greater rates in migration and population growth, this also contributes to higher rates of crime. However, this also pertains to overall crime, and does not account for homicides per se (Ladbrook 1988).
6. Additionally, it is hypothesized that as a state experiences a lower white population percentage, the homicide rate will increase. Although Whites commit more crimes than East Asians and Pacific Islanders, studies have found that African Americans commit more crime in general. (Beaver, Ellis, and Wright 2009). Additionally, it has also been reported that Hispanics commit a higher murder rate than Whites; however this data is also inconclusive. (Violence Policy Center 2014). Nevertheless, these factors suggest that a decreasing white population may experience the homicide rate as a result, especially as the U.S. Census Bureau has reported Hispanics to be the fastest-growing population.
7. Finally, it is hypothesized that the more states with the death penalty use it, the lower the homicide rate will be. Again, this stems from the deterrence theory; however, rather than merely having it legalized, this effect is expected due to the inherent fear the death

penalty should bring. Thus, if a state is more apt to sentence and execute offenders, then it is likely people will notice this and be deterred from committing homicides.

DATA

This section will describe the data and methods utilized to test the extent to which the deterrence effect has on the death penalty. To measure this, this study will analyze the homicide rate, the dependent variable, within multiple states over a period of time. In addition to measuring each state's homicide rate as it applies to their death penalty policy, this analysis will consider additional economic and demographic data within each state to determine whether there is correlation with the homicide rate; these will be the independent variables. The data collected consists of multiple components to serve as a current, widespread sample of what types of factors ultimately contribute to the homicide rate within states. The components of this dataset are necessary for evaluating the deterrence effect itself as it is applied within the United States today.

The first component of the dataset, the observed objects, are a sample of individual U.S. states. As the ruling in *Gregg v. Georgia* permitted states to reimplement the death penalty in a manner that made it more equitable, this gave authority of states to determine how they would or would not use the death penalty as punishment. As such, each state varies with their use of the death penalty, therefore making it appropriate to measure the total effectiveness of the death penalty by state. This study focuses on a sample of twelve states and divides each state into one of three groups: (1) states that legalized the death penalty before 1985, (2) states where the death penalty is legal, and (3) states that had the death penalty after 1985 but have since legalized it. Although calculating each of the fifty U.S. states would be preferable to attaining a completely accurate finding, its immense scale would make interpreting the data more complex, and therefore may lead to an inaccurate analysis. A sample of twelve states permits the

data analysis to be more concise and understandable, and retains the ability to indicate which factors can be replicated within other states not included within the sample.

The states chosen for this analysis are: Alaska, Michigan, and West Virginia for Group 1; Alabama, Florida, Ohio, Texas, and Wyoming for Group 2; Illinois, New Jersey, New Mexico, and New York for Group 3. For this study, Group 1 will be the control group, with Groups 2 and 3 being the experimental groups. The reasoning for this is that while each Group will be subjected to the same analysis, the treatment being measured which varies between states is whether they implement the death penalty. Whereas some states never have (after 1985), it is important focus on the states that currently do and the states which have legalized in between 1985 and 2020. By having Group 1 as the control group, this will allow a stronger determination of whether the treatment, implementing the death penalty, truly has a significant impact on Group 2 and 3's homicide rates as opposed to Group 1's homicide rates. It will also help eliminate making erroneous conclusions. Thus, the standards to which comparisons are made within this experiment will lie with Group 1's results.

The states in Group 1 and Group 2 were chosen specifically based on considerations of geographical location, population, and socioeconomic conditions to allow comparisons to be made between similar types of states. For example, Ohio and Michigan were selected due to their proximity and similar populations, thereby creating a sample that helps control for those underlying factors to allow a clearer comparison of whether the death penalty is effective or not. Additionally, other states within Groups 1 and 2 were selected to provide a greater variety of the types of states which do or do not have the death penalty to avoid any regional or economic biases. Thus, Alaska and West Virginia were selected to encompass this variability for Group 1, and Alabama and Wyoming being selected for this reason for Group 2.

In addition to these selections, the states chosen for Group 3 were done to demonstrate a split in years for when a state did or did not have the death penalty and permit an analysis of the death penalty's effectiveness before and after this policy change. As many states began to rid of the death penalty within the 2000s, this timeframe was used to help select the states that would be included for Group 3. Accordingly, the states in this study correspond with this notion, as New York, New Jersey, New Mexico, and Illinois all legalized the death penalty in 2004, 2007, 2009, and 2011 respectively. It should be noted that to qualify for Group 3, a state's death penalty policy for legalization must be ten years or more. This parameter is set so that any change made by the legalization of the death penalty would be a significant and noticeable trend.

After review of the theory of deterrence, Florida and Texas were added to Group 2, as along with implementing the death penalty currently, they are the two states who actually use the death penalty on a regular basis. The premise for this addition mirrors the deterrent effect theory: states which employ the death penalty regularly should see a decrease in homicide rate, as an offender would reason that execution is not just possible, but also likely to occur as a result. To represent this, the analysis for the experimental groups (Group 2 and Group 3) will account for the number of executions performed and number of death sentences administered per state by year. These two independent variables will account for whether deterrence merely rests on the possibility of being executed, or if a continuous threat of being executed necessary to deter homicides. The data for these variables was sourced from the Death Penalty Information Center's collection of state data resources found in each state's department of corrections and public defender's offices.

As alluded to by the experimental groups, the time period chosen to analyze the homicide rate consists of data between 1985 and 2020, which encompasses thirty-six years. This timeframe was chosen to establish a significant lapse in time for changes in variables to be adequately accounted for and to avoid biases within a given set of time, which was noted by Stephan Layson and subsequent researchers in their own studies (Layson 1985). Although this timeframe does not account for the entirety of the implementation of the death penalty in the United States, it is appropriate in assessing its effectiveness as it pertains to the current period. Additionally, this timeframe corresponds with the period by which the Federal Bureau of Investigation (FBI) set its current parameters for measuring the homicide rate.

Similar to previous studies primarily measure the rate of homicides as their dependent variable, this paper follows this trend. The homicide rate in the United States used in this paper is sourced from the FBI's collection through the Uniform Crime Reporting Program. This program has collected crime statistics since 1930 from law enforcement agencies that report to either the Summary Reporting System or the National Incident-Based Reporting System. Although a significant amount of law enforcement agencies provide data for these reports, some do not, and so the FBI estimates these using multiple factors. Based on the data received and estimated, it derives its findings by measuring the rate of homicides occurred at a rate per 100,000 people by year. The data used in this paper does not consider the rate of violent crime, as the Supreme Court's decision in *Kennedy v. Louisiana* (2008) established that only murders can be punishable by death (554 U.S. 407). As such, measuring the homicide rate provides the most accurate basis to measure other variables against to test for a deterrence effect.

The next component of the dataset involves the other independent variables which will test for other possible predictors for the homicide rate within states. These variables consist of

both economic and demographic/population factors to account for association between the homicide rate and outlying conditions which may impact an offender's choice to commit or refrain from homicide. The economic variables considered are a state's poverty rate and unemployment rate (each shown by percentage of the population), as well as the median household income in current U.S.D (not seasonally adjusted), from 1985-2020. "Poverty" is classified by families whose total income falls below the poverty threshold set at the federal level. The unemployment rate is measured by the level of employment by industry, including full, part-time, and self-employed workers. Median household income is measured by a linear interpolation to estimate the median income of households within a state. These were sourced from the Census Bureau's release, "Income and Poverty in the United States," the Census Bureau's Annual Poverty Thresholds, The National Center for Educational Statistics, and the U.S. Bureau of Labor Statistics.

The demographic/population variables consist of a state's metropolitan rate and white population rate (each shown by percentage of the population), as well as the population density, between 1985-2020. Population density was calculated by taking a state's population each year and dividing it by the total area (in square miles) of the state. The metropolitan rate includes the percentage of a state's population that lives in both metropolitan and micropolitan areas. A metropolitan area is defined by the U.S. Office of Management and Budget as cities and their surrounding areas which have a population of 50,000 or more; a micropolitan area is defined as cities and their surrounding areas which have a population between 10,000 and 50,000.

"Surrounding areas" include suburbs which contribute economically to the urban center of a city. This measurement was utilized instead of the urban population rate because the Census Bureau only measures urban population every census period and the definition of "urban population"

changes significantly between the 1990 and 2010 census. The white population rate is measured by the percentage of non-Hispanic people whose origins stem from any of the original peoples of Europe, the Middle East, or North Africa. These all were sourced from the Census Bureau, including their releases of the Statistical Abstract of the United States (by year), the State Area Measurements and Internal Point Coordinates, and Population Estimates.

METHODOLOGY AND HYPOTHESES

Although the National Research Council has found that there is not one single model of data analysis which may accurately observe the phenomenon in question, it is still necessary to evaluate this state data to provide empirical evidence for or against a deterrent effect (Nagin and Peppers 2012). To do so, a univariate analysis will be considered first, followed by a bivariate analysis, and then finally an Ordinary Least Squares (OLS) regression. The first analysis will analyze each Group's rate of homicide between the years 1985 and 2020 by looking at the descriptive statistics of the mean and median values. The mean will be prioritized; however, if the data is skewed, then the median will be interpreted. Determining whether the data is skewed involves looking at the standard deviation (SD) to show the amount of dispersion over the dataset. To determine whether this value is high or low, a coefficient of variation (CV) test will be done. The closer to 0 the CV value is, the lower the SD is. This would mean the data is not spread out and has few outliers, making it more accurate. This analysis will show the overall trend for the homicide rate by group, irrespective of other variables, and provide a basic level of analysis as to how effective having the death penalty may be.

The second analysis will comprise of a Pearson correlation test which will measure the strength and direction of a linear relationship between variables. It first indicates whether a statistically significant linear relationship exists by providing a p-value. The p-value determines

this significance by showing the probability by which the result presented is by random chance, measured at a 95% confidence rate, which is the default standard. As this analysis is only measuring a sample of states, where a variable is found to be statistically significant, it means it is representative of other states not included within this analysis. Because the confidence rate is 95%, the p-value must be below 5% to be considered statistically significant. However, if a variable is found not to be statistically significant, this means the alternative hypothesis (assuming a relationship exists) should be rejected in favor of the null hypothesis, which asserts no relationship exists between variables. Because the null hypothesis indicates no significant difference between populations, it may be determined to be a sampling or experimental error.

A Pearson correlation test will also provide a sample correlation coefficient, an r value, to show the strength and direction of the relationship. Where a statistically significant correlation is found between an independent variable and the dependent variable, the relationship will be interpreted accordingly, such as whether it is strong, moderate, or weak and whether it increases or decreases the homicide rate. If an increase in the independent variable causes an increase in the dependent variable, the two variables are related; the same is true where a decrease in the former causes a corresponding decrease in the other. This is described as a positive correlation, which has a positive r value. Additionally, if an increase in one causes a decrease in another (or vice versa), then the variables are said to be indirectly correlated. This is described as a negative correlation, which has a negative r value. Along with the direction of the relationship, the r value will demonstrate the relative strength of the relationship by its numerical value. The number will lie on a scale between 1 and -1, with 1 being the strongest positive correlation and a -1 being the strongest negative correlation. As the value nears 0, the relationship becomes weaker (Khurma 2014). This is indicated below:

Correlation Coefficient
Shows Strength & Direction of Correlation



Sourced from AI Source, 2016

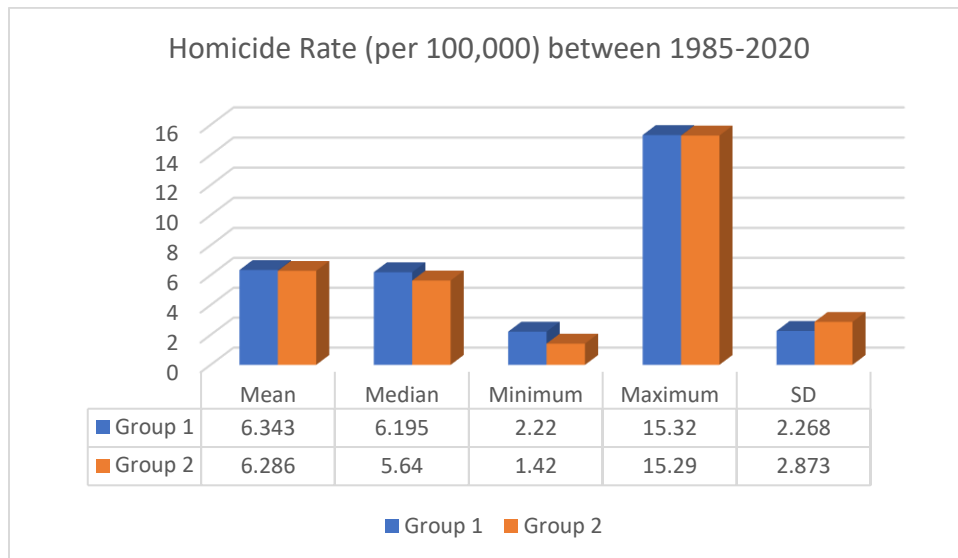
This analysis will be run by Group, and not by state, to account for the totality of the sample. Group 1 will not be tested for number of executions and number of death sentences, as they do not have sufficient data to purport a finding for this variable. As such, Group 2 and Group 3 will test these variables. In essence, this will show whether the state implementing and using the death penalty has any noticeable effect on the homicide rate, or whether it correlates with other variables instead. However, it should be noted that this analysis does not explain *causation*; it only explains correlation.

For the third analysis, an OLS regression will be run to compare the response of a dependent variable given a change in the independent variables. This analysis finds the best fit for a dataset by minimizing the sum of the errors or residuals from the plotted curve. Unlike the correlation test, this test will also analyze categorical variables such as whether a state implements the death penalty. To demonstrate this analysis, a multiple R value, the coefficient of multiple correlation between three or more variables, will show the correlation between actual and predicted values of the dependent variable. But to get a better understanding of this, an R^2 value will be provided as well, which demonstrates how well the data fits the regression model. This value essentially explains what percentage of variation of the dependent variable can be explained by the variation in the independent variable(s). Further, the p-value and confidence level will be provided to show which variables are statistically significant.

To measure the variables, the standard error (s) will be shown, showing the standard deviation of the sampling distribution. This represents the average distance the observed values fall from the regression line. The smaller the value, the better indication there is that the observations are closer to the regression line. The other value which will be observed is the coefficient, which tells the difference in the dependent variable for a unit change with the independent variable. These values estimate the relationship between the independent variables with the dependent variables. It should be noted that independent variables which are not statistically significant will indicate a coefficient close to 0, and be taken into account accordingly.

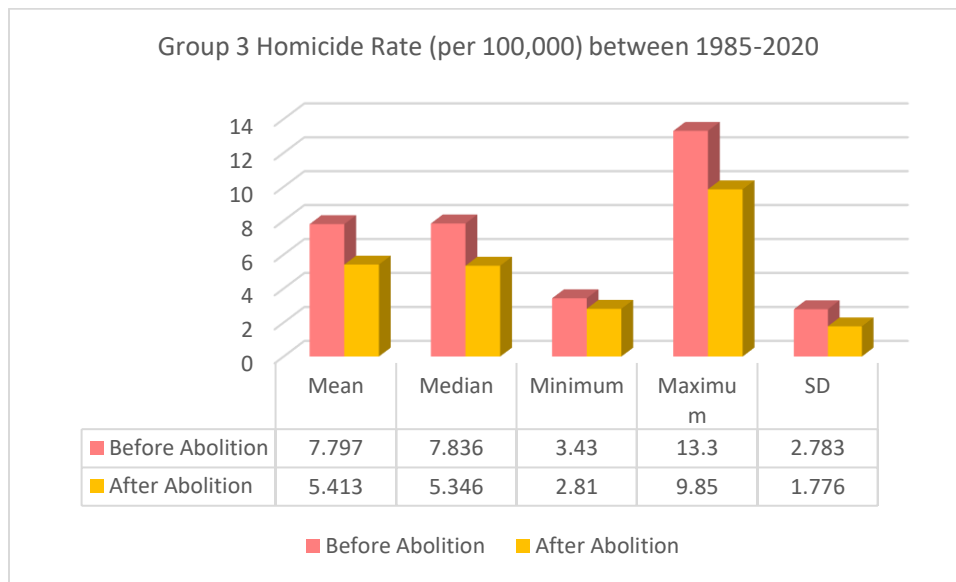
RESULTS AND DISCUSSION

Analysis 1: Univariate Statistics



Displayed above are the descriptive statistics for the homicide rate of Group 1, where there is no death penalty, and Group 2, where there has always been the death penalty. This graph shows a direct comparison between states either having or not having the death penalty, and whether this has affected the homicide rate. The data does not appear to be skewed, as in

calculating the coefficient of variation for each Group's SD, it produces values of 0.357 and 0.457 respectively. This signifies that each Group's data displays few outliers, and the mean may be interpreted as it is. As the means indicate, Group 2 has a lower average homicide rate by a miniscule margin when compared to Group 1. What this demonstrates is between 1985 and 2020, states that either used the death penalty completely or states that did not use at all experienced nearly identical rates of homicide on average. This may help reveal that the death penalty is not a significant factor in decreasing the homicide rate but is not conclusive to such a finding. For a better understanding of this, the same analysis is applied to Group 3.



Displayed above are the descriptive statistics for Group 3, which took data from states before they abolished the death penalty and afterwards. This graph displays a better understanding of how the homicide rate may be directly affected by the state's policy changing and whether ridding of the death penalty results in increased or decreased homicide rates. Like the previous analysis between Group 1 and 2, the data does not appear to be skewed, as in calculating the coefficient of variation for before and after abolition, it produces values of 0.357 and 0.328 respectively. Again, this signifies that the data displays few outliers, and the mean

may be interpreted as it is rather than the median. As the means indicate, Group 3 experienced a significant drop in the average homicide rate once its states abolished the death penalty. This is also supported by similar drops in the median, minimum, and maximum values between series. Contrary to the deterrence theory of the death penalty, this drop in the mean signifies that a state has less homicides when it does not have the death penalty, as opposed to when it did incorporate it. This is furthered by the graph not showing a consistent or higher rate of homicide once the death penalty was abolished. If the death penalty does have a deterrence effect, the graph should indicate this; yet, here, it does not.

Using the analysis for Group 1 and 2, not only does this show the death penalty may be a minor factor in decreasing the homicide rate, but that states are better off when they do not have the death penalty at all. However, even though this supports a finding against the death penalty having a deterrent effect, it should be considered that this analysis is limited by only looking at the means from 1985-2020. This data allows another inference to be drawn as a result: that the average rate of homicide has declined in the United States overall. Especially given that Group 3's analysis showed a drop in the average homicide rate, it is possible that this was due to higher rates of homicide within the earlier parts of the timeframe (1985-2020), followed by lower ones once those states abolished the death penalty later in the timeframe. Because of this, it is difficult to base a definitive conclusion against the death penalty not having a deterrent effect. Nonetheless, this analysis still provides that the death penalty on its own may not have a significant part in decreasing the homicide rate.

Analysis 2: Bivariate Correlation

Group 1 Correlation Matrix						
Variables	Poverty Rate	Median Household Income	Unemployment Rate	Metropolitan Population	White Population	Population Density

<i>R</i> value	-0.334	-0.078	0.137	0.560	-0.247	0.047
p-value	0.000	0.422	0.157	<0.0001	0.010	0.629
N	108	108	108	108	108	108

To better understand how different variables end up affecting the homicide rate, the second analysis looks a correlation model to determine the regression of each variable and their relationship with the homicide rate. The chart above displays this analysis by showing the measurement of each variable's p-value and correlation coefficient, measured as the *r* value. It also displays the number of observations ran for each variable as N. As the p-values suggest, the median household income, unemployment rate, and population density within Group 1 are not statistically significant. This signifies that the null hypothesis should be accepted regarding these variables, and thus conclude that no relationship exists between these variables and the homicide rate. However, it should be noted that this may have been the result of a sampling error; namely, the sample may have been too small, and should thereby be adjusted in future observations.

Regarding the other three variables (the poverty rate, metropolitan population, and white population), the p-values show these to be statistically significant. Thus, the alternative hypothesis can be accepted, and we may analyze the relationship of each variable. Each *r* value represents the relative strength and direction of the correlation. Here, both the poverty rate and white population percentage indicate a weak negative relationship with the homicide rate. This means that as the poverty rate and white population percentage decrease, the homicide rate actually increases. However, each of these relationships are somewhat weak, with each *r* value only having a strength of 33.4% and 24.7% correlation respectively. On the other hand, the metropolitan population percentage variable indicates a somewhat strong positive correlation. This means that as the metropolitan population percent increases, so does the homicide rate.

Each of these variables indicate some level of correlation exist, although they are not themselves suggestive for a finding that explains the homicide rate.

Group 2 Correlation Matrix								
Variables	Poverty Rate	Median Household Income	Unemployment Rate	Metropolit an Population	White Population	Population Density	Number of Executions	Number of Death Sentences
R value	0.599	-0.546	0.265	0.193	-0.332	0.021	0.098	0.673
p-value	<0.0001	<0.0001	0.000	0.010	<0.0001	0.782	0.19	<0.0001
N	180	180	180	180	180	180	180	180

Unlike Group 1, Group 2 was experimented to find the correlation with the same economic and demographic/population variables as well as the correlation with the number of executions and death sentences given per year by state. The p-values show that all of these variables are statistically significant barring the population density and the number of executions. Thus, the null hypothesis will be assumed for those variables and found that no relationship exists. Again, it is likely that this may have been due to a sampling or experimental error; regardless, like the previous analysis, it will not be considered in review.

The economic factors in conjunction seemingly create a convincing observation: the worse a state's economy is, the higher the rates of homicide will be. This is evidenced by the poverty rate and unemployment rate each having positive r values, with the median household income having a negative r value. While the relationship with the unemployment rate is relatively weak, both the relationship with the poverty rate and median household income rate are somewhat strong. This trend follows similar ones found by the FBI's analyses of variables affecting crime rates: that being economic conditions within a state or area largely contribute to the rate of crime experienced. The observation from this analysis mirrors this trend based on this correlation.

Like the findings in Group 1, the white population variable exerts a somewhat weak negative correlation with the homicide rate. As this relationship is consistent with the findings of the control group, this figure can be concluded to have a slight, but not insignificant, overall effect on the homicide rate. Furthermore, the metropolitan population, like the observation in Group 1, has a positive correlation with the homicide rate. However, within Group 2's analysis this correlation is much weaker, and given the other variables' stronger relationships, this variable ultimately is minor in explaining the homicide rate.

Additionally, the number of death sentences given is shown to have the strongest correlation with the homicide rate, having a relatively strong, positive correlation. Although this may be interpreted in the contrary, this correlation is likely the result of states sentencing more people to death because the homicide rate increases, as opposed to the rate increasing due to higher death sentences. This is largely true due to these states being afforded the option to use the death penalty as a form of punishment, so it can be reasoned that where more homicides occur, the more often judges will sentence people to death. However, it is also significant to note that this finding, unlike what the deterrence theory suggests, depicts the actual use of the death penalty as being unconnected with the levels of homicide experienced. Yet, due to the limitations of the correlation test, it can be argued that the true number of people deterred by higher death sentencing rates is unknown. Thus, this variable seemingly plays a larger factor in demonstrating the response by the criminal justice system to the homicide rate, rather than showing how the threat of the death penalty may deter crime.

Group 3 Correlation Matrix								
Variables	Poverty Rate	Median Household Income	Unemployment Rate	Metropolit an Population	White Population	Population Density	Number of Executions	Number of Death Sentences
R value	0.299	-0.658	0.139	-0.452	0.049	-0.563	0.180	0.282

p-value	0.000	<0.0001	0.098	<0.0001	0.557	<0.0001	0.031	0.001
N	144	144	144	144	144	144	144	144

Group 3 was analyzed in a similar manner as Group 2. Again, the p-values here display that the null hypothesis should be accepted with the unemployment rate and the white population percentages. Like Group 2, Group 3 saw a similar direction of correlation regarding its economic variables. However, while the median household income exerts a relatively strong relationship, the poverty rate and unemployment rates are far weaker by comparison. This suggests that while the Group 3 states experienced a familiar trend with their homicide rate being affected by the economic conditions of their state, it is not entirely suggestive of how the homicide rate is affected. Interestingly, both the metropolitan population and population density display a somewhat strong negative correlation with the homicide rate, which runs counter to both Group 1 and Group 2. With Group 3, this suggests that the homicide rate is more dependent upon where the population lives; specifically, this relationship indicates the more people live in centralized locations, the lower the homicide rate will be. Additionally, the number of executions and number of death sentences, like the analysis of Group 2, demonstrates a positive correlation. However, this is a relatively weak relationship by comparison to the other variables.

Analysis 3: OLS Regression

Group 1 Regression Statistics			
<i>Ind. Variable</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>p-value</i>
Intercept	-15.602718	8.176675573	0.059205
Poverty Rate	-0.0139224	0.110087625	0.899614
Median Household Income	-3.528E-05	2.70036E-05	0.194302
Unemployment Rate	0.15426255	0.112004256	0.171467
Metropolitan Rate	0.18870671	0.035539663	6.54E-07
White Population	0.15638054	0.070735257	0.029306
Population Density	-0.038382	0.012774165	0.003353
Multiple R		0.72847077	
R Square		0.53066966	

Confidence Interval	95%
Observations (N)	108

This analysis measures the regression statistics of the dataset to reveal whether such a relationship exists between independent variables and the dependent variable, the homicide rate. The multiple R value shows that 72.85% of the data fits the regression model, but the R² value displays only 53.1% of the variation in the dependent variables can be explained by these independent variables. This indicates that the independent variables are moderately able to predict the value of the dependent variable. This is further shown by the p-value statistics. As displayed by the table, the regression was run at a 95% confidence level, meaning for a p-value to be statistically significant it must have a value less than 0.05. The statistics show that only half of the independent variables are statistically significant enough to be considered, those being the metropolitan population, white population, and population density. Thus the null hypothesis is rejected regarding these variables, but it is accepted regarding the economic variables.

Considering the alternative hypothesis regarding the statistically significant variables, the coefficients denote a positive relationship for the metropolitan and white populations, but a negative relationship with the population density. Thus with every increase in the metropolitan and white populations, an increase should be expected within the homicide rate as well. The same review applies for population density, wherein as it decreases the homicide rate increases. As the standard errors show there is no indication that the observations deviate far from the regression line. The graph also shows the y-intercept value is a negative number. In this case the y-intercept should not be interpreted, either because the independent variables cannot all equal 0 or because of a sampling error. It is possible here that this would be a sampling error, and should be considered upon analysis.

Group 2 Regression Statistics			
<i>Ind. Variable</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>p-value</i>
Intercept	7.621652013	4.47775436	0.090551
Poverty Rate	0.446379911	0.074104094	1.02E-08
Median Household Income	-4.9174E-05	1.49259E-05	0.001198
Unemployment Rate	-0.16995324	0.081248397	0.037936
Metropolitan Rate	-0.03340798	0.037631753	0.375917
White Population	-0.0437619	0.020011978	0.030116
Population Density	-0.00052098	0.002745197	0.849709
Number of Executions	-0.14957963	0.021367636	5.57E-11
Number of Death Sentences	0.13666884	0.016662628	5.42E-14
Multiple R			0.863701944
R Square			0.745981048
Confidence Interval			95%
Observations (N)			180

Group 2’s regression analysis, unlike Group 1, also considers the number of executions and death sentences given per year, just as it was analyzed in Analysis 2. A regression analysis for Group 1 could not analyze these as there were no values available to be compared. The multiple R value shows that 86.37% of the data fits the regression model, with the R² value showing 74.6% of the variation in the dependent variables can be explained by the independent variables. This provides a stronger model to support Group 2’s analysis with the independent variables strongly predicting the value of the dependent variable. Further, the p-value statistics show that all but two independent variables (the metropolitan population and population density) are statistically significant to be considered. The null hypothesis is rejected and accepted accordingly.

Here, the coefficients show positive relationships for the poverty rate and number of death sentences given and negative relationship with the remaining statistically significant variables. What this shows is that as the poverty rate increases and the median household income decreases, the homicide rate increases. This follows suit with the observation from the previous

analysis regarding economic factors. Interestingly, however, the unemployment rate also has a negative coefficient, which indicates that economic factors are not completely indicative for the homicide rate increasing or decreasing. Additionally, as the standard of deviations for the economic factors are the highest among the variables, it is arguable that this higher deviation creates more volatility in determining a significant relationship.

Furthermore, the white population variable, like in Analysis 2 for Group 2, has a negative coefficient. However, regarding the number of executions and death sentences, an interesting observation can be made. As the number of executions decrease, and the number of death sentences increase, the homicide rate increases as well. This seems to correspond with the deterrence theory partially, as this shows less executions creates more homicides. Yet, it could also be said that the more death sentences are given, the more people should be deterred from committing homicide, thus lowering the rate. However, it may be the case that, like in Analysis 2, the increase in death sentences are due to increases in homicide rates. It may also be the case that more people are fearful, and therefore deterred, by the act of executions themselves rather than merely being sentenced as it is more serious, and sentences come with the possibility for exoneration. Yet, because this is unobservable, this may only be inferred from the data. Nonetheless, these last two variables give credence to the deterrent theory.

Group 3 Regression Statistics			
<i>Ind. Variable</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>p-value</i>
Intercept	7.5159287	1.934217983	0.000159
Poverty Rate	-0.004437	0.034714543	0.898484
Median Household Income	-3.34E-05	2.06626E-05	0.107927
Unemployment Rate	0.0678798	0.095602166	0.478914
Metropolitan Rate	-0.092138	0.027514151	0.001052
White Population	0.1556282	0.03886728	0.000102
Population Density	-0.00304	0.000662359	1E-05
Number of Executions	0.417069	0.35493013	0.242034

Number of Death Sentences	-0.075755	0.053169256	0.156526
Multiple R	0.7586069		
R Square	0.5754844		
Confidence Interval	95%		
Observations (N)	144		

Like Group 2, Group 3 considers the number of executions and death sentences given per year. Here, the multiple R value shows 75.86% of the data fits the regression model, yet with the R^2 value showing 57.55% of the variation in the dependent variables can be explained by the independent variables. This provides a stronger model than Group 1, but not as strong as Group 2. The p-value statistics here show, like Group 1, that the demographic and population variables are statistically significant, but not the economic factors. Additionally, the p-value for the number of executions and death sentences is less than 0.05, making these statistically insignificant. However, this may have been due to a modeling error as the states shifted from incorporating the death penalty to abolishing it. The null hypothesis is thus rejected and accepted accordingly.

The coefficients here show positive relationships for the white population rate with negative coefficients for the metropolitan population and population density. This partially follows the statistics analyzed within Group 1 and thus denotes a higher level of significance to these findings, especially the white population's increase contributing to the increase in the homicide rate. Additionally, the same can be said about the population density as it decreases; yet because the coefficient here is near 0, this shows that population density, while statistically significant, may not contribute greatly to the homicide rate increasing. However, this follows with the metropolitan population's coefficient, as these show the more people are decentralized

in a location the higher the homicide rate is. This suggests that being more centralized creates more safety from homicide.

Discussion

The sum of these results portrays an overarching and complex analysis is required to make a full determination of the deterrence effect of the death penalty. Even where variables can be accounted for, it is often the case that many of these variables are overlapping, and not one single observation is necessarily conclusive to an overall finding of what increases or decreases the homicide rate. Nevertheless, the results here are significant in indicating trends among different types of states, especially when considering the deterrence theory of the death penalty.

For a finding of deterrence to be supported, there must be clear empirical evidence that the homicide rate is affected by the death penalty policy of a state. As displayed by each of the graphs in Analysis 1, a state's policy on the death penalty appears to be relatively insignificant when comparing the level of homicides. Not only does the first graph demonstrate a near identical general trend of the homicide rate between states with and without the death penalty, but the second graph shows a significant difference in states before and after they had the death penalty. If the death penalty did decrease the homicide rate, then the graphs would either display a much lower homicide rate for Group 2, or in the case of Group 3, show an increase in homicides after states sampled ridded of the death penalty. However, neither of these occurred, suggesting the death penalty alone is insufficient to influence the homicide rate.

Similarly, Analysis 2 provides a variety of other factors which may explain the homicide rate based on their relative strength of correlation. As evidenced by Group 2 and Group 3, there is an indication that a significant relationship exists between economic variables and the homicide rate. When looking at this correlation with the rate of homicide over time, the same

general trend that the homicide rates follow correlates with the economic variables measured. In essence, it appears that as the states generally experienced better economic conditions, their rates of homicide tended to decrease as well. To a lesser extent the same logic can be applied to the metropolitan rate and white population rate, as among the analyses of the three Groups they displayed partially strong relationships in some circumstances.

Furthermore, Analysis 3 produces mixed results as of whether there is significant regression which may be compared in between states. Within Groups 1 and 3, all but the demographic and population variables were not statistically significant enough to be accounted for, suggesting they have no direct support to affect the homicide rate. As it follows, Group 2's analysis found that many of those variables were significant and attributed both economic factors and exercising the death penalty to reduce the homicide rate. Therein Group 2 provides a stronger showing that a deterrence effect does exist. Nevertheless, when compared to the findings of Groups 1 and 3, this conclusion seems indirect, displaying a common finding among previous studies that the methodological tools implemented by researchers makes it difficult to overcome and interpret conflicting findings among multiple research groups.

In the sum of all of these analyses, there is nothing which can be so obvious as to display a conclusive finding for or against the death penalty having a deterrent effect. Yet, while this evidence does not necessarily negate the death penalty having a significant deterrent effect, it weakens this argument, as again, the evidence presented is not clearly showing of any such deterrent effect. Not only do different types of variables have a stronger correlative effect on the homicide rate than the death penalty, but any regression results are not sufficiently indicative of the death penalty being more effective at lowering the homicide rate than other variables within other states. Within this analysis, especially of Group 2 and Group 3, there is a lack of

evidentiary support to make an overwhelming and obvious inference that the homicide rate decreased because of the death penalty being used. By this metric, while the theory of deterrence may persist, this analysis finds that having the death penalty is inconclusive to the rate of homicide decreasing at best, and insignificant at worst. Thus, the deterrent theory of the death penalty is largely conditioned on the result of other variables affecting the homicide rate, thereby being relatively insignificant in deterring the homicide rate.

CONCLUSION

In conclusion, the result of the regression and correlation analyses suggests that the deterrence effect of the death penalty is limited. Although the theoretical argument for a deterrent effect is compelling, the evidence in this study suggests that other variables, mostly economic factors, comprise a more significant role in affecting the homicide rate. Any trends that show the decrease in the homicide rate are thereby more indicative of other types of factors influencing it, rather than whether a state implements and uses the death penalty. However, this study does not necessarily disprove the death penalty having a deterrent effect. It should be noted that this analysis is limited in its scope, drawing upon a sample of twelve states out of the United States, measuring a total of eight independent variables, and using one form of methodology. As previous studies have shown, measuring the deterrent effect is an overtly complex task and often time immeasurable. Nevertheless, while this study should be taken with these limitations in mind, it is still contributive to the overall debate on the use of the death penalty, showing that the argument for its deterrent effect is limited, weakening its justification.

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Appendix A

Number of Executions Performed by State, per Year (includes federal)												
	AL	AK	FL	IL	MI	NJ	NM	NY	OH	TX	WV	WY
1985	0	0	3	0	0	0	0	0	0	6	0	0
1986	1	0	3	0	0	0	0	0	0	10	0	0
1987	1	0	1	0	0	0	0	0	0	6	0	0
1988	0	0	2	0	0	0	0	0	0	3	0	0
1989	4	0	2	0	0	0	0	0	0	4	0	0
1990	1	0	4	1	0	0	0	0	0	4	0	0
1991	0	0	2	0	0	0	0	0	0	5	0	0
1992	2	0	2	0	0	0	0	0	0	12	0	1
1993	0	0	3	0	0	0	0	0	0	17	0	0
1994	0	0	1	1	0	0	0	0	0	14	0	0
1995	2	0	3	5	0	0	0	0	0	19	0	0
1996	1	0	2	1	0	0	0	0	0	3	0	0
1997	3	0	1	2	0	0	0	0	0	37	0	0
1998	2	0	4	1	0	0	0	0	0	20	0	0
1999	2	0	1	1	0	0	0	0	1	35	0	0
2000	4	0	6	0	0	0	0	0	0	40	0	0
2001	0	0	1	0	0	0	1	0	1	17	0	0
2002	2	0	3	0	0	0	0	0	3	33	0	0
2003	3	0	3	0	0	0	0	0	3	24	0	0
2004	2	0	2	0	0	0	0	0	7	23	0	0
2005	4	0	1	0	0	0	0	0	4	19	0	0
2006	1	0	4	0	0	0	0	0	5	24	0	0
2007	3	0	0	0	0	0	0	0	2	26	0	0
2008	0	0	2	0	0	0	0	0	2	18	0	0
2009	6	0	2	0	0	0	0	0	5	24	0	0
2010	5	0	1	0	0	0	0	0	8	17	0	0
2011	6	0	2	0	0	0	0	0	5	13	0	0
2012	0	0	3	0	0	0	0	0	3	15	0	0
2013	1	0	7	0	0	0	0	0	3	16	0	0
2014	0	0	8	0	0	0	0	0	1	10	0	0
2015	0	0	2	0	0	0	0	0	0	13	0	0
2016	2	0	1	0	0	0	0	0	0	7	0	0
2017	3	0	3	0	0	0	0	0	2	7	0	0
2018	2	0	2	0	0	0	0	0	1	13	0	0
2019	3	0	2	0	0	0	0	0	0	9	0	0
2020	1	0	0	0	0	0	0	0	0	3	0	0

Source: State Public Defender and Departments of Corrections resources collected by the Death Penalty Information Center