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The Deterrent Effect of Expansions in Death Penalty Eligibility Criteria

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ABSTRACT

Homicides must possess certain characteristics before they become eligible for capital punishment. Over the last several decades, virtually every state has added to its list of possible eligibility criteria. We draw on this rich set of eligibility-law variation to identify the deterrent effects ensuing from expansions in the reach of capital punishment. Eligibility expansions may deter future homicides through two channels: (1) by paving the way for more death sentences and executions and (2) by providing prosecutors with greater leverage to secure enhanced sentences (capital or non-capital). The former channel is only rarely implicated, confounding the ability to identify deterrent forces. The latter channel, on the other hand, is likely to be triggered on a fairly common basis. We focus on the provision most responsible for the within-state variation in eligibility laws and estimate that the adoption of a law making child murders specifically eligible for capital punishment is associated with an approximately 19% reduction in the rate of homicides of youth victims. In two key falsification exercises, we find no evidence to suggest that this estimate is reflective of a differential trend between treatment and control states that originated in the period prior to the eligibility expansions and we estimate no corresponding association between child-murder eligibility laws and adult homicide rates. We estimate deterrence findings of similar magnitude when we turn to the estimation of an empirical specification that draws on variations in the full set of eligibility criteria and that parameterizes general eligibility statutes using a simulated measure of the propensity of each state to extend capital eligibility to a given murder. However, the findings of this general deterrence investigation are relatively noisy and are not robust to the exclusion of the child-murder factor from the simulation analysis.

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I. Introduction

Capital punishment has long been one of the most controversial topics in the political and moral discourse of the United States. The death penalty debate persists on numerous fronts today, as legislatures and courts continue to evaluate the general propriety of capital punishment, along with the propriety of its specific components (e.g., execution methods). In 2007, the New Jersey legislature even went so far as to repeal its death penalty statute entirely. New Mexico has recently followed suit. Those who continue to support the death penalty identify its potential to deter future homicides as a principal justification for its application. The existence of a deterrent effect itself, however, remains a controversial subject. An extensive empirical literature has attempted to estimate the association between homicide rates and the use of capital punishment. The literature to date, however, has presented a set of largely mixed and uncertain results.

In this paper, we take up this empirical task and estimate the deterrent effect of capital punishment using a novel source of variation in death penalty legislation: the within-state expansion of capital-eligibility factors over time. In accordance with relevant Supreme Court doctrine, states emerged from the 1970's death penalty moratorium by enacting statutes that restricted the application of capital punishment to homicides that meet certain delineated characteristics. Since the post-moratorium reinstatements, virtually every state has periodically added to its list of eligibility criteria. Studies that use variation in death penalty laws to test for deterrence generally focus on the extensive margin: does the relevant state have a death penalty statute in effect? We are aware of no study that has explored variations along the intensive margin attributable to within-state eligibility expansions.

We focus our deterrence analysis on a relatively targeted investigation into the relationship between child-murder eligibility provisions and child murder rates, derived using incident-level homicide

data from the Federal Bureau of Investigation's Supplementary Homicide Reports (SHR). Twenty states have amended their capital punishment eligibility statutes since 1983 to include a specific provision for child murders. While some amount of child murders would have been eligible for capital punishment prior to these amendments under the remaining eligibility characteristics, most of the relevant treatment states lacked alternative provisions flexible enough to cover this ground.

In each child-murder specification, we include a general eligibility measure to control for the scope of the remaining eligibility factors prevailing in the relevant state and year. This general measure also facilitates a falsification exercise in which we explore the relationship between child murder rates and the addition of eligibility factors that do not specifically target child homicides. To parameterize these multifaceted eligibility expansions, we embrace the incident-level nature of the SHR data and simulate the proportion of national homicides that would be eligible for the death penalty in each state-year cell based on (a) the death penalty laws prevailing in the relevant state and year (e.g., whether robbery homicides are capital-eligible) and (b) the observed characteristics of the individual homicides (e.g., whether the homicide occurred during the commission of a robbery). This simulation approach is inspired by various studies in public finance and labor economics that identify certain economic relationships using within-state variations in delineated sets of eligibility criteria – for instance, variations in the eligibility criteria for Medicaid coverage (Currie and Gruber 1996).

"Difference-in-difference" specifications based on expansions in the scope of death penalty eligibility have the potential to address two of the key obstacles that have faced the literature to date: (1) omitted variables bias and (2) the isolation of a deterrent effect based on events – e.g., executions – that occur with remarkable infrequency (Donohue and Wolfers 2006). With respect to this latter concern, an expansion of capital punishment eligibility may lead to enhanced deterrence under two channels: (1) by leading to an increase in the number of capital sentences imposed and the number of

executions performed and (2) by providing the state with greater leverage to prosecute murderers and thus to secure stronger punishments, even those non-capital in nature (Kuziemko 2006). While the first channel may be triggered in rare instances only, the effects arising from an enhanced prosecutorial bargaining position should be felt with much greater frequency given the proportion of homicides that meet the necessary eligibility requirements.

We find evidence of an association between child murder rates and the addition of child-murder provisions to capital eligibility statutes. Specifically, we estimate that the addition of a specific eligibility factor for child murder is associated with an approximately 19% reduction in the homicide rate of youth victims. The effects of child-murder expansions appear to be isolated to the case of child homicides, as we find no evidence of a comparable relationship between child-murder provisions and adult homicide rates. We also find no relationship between child-murder rates and general eligibility expansions that are not specific to child murders. Moreover, these results do not appear to be driven by state-specific trends that pre-date the adoption of child-murder eligibility laws.

We estimate deterrence effects of similar magnitude when we turn to the estimation of a general eligibility specification that explores the relationship between a more general homicide rate and a simulated eligibility measure that draws on the full range of eligibility criteria (including child-murders). However, these results are relatively noisy and do not hold up well to the exclusion of the child-murder factor from the general simulation calculation.

The paper proceeds as follows. In Section II, we review the existing literature. In Section III, we discuss the nature of the expansions in capital punishment eligibility criteria that have taken place over the last several decades. In Section IV, we discuss the data and illustrate the two approaches that we take in the parameterization of capital eligibility laws. In Sections V and VI, we present the empirical methodology and discuss the estimation results. Finally, in Section VII, we conclude.

II. Deterrence Literature

Theories on criminal behavior provide an ambiguous prediction regarding the impact of capital punishment. On the one hand, the threat of the death penalty may operate to increase the expected costs of murder and thus reduce incentives to engage in homicidal behavior. On the other hand, executions may stimulate more homicides by validating the social acceptability of retributive actions (Shepherd 2005). Moreover, even ruling out the possibility of this latter "brutalization" effect, the deterrent effect of capital punishment relies on the existence of certain preconditions. For instance, criminals must understand and acknowledge death penalty probabilities and must find this form of punishment sufficiently more severe than the alternatives.[1] Given this underlying theoretical ambiguity, further analysis becomes critical to understanding whether this principal justification for capital punishment holds empirical merit. Accordingly, a long line of empirical studies has endeavored to estimate the deterrent impact of the death penalty.

While earlier sociology studies did exist, the deterrence literature largely took off with Ehrlich's (1975) analyses of 1933-1969 national time series data. Ehrlich's findings suggested that each execution leads to 8 fewer homicides. Ehrlich's analysis received significant attention by both policymakers and academics alike and his findings inspired a slew of follow-up studies, many of which subjected these results to a range of specification checks.[2] The results of these studies varied markedly, throwing substantial uncertainty on the question of whether capital punishment deters criminal behavior.

The past decade has seen a resurgence of this literature, with a number of studies taking advantage of jurisdiction-level panel data on homicide rates during the post-moratorium period. Many

[1] See Hjalmarsson (2007) for a more complete discussion on the conditions that are likely required for capital punishment to deter criminal behavior.
[2] See Coleman (1994) for a review of many of these post-Ehrlich studies.

of these recent studies present evidence of significant and far-reaching deterrence effects.[3] Donohue and Wolfers (2006) take an intensive look at this recent wave of papers and attempt to replicate many of the key findings. Their analysis demonstrates the sensitivity of these recent findings to a host of specification checks and other modifications, including: (a) the use of alternative sample periods, (b) the addition of certain control groups, and (c) the treatment of within-group autocorrelation in estimating standard errors. We defer to Donohue and Wolfers' paper for a full discussion of the fragility of recent deterrence studies; however, we identify a couple of their more general observations about the limitations of the existing literature.

Donohue and Wolfers' primary insight is to cast doubt on the ability to estimate an association between homicide rates and measures of the intensity with which capital punishment is implemented. Given the rarity of death penalty sentences and executions, they argue that it is simply too difficult for the econometrician to separate the impact of these rare occurrences from the effects of other factors driving the large fluctuations in homicide rates. Second, Donohue and Wolfers identify another major concern generally confronted by the deterrence literature: omitted-variables bias. This concern is particularly pronounced in those studies that identify deterrence using variations in the intensity with which capital punishment is applied. Prosecutors, after all, may be subject to political and other influences in deciding whether to pursue the death penalty, where those influences may themselves be correlated in some fashion with observed homicide rates (e.g., "get tough on crime" philosophies). Similar confounding factors may also shape the decisions of the juries that ultimately impose the death penalty, along with the incentives of the state to push for executions in the post-sentencing period.

In the empirical analysis below, we explore the deterrent effect of capital punishment with these two empirical concerns in mind. With respect to the first point, we avoid estimating a

[3] Fagan et al. (2006) provides a list of recent studies claiming such effects. Examples include Mocan and Gittings (2003), Shepherd (2004), Dezhbakhsh et al. (2003), Dezhbakhsh and Shepherd (2006), and Zimmerman (2004).

specification that considers only the deterrent effects ensuing from those rare instances in which the death penalty is actually applied (i.e., sentences and executions). By exploiting variation in the existence or extent of capital punishment legislation, we draw on an additional source of criminal deterrence that is less prone to Donohue and Wolfers' concerns: prosecutorial leverage. That is, regardless of how often capital punishment is actually employed, as long as the threat of its use remains viable, the possibility of capital punishment may provide prosecutors with greater leverage to negotiate pleas with alleged murderers. These heightened negotiations may lead to stronger overall punishments.

Kuziemko (2006) provides evidence in support of the contention that capital punishment eligibility leads to greater bargaining power in the hands of prosecutors. Estimating differences-in-differences-in-differences models using the 1995 reinstatement of the death penalty in New York, in connection with variations in the propensity of county prosecutors to pursue the death penalty, Kuziemko estimates that the death penalty leads defendants to accept plea bargains with harsher terms, while finding no impact on a defendant's propensity to plead guilty itself. The harsher punishments ensuing from capital punishment under this bargaining story may, in turn, lead to a general deterrent effect on criminal behavior. While Donohue and Wolfers (2006) may be correct to observe that capital punishment is only applied in rare instances, the death penalty nonetheless remains an eligible option in a much greater number of occasions. Thus, by parameterizing capital punishment laws in such a fashion that one can pick up both the specific deterrent effects arising from the actual application of capital punishment and the general deterrent effects arising from the threat of its application, it becomes easier to statistically separate capital punishment forces from other confounding factors.

Second, we address omitted variables concerns by estimating "difference-in-difference" specifications that exploit within-state variation in capital-punishment eligibility statutes. Drawing on state-specific eligibility expansions allows us to address unobserved factors by controlling for fixed

differences across states, fixed differences across time periods, and state-specific linear time trends. The variation in these statutory eligibility parameters is arguably less sensitive, though still not immune, to confounding influences.

Of course, other deterrence studies have explored "natural-experiment" methodologies based on variations in state capital punishment laws. For instance, Dezhbakhsh and Shepherd (2006) use state abolitions of the death penalty, along with their subsequent reinstatements, during the period surrounding the 1970's death penalty moratorium to estimate a fixed-effects deterrence specification. While Donohue and Wolfers (2006) demonstrate the sensitivity of Dezhbakhsh and Shepherd's (2006) deterrence findings to certain specification checks (e.g., the inclusion of year fixed effects, as opposed to decade fixed effects), the abolitions and reinstatements of the death penalty considered by Dezhbakhsh and Shepherd nonetheless present an interesting set of variations by which to test the deterrent impact of capital punishment. Moreover, on-off policy changes of this nature will also pick up general deterrent effects arising from enhanced prosecutorial bargaining power.

However, while a large number of states experienced policy changes in the time period surrounding the national death penalty moratorium of the 1970's, most of this variation occurred at identical moments of time over a large number of states. In modeling abolitions of death penalty statutes, Dezhbakhsh and Shepherd consider 3 abolitions in the pre-1972 period (including New York in 1965), along with 34 abolitions in 1972, 32 of which occurred as a result of the Supreme Court's decision in *Furman v. Georgia*. This variation can thus be seen as attributable to a relatively limited number of actual policy changes. As such, with an arguably small number of effective treatment groups, the results of this abolition model implicate concerns over the consistency of the estimated coefficients along with the appropriateness of the standard methods of inference performed (Conley and Taber 2005). Of course, a difference-in-difference model exploiting the on-off variation associated with the 1970's

national moratorium, as estimated by Dezhbakhsh and Shepherd, also draws on the subsequent reinstatements of the death penalty statutes. The vast majority of these reinstatements effectively occurred in the 1-year period surrounding the 1976 *Gregg* decision by the Supreme Court. However, seven states did reenact their death penalty statutes in subsequent years (between 1978 and 1995).

In the eligibility-expansion model that we estimate below, we draw on a far more staggered set of policy changes than that possible by an exploration of early 1970's abolitions. Moreover, while our primary specifications focus solely on expansions of existing death penalty statutes, we also estimate specifications that parameterize general eligibility laws in such a fashion that we necessarily draw on the same set of post-*Gregg* statutory reinstatements considered by Dezhbakhsh and Shepherd (2006). In light of the rich level of policy variation available from a model that embraces post-moratorium eligibility expansions, our analysis may serve as a novel contribution to an empirical literature plagued with limitations in the amount of information available to identify deterrent effects.

Moreover, in addition to drawing on an extensive set of eligibility expansions, by taking advantage of incident-level homicide data made available in the post-moratorium period, we are able to target the deterrence analysis on the set of homicides that are generally implicated by capital punishment statutes – that is, those homicides that are potentially eligible for capital punishment. With this approach, we may derive more precise deterrence estimates by removing any noise arising from variations in the rates of non-capital-eligible homicides. This approach is in the spirit of Fagan et al. (2006) who estimate the association between the application of capital punishment (e.g., capital sentence and execution rates) and the rates of potentially-death-eligible homicides (and between the general incidence of capital punishment statutes and potentially-death-eligible homicides). However, we are aware of no study that has used variations in the underlying eligibility factors themselves as a source of exogenous variation to identify the deterrent effect of capital punishment.

III. Capital Punishment Eligibility

The Supreme Court effectively voided the capital punishment statutes of all death penalty states with its 1972 decision in *Furman v. Georgia* (and companion cases),[4] expressing concern over the unbridled discretion granted to juries in imposing death sentences. This decision suspended capital punishment in the United States until the Supreme Court's 1976 decision in *Gregg v. Georgia*,[5] in which the Court upheld newly-enacted death penalty statutes that provided juries with guided discretion in capital cases. The Court in *Gregg* specifically upheld a Georgia statute which bifurcated capital trials into guilt and sentencing stages, where juries in the latter stage were required to determine the existence of certain aggravating circumstances and then weigh those factors against other mitigating considerations. This process serves the function of both (a) providing juries with clear and objective guidance and (b) narrowing the class of crimes eligible for capital punishment (Kirchmeier 2006).

In the aftermath of these decisions, new death penalty statutes set the scope of capital eligibility either by restricting the definition of capital murder itself or by delineating a set of aggravating circumstances for juries to consider during sentencing stages (Kirchmeier 2006). Reviewing various statutory materials, we track the evolution of each state's list of eligibility factors / aggravating circumstances from the mid 1970's to the present.[6] From the beginning of the post-moratorium period, states did vary somewhat in the set of eligibility factors that they selected. Nonetheless, certain factors appeared rather consistently across these initial statutes, including: (a) murders of police officers or public officials, (b) murders committed by those with previous felony convictions (c) murders by those who knowingly created a great risk of death to more than one person by means of a destructive device,

[4] 408 U.S. 238 (1972).
[5] 428 U.S. 153 (1976).
[6] We codify those aggravating circumstances that can be identified by the SHR data. Table I indicates the year in which specific child-murder provisions became effective. The code used to assign capital eligibility status for each homicide in the SHR sample based on the prevailing eligibility laws of each state-year cell can be obtained from the authors upon request.

(d) felony murders (usually robberies, rapes, burglaries and arsons), (e) murders committed for pecuniary gain, and (f) murders committed to avoid arrest. Various other factors were found across some initial death penalty statutes, including murders committed while under incarceration, murders of witnesses in legal proceedings and murders involving especially heinous or atrocious behavior (e.g., torture).

Several states did expand their eligibility statutes to add some of the above factors (e.g., arson-related homicides) in the years following their initial reinstatements. However, the bulk of the post-reinstatement expansions involved the following identifiable factors: child murder (16 states), multiple-victim murders (9 states), murders committed in connection with infractions of narcotics laws (9 states), murders associated with gang-related activities (4 states), elderly murders (4 states), and murders committed during carjackings (5 states).[7] Moreover, in the case of most of these eligibility factors, the statutory expansions occurred in a relatively staggered manner over the sample period. For instance, as illustrated in Table I, five of the child-murder policy changes occurred during the 1980's, five during the early 1990's, five during the late 1990's and 1 during the 2000's. Additions of narcotics-related homicides, on the other hand, largely occurred over a very narrow time period (1989-1990).

While each of the specifications estimated below draws on all of these statutory amendments in some fashion (either as a control measure or as the regressor of interest), we begin with the estimation of a difference-in-difference specification that focuses on expansions of eligibility laws to provide capital eligibility for the murder of youth victims. Estimating models that utilize variation in a binary policy variable (i.e., child-murder provision versus no child-murder provision) allows us to avoid certain

[7] In summarizing the number of states that modify eligibility laws to add the identified provisions, we exclude those states that effectively impose a two-tiered eligibility process, as discussed below. These figures also exclude Florida, which is absent from the homicide sample after 1996. With respect to the number of states that add multiple-murder eligibility provisions, we exclude New York, New Jersey and Kansas, which add multiple-murder eligibility provisions during the sample period contemporaneously with the reinstatement of their capital punishment laws.

misspecification concerns that may arise in specifications that rely exclusively on a more general parameterization of eligibility laws, as discussed further below. Moreover, with 16 statutory amendments, child-murder eligibility expansions represent the most common of the relevant policy changes over the sample period. Accordingly, out of the possible set of eligibility factors, the child-murder factor is best suited to address limitations of difference-in-difference models arising from the use of a limited number of treatment groups (Conley and Taber 2005).

Child-murder adoptions also represent a considerable expansion in death penalty eligibility considering that roughly 5% of the homicides in our sample were committed against victims under the age of 15 and that the average state in our sample only extends capital eligibility to 17% of total homicides (based on the observed characteristics of the homicides in our sample). Of course, some child murders would have been eligible for capital punishment prior to these statutory amendments based on certain of the remaining eligibility factors, in which case these figures may overstate the extent of the expansion. For instance, certain states would have captured some range of child murders under the "especially heinous, atrocious or cruel" (HAC) aggravating factor. While all murders essentially meet the definitions of these words, courts are not meant to use this factor as a catch-all category and are generally required to restrict its application to extraordinary situations involving, for instance, wanton and depraved infliction of serious physical pain (e.g., torture).[8] However, many courts have nonetheless taken a flexible approach with this aggravating factor and some have allowed consideration of the helplessness of the victim in determining whether this condition has been met.[9]

In any case, it is reasonable to expect that the addition of a specific eligibility factor for child murder will indeed lead to the extension of capital eligibility to a large number of child murders. First of all, out of the 16 treatment states that adopt child-murder eligibility provisions over the sample period,

[8] See, e.g., *Godfrey v. Georgia*, 446 U.S. 420 (1980).
[9] See, e.g., *Arizona v. Gretzler*, 135 Ariz. 42 (1983). For a more complete discussion on the flexibility taken by courts in applying HAC-like aggravating factors, see Rosen (1986) and Kirchmeier (1998).

only 4 provide for an alternative eligibility factor concerning murders of an HAC-like nature.[10] The remaining treatment states either include no such factor (e.g., Ohio) or avoid the use of this vague terminology and specifically limit capital eligibility to instances of torture (e.g., Pennsylvania).[11] Out of those control states that did not amend their eligibility statutes over the sample period to add child-murder provisions, a larger proportion of them provide for an HAC-like alternative factor. Thus, it is possible that the treatment states, in enacting specific child-murder provisions, were responding to the perceived inability of the remaining factors to extend capital eligibility to child homicides.

Second, when applicable, the helplessness of the victim is but one factor to consider in determining whether murders are of an especially heinous, atrocious or cruel nature. Even when courts consider the helplessness of the victims in an HAC-like analysis, they nonetheless continue to stress other circumstances of the homicides as well, including the seriousness of the pain inflicted or the depraved state of mind of the offender.[12] Thus, there is little evidence to suggest that such states would extend capital eligibility to all instances of child homicide under an "especially heinous, atrocious or cruel" factor. Moreover, given the ill-defined and controversial nature of this eligibility factor (Rosen 1986), it is quite reasonable to believe that the separate delineation of a child-murder aggravating factor will strengthen the state's case for capital punishment and provide for an additional, clearly-defined aggravating factor that may be used in outweighing any determined mitigating circumstances.[13]

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[10] These states include Arizona, Colorado, South Dakota and New Jersey. Delaware also includes such a provision in its statute; however, the Delaware Supreme Court invalidated this provision in a 1981 decision. 433 A.2d 325.

[11] These latter states take two different approaches to limiting eligibility to instances of torture. Most of the relevant states avoid the use of any HAC-like language and only extend eligibility to instances of torture. Wyoming and Arkansas, on the other hand, include eligibility factors regarding murders that are especially atrocious or cruel (Wyoming) or especially cruel or depraved (Arkansas), while specifying (in the statutory language itself) that murders meet these conditions when they involve the infliction of torture (or serious physician abuse or mental anguish, in the case of Arkansas).

[12] See, e.g., *Gretzler*, 135 Ariz. at 52-3 ("[t]he mere existence of senselessness or helplessness of the victim, in isolation, need not always lead to a holding that the crime is heinous or depraved, however").

[13] In 1983, Illinois amended its capital punishment statute to extend eligibility to situations in which "the murdered individual was under 12 years of age and the death resulted from exceptionally brutal or heinous behavior

IV. Data and Parameterizations of Eligibility Laws

Homicide data from 1977 to 2004 comes from the Federal Bureau of Investigation's (FBI) Supplementary Homicide Reports (SHR). The SHR is an incident-level data base containing information on various individual characteristics of reported homicides, including (i) the time and location of the offense, (ii) certain victim characteristics (e.g., age, race, etc.), (iv) certain offender characteristics, (v) the weapon used, and (vi) the circumstances of the homicide (e.g., during robbery). This information is provided each month to the FBI by local law enforcement agencies participating in the FBI's Uniform Crime Reporting Program. While not completely inclusive, the SHR sample contains information on just over 90% of the homicides that occurred over the sample period. The SHR provides individual weights to allow state-year SHR homicide counts to match the more complete state-year homicide rates reported under the FBI's Uniform Crime Reports. We use un-weighted observations for the primary analysis below. However, as indicated in Section VI, we estimate nearly identical results when we incorporate the provided weights.

To form the dependent variables used in the specifications estimated below, we aggregate the SHR homicide records into state-year cells and calculate various state-year homicide rates. We use different homicide-rates for the different regression specifications estimated below -- e.g., murder rates of youth victims for the child-murder eligibility models. Thus, while the specifications are of an aggregate nature, we draw on the provided individual homicide characteristics to tailor the state-year cells to particular classes of homicides. We discuss these calculations in further detail in Section V

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indicative of wanton cruelty." 720 ILCS 5/9-1. Given the above treatment of HAC-like factors, it would be inconsistent to treat Illinois's statute as a pure child-murder eligibility factor. As such, we exclude Illinois from the child-murder specifications. However, the results presented below remain virtually unchanged when we include Illinois and treat this provision as representing a child-murder eligibility provision of the same nature as that adopted by the remaining treatment states. In the general deterrence specifications, which draw on additional eligibility expansions, we include Illinois in the regression analysis but drop those years prior to 1983. We drop observations from Illinois in the 2000 – 2004 period given the uncertainty in its capital punishment environment following the moratorium on executions announced by Governor Ryan.

below. We match data on certain covariates to each of these state-year cells. We control for the following state-year measures: unemployment rate, percent of the population that is black, percent of the population that is 15-19 years old, percent of the population that is 20-24 years old, percent of the population living in urban areas, and median household income.[14] In alternative specifications (which draw on a shorter sample period), we also include various criminal-justice employment and expenditure measures. Table II provides descriptive statistics for the homicide rates and covariate measures used in the regression analysis below, along with the relevant eligibility parameters.

To each state-year cell containing homicide and covariate information, we also merge parameters indicating the status of death penalty eligibility laws in effect in the relevant state and year. We parameterize eligibility laws in two basic manners. First, we consider the amendment of capital punishment statutes to extend eligibility to certain specific types of homicides, primarily child murder. That is, we match to each state-year cell a binary indicator variable that equals 0 during those years in which a state does not specifically include child murder as an eligibility factor / aggravating circumstance and 1 during those years in which it does provide for this factor. In the specifications estimated below, we drop the state-year cell corresponding to the year of the law change itself in order to avoid any difficulty in assigning indicator variables to mid-year adoptions.[15]

Second, instead of confining the analysis to the effect of specific eligibility expansions (i.e., child-murder), we attempt to draw on the full range of eligibility expansions that occur over the sample period. Rather than including a set of individual indicator variables for each such factor, we parameterize eligibility statutes along these more general lines using a single measure of the propensity

[14] State-year unemployment rates are from the U.S. Bureau of Labor Statistics. Demographic measures and percent urbanization are from decennial Census files (1969-1999) and American Community Surveys (ACS) (2000-2006).

[15] The estimation results presented below are nearly identical when we instead set the child-murder indicator equal to "1" in the year of adoption if the effective date of the law change occurs in the first half of the year and equal to "1" in the following year if the effective date falls in the latter half of the adoption year.

of a given state to provide capital eligibility for a given murder. Having documented the evolution of each state's eligibility statutes over time, we apply the operable statutes of each state-year cell to a sample of individual homicides in order to simulate the likelihood that a given homicide will be subject to capital eligibility. More specifically, we do the following calculation for each state-year cell: (1) determine whether each individual homicide from a national sample of homicides (for the relevant year) is eligible for capital punishment based on the laws of the state-year cell under investigation and the reported characteristics of the individual homicide[16] and (2) calculate the proportion of the national annual sample of homicides that is eligible for capital punishment based on the individual simulations from step (1).[17] Repeating this procedure for each state-year cell gives a full set of simulated eligibility percentages. In forming these simulated measures, we confine the underlying national sample of homicides to the universe of "potentially-death-eligible" homicides – that is, the set of homicides with characteristics that would trigger capital eligibility in at least 1 state.[18]

The resulting parameter can be thought of as a measure of the extent to which any given state draws from the universal list of eligibility characteristics. Additions of eligibility factors in a state translate into higher simulated percentages. The addition of a specific factor will contribute to this simulated percentage according to the joint likelihood of observing that specific factor, together with accompanying factors, in a given homicide. In Figure 1, we take the state of Virginia as an example and present the evolution of its general simulated eligibility percentages over time (based on all possible eligibility factors). The jumps in percentages observed in 1981, 1990 and 1998 correspond to the eligibility additions of multiple homicides, narcotics-related homicides and child homicides, respectively.

[16] The national sample of homicides used to simulate an eligibility percentage for a given state excludes the homicides associated with that state.

[17] We form eligibility percentages based on the SHR victim file, which provides one record for each homicide victim. The SHR data also includes an alternative organization of homicide records that provides one record for each offender. We estimate nearly identical results when we use the SHR offender file to generate the simulated eligibility measures.

[18] As discussed further in Section V below, in calculating these measures, we also exclude from the underlying national sample all homicides committed by offenders under the age of 16.

We apply this simulation approach in two ways in the death penalty analysis presented below. First, in the primary child-murder specification, which includes an indicator variable for the presence of a child-murder eligibility provision, we include a general simulation measure in order to control for the extent of the remaining eligibility provisions in effect for the relevant state and year. In calculating this general covariate measure, we exclude the child-murder eligibility factor from the simulation exercise. This control is important in light of the reasonable likelihood that child-murder eligibility provisions are correlated with the presence of additional eligibility factors. As discussed further in Section VI below, this general covariate measure also facilitates a falsification exercise in which we estimate the effect of general (i.e., non-child-murder) eligibility provisions on child murder rates. Second, we apply this simulation methodology in alternative specifications that explore a more general relationship between eligibility and homicide rates. In such specifications, we calculate a general simulation measure based on all eligibility factors, including child murder.

By using a national sample of homicides to simulate the above eligibility percentages, rather than a state-specific sample, we abstract from state-specific factors (other than eligibility laws) that may confound the empirical analysis below by contributing both to state-specific homicide rates and to observed measures of a state's likelihood of extending capital eligibility to given homicides. That is, this simulated eligibility measure is designed to capture variations in eligibility laws themselves and not variations in the state-specific applications of these laws. This simulation methodology is motivated by a number of studies in public finance and labor economics. Representing one of the pioneering applications of this approach, Currie and Gruber (1996) draw on within-state changes in Medicaid eligibility rules over time to estimate the effect of Medicaid eligibility on healthcare utilization and outcomes. To abstract from individual- and state-specific factors that may be correlated with both utilization and eligibility propensities, they instrument individual eligibility with simulated measures of

the percentage of children in randomly-drawn national samples (within age groups) that are eligible for Medicaid based on the prevailing eligibility rules for the relevant state-year-age group.

On average, there are roughly 6200 "potentially-death-eligible" homicides in the annual national samples from which these simulated eligibility percentages are derived. The SHR does not contain enough information to allow for a perfect eligibility calculation. For instance, it would not be possible to determine whether the homicide was committed against a potential witness to a crime or whether the murder involved torture. Nonetheless, the SHR does provide numerous homicide characteristics that implicate eligibility provisions, including the ages of the victims and offenders, the weapon used (e.g., explosives), and the following circumstances of the homicide: (1) robbery, (2) rape, (3) burglary, (4) arson, (5) certain other felonies (e.g., auto theft), (6) institution killing (e.g., prison homicide), (7) narcotics-related, and (8) gang-related. Moreover, the SHR files also allow for identification of those instances in which more than one victim were killed during this incident, another common eligibility factor. While incomplete, the information provided by the SHR data allows for the identification of a substantial majority of death-eligible homicides. Fagan et al. (2006) use the first 100 executions that occurred following March 1, 2006 as a benchmark to test the accuracy of a capital-eligibility assignment process based on SHR data. Using court records, they identify the aggravating circumstances established during the course of the proceedings of those benchmark cases. Based on the characteristics of the homicides associated with these executions, they then found that the categories available in the SHR files would have identified capital eligibility in all but 5 of these 100 cases.[19]

[19] The proceedings in 2 of those 5 unidentified cases, for instance, based the death sentence on the heinousness or atrociousness of the killing, without also basing it on another factor that would have been identified by the SHR data. Of course, Fagan et al.'s (2006) accuracy analysis assumes that a given jurisdiction's eligibility laws include all of those factors available in the SHR files. Thus, if one attempts to parameterize the expansion of eligibility factors, Fagan et al.'s reported analysis does not identify the accuracy of this parameterization. For instance, in the case of the addition of a child-murder factor, we do not know how many child homicides would have been deemed eligible for capital punishment prior to the addition of this new factor based on the alternative heinous, atrocious or cruel factor.

V. Methodology

We draw on within-state variations in laws respecting eligibility for capital punishment to identify the deterrent effect of the death penalty. We focus on estimating reduced-form models of the deterrent impact of capital eligibility, as distinct from the deterrent impact of the application of capital punishment – that is, executions and death penalty sentences. Specifically, we estimate the following specification:

$$H_{s,t} = \alpha + \gamma_s + \lambda_t + \varphi_{s,t} + \beta_1 X_{s,t} + \beta_2 ELIG_{s,t} + \varepsilon_{s,t} \quad (1)$$

where *s* indexes state and *t* indexes year and $X_{s,t}$ represents various state-year covariates (e.g., unemployment rate). State fixed effects, γ_s, and year fixed effects, λ_t, control for fixed differences across states and across years, respectively. We include a set of state-specific linear time trends, $\varphi_{s,t}$, to control for slowly-moving correlations between state homicide rates and expansions of capital punishment eligibility criteria.

The relevant eligibility parameters are included in $ELIG_{s,t}$. The construction of these parameters is discussed in greater detail in Section IV above. We estimate two essential types of specifications. In our primary specifications, we focus on the factor that contributes most to the within-state variation in eligibility laws over time: child murder. In such specifications, *ELIG* includes an indicator variable for the presence of a law making the murder of a youth victim specifically eligible for capital punishment. In each child-murder specification, we also control for the scope of the remaining eligibility provisions by including a single variable that simulates the percentage of "potentially-death-eligible" homicides that is eligible for capital punishment based on the eligibility provisions in place for the relevant state-year cell, excluding child-murder eligibility as a factor in this simulation exercise. In an alternative set of specifications, we investigate the relationship between capital eligibility and more general homicide rates (as opposed to child-murder rates). In such specifications, we parameterize eligibility expansions

using an even more general simulation approach that considers all possible eligibility factors, including child murder.

The coefficient of interest in the above specification is represented by β_2, which captures the association between homicide rates and capital punishment eligibility. Negative values of β_2 correspond to a deterrent response. Generally, reductions in rates of criminal behavior arising from stronger forms of punishment may be attributable to either a deterrent effect or an incapacitation effect (i.e., putting criminals in a position where they can commit no further crimes). In the present study, we examine the impact of enhancing the strongest form of punishment for murder. The alternatives to capital punishment, however, are already expected to result in significant prison time. Thus, it is reasonable to interpret the marginal impact of capital eligibility as arising from deterrence of criminal behavior and not from the incapacitation of convicted murderers (Abrams 2007).

We tailor the dependent variable, *H*, to the particular specification. The primary specification focuses on the effect of child-murder eligibility expansions. In these binary child-murder models, we specify the dependent variable as the log of the child-murder rate, where this rate equals the number of murders of youth victims divided by the youth population. Thus, we do not attempt to explain variations in those homicides that are not directly implicated by a child-murder eligibility provision. In the general percentage-eligibility models, we specify the dependent variable using a broader range of homicides and using total state-year populations as the denominator. However, as we do in the case of the child-murder models, we avoid any noise arising from variations in homicides that are not directly deterrable by capital punishment by focusing the homicide rate calculation on the set of "potentially-death-eligible" homicides (Fagan et al. 2006). That is, we compile a list of all of the aggravating circumstances that exist across the various death penalty statutes (and that can be identified in the SHR

data) and then calculate state-year homicide rates out of the universe of homicides that contain at least 1 such characteristic (regardless of the eligibility provisions of the given state).[20]

A small number of state-year cells have no child homicides. Before log-transforming the dependent variable, we set the homicide rates for these zero-valued cells at 0.1 (Malani 2002). The pattern and magnitude of results presented below remain virtually identical when we estimate alternative specifications that log-transform unadjusted homicide rates (and thereby drop zero-valued cells) and when we specify the dependent variable as actual homicide rates (i.e., non-log-transformed).

Over most of the sample period (from 1988-2004), states were subject to Supreme Court doctrine specifically prohibiting them from imposing capital punishment on offenders under the age of 16.[21] Prior to 1988, as discussed in the Supreme Court's 1989 *Stanford* decision, the majority of death-penalty states also declined to impose the death penalty on offenders under the age of 16 (15 states) or 17 (12 states). While we do not parameterize any slight variations in eligibility percentages that may exist due to variation in offender age limits, we nonetheless attempt to focus the empirical analysis on the set of homicides that are generally implicated by capital punishment laws. Accordingly, in calculating both the state-year homicide rates and the simulated eligibility measures, we exclude form the underlying sample all homicides committed by offenders under the age of 16.

Finally, we restrict the regression sample to those states that effectively narrow the scope of capital eligibility using only one set of eligibility restrictions. Most death penalty states meet this condition either by limiting the definition of capital murder or by requiring the finding of delineated

[20] In other words, we calculate general homicide rates excluding those homicides that would fail to trigger capital eligibility under the death penalty laws of every state. For instance, homicides committed by means of an explosive device trigger capital eligibility in certain states. Thus, to form the relevant dependent variable, we include all explosive-related homicides in the homicide-rate calculation for each state, even for those states that do not provide for capital eligibility in these instances.

[21] *Thompson v. Oklahoma*, 487 U.S. 815 (1988); *Stanford v. Kentucky*, 492 U.S. 361. The Supreme Court later raised this minimum age to 18 in 2005. *Roper v. Simmons*, 543 U.S. 551.

aggravating circumstances during capital sentencing stages. A small number of states, however, apply a two-tiered narrowing process that effectively imposes different (i.e., non-overlapping) eligibility restrictions in both the capital-murder definition and the sentencing proceedings.[22] We drop these states in order to avoid concerns over the unknown nature of the interaction between these two tiers (e.g., where states may place different emphasis on one set of restrictions over another). Alabama, for instance, added child murder as an eligibility factor in its capital homicide definition in 1992 but excludes a specific child-murder provision from the list of aggravating circumstances to be determined during sentencing. In this instance, it is possible that child murders will still meet one of the aggravating circumstances required at sentencing (e.g., Alabama's "heinous, atrocious or cruel" circumstance), even if we cannot identify that circumstance using SHR records. However, the reach of these alternative factors/circumstances is unknown, confounding our ability to properly specify both the binary child-murder model and the general simulated eligibility model. Nonetheless, we explore alternative specifications below that relax these sample restrictions and include capital eligibility provisions from the relevant two-tiered states.

The above model is identified under the assumption that there are no unobservable characteristics of the state-year cells that are correlated with both state-year homicide rates and death penalty eligibility laws, except for those characteristics accounted for with the inclusion of state-specific linear time trends. Moreover, in identifying the impact of capital punishment on homicide rates, the above model assumes that a state's decision to adopt a child-murder provision, or otherwise generally

[22] These states include Connecticut, Alabama, Mississippi, New Hampshire and Kansas. Certain other states technically contain a death-penalty evaluation process at both the capital-definition stage and the sentencing stage, but effectively impose delineated eligibility limitations at only one stage. In the other stage, such states often require juries to make more subjective determinations. For instance, at the sentencing stage in Texas, juries are asked to determine "whether there is a probability that the defendant would commit criminal acts of violence that would constitute a continuing threat to society." Tex. Code Crim. Proc. art. 37.071. For the purposes of this empirical analysis, we focus solely on those stages that impose delineated eligibility criteria.

expand capital punishment eligibility, is not endogenous to its prevailing homicide outcomes.[23] As one means of addressing these legislative endogeneity concerns, we modify the above model to include leads of the child-murder eligibility provision. Under the assumption that there are no confounding state-specific trends that predate the adoption of child-murder provisions, one would expect that the coefficients of the lead indicator variables are not significantly different from zero. In addition to estimating dynamic specifications of this nature, we subject the primary estimation results to a number of additional specification and falsification tests in Section VI below.

VI. Results

A. Child Murders

We begin by presenting difference-in-difference estimates of the effect of child-murder eligibility expansions on child murder rates. Each observation in the specifications estimated throughout Section VI is weighted by the state-year population count used to form the denominator in the relevant dependent variable (e.g., the number of children under the age of 15 for those models using a dependent variable based on the under-15 homicide rate). Moreover, in the models estimated throughout this section, all standard errors are clustered at the state level to allow for arbitrary within-state correlations of the error structure (Bertrand et al. 2004).

In our primary child-murder specification, we specify the dependent variable as the log of the rate of homicides of victims under the age of 15. We present results from these primary specifications in Table III. As presented in Column 1, we estimate a statistically-significant coefficient of -0.190 for the child-murder eligibility indicator, representing an approximately 19% decrease in the under-15 homicide

[23] One conceivable concern is that states would expand death penalty laws to provide specifically for child-murder eligibility during a time in which they anticipate an uptrend in child homicide rates. This could lead to the estimation of a positive relationship between child-murder adoptions and child homicide rates when no such causal relationship exists. Similarly, this potential positive bias could mask the identification of a true deterrent effect. However, in the face of this conceivable positive bias, we nonetheless estimate a negative relationship suggestive of a deterrent effect of capital eligibility.

rate following the adoption of a capital punishment law that establishes a specific eligibility category / aggravating circumstance for child-murder. With an average annual homicide rate of 1.7 per 100,000 children under the age of 15 (weighted by the under-15 population) and an average under-15 state population of 1.3 million (for the estimated sample), this estimate corresponds to an annual per-state reduction of roughly 4 child homicides.

In Column 2 of Table III, we modify the primary difference-in-difference specification to include a 2-year lead indicator variable, which switches from 0 to 1 two years prior to the adoption of the relevant child-murder provision. While we address mid-year eligibility amendments by dropping the actual year of the eligibility adoption, we specify the 2-year lead indicator based on whether the initial adoption occurred during the first or second half of the calendar year.[24] We now estimate a statistically significant coefficient of -0.21 for the contemporaneous child-murder indicator and a smaller, statistically-insignificant coefficient of 0.03 for the lead indicator variable. Accordingly, we find no evidence of differential trends between treatment and control states in child-murder rates that pre-date the adoption of child-murder eligibility laws. This finding provides greater confidence that the estimated contemporaneous results are reflective of a policy response to the amendment of capital punishment statutes and that such amendments are not themselves adopted in response to certain developments in state homicide rates.

We expand on this pre-adoption analysis in Column 3 of Table III by including an even greater number of lead indicator variables (from 2 to 6 years prior to adoption). This specification allows for a

[24] For instance, if an amendment occurred in the second half of 1996, the adoption is assumed to have occurred in 1997 (with 1996 being dropped from the specification), and thus the 2-year lead indicator variable switches from 0 to 1 in 1995. Given that we drop the actual year of law change from the specification, we do not present results for a 1-year lead indicator variable that is determined according to which half of the year the actual adoption occurs. However, we estimate a nearly identical result using an alternative approach that also drops the actual year of law change but that includes an indicator variable that switches from 0 to 1 in the period represented by the calendar year prior to the year of adoption (e.g., a lead period represented by the entirety of 1995 for a law change that occurs in September, 1996).

richer view of any differential pre-adoption trends between treatment and control states. We estimate statistically-insignificant coefficients for each of the lead indicator variables. The 2-, 3- and 4-year lead coefficients are positive in sign and small in magnitude (relative to the contemporaneous effects), again suggesting little difference between treatment and control states in the period leading up to child-murder eligibility adoptions. We estimate a larger negative differential in the period between 4 and 5 years prior to adoption, though this estimate is still smaller in magnitude than the contemporaneous effects. Finally, the estimated coefficient of the 6-year lead is virtually 0 in magnitude. The dynamic results presented in Column 3 emphasize the extent of the drop in child-homicide rates that occur upon the enactment of a child-murder eligibility provision and provide greater confidence in an interpretation of the primary deterrence estimates as not simply reflecting trends that began in the pre-adoption period.

It may take time for deterrent responses to materialize following the expansion of capital punishment statutes. Any increase in capital sentences or executions that arises from an expansion in the number of capital-eligible crimes may be slow to emerge considering the long delays that exist in the adjudication of capital cases and in the carrying out of capital sentences. On the other hand, increases in non-capital sentence lengths arising from death penalty eligibility may emerge with less of a delay depending on how quickly prosecutors begin to take advantage of their enhanced bargaining positions. In Column 3 of Table III, we also test for long-term effects of child-murder eligibility adoptions by including a 2-year lag indicator variable that switches from 0 to 1 two years following the adoption of the relevant eligibility provision. While we estimate an approximately 25% reduction in the under-15 homicide rate in the 2-year period following a child-murder adoption, we estimate a small, statistically-insignificant increase in child homicide rates in the subsequent period. Thus, the effects of child-murder eligibility adoptions appear to develop in the near term.

Column 4 of Table III estimates the same dynamic specification of Column 3, but no longer includes the set of state-year controls and state-specific linear time trends. We estimate a nearly identical pattern of results, suggesting that the estimated coefficients presented in Column 1 – 3 are not the spurious result of large changes in factors that happen to coincide with the adoption of child-murder provisions (Gruber and Hungerman 2008).

The final row in Table III presents estimated coefficients for the covariate measure represented by the simulated percentage of "potentially-death-eligible" homicides that are eligible for capital punishment based on the relevant state-year eligibility rules (excluding the child-murder factor from the calculation). This variable both controls for the scope of the remaining eligibility provisions prevailing in the relevant state and year, while at the same time allows for a falsification test in which we estimate the effect of expansions in other eligibility factors (e.g., narcotics-related) on the rate of child homicides. There may of course be some relationship between such expansions and child murder given that youths are the victims of homicides that may attain capital eligibility under some other factor. However, it is reasonable to expect that any such relationship is weaker than that resulting from an expansion of eligibility statutes that specifically reaches all child homicides. Consistent with these expectations, we find no statistically-significant relationship between child murders and general eligibility expansions. In most specifications, we estimate positive coefficients of the relevant simulation measure that are smaller in magnitude than the primary child-murder eligibility coefficients.

In the above specifications, we focus solely on eligibility expansions, as distinct from initial adoptions of capital punishment statutes. Accordingly, for those several states that enact general statutes over the sample period (e.g., New York), we exclude those years in which no death penalty statute was in effect. In Table IV, we present results from alternative specifications that include all

sample years, along with an indicator variable for the presence of a general death penalty statute.[25] We estimate nearly identical coefficients for the relevant child-murder eligibility dummies and continue to estimate a positive and statistically-insignificant coefficient for the general simulated eligibility percentage. Furthermore, we estimate a coefficient of -0.32 (p-value of 0.09) for the general death penalty indicator, suggesting that the general presence of a death penalty statute, aside from the scope of its eligibility, may have a deterrent effect on child homicide rates. In Column 2, we include 2-year lead indicators for both the child-murder provision and the general death penalty statute. We estimate a spike in child-homicide rates in the 2-year period prior to initial statutory enactments, followed by an even larger decline in the period thereafter.

States vary in the age cut-offs that they use in their child-murder eligibility statutes. While most statutes set cut-offs ranging from 11 to 16 years old, the state with the lowest limit, Texas, provides capital eligibility for murders of victims below the age of 6. We estimate a nearly identical pattern of results, however, when we specify the dependent variable as the log of the rate of homicides of victims under the age of 5 and thus confine the analysis to a set of homicides that falls entirely with the scope of each of the child-murder eligibility laws (not shown). For instance, we estimate an approximately 18% reduction in the under-5 homicide rate following the adoption of a child-murder eligibility provision. Moreover, with an estimated coefficient of -0.01 for the 2-year lead indicator variable, these results are also not likely a mere reflection of differential trends between treatment and control states that began in the pre-adoption period.

In Table V, we consider an alternative parameterization of the child-murder eligibility variable that also accounts for the variations across states in the operable victim age cut-offs. In this approach, we take a national sample of all homicides of children under the age of 17 and simulate, for each state,

[25] In no instance, does the date of an initial statutory enactment coincide with the date of a child-murder eligibility adoption. That is, for those states that adopt general statutes over the sample period, child-murder eligibility factors were not included among the relevant initial statutes.

the percentage of those child homicides that would be eligible for capital punishment under the relevant state's child-murder eligibility provisions. Wyoming, for instance, amended its statute in 1989 to provide capital eligibility for murders of victims under the age of 17 (the highest age cut-off among the states) and thus generates a simulated eligibility value of 1 in the post-1989 period. As presented in Column 1 of Table V, we estimate that as a state makes 100% of homicides of children under the age of 17 eligible for capital punishment, the child homicide rate falls by 29% (significant at the 1% level). Moreover, as suggested by Column 2, this negative effect does not appear to be reflective of a trend that began in the pre-adoption period.

Table VI presents the results from a falsification test in which we estimate the association between the adoption of child-murder eligibility laws and the rate of homicides of victims over 20 years old. Given that these particular expansions are expected to result in enhanced punishments of child murderers only, one may not expect to observe a reduction in homicide rates of older victims. Consistent with these expectations, we estimate a statistically-insignificant relationship between child-murder eligibility adoptions and adult homicide rates. While the estimated coefficient of the child-murder dummy, -0.09, is negative in sign, it is less than half the magnitude of the estimated coefficient from the primary child-murder specification. Moreover, as presented in Column 2, we estimate a coefficient of -0.10 for the 2-year lead indicator variable suggesting that this negative differential in adult homicide rates between treatment and control states may have begun in the period prior to the relevant eligibility amendment. Thus, unlike the primary specifications estimated above, it does not appear that the adoption of a child-murder eligibility law leads to a corresponding reduction in adult homicide rates. While it is possible that potential murderers may be deterred by stronger punishments of homicides generally (e.g., they may learn of the imposition of stronger punishments for murders but be unaware of the particulars of the crimes), we find that the response of child-murder eligibility laws is targeted at child homicide rates.

To the extent that child-murder eligibility adoptions may be correlated with a general "get-tough-on-crime" movement within a state, the estimated reduction in child homicide rates may be due to these latter unobserved efforts and not due to the eligibility expansions themselves. However, if such a correlation were to exist, one might expect to observe a relationship between child-murder eligibility adoptions and rates of other types of homicides. Thus, the results of the above falsification tests also alleviate omitted-variables concerns of this nature. Of course, these tests cannot address concerns arising from correlations with more specific "get-tough-on-youth-crime" movements within states.

To further test for any bias resulting from general crime-fighting efforts that occur simultaneously with eligibility expansions, we estimate specifications that include various criminal justice expenditure and employment measures. We exclude these variables from the primary specifications given that a consistent set of such measures are only available in the post-1981 period. With these additional covariates, we estimate an approximately 21% reduction in the child-murder rate following the adoption of a child-murder eligibility provision (not shown). While this estimate is slightly larger in absolute terms than the estimates presented above it is virtually identical to the estimated coefficient from a specification that excludes these expenditure and employment measures but that also confines itself to the post-1981 period.

B. Additional Child-Murder Specification Checks

We subject the above findings to various additional specification checks. First, considering that some child murders may attain capital eligibility under an aggravating factor that targets homicides of an "especially heinous, atrocious or cruel" nature, we also estimate a specification that excludes those four treatment states that provide for these alternative eligibility provisions (or similarly-worded

provisions).[26] We find that the adoption of child-murder eligibility laws by this more limited set of states leads to an approximately 21% reduction in the rate of homicides with victims under the age of 15 (not shown). This estimate is very close in magnitude to the primary results presented above and remains significant at the 1% level.

Second, we find that the sign, magnitude and statistical significance of the estimated coefficient of the child-murder indicator presented in Column 1 of Table III are robust to the systematic, one-by-one exclusion of each treatment state, including Texas, from the estimation model. We also estimate virtually identical results when we (1) calculate child homicide rates using the weights provided by the SHR to ensure that the SHR homicide counts match those of the FBI's Uniform Crime Reports, (2) include state-year robbery rates and state-year general homicide rates (e.g., adult homicide rates) as measures to control for prevailing violent-crime levels, (3) include the set of non-death penalty states as additional control groups, and (4) estimate the child-murder specification using only those states that have executed at least one person in the post-moratorium period (thereby excluding six states with capital-punishment laws). Moreover, we continue to estimate statistically-significant deterrence findings when we include the set of states that impose two-tiered eligibility criteria (and base eligibility solely on the restrictions imposed by the relevant definition of capital murder).

Finally, we also perform hypothesis tests on the child-murder eligibility coefficient using a randomization inference approach (Duflo et al. 2005). While we do draw on a relatively-large number of statutory amendments in the above estimation, this alternative approach is valid for any number of treatment states and thus addresses concerns over the reliability of difference-in-difference

[26] As discussed in Section III above, certain states (e.g., Pennsylvania) specify eligibility factors that are similar in spirit but that avoid the use of vague terminology. Instead, such statutes specifically limit capital eligibility to instances of torture. We continue to include these states in the estimation for the purposes of this specification check. There are two additional states, Arkansas and Wyoming, that include the vague terms in their statutes (e.g., specially cruel or depraved), but that subsequently define those terms (in the statute) to pertain to instances of torture or serious physical abuse. The estimation results remain largely unchanged when we also exclude these two additional states.

specifications that use a limited number of treatment groups (Conley and Taber 2005). Using only the set of states that did not amend their statutes to add child-murder eligibility over the sample period, we randomly generate (and assign) 5,000 sets of placebo laws and then estimate the specification used in Column 1 of Table III on each of these simulated sets of laws. We simulate the placebo set so that the expected distribution of placebo law changes over time matches the distribution of the child-murder law changes that actually took place (Gruber and Hungerman 2008). We find that the child-murder coefficient from the primary difference-in-difference specification estimated above (using actual variation in eligibility laws) is in the 2.1st percentile of the empirical distribution of the 5000 estimated coefficient means from the above simulations. This placement corresponds to a p-value of roughly 0.04 and is thus consistent with a 5% significance level.[27] This exercise provides additional confidence in the conclusion that the estimated deterrent effect of child-murder eligibility expansions would likely not be observed if the true effect were zero.

C. Potentially-Death-Eligible Murders

We next evaluate whether the child-murder results extend to the relationship between general expansions in death penalty eligibility factors and potentially-death-eligible homicide rates – that is, the rate of homicides that exhibit characteristics that would garner eligibility in at least one state. Panel A of Table VII presents results of specifications that parameterize variations in capital eligibility using an incident-level database of homicides to simulate the percentage of national potentially-death-eligible homicides that would be eligible for capital punishment based on the death penalty statutes in operation for each state-year cell. In Columns 1 and 2 of Panel A, we perform these simulations using all

[27] While this approach generally has less statistical power than more parametric methods of inference (assuming that the true deterrent effect is large), it makes no assumption about the structure of the error term and thus provides a welcome robustness check (Duflo et al. 2005). A couple of these control states (e.g., New York) adopt death-penalty statutes over the sample period. To facilitate the random assignment over the entire sample period, we include all years for these states, even those years during which they did not have death-penalty statutes in place. However, we include an indicator variable for the presence of a general death-penalty statute. Thus, the benchmark results for this randomization analysis are those presented in Column 1 of Table IV.

possible eligibility factors, including the murder of youth victims. We estimate that an increase from 0% to 100% in the percent of potentially-death-eligible homicides that are in fact eligible for capital punishment in a given state is associated with a roughly 21% decline in the potentially-death-eligible homicide rate (or an average annual reduction of roughly 33 such homicides). While this estimate is rather imprecise and statistically-insignificant, it corresponds very closely with the magnitude of the deterrence estimates derived in the above child-murder specifications. In Column 2, we test for pre-adoption trends and estimate a positive, statistically-insignificant coefficient for the 2-year lead indicator variable, suggesting that the negative homicide-rate differential between treatment and control states did not begin in the period prior to the expansion of eligibility statutes.

Having already established the relationship between child-murder eligibility provisions and child murder rates, we remove the child-murder eligibility factor from the simulation analysis in Columns 3 and 4 of Panel A. Focusing solely on the relationship between homicide rates and the scope of the remaining factors, we now estimate a positive coefficient for the simulated eligibility variable. In Column 2, we find that this positive relationship may be reflective of a positive trend that developed in the period leading up to the relevant eligibility expansions (perhaps indicative of legislative endogeneity). These findings thus do not appear to offer evidence in support of an extension of the above child-murder results to general eligibility factors. However, by removing the child-murder eligibility factor, we have removed a substantial portion of the variation in eligibility laws, leaving results that are quite noisy and limiting the ability to make inferences regarding a more general effect.

Over the length of the sample period, the vast bulk of the variation in capital-punishment statutes is represented by expansions of pre-existing statutes. However, several states, including New York, did wait well into the post-moratorium period and thus well into the sample period before reinstating their general death penalty statutes. While statutory reinstatements of the death penalty do

represent an increase in the number of homicides that are eligible for capital punishment, there is a reasonable possibility that the presence of a capital punishment statute has a deterrent impact independent of the reach of such a statute. For this reason, we separate these two elements to the variation in capital punishment statutes. To allow for a clean analysis of eligibility expansions, we focus in Panel A of Table VII solely on expansions of existing statutes and thus drop those state-year cells in which the relevant death penalty state had yet to enact a post-moratorium death penalty statute.

We do not attempt to estimate the separate effect of statutory reinstatements and subsequent statutory expansions in the same specification given that reinstatements necessarily occur at the same time that the affected states expand the number of homicides that are eligible for the death penalty. Nonetheless, in Table VIII, we estimate specifications that focus solely on the coefficient of the general death penalty statute variable. Given that such specifications no longer include the simulated eligibility percentage measure, we now include those 5 states that were dropped from the above analysis due to the two-tiered nature of their eligibility process (though the results are similar excluding such states). In Column 1, we estimate a large, statistically-significant deterrent effect of reinstating a death penalty statute, with a coefficient of -0.29 (implying an annual reduction of approximately 45 lives). In Column 2, we estimate a smaller (though still large) positive coefficient for the 2-year lead indicator variable. The extent of these estimates suggests that the act of reinstating a death penalty statute may have a large saliency effect that is independent of the scope of that statute.[28]

Of course, the substantial reduction in homicide rates estimated for those several reinstatement states may actually arise from a pure expansion effect (and not from any such independent reinstatement effect) that happens to be of significant magnitude for this small set of states. With this possibility in mind, in Panel B of Table VII, we estimate the same specifications considered in Panel A,

[28] However, with variation in only six states, there may be a concern as to the confounding influence of omitted state-year factors that are not averaged out over a large number of treatment states (Conley and Taber 2005).

but include the pre-reinstatement years for the relevant set of reinstatement states (e.g., New York). In such states, the simulated eligibility percentage jumps from a value of 0 to the proper percentage upon reinstatement. In each such specification, we estimate a large, statistically-significant deterrent effect of expansions in capital-punishment eligibility, even when we focus solely on eligibility factors other than child murder (Columns 3 and 4).

D. Discussion

The mixed findings of the general eligibility-expansion specifications stand in contrast with the robust deterrence findings of the child-murder specifications. This discrepancy may be attributable to several factors. First, by using total homicide rates and a general parameterization of eligibility factors, the general simulation specification inherently puts different types of homicides and different eligibility criteria on equal footing. However, the effect of adding eligibility for child murder, for instance, may differ from the effect of adding eligibility for narcotics-related homicides. Child murderers may simply perceive and respond to punitive risks in an entirely different manner. Moreover, prosecutors may elect to embrace the bargaining potential of capital eligibility in the case of child murderers to a different extent than they would in the case of other eligible murderers.

Second, the divergent findings between the child-murder eligibility model and the general simulated eligibility model may be due to certain other methodological limitations of the latter model. The inability of the SHR records to identify all instances in which homicides meet eligibility standards may lead to measurement error in the simulated eligibility measures. Moreover, each of the statutory amendments that drive the variation in the simulated eligibility probabilities are themselves only targeted at specific types of crimes. For instance, an amendment adding narcotics-related homicides to the list of eligibility factors may only lead to deterrence in homicidal behavior of this nature, depending on the channels by which these rules affect the criminal mind. However, our model necessarily

estimates the impact of such an expansion on a more broadly-defined homicide rate. While the tractability of the general simulation specification requires the use of a broad homicide definition, the fact that identification in this model results from staggered eligibility amendments of a distinct, limited nature may make it difficult to isolate the true deterrent forces in play. The child murder model, on the other hand, may simply provide for a more powerful statistical approach by targeting both the legislative variation and the dependent variable on the same subset of homicidal behavior.

VII. Conclusion

Drawing on a rich set of legislative variation, we have found evidence to suggest that extending eligibility for capital punishment to the murder of youth victims is associated with an approximately 19% reduction in the homicide rate of youth victims, corresponding to close to 4 fewer child homicides annually in a state of average size. Eligibility expansions may induce a deterrence response either by paving the way for ultimate executions or by providing prosecutors with enhanced bargaining leverage. While the former channel may only materialize on rare occasions, capital eligibility itself is triggered quite frequently, in which event the threat of its application may impact a relatively large number of plea-bargaining outcomes. While confining the estimation to the case of child murder leads to certain methodological advantages, one should be cautious in viewing the child-murder model as representative of a general deterrent effect.

When we turn to the estimation of a model that draws on a broader range of eligibility expansions, we continue to estimate regression coefficients of the same sign and of comparable magnitude. However, when we exclude the child-murder factor from consideration and focus solely on the extent of the remaining factors, we no longer estimate an eligibility coefficient indicative of a deterrent effect (unless we include initial statutory enactments as comparable eligibility expansions).

Thus, with relatively noisy and mixed findings, the results provide no indication that the more targeted findings of the child-murder specification will extend to expansions in eligibility criteria of other kinds.

REFERENCES

Abrams, D., "More Guns, More Time: Using Add-on Gun Laws to Estimate the Deterrent Effect of Incarceration on Crime," mimeo, MIT (2007).

Bertrand, M., Duflo E. and S. Mullainathan, "How Much Should We Trust Differences-in-Differences Estimates?", *Quarterly Journal of Economics*, 119-1 (2004), 249-75.

Cameron, S., "A Review of the Econometric Evidence on the Effects of Capital Punishment," *Journal of Socio-Economics* 23-1 (1994).

Conley, T., and C. Taber, "Inference with 'Difference-in-Differences' with a Small Number of Policy Changes," NBER Technical Working Paper 312 (2005).

Dezhbakhsh, H. and J. Shepherd, "The Deterrent Effect of Capital Punishment: Evidence from a Judicial Experiment," 44 *Economic Inquiry* 512 (2006).

Dezhbakhsh, H., Rubin, P.H., and J.M. Shepherd, "Does Capital Punishment Have a Deterrent Effect? New Evidence from Post-moratorium Panel Data," *American Law and Economics Review* 5 (2003).

Donohue, J. and J. Wolfers, "Uses and Abuses of Empirical Evidence in the Death Penalty Debate," 58 *Stanford Law Review* 791 (2006).

Duflo, E., Glennerster, R., and M. Kremer, "Using Randomization in Development Economics: A Toolkit," mimeo, MIT Poverty Action Lab (2005).

Ehrlich, I., "The Deterrent Effect of Capital Punishment: A Question of Life and Death," *American Economic Review*, 65-3 (1975).

Fagan, J., Zimring, F., and A. Geller, "Capital Homicide and Capital Punishment: A Market Share Theory of Deterrence," 84 *Texas Law Review* 1803 (2006).

Gruber, J. and D. Hungerman, "Church versus the Mall: What Happens When Religion Faces Increased Secular Competition," *Quarterly Journal of Economics*, 123-2 (2008), 831-62.

Hjalmarsson, R., "Does Capital Punishment Have A 'Local' Deterrent Effect On Homicides?" forthcoming *American Law and Economics Review* (2007).

Kirchmeier, J., "Aggravating and Mitigating Factors: The Paradox of Today's Arbitrary and Mandatory Capital Punishment Scheme," 6 *Wm. & Mary Bill Rts. J.* 345 (1998).

Kirchmeier, J., "Casting a Wider Net: Another Decade of Legislative Expansion of the Death Penalty in the United States," 34 *Pepp. L. Rev.* 1 (2006).

Kuziemko, I. "Does the Threat of the Death Penalty Affect Plea-Bargaining in Murder Cases? Evidence from New York's 1995 Reinstatement of Capital Punishment" *American Law and Economics Review* 8-1 (2006).

Malani, A., "Does the Felony Murder Rule Deter? Evidence from FBI Crime Data," Unpublished Working Paper available at http://www.law.virginia.edu/home2002/pdf/malani/FelonyMurder021111Rand.pdf .

Mocan, H.N. and R.K. Gittings, "Getting Off Death Row: Commuted Sentences and the Deterrent Effect of Capital Punishment, 46 *J.L. and Econ.* 453 (2003).

Rosen, R., "The `Especially Heinous' Aggravating Circumstance in Capital Cases - The Standardless Standard," 64 *N.C. L. Rev.* 941 (1986).

Shepherd, J., "Murders of Passion, Execution Delays, and the Deterrence of Capital Punishment," 33 *J. Legal Stud.* 283 (2004).

Shepherd, J., "Deterrence Versus Brutalization: Capital Punishment's Differing Impacts Among States," 104 *Michigan Law Review* 203 (2005).

Zimmerman, P., "State Executions, Deterrence, and the Incidence of Murder," *Journal of Applied Economics*, 7-1 (2004).

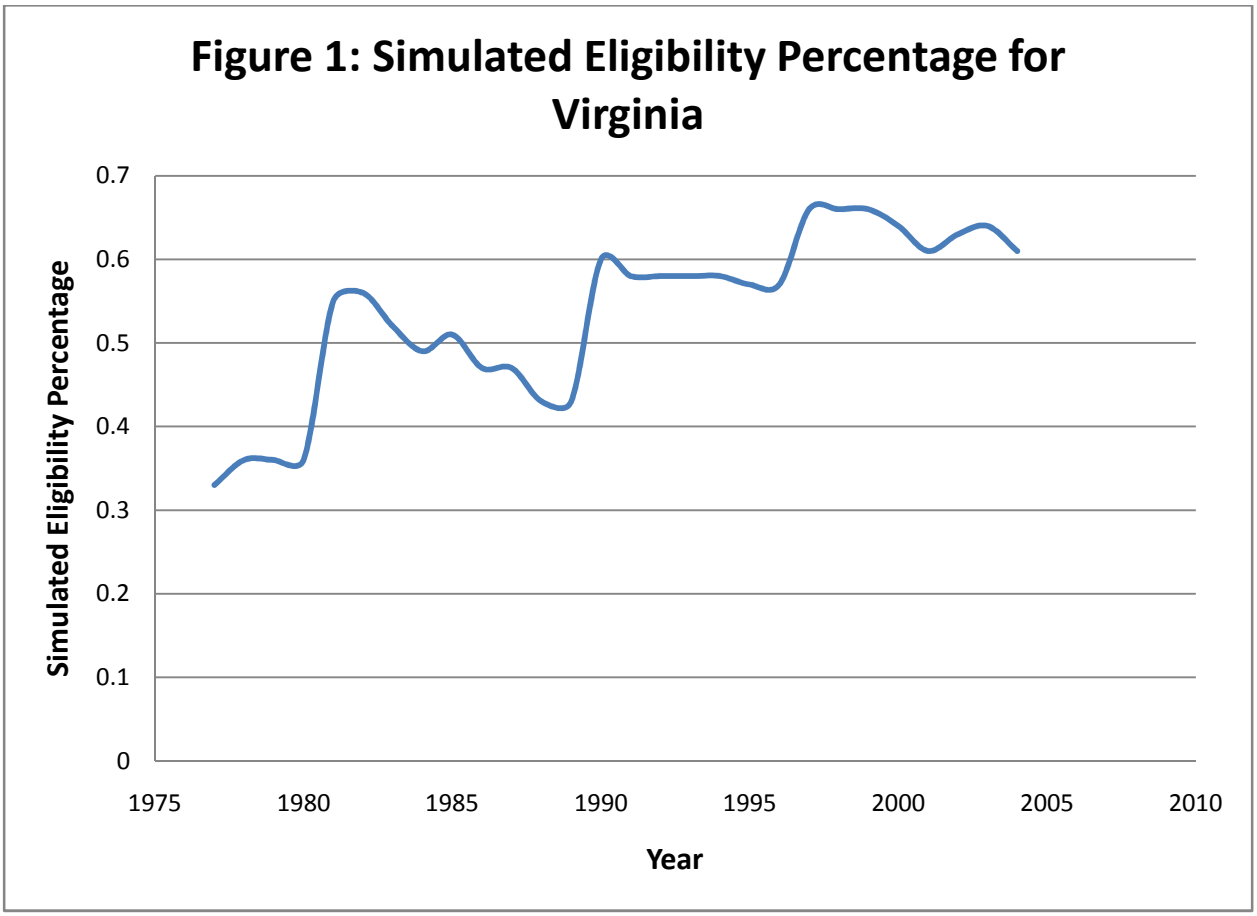
Figure 1: Simulated Eligibility Percentage for Virginia
Simulated Eligibility Percentage
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1975
1980
1985
1990
1995
2000
2005
2010
Year

Table I: Expansions of Death Penalty Statutes to Include Murders of Youth Victims

State	Year of Adoption
Mississippi*	1983
Arizona	1985
Louisiana	1986
South Carolina	1986
Indiana	1987
Wyoming	1989
Pennsylvania	1990
Alabama*	1992
Colorado	1994
Texas	1994
Delaware	1995
New Jersey	1995
Connecticut*	1996
Florida**	1996
Nevada	1996
South Dakota	1996
Ohio	1998
Oregon	1998
Virginia	1998
Arkansas	2001

*These states effectively place different sets of restrictions on capital eligibility in both the definition of capital murder and the list of aggravating circumstances to consider during sentencing. We exclude these states from the regressions given the difficulty in determining how these dual sets of restrictions interact with each other. For instance, it is possible that a state will place greater emphasis on one set of restrictions over the other.
** Florida is only represented in the SHR prior to 1996.

Table II: Means and Standard Deviations of Selected Variables

Variable	Mean (standard deviation)
Child Murder Eligibility Law Dummy	0.27 (0.45)
Simulated Percentage of Child Murders (under 17 years old) Eligible for Death Penalty	0.16 (0.26)
Simulated Percentage of "Potentially-Death-Eligible" Murders Eligible for Death Penalty	0.56 (0.14)
Simulated Percentage of "Potentially-Death-Eligible" Murders Eligible for Death Penalty (excluding child-murder factor from simulation)	0.60 (0.15)
Homicide Rate: victim age < 15 years old (per 100,000 people < 15 years old)	1.70 (0.60)
Homicide Rate: victim age < 5 years old (per 100,000 people < 5 years old)	3.25 (1.20)
Homicide Rate: victim age >= 20 years old (per 100,000 people >= 20 years old)	9.02 (3.90)
Homicide Rate: "potentially-death-eligible" homicides (per 100,000 people)	2.60 (1.26)
Homicide Rate: "potentially-death-eligible" homicides (excluding child-murder factor, per 100,000 people)	2.35 (1.22)
Unemployment Rate	0.06 (0.02)
Median Household Income (in thousands, $2006)	49.39 (6.50)
Percent Living in Urban Areas	0.77 (0.12)
Percent Black	0.13 (0.07)
Percent 15-19 Years Old	0.08 (0.01)
Percent 20-24 Years Old	0.08 (0.01)

1978 – 2004 homicide data is from the Federal Bureau of Investigation's Supplementary Homicide Reports (SHR). Homicide rates are calculated at the state-year level and are derived from a national sample of homicides, with an average annual sample size of roughly 17,000. Homicides are excluded from the calculation where the offender is under 16 years of age. Reported statistics are then presented for a sample of 850 state-year cells, weighted by the total population of the relevant state and year. The sample excludes states that effectively impose a two-tiered eligibility process. States without an effective death penalty over the entirety of the sample period are also excluded, as are state-year cells during which the relevant portions of the death penalty statutes were deemed unconstitutional or during which the constitutionality of such provisions was uncertain. Denominators used for the age-specific homicide rates are based on the population within the relevant age group. Denominators used for "potentially-death-eligible" homicide rates are based on total population counts for the relevant state and year.

Table III: The Relationship Between Child-Murder Eligibility Provisions and Murder Rates of Victims Under 15 Years Old

	(1)	(2)	(3)	(4)
Coefficient of Child-Murder Eligibility Law Dummy				
2-Year Lag	-	-	0.039 (0.074)	0.120 (0.080)
Contemporaneous	--0.189** (0.042)	-0.211** (0.052)	-0.252** (0.075)	-0.225** (0.078)
2-Year Lead	-	0.034 (0.064)	0.049 (0.097)	0.053 (0.084)
3-Year Lead	-	-	0.059 (0.111)	0.062 (0.111)
4-Year Lead	-	-	0.013 (0.069)	0.015 (0.070)
5-Year Lead	-	-	-0.152 (0.097)	-0.166 (0.095)
6-Year Lead	-	-	-0.001 (0.077)	-0.009 (0.087)
Coefficient of Simulated Eligibility Percentage (excluding child murders)	0.065 (0.261)	0.067 (0.260)	0.111 (0.261)	0.115 (0.290)
State-Year Controls and State-Specific Linear Trends?	YES	YES	YES	NO
R^2	0.55	0.55	0.57	0.48
N	758	758	706	706

* significant at 5%; ** significant at 1%. Robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Reported coefficients are from difference-in-difference regressions of the log of the state-year homicide rate of victims under 15 years old on a dummy variable for the presence of a law specifically extending capital eligibility to child murders, along with a measure of the percentage of national potentially-death-eligible homicides that are in fact eligible for capital punishment based on the relevant state-year eligibility laws (based on the remaining eligibility factors). The specification estimated in Column 4 includes no additional control variables. The remaining specifications include various state-year controls along with a set of state-specific linear time trends. Column 2 includes a 2-year lead dummy variable that indicates at time *t* the status of a state's child-murder eligibility law at time *t*+2. Columns 3 and 4 estimate an even richer dynamic specification that modifies the specification estimated in Column 2 to include additional 3-, 4-, 5- and 6-year lead dummy variables, along with a 2-year lag dummy variable that indicates at time *t* the status of a state's child-murder eligibility law at time *t*-2. Regressions are weighted by the under-15 population count used in the utilization-rate calculation. Homicide data is from the SHR.

Table IV: The Relationship Between Murder Rates of Victims Under 15 Years Old and the Enactment of General Death Penalty Statutes and Child-Murder Eligibility Provisions

	(1)	(2)
Coefficient of General Death Penalty Enactment Dummy:		
Contemporaneous	-0.320 (0.183)	-0.454* (0.211)
2-Year Lead	-	0.196** (0.068)
Coefficient of Child-Murder Eligibility Law Dummy		
Contemporaneous	-0.183** (0.042)	-0.201** (0.053)
2-Year Lead	-	0.034 (0.063)
Coefficient of Simulated Eligibility Percentage (excluding child murders)	0.014 (0.237)	0.045 (0.230)
R^2	0.56	0.56
N	784	784

* significant at 5%; ** significant at 1%. Robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Reported coefficients are from difference-in-difference regressions of the log of the state-year homicide rate of victims under 15 years old on dummy variables for the presence of a general death penalty law and a law specifically extending capital eligibility to child murders, along with a measure of the percentage of national potentially-death-eligible homicides that are in fact eligible for capital punishment based on the relevant state-year eligibility laws (based on the remaining eligibility factors). Each specification includes various state-year controls along with a set of state-specific linear time trends. Column 2 includes 2-year lead dummy variables for general death penalty laws and child-murder eligibility provisions. Regressions are weighted by the under-15 population count used in the utilization-rate calculation. Homicide data is from the SHR.

Table V: The Relationship Between Murder Rates of Victims Under 15 Years Old and the Simulated Percentage of Child Murders Eligible for the Death Penalty

	(1)	(2)
Coefficient of Simulated Child-Murder Eligibility Percentage:		
Contemporaneous	-0.298** (0.085)	-0.349** (0.094)
2-Year Lead	-	0.084 (0.111)
Coefficient of General Simulated Eligibility Percentage (excluding child murders)	0.033 (0.270)	0.036 (0.267)
R^2	0.55	0.55
N	758	758

* significant at 5%; ** significant at 1%. Robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Reported coefficients are from difference-in-difference regressions of the log of the state-year homicide rate of victims under 15 years old on a variable capturing the percentage of national homicides of victims under the age of 17 that are eligible for capital punishment based on the eligibility laws for the relevant state-year cell. The estimated specifications also include a measure of the percentage of national potentially-death-eligible homicides that are in fact eligible for capital punishment based on the relevant state-year eligibility laws (based on the remaining eligibility factors). Each specification includes various state-year controls along with a set of state-specific linear time trends. Column 2 includes a 2-year lead dummy variable for the adoption of child-murder eligibility provisions. Regressions are weighted by the under-15 population count used in the utilization-rate calculation. Homicide data is from the SHR.

Table VI: The Relationship Between Child-Murder Eligibility Provisions and Homicide Rates of Victims Over 20 Years Old (Falsification Test)

	(1)	(2)
Coefficient of Child Murder Eligibility Law Dummy:		
Contemporaneous	-0.086 (0.065)	-0.026 (0.062)
2-Year Lead	-	-0.096** (0.031)
R^2	0.91	0.91
N	758	758

* significant at 5%; ** significant at 1%. Robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Reported coefficients are from difference-in-difference regressions of the log of the state-year homicide rate of victims over 20 years old on a dummy variable for the presence of a law specifically extending capital eligibility to child murders, along with a measure of the percentage of national potentially-death-eligible homicides that are in fact eligible for capital punishment based on the relevant state-year eligibility laws (based on the remaining eligibility factors). Each specification includes various state-year controls along with a set of state-specific linear time trends. Only the coefficients for the child-murder eligibility variables are presented. Column 2 includes a 2-year lead dummy variable that indicates at time *t* the status of a state's child-murder eligibility law at time *t*+2. Regressions are weighted by the over-20 population count used in the utilization-rate calculation. Homicide data is from the SHR.

Table VII: The Relationship Between Potentially-Death-Eligible Homicide Rates and Simulated Eligibility Percentages

	(1)	(2)	(3)	(4)
Panel A: Excluding expansions associated with general death penalty reinstatements				
Coefficient of Simulated Eligibility Percentage:				
Contemporaneous	-0.210 (0.233)	-0.300 (0.262)	0.173 (0.248)	0.003 (0.288)
2-Year Lead	-	0.225 (0.348)	-	0.474 (0.458)
N	819	819	819	819
Panel B: Including expansions associated with general death penalty reinstatements				
Coefficient of Simulated Eligibility Percentage:				
Contemporaneous	-0.433** (0.139	-0.503** (0.182)	-0.298* (0.118)	-0.407** (0.147)
2-Year Lead	-	0.177 (0.210)	-	0.236 (0.181)
N	849	849	849	849
Eligibility factors considered in eligibility simulations and in potentially-death-eligible homicide rate calculation?	All eligibility factors		All eligibility factors other than child murder	

* significant at 5%; ** significant at 1%. Robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Reported coefficients are from difference-in-difference regressions of the log of the state-year potentially-death-eligible homicide rate on a measure representing the percentage of national potentially-death-eligible homicides that are in fact eligible for capital punishment based on the relevant state-year eligibility laws. Potentially-death-eligible homicide rates represent the rate of homicides with characteristics that trigger eligibility in at least one state. Each specification includes various state-year controls along with a set of state-specific linear time trends. Columns 3 and 4 exclude the child-murder factor from both the calculation of potentially-death-eligible homicide rates and from the calculation of the simulated eligibility percentage. Columns 2 and 4 include a 2-year lead eligibility percentage variable that equals at time *t* the state's simulated eligibility percentage at time *t*+2. Regressions are weighted by the total population count used in the utilization-rate calculation. Homicide data is from the SHR.

Table VIII: The Relationship Between Potentially-Death-Eligible Homicide Rates and the Enactment of General Death Penalty Statutes

	(2)	(3)
Coefficient of General Death Penalty Enactment Dummy:		
Contemporaneous	-0.293** (0.054)	-0.435** (0.121)
2-Year Lead	-	0.201 (0.102)
R^2	0.82	0.82
N	956	956

* significant at 5%; ** significant at 1%. Robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Reported coefficients are from difference-in-difference regressions of the log of the state-year potentially-death-eligible homicide rate on a dummy variable for the presence of a general death penalty statute. Potentially-death-eligible homicide rates represent the rate of homicides with characteristics that trigger eligibility in at least one state. Each specification includes various state-year controls along with a set of state-specific linear time trends. Column 2 includes a 2-year lead indicator variable for a state's general death-penalty laws. Regressions are weighted by the total population count used in the utilization-rate calculation. Homicide data is from the SHR.