Economic Models of Crime and Punishment

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OVER THE LAST 45 YEARS, THREE MONUMENTAL STORIES HAVE dominated the national American crime scene. The first was the run up in crime in the 1960s as a number of social forces converged into a perfect storm of increased criminal activity. These forces included the coming of age of the baby boomers and the accompanying and inter-related stresses of the massive baby boom cohort entering its high-crime years at a time of rebellion and strife over racial injustice and the Vietnam War. Moreover, the youth counterculture fueled a growing black market for illegal drugs, and an ideology of permissiveness likely encouraged greater lawlessness and restrained effective criminal justice responses to the burgeoning crime rates. In 1968, the famed psychiatrist Karl Menninger wrote in his book *The Crime of Punishment* that "I suspect that all the crimes committed by all the jailed criminals do not equal in total social damage that of the crimes committed against them." A *Time* magazine review of Menniger's book captures a dominant strain of thought at that time:

Judges before sentencing should be provided with psychiatric reports and (as in California) hand out only indeterminate sentences, the ultimate length to be decided by skilled penologists according to each prisoner's response to treatment. Penologists already agree that only about 15% of convicted people are so dangerous or hopeless as to require imprisonment. The new consensus is that many offend-
ers should remain either in or close to their communities and be taught how to cope with life and work under close supervision ("A Psychiatrist Views Crime," 1968).

The major increase in crime in the United States set the table for Gary Becker's pioneering work on the economics of crime. Writing in the same year that Menninger published his book, Becker became an early advocate for increasing the costs of engaging in criminal activity, which was an important corrective to the somewhat Pollyannish opposition to punitive sanctions in the late 1960s. Becker’s message started to powerfully influence criminal justice policy in the 1970s and provided the intellectual support for the second major story: the increasing harshness of the American criminal justice system over the last 30 years. The major elements of this increasing punitive sentiment were fueled by a somewhat one-sided focus on the punitive dimension of the economic model of crime: raise the price of an undesirable behavior, and you will get less of it. This approach led to an explosion in the prison and jail populations, propelled in part by another victory of the punitive element of the economic model of crime: the war on drugs. Similarly, the punitive message has carried over to a revival of the use of capital punishment, which was sustained in 1976 by the US Supreme Court after a brief moratorium and then used with increasing frequency in the early to mid-1990s.

The third major story—finally some good news—was the dramatic, abrupt, and widespread drop in crime that began in the early 1990s. For some, the story is a neat and tidy one: laxity bred crime in the late 1960s, and the criminal justice system’s ultimate harsh response restored greater order. Others are convinced that none of the harsh measures—increased levels of incarceration, the war on drugs, greater reliance on the death penalty, and a more visible and aggressive police presence—had any impact on criminal behavior. To have any hope of teasing out the causal factors behind these dramatic events, one needs a sound theoretical framework, a sophisticated understanding of the empirical/econometric literature, and, equally importantly, a relentless
commitment to a scientific search for truth rather than an eagerness to offer tidbits of empirical evidence as validation for particular pet theories. In this paper, I will try to sort through some of these issues while examining the development of the economic model of crime and punishment and the beliefs of those who subscribe to or strongly contest this model.

**THE BECKER MODEL**

In 1968, Gary Becker provided the modern, mathematical formulation of what is now generally considered to be the economic model of crime. Becker posits that criminals, indeed all individuals, are rational maximizers of expected utility. On the one side, criminal acts can generate benefits for perpetrators—for example, the utility they might derive from hurting someone they are angry with or the resources obtained through theft. On the cost side, society imposes sanctions, generally with uncertain probability, on those who commit crimes. The Beckerian rational calculator weighs the expected costs against the expected benefits, and if the first are lower than the second, the person commits the crime. From this very simple model, Becker emphasized that society could reduce the amount of crime by either lowering the benefits that criminals garnered from their illegal activities or by raising the costs that would befall them (or both).

One could reduce the benefits of crime in a number of ways. As Becker emphasized in his Nobel lecture, one approach might be to enhance education or job training so that the opportunity cost of crime would be higher, and individuals would find options in the legitimate sector to be more attractive than in the criminal one. More targeted approaches could also be used to reduce the benefits of particular criminal choices (Becker, 1993: 389-392). For example, one could reduce the benefits of theft by making car radios inoperable if taken from the car without having a security code.

Becker also stressed that policymakers could use two tools in an effort to raise the costs of crime: increasing the probability of apprehension and increasing the severity of the punishment for those...
who are caught. Some have believed that Becker is the intellectual champion behind the policy of increasing incarceration, but this is only partially correct. Becker's basic model actually favored monetary fines over incarceration since the former, being mere transfers, are socially costless: one reduces the utility of the miscreant by transferring his wealth to the state. Unlike fines, locking up inmates is obviously socially costly: the miscreant suffers a loss of utility, but the state ends up expending resources rather than collecting them. In addition, convicts are frequently unable to work productively during their time in prison, so the diminished work output also represents a social cost. Note then that Becker's basic model focused on pure deterrence rather than incapacitation; fines can deter but certainly do not incapacitate.

Becker's insight is important and suggests that society should look for opportunities to use fines when appropriate. Unfortunately, when we are talking about street crime, Becker's basic model has the extreme shortcoming of depending on a sanction—a monetary fine—that is of little value for the large percentage of the offending population that is essentially judgment proof (or close enough to make large fines ineffectual). This shortcoming was further compounded by Becker's emphasis that the combination of low probability of apprehension and high sanction was optimal because it reduces the social costs that accompany high rates of arrest and prosecution.

Becker's model was brilliant and would be unassailable if the model fully captured the calculus of potential criminals and the factors influencing the decision to commit crime, and if criminals were fully rational, well informed, sufficiently solvent to be responsive to high monetary sanctions, and risk neutral. Unfortunately, none of these conditions are true. Thus, a number of lessons that emerged from Becker's work—rely on fines as much as possible, and reduce the likelihood and increase the severity of punishment—are probably bad advice for setting good criminal justice policy for the type of street crime that Americans have been most worried about over the last four decades. As Cesare Beccaria had written centuries ago, higher likeli-
hood of apprehension and less extreme sanctions probably work best to dampen criminal propensities. The more impulsive the criminal, the more Beccaria’s insight is likely to be important and the less valuable Becker’s recommendation. I should stress that Becker did not overlook this point; he is far too sharp a mind for that, and he specifically noted that if potential criminals are risk loving instead of risk averse one would want to increase the likelihood of apprehension.

It is somewhat unfair to blame the massive increase in incarceration on Becker’s views about punishment, which are actually far more nuanced than some have realized. Indeed, his emphasis on monetary sanctions was part of his belief that the criminal justice system relied too heavily on incarceration as a punitive sanction. Becker pointed out that if criminals are risk neutral, they might perceive equal expected punishment from a regime that caught a high percentage of criminals and gave them all a relatively light sentence and one that caught a low percentage but really punished these few very harshly. If equal levels of deterrence could be obtained from these two regimes, Becker explained that we should opt for the low probability of catching the criminals since this will lead to lower costs of processing them through the criminal justice system. Becker correctly stated that risk-averse criminals would actually be more deterred by the low probability, high-sanction regime, but that risk-loving criminals would respond more to a Beccarian rather than a Beckerian approach (Levitt and Miles, 2005: 4-5).¹

Thus, the three messages to emerge from Becker’s work were: 1) we need to raise the expected costs of criminal behavior if we are to reduce crime; 2) the most efficient way to achieve these higher expected costs is through fines (where fines are possible) and through greater resort to incarceration (or executions, if potential murderers perceive a death sentence to be worse than a life sentence) when fines are not feasible (obviously, those without resources cannot pay fines and thus will not be deterred); and 3) increasing penalties for the relatively few criminals that are caught achieves the goal of deterrence at lower costs since fewer defendants would need to be caught and processed through the criminal justice system. But moving from Becker’s theory into a
public policy arena, where it was recognized that reliance on fines was not a practically feasible deterrent to the street crime that most Americans feared, the Beckerian model has not generated unvarnished success. Becker's work, though nuanced, provided a strong intellectual stimulant to the massive increase in incarceration, which was effectuated through more frequent and longer impositions of terms of imprisonment as well as through the war on drugs. There is certainly some reason to fear that the mass incarceration policy, however appropriate the initial increases were, may have gone too far. Moreover, the war on drugs, while successful in some respects, has not followed Beckerian predictions since the effort to raise the price of drugs by tough criminal enforcement has in fact failed. Indeed, over the last 20 years, Caulkins and Reuter (2006) assert that the inflation-adjusted price of cocaine has fallen by more than two-thirds.

At the same time, Becker also weighed in as a supporter of the death penalty on the grounds that it acted as a "substantial deterrent" of murder. Specifically, he claimed to support the use of capital punishment "for persons convicted of murder because, and only because ... it deters murders" (Becker, 2006: 1). Many knowledgeable commentators were highly skeptical of the view that the death penalty, as implemented in the United States, could serve as much of a deterrent. For example, as early as 1967, sociologist Thorsten Sellin, through a comparison of homicide rates in contiguous states, created doubt about the existence of a deterrent effect. Basically, he tried to choose comparable states that differed only in their reliance on the death penalty and then used their similar patterns of homicide to suggest that the death penalty had no impact on crime (Selling, 1967). Sellin's work had the advantage of simplicity and transparency but the defect of not being able to statistically control for all of the factors—for example, changes in the rate of incarceration or in the numbers of police—that might influence homicide rates. Others challenged the deterrence hypothesis by questioning its sociological effects on communities. For example, William Bowers and Glenn Pierce (1980) argued that the death penalty would make a statement about the acceptability of deadly retributions,
leading to a "brutalization effect" on society. Consider whether the recent execution of Saddam Hussein in Iraq may have stimulated more killings than it deterred.

Unfortunately, some of the followers of Becker applied their views about the economic model of crime too monolithically. "Raise the price and you will get less of it," while certainly true if other things remained equal, became a mantra that often obscured some of the other things that did not remain equal. While others followed the view championed by Beccaria that criminals were most likely to be deterred by high certainty of punishment (thereby allowing more lenient sentences), Becker's model was used to champion the notion that greater deterrence would be found in infrequent resort to harsh penalties. In this way, a woodenly applied version of Becker's model, which many came to associate with the economic model of crime, seemed to champion, among other things, the administration of the US death penalty apparatus.

One other important development in the last two decades is the American justice system's resort to sentencing guidelines designed to reduce the variability in sentencing. Interestingly, this is one area where the law has moved in a direction counter to the thrust of the economic model of punishment that Becker advanced. He predicted that if criminal sentences are kept the same in terms of harshness but become more uniformly applied, risk-neutral criminals would be unaffected. Furthermore, risk-averse criminals actually feel less deterrent pressure: punishments applied with greater certainty are less onerous than the more variable prospect of punishment.

So much for the theory. What are the facts?

THE GROWTH IN INCARCERATION
The great public works project of our time—prison construction—has been an essential feature of the massive growth in America's prison population. In 2003, about 2 million Americans were imprisoned, with roughly 600 out of 100,000 behind bars, a figure that is far higher than analogous rates in other developed countries. To place the growth in
incarceration in historical context, consider that between 1933 and 1973, "incarceration in the United States varied within a narrow band of roughly 100 to 120 prisoners per 100,000 population" (Donohue, 2005: 48). To achieve today's large prison population, the fraction of those imprisoned grew by an annual average of 5 percent starting in the mid-seventies. At times, the debate over the level of incarceration in the United States has seemed to divide into polar camps: those opposing the post-1970s increase or those fully endorsing it (and even calling for further prison expansions).²

Some of the strongest critics have questioned whether increased incarceration really lowers crime, pointing out that the deterrent impact of incarceration (as opposed to the admitted incapacitative benefits) has not been established and arguing that there are negative consequences on those incarcerated that may enhance subsequent levels of criminal misconduct. This concern about possible adverse effects on crime rates from increasingly punitive sanctions is buttressed in a recent study by Chen and Shapiro (2005), which uses a regression-discontinuity analysis to study the effects of prison conditions and sentence length on recidivism rates. Specifically, they exploit the fact that prisoners in their sample are assigned to prisons based on a security-level score, allowing them to study prisoners whose scores lie close to the cutoff points. For example, the cutoff between a lower and a higher security prison provides a natural experiment to assess the effects of prison conditions, as inmates on the dividing line are relatively equal in their initial criminality characteristics but are exposed to substantially different prison conditions. Chen and Shapiro find that

worsening prison conditions produces recalcitrant criminals who are far more prone to violence. For example, moving from minimum to low security prison reduces the time it takes a prisoner to be re-arrested by over 70%, and makes it roughly 30% more likely that crime will involve violence (crimes such as manslaughter, homicide, and rape.) These effects also respond strongly to longer
sentences, nearly doubling with each additional year (Chen and Shapiro, 2005: 1).

Their fascinating work will need to be confirmed in larger data sets, but it underscores an essential point: crime is too complex a phenomenon to think that a simple model of "raise the price and you will get less of it" will have complete explanatory power. While noneconomists have been insufficiently attentive to this Beckerian dictum, the champions of the economic model of crime must be careful to confirm when this simple dictate will be a useful guide to policy—and when "raising the price" generates other effects that may weaken or even overwhelm the posited dampening effect.

Although it is true that the empirical literature has not yet clarified the independent influences of deterrence, incapacitation, and any criminogenic influence on those who spend time in prison, the net effect of the American prison experiment does seem to be clearly crime-reducing at the levels we have thus far experienced. But the simple fact that the first derivative of crime with respect to incarceration is negative does not tell us whether the current high levels of incarceration are optimal. Incarceration is a costly policy, as Becker had initially observed, and identifying the optimal level requires an assessment of marginal costs as well as marginal benefits.

A. Comparing Marginal Costs and Benefits of Incarceration

We can begin addressing this question by looking at whether the marginal benefits of additional increments of incarceration exceed the marginal costs. Starting with benefits to society, we can quantify them by considering the elasticity of crime with respect to incarceration—that is, the percentage by which crime will change in response to some percent increase in incarceration. William Spelman has conducted some of the most careful research on the elasticity of crime with regard to incarceration; he estimated this elasticity as .16, with a 90 percent confidence interval ranging from .12 to .20 (Spelman, 1994: 220). For a variety of reasons—for example, Spelman's research design focuses
only on incapacitation and ignores potential crime reductions due to deterrence—it is probably more appropriate to rely on the upper-bound of his calculation, .20. On the cost side, we can estimate the economic burden of keeping individuals in the prison system. Such costs should include the actual expense of incarceration (both variables and fixed, appropriately amortized) and the lost production of those who are incarcerated but should ignore any utility burdens on the prisoners themselves. The National Institute of Justice, which has released the most comprehensive study on this topic, has estimated that the annual cost of maintaining one prisoner in the system is in the neighborhood of $57,000. Since the NIJ study overstates the social cost by including transfer payments to the dependents of incarcerated, I have adjusted this estimate downward, to $46,000 per prisoner per year.

Using an estimate of the elasticity of crime with respect to incarceration of .20 and an average per inmate cost of $46,000, we can calculate the “optimal” incarceration rate: the point at which the net benefit to society is greatest. To think in broad terms, the last increase of 5 percent in the prison population added 100,000 prisoners, thereby imposing costs of $4.6 billion per year. This amount of incarceration increase would be expected to reduce crime by about 1 percent (.20 times 5 percent). How much did a 1 percent drop in crime benefit society? If, say, the total variable cost of crime was $400 billion per year, then imprisoning the last 100,000 individuals would have not been optimal: it cost society $4.6 billion to lock them up, and they would have committed $4 billion in crime damage if they had remained free ($400 billion times 1 percent). Conversely, higher estimates of the variable cost of crime might suggest that the last 5 percent increment in incarceration was cost beneficial. For example, Jens Ludwig, updating previous figures generated by Anderson (1999) and Cohen (2005), estimates that total (variable and fixed) costs from crime to American society may be in the order of $2 trillion per year. Of these total costs, nearly $700 billion come from costs to victims (about 70 percent of which can be accounted for by just serious violent crimes alone); around $350 billion comes from government or private expenditures on protective
measures; $250 billion is from the lost value due to criminals’ time spent planning crimes or in prison; and the remaining $700 billion or so is from costs imposed by white collar or economic crimes (Ludwig, 2006: 1-2).³ For our purposes, the relevant figure from Ludwig would be the total victim costs of $700 billion, which would lead to the conclusion that the final increment in incarceration was desirable, since the $4.6 billion in incarceration costs provided $7 billion in reduced victimization costs.

This exercise shows that greater precision is needed in many of these estimates before clear policy predictions can be made. The range of reasonable estimates of the cost of crime in the existing literature is broad enough to encompass the conclusion that the “optimal level of incarceration would require imprisoning 300,000 fewer individuals” than are currently in the system (Donohue, 2005: 48) as well as the conclusion that substantial increases in imprisonment are warranted. In other words, before strong conclusions about the optimal level of incarceration can be made, researchers will need to considerably refine current estimates of the variable cost of crime, as well as the other key variables, such as the elasticity of crime with respect to incarceration and the social costs of imprisonment. Note though that additional percentage increments of incarceration are increasingly expensive (because the base level of incarceration keeps growing). For example, the last doubling of the prison population added 1 million prisoners at a cost of $46 billion per year to generate the predicted 20 percent drop in crime; the next doubling will add 2 million prisoners and therefore cost twice as much to generate another 20 percent reduction. Indeed, further increases in incarceration are increasingly less beneficial even if the elasticity of crime with respect to incarceration is constant (because the base crime level is falling; that is, the dollar value of the 20 percent crime reduction from the first doubling in the incarceration rate is greater than the dollar value of the 20 percent reduction in crime from the second doubling). At the least, this combination of rising costs and falling benefits suggests caution about further increases in incarceration. Indeed, this caution will be further underscored if research were
to show that the elasticity of crime, which we have assumed constant at .20, were itself to decline as incarceration grows.

B. Evaluating the Opportunity Cost of Increased Incarceration

In addition to using a cost-benefit analysis, there is a second way through which to assess the efficiency of relying on incarceration. Specifically, we can study the opportunity costs of incarceration and the relative efficiency of different ways of allocating crime-fighting resources. Besides incarceration, a variety of additional crime-fighting strategies exist, for example, increasing the police force, changing policing strategies, or spending on education or social programs. Given these options, we must ask ourselves whether our heavy reliance on incarceration is the most effective way of allocating resources from our limited crime-fighting budget: "Unless the government spends in such a way that the marginal benefit (the crime reduction achieved from the last dollar spent) is the same for each activity, society will not be fighting crime in a cost-effective manner" (Donohue and Siegelman, 1998: 2).

With this in mind, Donohue and Siegelman offer a thought experiment that lays out "the conditions under which it would be possible to reduce spending on prisons, use the money to fund social programs, and reduce the overall crime rate in the process" (Donohue and Siegelman, 1998: 2). This study examines the effectiveness in reducing criminal behavior of certain social programs, such as preschool and early childhood education, family therapy, programs for juvenile delinquents, and labor market interventions. After assessing these programs, the paper considers a hypothetical choice between two crime-fighting strategies for the future: "(1) increase the prison population by 50 percent over the level in December of 1993, which seems to be the trend of current policy, or (2) maintain the December 1993 level of incarceration and spend the present value of the saved social resources on crime-reducing social programs" (Donohue and Siegelman, 1998: 31). The question thus becomes, can the second policy achieve the same levels of crime reduction as the first?

To focus the inquiry, the paper estimates that increasing incarceration rates by 50 percent beyond the 1993 level would cost about
$5.6 to $8 billion and that crime rates would be 5 to 15 percent lower than if the money had not been spent. Based on an examination of research studies regarding the effects of various social programs, the paper finds that the most promising ones are capable of matching the 5 to 15 percent crime reduction if the equivalent incarceration money ($5.6 to $8 billion) were invested in them. For example, the paper documents that if the money were used to fund a national targeted program like the Perry Preschool, the volume of crime would be reduced by 9.3 percent in the worst-case scenario (if $5.6 billion were invested and assuming that the real-life program would be half as effective as that the small, pilot study) and by 20.1 percent in the best-case scenario (using the $8 billion cost estimate and assuming the preschool program would be just as effective as the pilot one).

Importantly, these estimates are based on the assumption that the social spending could be targeted toward those most at risk for future criminal behavior. The targeting issue is important because spending the money on children with low risk of future crime commission leads to only modest benefits, thus costing billions of dollars for little gain. But in theory the targeting problem is solvable if political, legal, and ethical concerns can be addressed. The paper shows that even a crude target, such as young, black males, would generate high social benefits if the programs could work in large-scale implementation with reasonable effectiveness. Donohue and Siegelman thus illustrate that under certain conditions, “increased spending [on] social programs [can] generate crime reductions of the same order of magnitude as the prison spending it replaces” (1998: 40). In addition, when we consider that social programs have many positive spillovers such as improving earnings and education for some of the worst-off communities in the country, the appeal of social programs becomes further accentuated (and even more so if we consider incarceration’s negative spillovers on these same communities, such as on family structure). In summary, considering the question of incarceration from an opportunity cost perspective, it becomes clear that even if incarceration is effective, if resources can generate greater or equal crime reductions...
through social spending, this latter option might be a more sound and socially beneficial strategy.

**THE DEATH PENALTY**

The economic model of crime and punishment provides support for the increase in the incarceration rate that began in the 1970s, but more nuanced economic analysis raises questions about whether that increase has been taken too far. The death penalty is another feature of increased harshness in U.S. criminal justice policy that has gained intellectual sustenance from Becker's economic model of crime. Indeed, while Becker's work is arguably less enthusiastic about increased incarceration (given its highlighting of the advantages of fines), Becker has directly stated his support for the death penalty in a recent piece published in the *Economists' Voice*. He begins by stating that "the capital punishment debate comes down in essentials to a debate about deterrence" and claims that he supports the use of capital punishment "for persons convicted of murder because, and only because, [he] believes it deters murders" (Becker, 2006: 1). His claim essentially rests on two arguments. The first is a moral argument: if the death penalty deters potential murderers from killing innocent people, then, by refusing to use capital punishment, the government would be indirectly "taking many lives." Thus, as long as executing convicted murderers saves lives of innocent victims in the future, "the State has a 'moral' obligation to use capital punishment" (Becker, 2006: 2). Becker admits that as the deterrent effect of capital punishment becomes smaller, at some point he—and, by extension, the moral obligation that underlies his beliefs—would shift to the anti-capital punishment camp.\(^8\)

Even if we accept Becker's moral argument as unassailable, it remains a conditional argument (*if* there is a deterrent effect, *then* capital punishment is morally justified . . .). Morality tells us nothing about whether a deterrent effect exists, let alone the magnitude of any such effect. Becker does, however, introduce a second argument that attempts to fill this gap. Despite the fact that he admits that "available data are quite limited . . . so one should not base any conclusions solely
on the econometric evidence," he believes there are still good reasons to think that capital punishment deters. These "good reasons" can be essentially condensed into one sentence: "most people, and murderers in particular, fear death" (Becker, 2006: 1). This, of course, brings us back to Becker's economic model of criminal behavior. Because of this universal fear of death, capital punishment must represent a significant cost that will shift murderers' calculus away from the decision to kill an innocent victim. Thus, in a way, for Becker "price theory can fill in where empirical evidence is lacking" (Donohue and Wolfers, 2006b: 4).

As I will mention below, we can question whether this characterization of potential murderers' calculus is so direct and evident. But even if one fully accepts Becker's theory, a central question remains unanswered, namely, what is the magnitude of the deterrent effect? After the fear of death factors into potential murderers' calculus, how far does it shift them away from the decision to commit a capital murder? When developing the moral part of his argument, Becker holds that one should support capital punishment as long as it "significantly reduces the number of murders" (Becker, 2006: 2; emphasis added). Becker's price theory points toward deterrence; but we cannot deduce from it the magnitude or significance of this deterrence.

Given that theory gives us little notion about the extent of deterrence, if this effect exists at all, the question becomes an empirical one. One of the first and most influential economists who sought to address this issue empirically was Isaac Ehrlich. In 1975, he "developed a sophisticated econometric model using national time-series data and claimed to show that each execution between 1933 and 1969 saved eight lives. Although Ehrlich merits credit as an original and innovative contributor to an important conceptual literature on the economics of deterrence, he wrote at a time when the advantages of panel data analysis over either time-series or cross-sectional analysis as a tool to estimate the impact of law or public policy had not been widely appreciated" (Donohue and Wolfers, 2006a: 4). Beyond the problems with his econometric methods, Ehrlich's theoretical
model simplified all the costs faced by potential murderers into three ratios: murder to arrest, arrest to conviction, and conviction-to-execution ratios. His estimate of these ratios is not only crude and does not necessarily reflect the *ex ante* probabilities of interest, but the simplification also overlooks an array of costs that clearly influence criminal behavior (Donohue and Wolfers, 2006a: 16-18). By 1977, few nonideologues believed that Ehrlich's analysis offered substantial statistical support for the idea that each additional execution saves many lives. Yet Ehrlich and a variety of researchers that have continued his work and have attempted to refine his models still argue for the deterrence hypothesis. In the case of Ehrlich, it seems as if his empirical research was largely window dressing to provide empirical support for a preferred theory: *price theory*. Others, such as Leamer (1983: 93) and McManus (1985: 417, 425), have previously made a similar argument, claiming that "prior beliefs taint empirical evidence in support of the deterrence hypothesis" (Anderson, 2002: 299).

Perhaps some "Chicago school" economists have clung so tenaciously to a belief in the deterrent effect of the death penalty for fear that all of price theory collapses if the deterrence of the death penalty is undermined. This view seems unwarranted. A true and practically relevant economic model of punishment is, and should be, more comprehensive than the sparse dictum that "demand curves slope downward" (that is, that if you increase the cost of a "good," in this case murder, demand for it will fall). If the threat of death were immediate, inescapable, and known and understood by all, I doubt many would reject the deterrence hypothesis. If a death penalty regime imposed a cost as easily understood and unidimensional as, say, the price of a television set, price theory might well be sufficient to understand criminal behavior.

But neither of these conditions is true. First, there is enormous uncertainty about the expected risk of execution, even for someone highly informed about the legal system. Furthermore, the extent to which potential criminals know and use information about the nature of penalties is questionable. For example, in a survey study of 278
prison inmates, David Anderson finds that among prisoners convicted for murder or nonnegligent manslaughter, 68 percent either never thought about the penalty before committing the crime or “had no idea, or thought I knew but I was wrong” (2002: 302-304). Given this, can we think that potential murderers understand the legal difference between a capital murder and a noncapital one? Moving into a slightly different perspective, it is possible that a variety of complex psychological factors come into play. For example, how many criminals conceive of themselves as invincible? Anderson finds that 73 percent of inmates convicted for murder and nonnegligent manslaughter either did not think that they would be caught or did not consider the probability of being caught whatsoever, when in reality the clearance rate for murder is roughly 70 percent (2002: 302-304). For the substantial number of criminals who (incorrectly) believe that they will not be caught, does the severity of the potential punishment even factor into their decisions about crime?

Ignoring the crucial question of how much potential murderers really know about and are influenced by penalties, additional questions arise on how to use price theory as a model. It is important to emphasize that potential murderers will be influenced by the perceived cost of committing the crime, as opposed to the actual cost. Yet it is not always clear which elements of the justice system will more heavily influence this perception: sentencing rates, duration of sentences, costs of defense in court, prison conditions, social stigma, time until execution, and so on. To illustrate this difficulty, the potential capital murderer at all times faces the possibility of life in prison under harsh living conditions; how much does his perceived cost shift by adding the death penalty on top of life in prison?

An ardent Chicago-schooler might respond that even if the death penalty does not add much to the perceived cost of committing murder, it must add some and thus diminish murders to some extent. But the premise that the existence of a death penalty sanction raises the expected cost of murder to potential murderers is not as clear as the Chicago economists believe. The strongest evidence in favor of their
position is that most death row inmates fight execution, but this is not dispositive. What is important is not what a broken inmate sitting on death row finds more painful: the prospect of remaining in prison for life or execution. The relevant question is what does the arrogant and impetuous potential murderer perceive as more unappealing: life without parole or capital punishment? Here the answer is less certain. I could imagine that the bravado of someone contemplating murder might lead them to view that choice differently when out on the street than when convicted and facing execution.

A simple example might illustrate my concern that the price-theory model does not fully capture the behavioral patterns of murderers. In October 25, 2003, a savage riot erupted between black and Hispanic inmates at a California low-security prison. For 90 minutes prison cameras captured the brutal killing of 2 inmates and the savage beatings of many others. In the end, eight were charged with murder. Interestingly, the inmates were not lifers with nothing left to lose but generally those serving relatively modest sentences (hence their placement in a low-security environment). It was widely known that the prison yard contained extensive video equipment, so it must have been clear that any misconduct would be captured on film, leading to unavoidable prosecution. But once the riot broke out over a dispute that erupted while watching the World Series, the inmates were undeterred and the riot raged on for 90 minutes until an armed guard from another prison arrived and fired one warning shot into the ground. The rioting ended instantaneously (Sahagun and Pugmire, 2004).

What are the lessons from this gruesome event? The Chicago-schooler might respond that if California executed more murderers perhaps the two inmates—one serving a two-year sentence for burglary and the other serving a 16-month sentence for a drug offense—might still be alive. Indeed, while California had a death penalty law in place at the time, only 1 execution had taken place each year between 2000 and 2002 and none had occurred in 2003 (despite roughly a score of death sentences being handed out in each of these years).12
But a different model of criminal behavior might suggest that these criminals were highly sensitive only to what could happen to them immediately. For 90 minutes, the riot raged out of control because the unarmed prison guards retreated and simply filmed the violence. When the armed guard arrived and fired one shot signaling something bad could happen at the moment, the prisoners stopped their fighting. The lesson seems to be that distant penalties would have to be ratcheted up to an enormous level to change behavior, while the presence of a single guard with a gun was enough to hold the prisoners in check. This seems to suggest that adding more police, rather than elevating distantly imposed penalties, is the surer way to reduce murder.13

With the brutalization effect serving as a possible stimulant to murder, the uncertainty about whether criminals perceive capital punishment to be worse than a life sentence at the time of murder contemplation, and the overall doubts about the degree of responsiveness of potential murderers to a distant sanction (beyond that of incarceration), one can say relatively little about the direction of the death penalty effect. And one can say nothing about its magnitude without conducting serious empirical research. Given this complexity, questioning whether the death penalty deters does not constitute a rejection of price theory, as some Chicago economists seems to think, but merely reflects that the price theoretic dimension may be only one part of the total effect of a death penalty regime, which can be identified only through empirical analysis.

But these studies are not easy to do correctly. Many difficult modeling judgments need to be made and when the resulting estimates of the impact of the death penalty on murder turn on these judgments, there is danger that the blinders of a monolithic belief that price theory provides “the answer” may well guarantee that the empirical results are not confirmatory of the theory but simply selected from a multitude of competing estimates because they are consistent with the theory. It is perhaps for this reason that the empirical studies on the deterrent effect of the death penalty have led to such widely conflicting estimates.
To give a sense of the array of modeling choices and difficulties in empirical studies of the death penalty, note that, in theory, capital punishment should influence only capital murder rates. Yet most empirical studies usually look at aggregated murder rates, as this data is more readily available. This illustrates that there exist conceptual difficulties on how to proxy for the dependent variable. Does the death penalty lead potential murderers to shift away from capital murder toward noncapital murder, or does it shift them away from murder in general? My central point is that correctly modeling what potential murderers perceive as the cost of their crime is complex even at a theoretical level (let alone in empirical applications). It is important that economic models be enriched to see how psychological and information factors influence price theoretic conclusions.

Indeed, the one study that has tried to probe the impact of the death penalty on death eligible cases concluded that the empirical evidence is not supportive of the deterrence hypothesis. The authors—Jeffrey Fagan, Frank Zimring, and Amanda Geller (2006)—conclude that:

Where the risk of execution goes up in a death penalty state, the death-eligible cases where that risk should make a difference do not decline more than the non-eligible cases, nor is the proportion of all homicides that risk a capital sanction in death states any smaller in those states than it is in states without any death penalty. An effective death penalty would produce changes in this category of homicides: the market share of all homicide that are death-eligible should decline in the face of the threat of execution. But that is not the case.

In fact, the incidence of death-eligible cases in those states is remarkably stable over time, insensitive to variations in the incidence of executions or to the large swings from one decade to the next in the number or rate of nondeath-
eligible killings. Even in Texas, the leading execution state by far in the nation, the proportion of death-eligible killings is no smaller than in other categories of states, and there is no differential decline in death-eligible killings as the execution rate increased in the 1980s and 1990s. The marginal deterrent threat of executions on trends in these homicides would be plainly visible if it existed. This lack of effect obtains when simple comparisons are made over time and cross-sectionally, and the same pattern of non-effect persists when models to account for other influences on homicide are added. There is simply no visible evidence of the marginal deterrent impact of the death penalty on death-eligible killings (1859-1860).

While no statistical study is unassailable, this work has the strong advantage of looking for an effect of the death penalty where it should be strongest. The fact that they find none, therefore, seems telling. Moreover, while econometric methods have vastly improved since Ehrlich's time, econometric models can go astray if they rely on theoretical models that are inappropriate. To illustrate, some of the papers that found a deterrent effect, such as Dezhbakhsh, Rubin, and Shepherd (2003), followed Ehrlich's approach and did not control for the effect of increased incarceration on murder. While this seems odd, it actually follows from Ehrlich's economic model of deterrence, which assumed that all that mattered for the analysis was the deterrent effect of incarceration, not its incapacitation effect. Since Ehrlich and his followers were attempting to control for the risk of arrest, conviction, and execution facing murderers, they saw no reason to control for the level of incarceration. But locking up a lot of rapists and robbers almost certainly cuts down on murder, an intuitive idea if one is not shackled by an excessive reliance on the economic model of crime. As figure 1 suggests, the failure to control for incarceration levels creates a substantial risk of omitted variable bias—particularly since Texas, the state that has had the greatest increase in incarceration, also had the greatest increase in executions in the 1990s.
As figure 1 shows, "in 1992 Texas and New York had very similar murder rates [and] incarceration rates. . . . Texas responded to the crime peak not only with a revival of executions, but also with a massive increase in incarceration rates" (Donohue and Wolfers, 2006a: 27). Spelman conducted a county by county assessment of the crime drop in Texas and concluded:

Texas' prison buildup was massive: 100,000 more prisoners, 5,000 more jail inmates, at an estimated direct cost of $1.5 billion per year for Texas taxpayers. The increase was much larger, on both a percentage and an absolute basis, than the prison expansion of any other state. It was Texas's principal response to the crime problem (Spelman, 2005: 158).
Researchers, such as Dezhbakhsh, Rubin, and Shepherd, who do not control for a variety of inhibiting influences on murder (for example, the magnitude and harshness of incarceration), risk attributing the decline in the murder rate to the executions rather than these other factors. Furthermore, this graph illustrates the possibility that mean reversion in the murder rate and the impact of other crime-fighting strategies not included in the model would be incorrectly attributed to “deterrence variables,” leading to an overstatement of the deterrence effect.

Valid estimates of the impact of the death penalty cannot be obtained if the statistical models do not properly proxy for the effect of the death penalty. For example, two studies that have found a deterrent effect (Dezhbakhsh and Shepherd, 2004; and Mocan and Gittings, 2003) have used a law dummy—a variable that is equal to 1 if a death penalty law is in effect—to proxy for the death penalty. The consequence of this statistical approach is that these papers attribute the post-1995 crime decrease in New York to the death penalty, although no one has been executed in New York in 30 years. This may be appropriate if potential murderers know of the existence of the death penalty law, which was reintroduced in 1995 after the election of Governor George Pataki, and adjust their behavior accordingly. But this behavioral adjustment to the existence of the law is in tension with a tenet of economics, namely, that rational individuals will know the important information relevant to their choices (in this case, that the risk of execution in New York state is vanishingly small or even zero in Manhattan, as we illustrate below).

In fact, “the state of New York actually enjoyed a steeper decline in homicide rates of 62.9 percent from 1992-2003 versus the decline of 49.6 percent in Texas over the same period, even though New York had no executions and only a fraction of the increase in the rate of incarceration” (Donohue and Wolfers, 2006a: 25-26). Is it reasonable to think—as Dezhbakhsh and Shepherd and Mocan and Gittings assume—that potential murderers are aware of the status of the law? Do they know, precisely, what qualifies as a capital murder? Do they know the...
frequency of death sentencing and executions in their geographic area? Indeed, a key element of many pro-deterrence papers is an implicit assumption about what potential murderers know about the risk of the death penalty. Since the results often vary depending on these modeling choices, one would expect a careful researcher to either show the sensitivity of their results to various modeling choices or offer persuasive reasons to justify their model choice. It is not a useful answer to say that a particular model was chosen because it generated the answer predicted by the economic model of crime. If this reasoning were allowed, random numbers could be used to support any theory.

Another concrete example of the importance of modeling decisions concerning the knowledge of potential murderers and other complexities in estimating the impact of capital punishment is shown by a comparison of the murder rates and death penalty prosecutions in two boroughs in New York City, Manhattan and Brooklyn. The previously mentioned Dezhbakhsh, Rubin, and Shepherd study attempts to use county data to document a deterrent effect, yet the analysis relies on flawed data and ignores conceptual difficulties. To explain these difficulties, we can start by considering that Manhattan's crime rate dropped by 64.4 percent from 1995 to 2004 (Donohue and Wolfers, 2006a: 17). By contrast,

Brooklyn, the county that issued the largest number of notices of intention to seek the death penalty (albeit with no execution), experienced only a 43.3 percent decline in murders over this period, from an initial figure (almost identical to Manhattan's) of 16.6 murders per 100,000 in 1995 down to 9.4 in 2004. One immediately sees that, during the 1990s, murder rates in very large population centers like Manhattan and Brooklyn dropped sharply, yet differentially. But these differential trends are not explained by the included explanatory variables and are little influenced by the relatively minor factor of the death penalty (Donohue and Wolfers, 2006a: 13).
To further complicate our interpretation of the Manhattan versus Brooklyn results, we can consider that Manhattan district attorney Robert Morgenthau was a strong opponent of the death penalty, making the risk of execution effectively zero. As Donohue and Wolfers (2006a) ask, “was any of the two-thirds drop in the Manhattan murder rate the result of New York’s death penalty law, or did potential murderers understand and rely upon the DA’s position that there would be no risk of execution in Manhattan?” This analysis of New York counties illustrates “the difficulties in assessing the impact of the death penalty when there are large, unexplained swings in murder, the death penalty is rarely invoked, and the data does not always match the risk (or perceived risk) of execution with the true murder rate” (Donohue and Wolfers, 2006a: 13).

In two previous papers, Justin Wolfers and I have analyzed in detail the validity of the most influential pro-deterrence papers. In the first (Donohue and Wolfers, 2005), we showed that existing studies documenting a deterrence effect either contained coding errors, used inappropriate study designs (of the type that have been mentioned throughout this essay) and invalid instrumentation, and often incorrectly stated the statistical significance of their results. In our latest paper, we further assess the problems of endogeneity, bias, model design, and the appropriateness of various econometric methods in the death penalty debate. This paper builds on the model of Katz, Levitt, and Shustorovich (2003) and “offers an array of estimates of the death penalty using modifications of their models and extensions of their data set to the period 1934-2000” (Donohue and Wolfers, 2006a: 4). All in all, we estimated what we think are the most theoretically reasonable specifications, which led us to 36 estimates of the coefficient on the death penalty variable. We found these 36 to be either statistically insignificant or suggestive of anti-deterrence. Taking all the above together, we can reasonably conclude that

the fact that our analyses over such a long period of time using plausible data and models generates so little evidence
of deterrence suggests that any effect is likely to be small, and that one should be highly dubious about "new" claims that strong evidence of deterrence exists. Clearly, a functioning system of criminal justice that exposes criminals to a sizeable risk of arrest, conviction, and punishment will deter all crimes including murder. Beyond that, there is no statistically significant evidence of additional deterrence from either the period of more frequent and quicker application of capital punishment or in the post-moratorium phase when incremental tweaks through small numbers of executions are handed out in a highly unpredictable manner and implemented only after a decade or more of appeals. At this point, we are left to struggle with the difficult question of whether these results can be taken to show that the death penalty has had no effect on murder in the United States or that we simply can't detect the likely small effect (positive or negative) given the crudeness of our data, our models of potential criminal conduct, and our improving but still imperfect econometric tools (Donohue and Wolfers, 2006a: 36).

CONCLUSION
The economic model of crime and punishment has been widely discussed and selectively endorsed by politicians and policymakers, who have at times offered it as a justification for the increasing harshness of the criminal justice system of the 1990s. This model has generated some useful insights, but it has also been applied (or misapplied) in ways that may well have been quite harmful. On the plus side, Becker's work has made us alert to the benefits of fines versus incarceration and suggests we should look for areas, perhaps in the white collar crime arena, where fines can be more extensively employed. Ironically, Becker's economic model of deterrence, which stressed the benefits of high fines and the social burdens of imprisonment, has probably had its greatest influence in justifying the large increase in the US incarceration rate. While
this development was probably helpful in overcoming some tendencies toward insufficient reliance on punitive sanctions in the late 1960s and 1970s, the continuing growth in the prison industrial complex has raised concerns that criminal justice policy may have moved too far in the direction of massive levels of incarceration. Imprecision in the various parameters needed to estimate the optimal level of incarceration makes it hard to know whether we are far beyond or about at the point where marginal increments in imprisonment impose more costs than the benefits they provide. Hence, further research into enhancing the precision of these estimates—as well as into identifying other social costs associated with a policy of mass incarceration of a disproportionately male minority population—should be a high social priority.

Unfortunately, the dimension of the economic model of crime that focuses on reducing crime through social spending has largely been ignored, despite work by Donohue and Siegelman and others suggesting that allocating resources away from prison building and toward social programs may be cost beneficial. To the extent that the war on drugs was encouraged by Beckerian thinking about raising the price of undesirable behavior, the economic model as applied to drug policy may have been both counterproductive (the costs of drugs have fallen) and astonishingly costly in both human and social terms. The tensions over racial profiling alone—while perhaps a rational enforcement strategy under a narrow economic calculus—may have imposed such high social costs that a rejection of the criminal justice approach to drug policy may be appropriate. Becker himself and other advocates of the economic model of crime have recently lined up behind the view that the death penalty has a substantial deterrent impact and therefore should be used to reduce crime. Recent work by Donohue and Wolfers, as well as Berk (2005) and Fagan, Zimring, and Geller (2006), has shown that solid empirical support for this proposition is virtually nonexistent. Perhaps the tools of econometrics will ultimately resolve many of the empirical questions whose proper resolution is necessary if the economic approach to crime and punishment is to play a more consistently useful role as a guide to criminal justice policy.17
NOTES

• The author gratefully acknowledges the outstanding research assistance of Sascha Becker and Tatiana Neumann.

1. See pp. 4-5 for an insightful discussion of Becker’s model. In addition, this chapter offers an interesting comparison of the economic and criminological approaches. Specifically, while the economic model focuses on behavioral changes due to incentives (benefits and costs), the criminological literature often focuses on biological, psychological, and social influences on criminal behavior. Behavioral economics incorporates some of the insights from criminology into the economic framework.


3. The reported figures for the costs of crime victimization come from multiplying estimates from Cohen et al. (2004) for the costs per serious violent crime by the aggregate number of crimes estimated to have occurred in the United States during the most recent year for which data are available (from the 2004 National Crime Victimization Survey and 2005 data from the FBI’s Uniform Crime Reporting system). Cohen (2005) reports older but more complete estimates about the share of victimization costs from all crimes that can be attributed to just these serious violent crimes; we assume this multiplier is roughly constant over time and use this figure to derive our new aggregate victimization cost estimate. Ludwig (2006) provides full details.

4. See, for example, the interesting work by Lochner and Moretti suggesting that government efforts to mandate more schooling may dampen crime. See Lochner and Moretti (2004).

5. Most of these programs did not have as their central focus reducing criminal behavior; instead, they were focused on improving education, earnings, child behavior, family relations, etc. Nevertheless, many of them also documented the collateral effect of improved criminal behavior in the programs’ participants.

6. As was mentioned earlier, estimates about the elasticity of crime and...
the cost of incarceration are not perfectly accurate, and debate exists about their magnitudes. Hence, we take what we consider to be the lower and upper bounds of existing estimates, and we use these bounds to create the figures of $5 billion to $8 billion costs and 5 to 15 percent crime reduction for our hypothetical situation (implying an elasticity of crime with respect to incarceration of between 10 and 30 percent). The $5.6 billion to $8 billion range is the present value of future cost of incarceration. To explain, the paper takes today’s cohort of 3-year-olds as the reference point (mainly because this is the age at which early childhood programs begin). Hence, the cost of incarceration is the expense that would be required to incarcerate criminals of this cohort in the future, once they reach their high-crime years. However, we want to bring this future cost into the present, which is when the spending on social programs would occur. Therefore, the $5.6 billion to $8 billion represents the present value of the future increase in incarceration (with a target incarceration growth of 50 percent).

7. For a description of the Perry Preschool curriculum, see Hohmann et al. (1979).

8. The point at which one would have to shift camps—based on Becker’s moral argument—is not clear cut, as it requires one to make judgments about the inherent value of victims’ and murderers’ lives. However, it seems that Becker would support the death penalty up to the point of 1-to-1; that is, up until the point where an additional execution would deter the murder of one innocent victim (since he seems willing to give the victim’s life more moral weight than that of the criminal).

9. This argument—that victims’ lives would be saved—is not necessarily true. If potential murderers understand the conditions under which capital punishment applies, then the death penalty would deter them from capital murder but not necessarily from murder in general. The death penalty might shift the potential murderer’s calculus toward noncapital murder. And if this is the case, it is not clear whether victims’ lives would be saved.
10. But even the strongest supporters of deterrence would probably not favor a system in which the death penalty was applied with such immediacy (even though immediacy would clearly increase its deterrent effect, if this effect exists). Immediate punishment would run counter to many values of the American justice system, such as due process.

11. Anderson's study does not exactly capture what we are looking for. Specifically, his sample, obviously, is a sample of convicted murderers as opposed to potential murderers, which are our theoretical interest. There are other reasons why Anderson's sample might not be representative of the pool of potential murderers. Nevertheless, the article is quite suggestive of the extent to which criminals understand the legal system and helps set broad boundaries around what we can expect potential criminals to know.

12. For documentation of this, see the “Execution Database” compiled by Death Penalty Information Center and Bureau of Justice Statistics Bulletin, Capital Punishment Annual Reports, 1977-2005.

13. The two most culpable murderers in the prison riot each received sentences of life without parole, while two others received sentences of 22 and 23 years in prison. Three others received lesser sentences (and one defendant was acquitted at trial).

14. Not including incarceration, however, is problematic for a second reason: incapacitation. In other words, incarceration can affect crime rates both through deterring future potential criminals as well as by incapacitating existing criminals (taking them “off the street,” which tells us nothing about changes in criminal behavior due to incentives). This means that the DRS model, by not including incarceration, is incorrectly attributing two distinct effects to their death penalty variable. As Levitt and Miles (2005) find, it is quite difficult to empirically separate the effects of incapacitation and deterrence and to attribute specific changes in crime rates to one or the other.

15. At the data level, the problem is that the “UCR simply used a single murder count for the entire city of New York and then allocated the decline proportionally (by population) across counties. We secured
actual crime data by county from the New York State Division of Criminal Justice Services, and learned that over the period from 1995-2004 the murder rate dropped in Manhattan by 64.4 percent (from 16.3 to 5.8 murders per 100,000), and in the rest of New York state (excluding Manhattan) by 41.8 percent (from 7.9 to 4.6)” (Donohue and Wolfers, 2006a). Hence, the DRS article does not even have the accurate data to carry out its intended county-data analysis.

16. For example, see table 1 in Kuziemko (2006a).

17. Kuziemko (2006b) offers a wonderful illustration of how nuanced empirical analysis using state-of-the-art econometrics tools has the capacity to shed light on a large number of important policy-relevant questions. Specifically, Kuziemko finds that, at least for criminals who are incarcerated for roughly one year, each extra month of incarceration is likely to substantially reduce their rate of recidivism. Since more than half a million prisoners are released each year, and their rate of return to prison is shockingly large, this finding is of potentially great significance. At the same time, the move away from parole determinations seems to have had an unfortunate effect, since Kuziemko shows that parole boards did a fairly good job of separating out those with higher and lower risks of recidivism. Moreover, the elimination of parole may have dulled inmate incentives to invest in human capital development in a way that increases recidivism.

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