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Deterrence: A Review of the Evidence by a Criminologist for Economists

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## Abstract

This essay reviews the evidence on the deterrent effect of police, imprisonment, and capital punishment and in addition summarizes knowledge of sanction risk perceptions. Studies of changes in police presences, whether achieved by changes in police numbers or in their strategic deployment, consistently find evidence of deterrent effects. Studies of the deterrent effect of increases in already long prison sentences find at most a modest deterrent effect. Studies of the deterrent effect of capital punishment provide no useful information on the topic. Four high priority areas for future research are identified: developing and testing an integrated model of the effects of the threat and experience of punishment, measuring perceptions of sanction regimes, developing and testing a theory of criminal opportunities, and estimating the deterrent effect of shorter prison sentences and identifying high- deterrence policies.

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CLOSING COMMENT

## 1. INTRODUCTION

The criminal justice system (CJS) dispenses justice by apprehending, prosecuting, and punishing individuals who break the law. These activities may also prevent crime by three distinct mechanisms. One is incapacitation. Convicted offenders are often punished with imprisonment. Incapacitation refers to the crimes averted by their physical isolation during the period of their incarceration. Two other mechanisms involve possible behavioral responses. The threat of punishment may discourage criminal acts. In economics this effect is called deterrence whereas in criminology it is referred to as general deterrence. However labeled, the subject of this essay is the crime prevention effect of the threat of punishment, which I will refer to as deterrence. The second behavioral mechanism concerns the effect of the experience of punishment on reoffending. In criminology this effect is termed specific deterrence. I note, however, that there are many sound reasons for suspecting that the experience of punishment might increase, not decrease, future offending. I return to this observation in my discussion of directions for future research. For a review of the evidence on the effect of the experience of punishment on reoffending see Nagin, Cullen, and Jonson (2009) and for a review of the evidence on incapacitation effects see Spellman (1994).

The distinction between incapacitation and deterrence is also important for policy. Crime prevention by incapacitation necessarily requires higher imprisonment rates and all the attendant social costs. By contrast, if crime can be deterred from occurring in the first place, there is no perpetrator to punish. As a consequence crime prevention by deterrence does not necessarily involve a trade-off between crime rates and imprisonment rates (Durlauf and Nagin 2011a) (Blumstein and Nagin 1978)

Going back at least to the Enlightenment-era legal philosophers Cesare Beccaria and Jeremy Bentham, scholars have speculated on the deterrent effect of official sanctions, but sustained efforts to empirically verify their effects did not begin until the 1960s. Since that time, hundreds of studies have tested for deterrent effects. There is also a large theoretical literature on deterrence both within and outside economics. Becker's seminal article, "*Crime and Punishment: An Economic Approach*" forms the foundation for much of the theoretical and empirical research in economics that followed its publication in 1968.

This review is not intended to be encyclopedic of either the empirical or theoretical literature on deterrence. Its objective is to highlight findings and conclusions that are particularly important and to layout areas of research, which in my judgment, have high potential payoff and are especially amenable to economic analysis. For extended reviews of the theoretical and empirical literature both within and outside economics see Durlauf and Nagin (2011b) and Nagin (forthcoming), and Nagin (1998).

## 2. KEY THEORETICAL IDEAS

Since Bentham and Beccaria, three key concepts underlay theorizing about deterrence—the certainty, severity, and immediacy (celerity) of punishment. Certainty refers to the probability of legal sanction given commission of crime, severity refers to the onerousness of the legal consequences given a sanction is imposed, and celerity refers to the lapse in time between commission of the crime and its punishment. Becker's model and most of its progeny in economics focus only on certainty and severity (For exceptions see (Lee and McCrary 2009) and (Polinsky and Shavell. 1999)). Let  $p$  denote the probability of sanction given commission of a crime and  $U(S)$  measure the (dis)utility of a sanction of severity  $S$ . In Becker's model  $pU(S)$

measures the expected sanction cost of committing a crime. This quantity is embedded in a larger choice theoretic model of crime and punishment which is beyond the scope of this essay but suffice it to say that like all models of deterrence, *ceteris paribus*, increases in either  $p$  or  $S$  are disincentives to criminal behavior.

Most economic models of crime do not include celerity of punishment as a theoretical component. Perhaps the reason is that even in theory the swiftness of punishment, except for the payment of a monetary fine, has an ambiguous incentive effect. While it is always advantageous to delay payment of a monetary fine, there is nothing irrational about a desire to get non-monetary punishment over with. Further complicating matters is that most non-monetary legal sanctions (e.g., imprisonment) are themselves experienced over time.

As discussed below, there is far more empirical support for the deterrent effect of changes in the certainty of punishment than changes in the severity punishment. One explanation for what I will call the “certainty effect” comes from criminology which places at least as much emphasis on the deterrent effect of informal sanction cost as formal sanction cost (Williams and Hawkins 1986) (Zimring and Hawkins 1973) (Klepper and Nagin 1989). Informal sanction cost measures costs that are separate from those that attend the imposition of formal sanctions such as loss of freedom or fine cost and include censure by friends and family and loss of social and economic standing. Importantly the magnitude of informal costs may be largely independent of the severity of legal consequences. Merely being arrested for committing a crime may trigger the imposition of informal sanctions. Williams and Hawkins (1986) use the term “fear of arrest” to label the deterrent effect of informal sanction cost.

The concept of fear of arrest is a reminder that  $p$  is itself a product of a series of conditional probabilities associated with various stages of the criminal justice system—

probability of apprehension, probability conviction given apprehension and so on. Each of these conditional probabilities has costs associated with them. A simple two-stage model in which  $p$  is the product of the probability apprehension,  $p_a$ , and the probability sanction given apprehension,  $p_{s|a}$  demonstrates how informal sanction cost may be the source of the certainty effect. Let  $ISC$  denote the fixed informal sanction costs that attend apprehension. In this model the expected sanction cost of committing a crime is:

$$E(S, ISC, p_a, p_{s|a}) = p_a ISC + p_a p_{s|a} U(S) \quad (1)$$

Under this formalization unless  $U(*)$  is highly convex in  $S$ ,  $\frac{\partial E}{\partial p_a} > \frac{\partial E}{\partial S}$ . Thus, the informal sanction costs that attend arrest alone are one explanation for the certainty effect. Another, which was first suggested in Becker (1968), is that criminals are risk takers. While there is evidence from psychology that crime prone individuals enjoy engaging in risky behaviors, I know of no evidence that their risk preference for non-monetary punishments such as imprisonment, can be characterized as convex in severity of punishment.

## 1. DETERRENT EFFECT OF IMPRISONMENT

There have been two distinct waves of studies of the deterrent effect of imprisonment. Studies in the 1960s and 1970s, which were primarily cross-sectional analyses of states, examined the relationship of the state's crime rate to the certainty of punishment, measured by the ratio of prison admissions to reported crimes, and the severity of punishment measured by median time served in prison. These studies suffered from a number of serious statistical flaws that are detailed in Blumstein, Cohen et al (1978). One was that they confounded deterrent and

incapacitation effects. The second was more fundamental. There are many good reasons for believing that crime rates and sanction levels are endogenously determined. Indeed Becker's theory is predicated on their endogenous determination. Most studies did not even attempt to deal with the endogeneity issue and those that did invoked identification restrictions that were not credible.

In response to these deficiencies, a second generation of studies emerged in the 1990s. Unlike the first-generation studies which primarily involved cross-sectional analyses of states, second-generation studies had a longitudinal component in which data were analyzed not only across states but also over time. Another important difference is that the second-generation studies did not attempt to estimate certainty and severity effects separately. Instead they examined the relationship between the crime rate and rate of imprisonment (prisoners per capita).

Durlauf and Nagin (2011a) (2011b) discuss at length the reasons why these studies provide little useful information on deterrence. One is that like the earlier studies they confound deterrent and incapacitation effects. Second like the earlier studies, with the possible exception of Levitt (1998) and Johnson and Raphael (forthcoming), they do not resolve the identification problem resulting from the endogenous determination of crime rates and imprisonment rates. Third, all of these studies suffer from an important theoretical flaw. Prison population is not a policy variable; rather, it is an outcome of sanction policies dictating who goes to prison and for how long – namely,  $p$  and  $S$ . In all incentive-based theories of criminal behavior in the tradition of Bentham and Beccaria, including most importantly Becker's, the deterrence response to sanction threats is posed in terms of the certainty and severity of punishment, not the imprisonment rate. Therefore, to predict how changes in certainty and severity might affect the crime rate requires knowledge of the relationship of the crime rate to certainty and severity as



separate entities, which is not provided by the literature relating the crime rate to the imprisonment rate.

I turn now to six studies which in my judgment report convincing evidence of the deterrent effect of incarceration. They also nicely illustrate heterogeneity in the deterrence response to the threat of imprisonment. These studies are: Weisburd, Einat, and Kowalski (2008) and, Hawken and Kleiman (2009) who study the use of imprisonment to enforce fine payment and conditions of probation, respectively, and find substantial deterrent effects; Helland and Tabarrok (2007), who analyze the deterrent effect of California's third strike provision and find a moderate deterrent effect; (Raphael and Ludwig 2003) who examine the deterrent effect of prison sentence enhancements for gun crimes and find no effect; and Lee and McCrary (2009) and Hjalmarsson (2009), who examine the heightened threat of imprisonment that attends coming under the jurisdiction of the adult courts at the age of majority, and find no deterrent effect.

Weisburd, Einat, and Kowalski (2008) report on a randomized field trial of alternative strategies for incentivizing the payment of court-ordered fines. The most salient finding is that the imminent threat of incarceration provides a powerful incentive to pay delinquent fines, even when the incarceration is only for a short period. They call this effect "the miracle of the cells." The miracle of the cells provides valuable perspective on the conclusion that the certainty rather than the severity of punishment is the more powerful deterrent. Consistent with the "certainty principle," the common feature of treatment conditions involving incarceration is a high certainty of imprisonment for failure to pay the fine. However, the fact that Weisburd et al. label the response the "miracle of the cells" and not the "miracle of certainty" is telling. Their choice of label is a reminder that certainty must result in a distasteful consequence in order for it to be a

deterrent. The consequences need not be draconian, just sufficiently costly, to deter the proscribed behavior.

The deterrence strategy of certain but non-draconian sanctions has been applied with apparently great success in Project Hope, an intervention heralded in Kleiman (2009) and Hawken and Kleiman (2009). Project Hope is a Hawaii-based probation enforcement program. In a randomized experiment probationers assigned to Project Hope had much lower rates of positive drug tests, missed appointments, and – most importantly – were significantly less likely to be arrested and imprisoned. The cornerstone of the HOPE intervention was regular drug testing, including random tests, and certain but short punishment periods of confinement (i.e, 1-2 days) for positive drug tests or other violation of conditions of probation. Thus, both the fine experiment and Project Hope show that highly certain punishment can be an effective deterrent for persons for whom deterrence has previously been ineffective in averting crime.

Helland and Tabarrok (2007) examine whether California’s “Three Strikes and You’re Out” law deters offending among individuals previously convicted of strike-eligible offenses. The future offending of individuals convicted of two previous strikeable offenses was compared with that of individuals who had been convicted of only one strikeable offense but who, in addition, had been tried for a second strikeable offense but were ultimately convicted of a non-strikeable offense. The study demonstrates that these two groups of individuals were comparable on many characteristics such as age, race, and time in prison. Even so, Helland and Tabarrok finds that arrest rates were about 20 percent lower for the group with convictions for two strikeable offenses. The authors attribute this reduction to the greatly enhanced sentence that would have accompanied conviction for a third strikeable offense. Note, however, that their cost-

benefit analysis found that the cost of 25 years or more of imprisonment of the third-strike threat likely far exceeded the crimes avoidance benefits.

Raphael and Ludwig (2003) examine the deterrent effect of sentence enhancements for gun crimes that formed the basis for a Richmond, Va. intervention called Project Exile. Perpetrators of gun crimes, with a particular emphasis on those with a felony record, were targets of Federal prosecution which provided for far more severe prison sentences for weapon use than Virginia state law. Based on an analysis involving comparisons of adult homicide arrest rates with juvenile homicide arrest rates within Richmond and comparisons of Richmond's gun homicide rate with other cities that had comparable pre-intervention homicide rate trends, Raphael and Ludwig conclude that the threat of enhanced sentence had no apparent deterrent effect.

For most crimes, the certainty and severity of punishment increases discontinuously upon reaching the age of majority, when jurisdiction for criminal wrongdoing shifts from the juvenile to the adult court. In an extraordinarily careful analysis of individual-level crime histories from Florida, Lee and McCrary (2009) attempt to identify a discontinuous decline in offending at age 18, the age of majority in Florida. Their point estimate of the discontinuous change is negative as predicted, but minute in magnitude and not even remotely close to statistical significance.

Another analysis of the effect of the effect of moving from the jurisdiction of the juvenile to adult courts by Hjalmarsson (2009) uses the 1997 National Longitudinal Survey of Youth to examine whether young males' perception of incarceration risk changed at the age of criminal majority. She found that on average subjective probabilities of being sent to jail for auto theft increased discontinuously by 5.2 percentage points when youth reached the age of majority in

their state of residence. While youth perceived an increase in incarceration risk, she found no convincing evidence of an effect on their self-reported criminal behavior.

## 2. DETERRENT EFFECT OF POLICING

The police may prevent crime through many possible mechanisms. Apprehension of active offenders is a necessary first step for their conviction and punishment. If the sanction involves imprisonment, crime may be prevented by the incapacitation of the apprehended offender. Many police tactics, such as rapid response to calls for service or post-crime investigation, are intended not only to capture the offender but to deter others by projecting a tangible threat of apprehension. Police may, however, deter without actually apprehending criminals—their very presence may deter a motivated offender from carrying out a contemplated criminal act.

Research on the deterrent effect of police has evolved in two distinct literatures. One has focused on the deterrent effect of the level of police numbers. The other has focused on the crime prevention effectiveness of different strategies for deploying police. These two literatures are reviewed separately.

### 4.1 Studies of Levels of Police Numbers and Resources

Studies of the effect of police numbers and resource come in two forms. One is an analogue of the imprisonment rate and crime rate studies described in the prior section. These studies are based on panel datasets, usually of US cities over the period circa 1970 to 2000. They relate FBI Index crime rates to the resources committed to policing as measured by police per capita or police expenditures per capita. Examples of this form of study include Levitt (1997) and Evans and Owens (2007). The second form of study is more targeted and analyze the impact on crime that results from abrupt changes in the level of policing due, for example, to terror

alerts. Both types of studies consistently find that greater police presence reduces crime.

In my view the most convincing evidence comes from the abrupt-change type of study in circumstances where the regime change is clearly attributable to an event unrelated to the crime rate. For example, in September 1944, German soldiers occupying Denmark arrested the entire Danish police force. According to an account by Andeneas (1974), crime rates rose immediately but not uniformly. The frequency of street crimes like robbery, whose control depends heavily upon visible police presence, rose sharply. By contrast, crimes like fraud were less affected. See Sherman and Eck (2002) for other examples of crime increases following a collapse of police presence.

Contemporary tests of the police-crime relationship based on abrupt decreases in police presence investigate the impact on crime of reductions in police presence and productivity as a result of large budget cuts or lawsuits following racial profiling scandals. Such studies have examined the Cincinnati Police Department (Shi 2009), the New Jersey State Police (Heaton in press), and the Oregon State Police (DeAngelo and Hansen 2008). Each of these studies concludes that decreases in police presence and activity substantially increase crime. Shi (2009), for example, studies the fallout from an incident in Cincinnati in which a white police officer shot and killed an unarmed African American suspect. The incident was followed by rioting, heavy media attention, a federal civil rights investigation, and the indictment of the officer in question. These events created an unofficial incentive for officers from the Cincinnati Police Department to curtail their use of arrest for misdemeanor crimes. Shi demonstrates measurable declines in police productivity in the aftermath of the riot and also documents a substantial increase in criminal activity. She estimates elasticities of crime to police presence of  $-0.5$  for violent crime and  $-0.3$  for property crime.

The ongoing threat of terrorism has also provided a number of unique opportunities to study the impact of police resource allocation in cities around the world, including the District of Columbia (Klick and Tabarrok 2005), Buenos Aires (Di Tella and Schargrotsky 2004), Stockholm (Poutvaara and Priks 2006), and London (Draca, Machin et al. 2008). The Klick and Tabarrok (2005) study examines the effect on crime in the Mall area of Washington, D.C. of the color-coded alert system implemented in the aftermath of the September 11, 2001 terrorist attack. The purpose of the alerts is to signal federal, state, and local law enforcement agencies to occasions when it might be prudent to divert resources to sensitive locations, such as the Mall. (Klick and Tabarrok 2005) use daily police reports of crime for the period March 2002 to July 2003, during which time the terrorism alert level rose from “elevated” (yellow) to “high” (orange) and back down to “elevated” on four occasions. During high alerts, anecdotal evidence suggested that police presence increased by 50 percent. They estimate a police-to-crime elasticity of .3.

To summarize, studies of police presence consistently find that putting more police officers on the street has a substantial deterrent effect on serious crime. Yet these police manpower studies speak only to the number and allocation of police officers and not to what police officers actually do on the street beyond making arrests.

#### 4.2 Police Deployment and Crime

Much research has examined the crime prevention effectiveness of alternative strategies for deploying police resources. This research has largely been conducted by criminologists. Among this group of researchers, the preferred research designs are interrupted time series studies of the effect of targeted interventions and true randomized experiments. The discussion

which follows draws heavily upon two excellent reviews of this research by Weisburd and Eck (2004) and Braga (2008).

For the most part, deployment strategies affect the certainty of punishment through their impact on the probability of apprehension. One way to increase apprehension risk is to mobilize police in a fashion that increases the probability that an offender is arrested after committing a crime. In Nagin (forthcoming) I describe police acting in this role as apprehension agents. Strong evidence of a deterrent as opposed to an incapacitation effect resulting from the apprehension of criminals is limited. Studies of the effect of rapid response to calls for service (Kansas 1977); Spelman and Brown (1981) do not directly test for deterrence but found no evidence of improved apprehension effectiveness. This may be because most calls for service occur well after the crime event, with the result that the perpetrator has fled the scene. Similarly, apprehension risk is probably not materially increased by improved investigations (Eck (1992), Greenwood, et al, (1977) and Braga et al., (2011)).

The second source of deterrence from police activities involves averting crime in the first place. In this circumstance, there is no apprehension because there is no offense. In Nagin (forthcoming) I describe police acting in this role as sentinels. In my view, the sentinel role is the primary source of deterrence from policing. Thus, measures of apprehension risk based only on enforcement actions in response to crimes that actually occur, such as arrests per reported crime, are not valid measures of the apprehension risk represented by criminal opportunities not acted upon because the risk was deemed too high (Cook 1979).

One example of sentinel-like police deployment strategies that have been shown to be effective in averting crime in the first place is “hot spots” policing. Another example is problem-oriented policing. However, evidence of its effectiveness is less clear cut.

The idea of hot spots policing stems from a striking empirical regularity uncovered by Sherman et al. (1989) who found that only 3 percent of addresses and intersections (“places,” as they were called) in Minneapolis produced 50 percent of all calls to the police. Twenty five years later in a study in Seattle, Washington, Weisburd et al. (2004) reported that between four and five percent of street segments in the city accounted for 50 percent of crime incidents for each year over a fourteen-year period.

The first test of the efficacy of concentrating police resources on crime hot spots was conducted by Sherman and Weisburd (1995). In this randomized experiment, hot spots in the experimental group were subjected to, on average, a doubling of police patrol intensity compared to hot spots in the control group. Declines in total crime calls ranged from 6-13 percent. In another randomized experiment, Weisburd and Green (1995) found that hot spots policing was similarly effective in suppressing drug markets.

Braga’s (2008) informative review of hot spots policing summarizes the findings from nine experimental or quasi-experimental evaluations. The targets of the police actions varied. Some hot spots were generally high-crime locations, whereas others were characterized by specific crime problems like drug trafficking. All but two of the studies found evidence of significant reductions in crime. Further, no evidence was found of material crime displacement to immediately surrounding locations. On the contrary, some studies found evidence of crime reductions, not increases, in the surrounding locations—a “diffusion of crime-control benefits” to non-targeted locales. Note also that the findings from the previously described econometric studies of focused police actions – for example, in response to terror alert level – buttress the conclusion that the strategic targeting of police resources can be very effective in reducing crime.



A second example of a sentinel-like policing strategy is problem oriented policing. Problem oriented policing involves organizing residents and property owners to help police identify the sources of violent and property crime, and then targeting these problems with focused deterrence-based warnings to repeat offenders, increased police, citizen, and technological monitoring, and better control of physical and social disorders. It also involves orchestrated efforts between police and prosecutors to increase sanction costs.

One of the most highly publicized instances of problem-oriented policing is Boston's Operation Ceasefire (Kennedy, Braga et al. 2001). The objective of the operation was to prevent inter-gang gun violence using two deterrence-based strategies. The first strategy was to target enforcement against suppliers of weapons to Boston's violent youth gangs. The second involved a more novel approach. The youth gangs themselves were assembled by the police on multiple occasions, in order to send the message that the response to any instance of serious violence would be "pulling every lever" legally available to punish gang members collectively. This included a salient severity-related dimension—vigorous prosecution for unrelated, non-violent crimes such as drug dealing. Thus, the aim of Operation Ceasefire was to deter violent crime by increasing the certainty and severity of punishment, but only in targeted circumstances – specifically, if the gang members commit a violent crime.

Since Operation Cease Fire, the strategy of "pulling every lever" has been the centerpiece of field interventions in many large and small US cities including Richmond, VA; Chicago, IL; Stockton, CA; High Point, NC; and Pittsburgh PA. See Kennedy (2009), one of the architects of the "pulling every lever" strategy, for an extended description of these interventions and the philosophy behind them. Independent evaluations have also been conducted of some of these interventions. For Boston see Cook and Ludwig (2006) for Richmond see Raphael and Ludwig

(2003), for Chicago see Papachristos, Meares and Fagan (2007), for Pittsburgh see Wilson and Chermak (2011), and for High Point see Corsaro, Hunt, Krovand, Hipple, and McCarrell (2012).

The conclusions of the independent evaluations are varied but Cook's (2012) characterization of the much publicized High Point drug market intervention seems apt: initial conclusions of eye-catchingly large effects have been replaced with far more modest assessments of effect sizes and cautions about the generalizability of the results. Reuter and Pollack (2012) wonder whether a successful intervention in a small urban area such as High Point can be replicated in a large city such as Chicago. Ferrier and Ludwig (2011) point out the difficulty understanding the mechanism that underlies a seemingly successful intervention that pulls many levers. Despite concerns, these interventions illustrate the potential for combining elements of both certainty and severity enhancement to generate a targeted deterrent effect.

### 3. DETERRENT EFFECT OF CAPITAL PUNISHMENT

Studies of the deterrent effect of capital punishment have been and continue to be the source of bitter contention. Isaac Ehrlich's 1975 study in which he concluded that each execution averted 7 to 8 homicides, is undoubtedly the most cited study of this kind. The 1978 National Research Council report (Blumstein, Cohen et al. 1978) laid out a lengthy list of criticisms of the Ehrlich analysis. The NRC report concluded: "available studies [including Ehrlich's] provide no useful evidence on the deterrent effect of capital punishment." (p. 9)

Coincidentally, that report was issued shortly after the 1976 Supreme Court decision *Gregg v. Georgia* ended a four moratorium on execution in the United States. In the 35 years since the publication of the 1978 report, and more especially in recent years, a considerable

number of post-*Gregg* studies have attempted to estimate the effect of the legal status or the actual implementation of the death penalty on homicide rates. These studies have reached widely varying conclusions that have resulted in often bitter disagreement about their interpretation.

This more recent literature has been the subject of another NRC report (2012) titled *Deterrence and the Death Penalty*, which I co-edited, as well as two reviews of the literature commissioned for the report (Chalfin, Haviland et al. 2012) and (Durlauf and Charles forthcoming), and two previously completed reviews by Donohue and Wolfers (2005) (2009). The 2012 report reached a conclusion similar to the 1978 report: “[R]esearch to date on the effect of capital punishment on homicide is not informative about whether capital punishment decreases, increases, or has no effect on homicide rates.” (p.2)

The NRC (2012) leveled three key criticisms of the post-*Gregg* capital punishment deterrence research that transcend the high profile but still narrow issue of the deterrent effect of capital punishment. They also apply to studies of the deterrent effect of other forms of sanction—prison, fines, and community control—that form the backbone of contemporary sanction policy in the US and most other countries throughout the world.

One criticism concerned the incomplete specification of the sanction regime for homicide. Even for capital eligible convictions for homicide, only a minority result in a sentence of death, let alone an actual execution. This is true even for states such as Texas and Virginia which make the most intense use of capital punishment. Instead, most homicides result in a lengthy prison sentence, sometimes life without parole. A study by Cook (2009) illustrates this point. Of 274 cases prosecuted as capital cases, only 11 resulted in a death sentence. Another 42

resulted in dismissal or a verdict of not guilty, which left 221 cases that resulted in conviction and sentences to a noncapital sanction.

None of the post-*Gregg* studies take into account the non-capital component of the sanction regime. There are sound reasons for expecting that the severity of the non-capital sanctions for homicide vary systematically with the availability and/or the intensity of use of capital punishment. For example, the political culture of a state may affect the frequency of use of capital punishment and also the severity of non-capital sanctions for homicide. Thus, any effect that these non-capital sanctions have on homicide may contaminate the estimated effect of capital punishment on homicide. In capital punishment studies the potential for such bias is particularly strong because non-capital sanctions remain the dominant sanction response to capital eligible murders.

Homicide is not the only criminal offense punishable by a range of qualitatively different sanction alternatives. Indeed the sanction regimes for most other criminal offenses, even felonies, include more than one sanction option for their punishment. This point is returned to in the discussion of future research directions.

A second key criticism elaborated in the NRC report concerned the specification of perceptions of the capital punishment component of the sanction regime. Studies typically suppose that people who are contemplating murder perceive sanctions risks as subjective probabilities of arrest, conviction, and execution. Lacking data on these subjective probabilities, researchers presume that they are somehow based on the observable frequencies of arrest, conviction, and execution.

The report concluded that several factors made the attempts by the panel studies to specify the capital component of state sanctions regimes uninterpretable. First, the findings are very sensitive to the way the risk of execution is specified. For example, because of delays between the imposition of a death sentence and it being carried out, if ever, researchers routinely computed ratios in which the numerator was the number of executions in given state and year divided by the number of death sentences imposed in that state in some prior year. Results are very sensitive to how that ratio is computed and there is no logical basis for resolving disagreements about how the true risk of execution should be measured. Among the difficulties is the fact that only 15 percent of those sentenced to death in the United States since 1977 have been executed, with close to 40 percent leaving death row for other reasons (vacated sentences or convictions, commutations, a successful appeal, or death by other causes), and 45 percent still awaiting execution. (Snell 2010). Available information for calculating the risk depends upon the size of the state—for large states such as Texas and California there is far more data for calibrating risk than for small states such as Delaware and Montana. Further complicating matters, policies can change due to court decisions and administrative decrees of elected officials. This unpredictability calls into question the usefulness of prior data on the death penalty when calculating present and future risk. Because none of the measures used has any clear relationship with the correct measure, there is no reasoned basis for arbitrating competing claims about which study provides the better estimate of the deterrent effect of the death penalty.

Even if it were possible to judge which measure more closely corresponds to true risk, there is no evidence that the perceptions of potential murders correspond to this risk. The above discussion concerns only one aspect of the sanction regime, the risk of execution given conviction. Other relevant dimensions of the sanction regime are the risk of conviction given

commission of a murder and the certainty and severity of the non-capital alternatives to the death penalty. The assumption that potential murders have accurate perceptions of these risks and consequences is not credible: indeed it is preposterous.

The third key criticism of the capital punishment literature is that much of the research is based on linear-in-parameters, fixed-effect panel data models that make exceedingly strong assumptions that were not credible. Among these are that the deterrent effect of capital punishment is additive to the rest of model and homogenous and that the legal status and administration of capital punishment is random across states. The report recommended that future research use methods that identify deterrent effects using models that make less strong assumptions or that make clear the sensitivity of findings to modeling assumptions. Because the panel regression models are also routinely used in deterrence research outside of capital punishment, this recommendation also applies to the wider body of non-capital punishment research. See Manski and Pepper (forthcoming) and Durlauf, Fu, and Navarro (forthcoming) for two methodological alternatives to standard practice, partial identification and model averaging, respectively.

#### 4. SANCTION RISK PERCEPTIONS

This section selectively reviews studies of sanction risk perceptions. For an exhaustive and thoughtful review, on which this discussion draws heavily, see Apel (in press). Studies of sanction risk perception come in three primary forms: surveys of the general public's knowledge of the sanction regime; studies of the effect of apprehension (or non-apprehension) on risk perceptions and subsequent behavior, and scenario-based studies in which respondents are

questioned about their perceptions of the risk of apprehension and punishment in specific circumstances.

## 6.1 General Population Surveys

Apel (in press) identifies only two surveys of the general public's knowledge of the statutory penalties for the types of crime that compose the FBI's crime index (e.g., murder, robbery). Both are dated. A survey of Tucson, Arizona residents conducted in the 1970s suggests generally good knowledge of the types of sanctions (e.g., fine, prison) available for the punishment of the 14 types of crime surveyed (Williams, Gibbs et al. 1980). Erickson and Gibbs (1979) also find that respondents were reasonably well calibrated on the relative severity of punishments across types of crime (e.g., punishment for robbery is generally more severe than for larceny). However, a 1960s study commissioned by the California Assembly (1968) found that the general public's knowledge of the statutorily prescribed level of punishment was poor. Only about a quarter of the sample correctly identified the maximum prison sentence available for the punishment of the various crimes included in the survey. However, 62% of incarcerated adults correctly identified the maximum. I return to the large difference in knowledge between the incarcerated and not-incarcerated samples below.

There have also been general population surveys of sanction perceptions for two types of crimes—marijuana use and drunk driving—that are far more prevalent in the general population than crimes like robbery or burglary. The surveys suggest far better, although hardly perfect, knowledge of the legally available sanctions for these two offenses. MacCoun et al.,(2009) report that in states that decriminalized possession between 1976 and 1980 the percentage of student respondents to the Monitoring the Future survey reporting a possible jail sentence declined from

58% to 18%. Corresponding changes for students living in states that did not decriminalize were not as large. This finding suggests that for populations in which there is greater need-to-know of sanction risk, knowledge of the risks is better. Note, however, that MacCoun et al. also report that, as in the California survey, knowledge of the maximum penalties for marijuana use was not good. Surveys of knowledge among adults of drunk driving penalties by Ross (1973) suggest greater awareness of the drunk-driving sanctions and available enforcement tools (e.g., breathalyzers) than corresponding knowledge for street-type crimes.

An important finding of the early panel perceptual deterrence studies in which participants were surveyed on the sanction risk perception and self-reported delinquency over time was that there is considerable instability in sanction risk perceptions and that non-offenders and novice offenders had higher sanction risk perceptions relative to experienced offenders. Paternoster et al. (1982) called this an experiential effect whereby delinquent youths learned that sanction risks were lower than initially anticipated.

A large number of studies have used longitudinal data to analyze whether the effect of success or failure in avoiding apprehension influences sanction risk perceptions. The analytical strategy involves relating experience with success or failure in prior survey waves with perceptions of apprehension risk in later survey waves. Studies by criminologists of this type were prompted by an influential article by Stafford and Warr (1993), who distinguished between two sources of information on sanction risk: own experience and experience of peers. A parallel literature has also appeared in economics based on Bayesian updating that began with Lochner (2007). The Bayesian updating model and the arguments of Stafford and Warr are complementary. In fact, Bayesian updating formalizes their arguments.



Among the predictions of a Bayesian updating model is that people generally do not entirely abandon prior beliefs based on new information. Instead they will only incrementally adjust them. In the case of perception of apprehension risk, this implies that the experience of apprehension will result in an incremental upward shift in risk perception and experience of what Stafford and Warr (1993) call “apprehension avoidance” will result in an incremental reduction in risk. A second prediction of the Bayesian updating model is that the magnitude of the change will depend on the depth of prior knowledge. Individuals with more prior knowledge will tend to adjust less to new information than individuals with less prior knowledge. In the context of sanction risk perceptions, this implies that individuals with more experience with offending will make smaller adjustments in their risk perceptions based on current experience with apprehension than individuals with less experience.

Concerning the first prediction, a long list of studies find that increases (decreases) in perceived apprehension risk are associated with the failure (success) in avoiding apprehension (Pogarsky, Kim et al. 2005), (Matsueda, Kreager et al. 2006), (Lochner 2007), (Hjalmarsson 2008), (Anwar and Loughran 2009).

Evidence consistent with the second prediction is reported in Pogarsky, Piquero, and Paternoster (2004), Matsueda, Kreager, and Huizinga (2006), and Anwar and Loughran (2011). Anwar and Loughran (2011) conducted a particularly thorough test of this prediction. They analyzed a sample composed of about 1,300 adjudicated/convicted youth from Arizona and Pennsylvania enrolled in the Pathways to Desistance study (Mulvey 2011) who were interviewed eight times in five years. They found that that being arrested significantly increased subjective

probabilities (prediction 1) but that magnitude of the change was less for more experienced offenders (prediction 2). Specifically, they showed that experienced offenders placed relatively more weight on their prior subjective probabilities and therefore updated less in response to new arrests. Inexperienced offenders, by contrast, updated more by placing more weight on their current arrest ratios and less weight on their prior subjective probabilities. It is also noteworthy that they concluded that the impact of arrest on subjective probabilities was specific within classes of criminal behaviors—youth arrested for aggressive crimes did not update their subjective probabilities concerning income-generating crimes. This finding implies that there are not spillover effects across classes of crime.

### 6.3 Studies of Situational Factors on Risk Perceptions

This grouping of studies examines the effect of situational factors on risk perceptions. Particularly important in this regard are situational factors that can be manipulated by policy, such as official sanctions and police presence.

As already discussed, knowledge of official sanctions seems to be strongly affected by the need-to-know principle. Knowledge is better, but hardly perfect, among populations with the greatest involvement in the illegal activity. Based on the California Assembly study, for example, knowledge of the maximum penalty for various FBI index type crimes was far better for incarcerated sample members than for the not-incarcerated sample members.

Other interesting evidence of awareness of official sanctions is reported in the previously referenced study by Hjalmarsson (2009) in which she found that upon reaching the age of majority male respondents to the 1997 National Longitudinal Survey of Youth on average increased their perceived risk of incarceration for auto theft by 5.2 percentage points.

Evidence on how police presence affects perceptions of apprehension risk is scant. In my own work with Raymond Paternoster we constructed scenarios and examined how respondent perceptions of sanction risks were affected by scenario conditions. In Nagin and Paternoster (1993) we found that respondent perceptions of sanction cost in a drunk driving scenario were higher in the scenario condition involving a police crackdown on drunk driving vs. a scenario condition described as involving state police cutbacks. In addition, perceptions of sanction cost were lower if surveillance could be avoided by driving on back roads. In scenarios concerning peer provocation Wikstrom, Obersittler et al. (2012) found that adolescents reported a lower likelihood of violent response in scenario conditions in which adult monitors were present. Evidence from ethnographic studies suggests that offenders are very conscious of police presence when selecting targets. Wright and Decker (1994) report that burglars avoid neighborhoods with a heavy police presence, and that robbers prefer to target individuals unlikely to report the crime to the police

## 5. FOUR TOPICS FOR FUTURE RESEARCH

In this section I lay out four topics for future research on deterrence.

### 7.1 Developing and testing an integrated model of the effects of the threat and experience of punishment

At the outset of this essay I distinguished between what criminologists call specific deterrence and general deterrence. The former is the response to experience of punishment whereas the latter is the response to the threat of punishment. There is no logical contradiction between the conclusions that the experience of punishment actually increases propensity for offending even as the threat of punishment deters it. Indeed a key conclusion of a review by Nagin, Cullen, and

Jonson (2009) of the effect of the experience of imprisonment on recidivism is that the great majority of studies point to a criminogenic effect of the prison experience on subsequent offending but see Nagin and Snodgrass (2012) and Loeffler (2011) who find no such effect.

While the literature suggesting that the experience of imprisonment increases offending suffers from statistical shortcomings that make this conclusion far from definitive, serious attention should be committed to extending and testing the economic model of crime to account for the possibility of a criminogenic effect of the experience of punishment. Langan and Levin (2002), who analyzed data on 272,111 individuals released from the prison in 1993, found that within three years 68 percent had been arrested, 46.9 percent had been convicted, and 25.4 percent had been re-imprisoned. According to a 2006 Bureau of Justice Statistics study of felony defendants in the 75 largest cities, at the time of arrest 32% of defendants had an active criminal justice status, such as probation (15%), release pending disposition of a prior case (10%), or parole (5%). Further, 76% of all defendants had been arrested previously, with 50% having at least five prior arrest charges.

There are two very different interpretations of these statistics. One is that the high concentration of recidivists in the criminal justice system represents the ongoing failure of deterrence to suppress the criminal behavior of a small minority of the population. The other is that the experience of contact with the criminal justice system, most specifically in the form of imprisonment, is criminogenic. These two diametrically opposing interpretations of the data lay at the core of much academic and public policy debate about the role of imprisonment in crime control. The difficulties in disentangling them may be seen in a recent study by Drago, Galbiati, and Vertova (2009) of Italy's Collective Clemency Bill. In May of 2006, this Bill resulted in the release of more than 20,000 inmates from Italian prisons. The release came with the condition

that individuals convicted of another crime within five years of their release would have to serve the residual of the sentence that was suspended in addition to the sentence for the new crime. The residual sentence length varied between 1 and 36 months. Drago et al.(2009) find that each month of residual sentence was associated with 1.24% reduction in the propensity to recommit crime. The authors interpret this finding as a deterrent effect but an alternative and equally valid interpretation is that each additional month of imprisonment increases the propensity to offend by 1.2%.<sup>1</sup> The respective roles of these distinct explanations cannot be identified.

The logic of specific deterrence is grounded in the idea that if the experience of imprisonment is sufficiently distasteful some of the punished may conclude that it is an experience not to be repeated. The structure of the law itself may also cause previously convicted individuals to revise upward their estimates of the likelihood and/or severity of punishment for future lawbreaking. Criminal law commonly prescribes more severe penalties for recidivists. The experience of punishment may also affect the likelihood of future crime by decreasing the attractiveness of crime itself or by expanding alternatives to crime through participation in rehabilitation programs.

There are, however, a number of reasons for theorizing that the experience of punishment might increase an individual's future proclivity for crime. One argument relates to the effect of the experience of crime on expectations about the prison experience. While some individuals might conclude imprisonment is not an experience to be repeated, others might conclude that the experience was not as adverse as anticipated. Other reasons have to do with the social interactions resulting from imprisonment. Prisons might be "schools for crime" where inmates learn new crime skills even as their non-crime human capital depreciates. Associating with other

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<sup>1</sup> Thanks to Philip Cook for this important insight on the alternative interpretation.

more experienced inmates could lead new inmates to adopt the older inmate's deviant value systems. Being punished may also elevate an offender's feelings of resentment against society.

The experience of imprisonment may also increase future criminality by stigmatizing the individual socially and economically. A substantial body of body of research finds that arrest and conviction adversely affects various forms of conventional attainment such as access to legal labor markets. For reviews see (Sampson and Laub 1993; Waldfogel 1993; Nagin and Waldfogel 1995; Freeman 1996; Nagin and Waldfogel 1998).

I see two major tasks related to developing an integrated model of the response to both the threat and experience of legal sanctions. One involves extending Becker's model to account for how the proclivity for crime is affected by the experience of punishment. This will require at a minimum consideration of the effect of the experience of punishment on sanction risk perceptions and the limiting of legal alternatives to crime due to factors such as stigma and erosion of human capital. More ambitious efforts might also consider issues related to social interaction that occur in prison that may affect the utility of crime itself.

Because by construction this model will recast Becker's model in a dynamic framework, it will also require consideration of the degree to which potential offenders anticipate and discount future consequences of crime and non-crime. There is a vast literature outside of economics that documents the present orientation of criminals. For reviews see Jolliffe and Farrington (2009) and Wilson and Herrnstein (1985). This raises difficult issues of how best to model this present orientation in the context of the rational calculator that typifies economic models. For an extended discussion of these issues see Durlauf and Nagin (2011b).

Empirical testing of the model will require longitudinal data. The specific form of the data that will be required will, of course, depend on the specific form the model that is

developed. Two promising publically available data set are the National Longitudinal Survey of Youth that collects considerable crime related data. A disadvantage of this data source is that because it samples the general population, it includes few serious criminals. Another possible data source is from the Pathways to Desistance project (Mulvey 2011) which as already indicated is composed of a sample of youth with felony criminal records. This data source has extraordinarily rich crime-related data.

## 7.2 Measuring perceptions of sanction regimes

A sanction regime defines the sanctions that are legally available for the punishment of various types of crime and the way that legal authority is actually administered. Depending on the crime and characteristics of the offenders, such as age or prior record, available sanctions range in severity from verbal reprimand to fines and different forms of community service to lengthy terms of imprisonment and execution. The way that the legal authority is actually administered determines the relative frequency that the available sanction options are used and also the swiftness of their application. Thus, both dimensions of the sanction regime—the legal authority for different types of sanctions and the way that authority is administered—combine to determine the certainty, severity, and celerity of sanctions options available for punishment of a specific type of crime.

A major theoretical and empirical gap involves how active criminals and people on the margin of criminality perceive the sanction regime. Deterrence is the behavioral response to perceptions of sanction threats. Establishing the linkage between risk perceptions and actual sanction regimes is imperative. Unless perceptions adjust, however crudely, to changes in the sanction regime, the desired deterrent effect will not be achieved. The Bayesian updating research and the survey evidence showing better knowledge of sanctions among active offenders suggests

that there is a linkage. However, many fundamental questions remain unanswered. Among these are: (1) Sanction regimes are multifaceted, their administration is complex, and data measuring that administration has many gaps and are not widely publicized. The aforementioned report on the deterrent effect of the death penalty (NRC 2012) discusses this problem in detail, particularly as it relates to the assumption of many economic studies of the death penalty that subjective perceptions of risk correspond to objective risk. The report observes that this assumption “hardly seems credible.” (p. 106). Thus, the question is: how are sanction regimes actually perceived? (2) There is much evidence that most criminals do not specialize —burglars also tend to commit robberies, engage in other types of violence and deal drugs. Each of these specific crimes has its own sanction regime. It seems unlikely criminals have well formed perceptions of the sanction regimes for specific crimes. How then do they form their subjective perceptions over the types of crimes that they actually commit or are on the margin of committing? (3) How do perceptions of the sanction regime evolve over time as function of own experience, the experience of peers, and information from other sources such as the media?

The death penalty report goes on to lay out a research program for assembling data on sanction regime perceptions not only for murder but other serious crimes. I summarize the program here. Readers should refer to the report and associated references for detail.

The essential task is to measure the perceptions of sanctions risks that potential criminals actually hold. How might this be done? Researchers have developed considerable experience measuring beliefs probabilistically in broad population surveys. Manski (2004) reviews the history in several disciplines, describes the emergence of the modern literature, summarizes applications, and discusses open issues. Among the major U.S. platforms for collection of such data are the Health and Retirement Study which has periodically elicited probabilistic



expectations of retirement, bequests, and mortality from multiple cohorts of older Americans, the Survey of Economic Expectations which has asked repeated population cross sections to state the percent chance that they will lose their jobs, have health insurance, or be victims of crime in the year ahead, and the National Longitudinal Survey of Youth 1997 which has periodically asked young people about the chance that they will become a parent, be arrested, or complete schooling.

However, success in measuring beliefs probabilistically within the general public does not imply that survey research could similarly measure the sanction risk perceptions of potential criminals. A major issue for studies of this type is obtaining data from the relevant population, in this case, the population of potential criminals. Theoretically, most adolescents and adults are physically capable of committing a serious crime. The reality, however, is that the probability of most people doing so is so small that as a practical matter it can be treated as zero.

Thus, the first step and an important prerequisite for a program of research on sanction risk perceptions is to define the relevant population of potential criminals. Such a definition will be required to devise cost-effective sampling strategies for interviewing people with nontrivial risks of committing crimes. We expect that one important segment of the relevant population is people with criminal records. The correlation between past and future offending is among the best documented empirical regularities in criminology (NRC 1986).

Some may question the feasibility of collecting data on the sanction risk perceptions and criminal behavior of individuals with prior histories of serious crimes, especially if subjects are repeatedly interviewed for the purpose of obtaining longitudinal data. Longitudinal data are useful to study how offending experience and external events, such as police crackdowns or policy changes, affect sanction risk perceptions. However, as already noted the Pathways to

Desistance Project demonstrates that, with sufficient diligence, it is feasible to collect longitudinal data on highly crime-prone people.

### 7.3 Developing and testing a theory of criminal opportunities

At the outset of this essay I pointed out that the certainty of punishment is determined by the product of conditional probabilities corresponding to stages of the criminal justice system—probability apprehension, probability conviction given apprehension, and so. In turn, the levels of these probabilities are determined by the decisions and effectiveness of various actors in the criminal justice system and statutory and legal requirements.

One such set of actors who are especially important in affecting certainty are the police through their influence on the probability of apprehension, which I previously denoted by  $p_a$ . For several reasons  $p_a$  is probably the most important of the certainty related probabilities in the deterrence process. First, absent apprehension, the process leading to sanction cannot be initiated. Second, conditional on apprehension for a serious crime the probability of sanction is high. Sixty-eight percent of felony prosecutions result in conviction and imposition of some type of sanction, usually incarceration (BJS 2006). Third, as discussed in the theory section, the informal sanction costs triggered by arrest are likely a major contributor to total sanction cost. Fourth, the well documented present orientation of most criminals likely makes their perception of  $p_a$  a salient factor in their decision calculus.

In the discussion of the deterrent effect of police, I indicated that police could affect  $p_a$  in two distinct ways. One was through their effectiveness in apprehending criminals after they had committed crimes. The other was by their effectiveness in deterring crime from happening in the first place by tactics such as hot spots policing. In Nagin (forthcoming)), I describe police in

the former role as apprehension agents and the latter role as sentinels. Also in Nagin (forthcoming), as here, I concluded that the evidence suggests that the deterrent effect of the police stemmed primarily from their role as sentinels.

This brings me to the concept of a criminal opportunity. In criminology there is a large literature devoted to the subject of situational crime prevention. For a good review see Clarke (1995). This literature has a decidedly practical orientation—it focuses on ways to make potential targets of crime, whether people, objects, or places, more difficult to successfully victimize. Approaches to reducing vulnerability include installation of alarm systems, improved lighting, surveillance systems, fencing, and electronic tagging of property. It also includes human surveillance in the form of community watch groups and security guards. Cohen and Felson (1979) describe human surveillance as “guardianship.” The police in their role as sentinels also act as guardians—a liquor store with a police car idling outside is not an attractive criminal target.

A useful metric for measuring the desirability of a criminal opportunity from the would-be offender’s perspective is  $p_a$ . Viewed from this perspective  $p_a$  is not a homogenous quantity; it clearly depends on characteristics of the target and level of its protection-- $p_a$  equals 1 for anyone foolish enough to try to rob the President of the United States and is close to zero for a robbery of a feeble elderly person in a deserted location. Figure 1 shows a hypothetical distribution of criminal opportunities which is depicted as leftward skewed. Assume that in this population of opportunities the expected gain from victimization and expected punishment conditional on apprehension is constant. Also, assume that would-be offenders have homogeneous preferences. Let  $p^*$  denote the maximum probability of apprehension for an acceptable target. Under these assumptions only opportunities where  $p_a < p^*$  would be victimized. Interesting questions that

might be addressed under this set up include: How can this model of target choice be imbedded into a Beckerian-type model of the decision to engage in crime? How does policing, as well as other situational crime prevention tactics, shift this distribution? How do such shifts affect the crime rate and the probability of apprehension for targets that are victimized? How do changes in other aspects of target attractiveness such as expected sanction if apprehended affect crime rates and how can the sizes of these effects be compared with changes in the distribution of  $p_a$ ? How can a model of this sort be empirically calibrated? Answers to all of these questions should be high priority research topics.

#### 7.4 Estimating the deterrent effect of shorter prison sentences and identification of high-deterrence policies

In the introduction I pointed out that crime prevention by incapacitation necessarily requires higher imprisonment rates and all the attendant social costs. By contrast, if crime can be deterred from occurring in the first place, there is no perpetrator to punish. As a consequence crime prevention by deterrence does not necessarily involve a trade-off between crime rates and imprisonment rates (Durlauf and Nagin 2011a). It is thus important for crime control policy to identify policies that on the margin have large incremental deterrent effects not only because of their crime prevention benefits but also because they may reduce imprisonment rates.

I preface the remainder of this discussion with an important caveat from Durlauf and Nagin (2011a) concerning identification of high-deterrence sanction policies. Ultimately, a criminal justice policy, assuming it passes a priori justice considerations, should be judged on whether its benefits exceed its costs, including broad social conceptions of the costs of imprisonment. Policies with small or no deterrent effects might pass a benefit–cost test even

though they increase prison population. Likewise, high-deterrence policies that are costly to implement might fail the benefit–cost test even though they reduce prison populations. Still, in terms of policy evaluation, the message that these theoretical conditions are meant to convey is that high-deterrence policies are, other things being equal, more desirable than low-deterrence policies and that in principle no logical requirement exists that lower crime means higher imprisonment. The latter is important because of widespread concerns about the social costs of mass incarceration. So, in conjunction with the evaluation of policy effects on crime and imprisonment, clear delineation is needed of the overall costs of the policy.

In Durlauf and Nagin (2011a) we express skepticism that there are large numbers of policies involving increases in sentence length that produce substantial deterrent effects. The one exception may involve short prison sentences. The fine payment experiment conducted by Weisburd et al. (2008) and the Project Hope experiment make it clear that the imminent threat of incarceration is a powerful incentive for paying delinquent fines or for conforming with conditions of probation even for populations who have not been deterred previously by the threat of punishment. These experiments suggest that there is a concave relationship between the magnitude of deterrent effects and sentence lengths. Sentence lengths in Western European countries tend to be far shorter than in the United States. For example, more than 90% of sentences in the Netherlands are less than 1 year (Nieuwebeerta, Nagin et al. 2009). Research based in European data on the deterrent effect of shorter sentence length should be a priority.

In Durlauf and Nagin (2011a) we also express optimism that viable police deployment strategies based on the sentinel role of policing hold promise for having large deterrent effects. Specifically, we speculate that strategies that result in large and visible shifts in apprehension risk are the most likely to have deterrent effects that are large enough to reduce imprisonment as

well. Hot spots policing might have this characteristic. More generally, the types of problem oriented policing strategies described and championed by Kennedy (2009) and by Kleiman (2009) have the common feature of targeting enforcement resources on selected high-crime people or places. Also, the multimodal approach to preventing crime among high-risk groups that combines deterrent and reintegration tactics described in Papachristos et al. (2007) is a creative example of a “carrot-and-stick” approach to crime prevention. Although the effectiveness of these strategies for focusing police and other criminal justice resources has yet to be demonstrated, priority attention should be given to their continued evaluation, particularly as they relate to the “carrot” component of the intervention. The effectiveness of positive incentives is an understudied topic.

## 6. CLOSING COMMENT

The aim of this essay was to provide a non-economist’s perspective to economists on important findings about the deterrent effect of legal sanctions and on fruitful research opportunities. In my view, research on deterrence in criminology and economics has been too insular and that each discipline would benefit from a better understanding of the perspectives and findings from the other discipline. In this essay I attempted to inform economists about relevant research from criminology. Nagin (forthcoming) attempts to do the reverse intellectual cross pollination. (Owens 2009), (Canela-Cacho, Blumstein et al. 1997; Useem and Piehl 2008)

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