

# Imprisonment and crime

## Can both be reduced?

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Since 1972, the rate of incarceration in U.S. state and federal prisons has increased every year without exception from a rate of 96 prisoners per 100,000 population in 1972 to 504 prisoners per 100,000 in 2008 (BJS, 2008).<sup>1</sup> Counting those housed in jails, the nation's total incarceration rate has surpassed 750 per 100,000 (Liptak, 2008). Accompanying the 40-year increase in imprisonment has been a companion growth in corrections budgets from \$9 billion in 1982 to \$69 billion in 2006, which is a 660% increase (BJS, 2008).

Much research has been done on the effect of this increase in incarceration on crime rates as well as on the social and economic costs of the ensuing fivefold increase in the nation's imprisonment rate. The point of departure for this article is the recognition that sanction policies that reduce both crime and punishment have the desirable feature of avoiding not only the costs of crime but also the costs of administering punishment. As a theoretical matter, this observation is certainly not new and was recognized at least as long ago as Becker (1968). Of course, the policy question is whether, relative to the status quo, alternative policies exist that can achieve these simultaneous effects. In this article, we argue that it is a realistic possibility that crime, prison costs, and imprisonment numbers can be

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1. Incarceration rates in state prisons declined slightly in 2009, but increased incarceration in federal prisons resulted in a small increase in the combined state and federal incarceration rates (Pew Center for the States, 2010).

reduced simultaneously if policy makers shift their focus from a primary reliance on severity-based policies, mandating lengthy prison terms, to a focus on a more effective use of police to make the risks of crime clearer and the consequences of crime faster and more certain.

We make no claim about the novelty of our overall policy contention that, given the set of sanctions in place in the current criminal justice system, a simultaneous improvement is possible. In many ways, our position echoes claims advanced in two recent books, Mark Kleiman's (2009) *When Brute Force Fails: How to Have Less Crime and Less Punishment* and David Kennedy's (2009) *Deterrence and Crime Prevention: Reconsidering the Prospect of Sanction*. Aspects of our position also might be found in the commentaries of authors such as Clear (2007), Doob and Webster (2003), Garland (2001), Irwin (2005), Tonry (2004), Useem and Phiel (2008), and Western (2007). Our hope is that the particular framing of the arguments we provide will provide an impetus for a reorientation away from the severity-oriented, crime-prevention strategies that have prevailed for the last 40 years toward more certainty-oriented, crime-prevention strategies.

The evidentiary bases for our conclusion are taken from recent reviews of the empirical studies on deterrence conducted by the authors and colleagues.<sup>2</sup> These reviews led us to the following broad empirical conclusions that inform our policy views:

1. The marginal deterrent effect of increasing already lengthy prison sentences is modest at best.
2. Increasing the visibility of the police by hiring more officers and by allocating existing officers in ways that heighten the perceived risk of apprehension consistently seem to have substantial marginal deterrent effects.
3. The experience of imprisonment compared with non-custodial sanctions such as probation, sometimes called specific deterrence, does not seem to prevent reoffending. Instead, the evidence suggests the possibility of a criminogenic effect from imprisonment.

Together, these conclusions have a range of policy implications; most important, they call into general question the efficiency of current sanction policies and point in directions along which these policies should be changed.

This article is organized as follows: In the next section, we discuss the conceptual framework for the determination of criminal behavior that explains why, theoretically, crime can be reduced without an increase in the resource commitment to the criminal justice system. The theoretical possibility of a cost-free reduction derives from a shift toward certainty-based as opposed to severity-based sanction policies. We also argue that for a sanction policy to reduce both imprisonment and crime simultaneously, it must deter in addition to incapacitate would-be criminals. Thus, the possibility of deterrence is crucial to the goal of reducing prison populations without incurring higher crime rates. The next

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2. Our conclusions derive from Durlauf and Nagin (in press), Apel and Nagin (2009), as well as Nagin, Cullen, and Jonson (in press); this article will rely especially heavily on Durlauf and Nagin.

section reviews and critiques the empirical evidence on the deterrent effect of severity-based and certainty-based sanction policies. Policy and research recommendations are discussed in the last section.

At the outset, we note two important restrictions to the scope of this article. First, we restrict our attention to changes in sanction policy that have the potential to reduce both imprisonment and crime. Imprisonment and crime might be reduced by making greater investments in non-sanction-related policies. For example, evidence is mounting regarding the effectiveness of early childhood development programs in reducing criminality (Heckman, Malofeeva, Pinto, and Savalyev, 2010; Piquero, Farrington, Welsh, Tremblay, and Jennings, 2009).<sup>3</sup> We restrict our attention to sanction policies, in part, because non-sanction-related policy alternatives have received considerable attention elsewhere. Even more important, we think it valuable to consider the restricted question of whether the current level of investment in the criminal justice system is allocated most effectively among its various components. As we observe in the Policy Implications and Future Research section of this article, the mechanics of shifting resources from imprisonment to policing is institutionally difficult because the former is primarily a state and federal function and the latter is primarily a local government function. Notwithstanding, both functions are understood by policy makers, mostly elected officials, to be components of an integrated system to control crime and punish criminal wrongdoing. Shifting resources from the criminal justice system to other activities such as education or early childhood development in our judgment would pose far more daunting institutional and political challenges to justify to policy makers. We, thus, restrict our attention to the issue of reallocation of resources within the criminal justice system.

Second, we note that our analysis does not address incapacitation effects, which constitute a logically independent way of reducing crime from deterrence. We recognize that the possibility that incapacitation effects are large represents a potential challenge to our objective of reducing crime and imprisonment, and we will return to this point in the Policy Implications and Future Research section.

### **Key Concepts**

Discourse about deterrence often takes the form of one side, with one side, mostly, but not always, economists arguing that sanction threats always deter and the other side, mostly, but not always, criminologists arguing that sanction threats never deter. Based on our assessment of the existing evidence, it would be unwise for criminologists to ignore that deterrence should be part of any coherent crime-control policy. However, when deterrence effects are

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3. Borghans, Duckworth, Heckman, and ter Weel (2008) provided a recent survey of the state of knowledge of the development of cognitive and non-cognitive skills. An important theme of recent research is the relative manipulability of non-cognitive skills such as self-control, which has obvious implications for criminal behavior.

unpacked, it is clear that sanction threats are not universally efficacious as magnitudes of the deterrent effects range from none to seemingly very large.

In this section, we discuss possible reasons why substantial heterogeneity persists in the size of deterrent effects and the implications of such heterogeneity for sanction policy. In particular, we discuss the conceptual basis for our claim that it is possible for changes in current sanction policy to reduce both crime and imprisonment. To this end, we make three related points.

First, levels of deterrence always depend on the interplay of the certainty and severity of punishment. Thus, it is meaningless to say that one is more important than the other in determining the strength of deterrence or the level of the crime rate. However, it is meaningful to consider the relative magnitude of the deterrent effects of certainty and severity resulting from changes in their status quo levels and, therefore, to make claims about their relative importance at the margin.

Second, a sanction policy that reduces crime solely by incapacitation necessarily will increase the rate of imprisonment. In contrast, if the policy also prevents crime by deterrence, then it is possible that it will be successful in reducing both imprisonment and crime. Hence, the rejection of deterrence as a crime-reduction mechanism implicitly can constitute a reason for mass incarceration.

Third, if the experience of imprisonment is criminogenic, then an added benefit of sanction policies that reduce both crime and imprisonment is that it likely averts reoffending attributable to the possible criminogenic effects of the prison experience. Although these criminogenic effects have yet to be documented with much precision, their possible existence reinforces our general policy recommendation.

### *The Interplay of Certainty and Severity in Producing Deterrence*

The theory of deterrence is predicated on the idea that a sanction regime, by affecting the relative anticipated costs and benefits of a crime, can lead at least some members of a population to choose not to commit crime. Sanction regimes, from this perspective, simply raise the anticipated costs of criminal activity. As such, one of the key concepts of deterrence is the severity of punishment. In the context of this article, severity refers to sentence length, which we denote by  $L$ . Severity alone does not deter; the likelihood of a punishment's imposition also matters to the criminal choice. The offender first must be apprehended, presumably by the police. He next must be charged, prosecuted successfully, and finally sentenced by the judiciary. None of these successive stages in processing through the criminal justice system is certain. Thus, another key concept in deterrence theory is the certainty of punishment, which we denote by  $p$ . In this regard, the most important set of actors are the police; absent detection and apprehension, conviction or punishment is not possible. For this reason, we discuss separately what is known about the deterrent effect of police.

In its simplest form, the economic model of deterrence theorizes that would-be offenders compare the expected utility under the choice of committing a crime with the expected utility of not committing a crime. These types of calculations cannot be reduced to the sum of a function of  $p$  and a function of  $L$ ; the two terms interact in determining the expected costs and benefits of a crime. Durlauf and Nagin (in press) provided formal algebraic descriptions of this interaction,<sup>4</sup> but the basic intuition is evident when one considers that no level of severity will deter when no prospect of actual punishment is present (i.e.,  $p = 0$ ) just as certain punishment (i.e.,  $p = 1$ ) will not deter without severity (i.e.,  $L = 0$ ).

Moving beyond these extreme, and admittedly fanciful, cases, the interaction of certainty and severity in producing deterrence has a basic implication for the arguments that we will advance here; the deterrent effect of a change in  $p$  will depend on the level of  $L$ , and conversely, the deterrent effect of a change in  $L$  will depend on the level of  $p$ . Thus, even though we make reference throughout this article to the deterrent effects of certainty and severity, it is important to understand that these references concern incremental changes from the status quo levels in  $p$  and  $L$ , namely incremental changes in  $p$  at prevailing levels of  $L$  or, alternatively, incremental changes in  $L$  at prevailing levels of  $p$ . Because certainty and severity interact, it does not follow that incremental changes in  $p$  (at prevailing levels of  $L$ ) and incremental changes in  $L$  (at prevailing levels of  $p$ ) always will be equally effective in generating deterrence. In Durlauf and Nagin (in press), we discussed in detail the reasons why the magnitude of deterrent effects depend upon the interaction of certainty and severity and why certainty and severity effects themselves might be heterogeneous because of heterogeneity in individual characteristics and in criminal opportunities.

As will be described in the next section, the empirical support for the deterrent effect of certainty is far stronger than for severity. Several theoretical explanations suggest why this finding should not be regarded as surprising. Prison sentences necessarily are experienced over time and with delay from the time of the criminal act. Both might contribute to the dearth of strong evidence of a severity effect. In economics, the concept of discounting is used to explain why future consequences might be given less weight than present consequences.<sup>5</sup> Criminals might have higher discount rates than the typical member of the population. Indeed, much psychological and criminological research documenting the present orientation of criminal offenders (Jolliffe and Farrington, 2009; Moffitt,

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4. One easy way to see the interaction is to consider the expected utility of committing a crime. Assume that the utility of committing a crime and not being apprehended is the same as being apprehended and given a sentence of length 0. Assume that apprehension means that a sentence of length  $L$  is received with certainty. The expected utility of a criminal can be written as  $pU_C(L) + (1 - p)U_C(0)$ , where  $U_C(\cdot)$  denotes the utility of a crime as a function of sentence length. It is immediate that certainty and severity interact as is shown the fact that  $p$  is multiplied by  $U_C(L)$  in the expected utility calculation.
  5. See Polinsky and Shavell (1999) for a formal analysis of the importance of discounting in determining the effects of changes in sanction severity.

1993; White et al. 1994; Wilson and Herrnstein, 1985) strongly supports this possibility. Furthermore, present orientation might cause would-be offenders to be far more attentive to cues related to the likelihood of apprehension than to the future punishment they will receive in the event of apprehension. For example, would-be offenders might be affected little by the prospect of a 50% increase in sentence length from, for example, 10 to 15 years but might be affected greatly by a 50% increase in apprehension probability from, for example, .2 to .3 even though each policy means that a given crime is associated with the same expected number of years of time served. Also, as discussed in Durlauf and Nagin (in press), other factors that might result in differential deterrent effects of certainty and severity are cognitive biases resulting in the overweighting of small (and large) probabilities; perhaps paradoxically, these biases operate in a way that might render subjective beliefs about the probability of apprehension sensitive to the actual probabilities.

### *The Interrelationship of the Crime and Imprisonment Rates*

Our emphasis on deterrence stems from our interest in identifying policies that can reduce imprisonment and crime rates simultaneously. An essential feature of this perspective is that the imprisonment rate and crime rates are treated as joint outcomes of sanction policies determining certainty and severity of punishment. One implication of this perspective is that the imprisonment rate should not be regarded as a policy variable per se but should be treated appropriately as an outcome of sanction policies determining who goes to prison and for how long.

Blumstein and Nagin (1978) examined the relationship of imprisonment and crime rates in the context of a model that allowed for both incapacitation and deterrent effects. Two critical findings of their analysis were that, in the absence of deterrent effects, a logically necessary trade-off takes place between imprisonment and crime rates and that the presence of a deterrent effect is a necessary condition for the possibility that a change in sanction policy could reduce crime and imprisonment rates simultaneously. The intuition for this conclusion is straightforward; crimes averted by incapacitation necessarily require the incarceration of the individuals who otherwise would be committing crimes outside the prison walls. However, if deterrent effects are present, then heightened sanction risks, when perceived as credible, can result in both lower crime rates and lower imprisonment rates. Again the intuition is straightforward; deterred crimes mean that no one can be punished for them.

That said, the presence of deterrence effects does not guarantee the existence of such policies. What are the technical requirements for a change in sanction policy to reduce both imprisonment and crime? The concept of an elasticity from economics can be used to characterize what is needed. An elasticity measures the absolute value of the percentage change in some outcome variables with respect to a 1% change in another variable, holding other variables constant. Formally, suppose that the crime rate  $C$  is functionally dependent on certainty and severity (i.e.,  $C(p, L)$ ). Let  $e_p$  and  $e_L$  denote the elasticities of the crime rate

with respect to  $p$  and  $L$ , respectively. The Blumstein and Nagin (1978) analysis demonstrated that a 1% increase in either  $p$  or  $L$  will induce a sufficiently large reduction in the crime rate to reduce the imprisonment rate also if the respective elasticity of the crime rate with respect to the policy variable is greater than 1. Conversely, if the magnitude of either elasticity is less than 1, then the decline in the crime rate associated with an increase in that sanction policy variable will not be sufficiently large to avert an increase in the imprisonment rate. In turn, Blumstein and Nagin showed that, for either  $e_p$  or  $e_L$  to exceed 1, a deterrent effect must be present. The intuition for this result has been stated already; crime prevention by incapacitation necessarily requires the incarceration of an individual who otherwise would be criminally active. Technically, this concept ensures that  $e_p$  and  $e_L$  must be less than 1. However, if deterrent effects are present, then crime reduction does not necessarily require the actual incarceration of individuals who otherwise would be committing crimes. This outcome makes for the possibility of simultaneously having both less crime and less imprisonment. We will illustrate this possibility in a later section with a numerical example.

Although we have treated  $p$  as a policy variable, it is important to recognize that its role with respect to the criminal decision process can be complicated. For criminal decisions, what matters is the subjective probability a potential criminal assigns to apprehension (i.e.,  $p^e$ ). This subjective probability can be affected by the police in various ways. Most obvious, presumably a relationship exists between the subjective belief  $p^e$  and the objective probability  $p$ . Conventional notions of rationality, at least in economics, impose the restriction that  $p^e = p$ , but increased objective certainty of punishment will induce deterrence so long as  $p^e$  is an increasing function of  $p$ . This can happen through several channels. The experience of capture might cause the apprehended offender to revise upward his estimate of apprehension risk and thereby deter him from future crime. Indeed, Anwar and Loughran (2009), Hjalmarsson (2009), Horney and Marshall (1992), and Lochner (2007) found evidence that such risk updating seems to occur. Furthermore, other criminals might gain new information about the risk of apprehension from the apprehension experience of criminal compatriots, but the limited research on such indirect experiential effects suggests that they are small (Lochner, 2007).<sup>6</sup> Announcements of changes in police expenditures and the like can lead directly to upward adjustments of the probability of punishment. So, even if one rejects the economist's notion of rationality when modeling how crime choices are made, the policy variable  $p$  still matters.

Our emphasis on crime and imprisonment rates as joint outcomes of the sanction regime also has the implication that the clearance rate for crimes (i.e., the percentage of actual perpetrators of crimes who are apprehended) is an incomplete signal of the certainty

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6. The presence of indirect experiential effects from enforcement might be context specific. Many European countries require television owners to pay a licensing fee. Electronic means are used to detect non-compliers. Rincke and Traxler (in press) found substantial evidence of enforcement spillover effects whereby enforcement action against an identified non-complier seems to increase compliance rates in nearby households.

of punishment posed by the police because it does not incorporate the probability of apprehension and, hence, the punishment that existed for criminal opportunities that were not acted on because the perceived risk of apprehension was deemed too high (Cook, 1979). For example, a would-be robber of a liquor store is unlikely to carry out the robbery if an occupied police car is parked outside. More generally, would-be offenders might be deterred from committing a crime even if the apprehension risk is less than certain but is still judged to be too high because of the overall presence of police or other threats of apprehension. We emphasize the distinction between the probability of punishment for targets that were acted on and the probability of punishment attending targets that were not acted on because the latter are an example of the way a deterrence-based mechanism can prevent crime without actually having to apprehend a perpetrator of a crime to demonstrate the “price of crime.”

This observation serves as a point of departure for illustrating with a concrete, albeit stylized, example of how a deterrence-based policy with an elasticity greater than 1 might reduce both crime and imprisonment. Assume that each individual has a probability of 50% of facing a criminal opportunity. Suppose that in this stylized world would-be criminals will take advantage of all criminal opportunities with a risk of apprehension less than 35% and that two types of criminal opportunities exist—good opportunities from the criminal’s perspective that have a risk of apprehension of 10% and marginal opportunities with a risk of apprehension of 30%. The latter are described as marginal because their attendant risk of apprehension is only just less than the 35% threshold of acceptability. Suppose also that 75% of criminal opportunities are marginal and that 25% are good. In this world, all criminal opportunities are exercised, so the crime rate is 50%. The clearance rate, which is the apprehension rate for crimes actually perpetrated, is 25% ( $25\% = 25\% \times 10\% + 75\% \times 30\%$ ). The imprisonment rate is 12.5% ( $12.5\% = 50\% \times 25\%$ ).

Suppose now that a new police chief introduces innovations in policing (e.g., problem-oriented policing [POP]) that increase the risk of apprehension at both good and marginal opportunities by 50%—from 10% to 15% for the good opportunities and from 30% to 45% at what previously had been marginal opportunities. We use the past tense to describe the marginal opportunities because they would no longer be taken advantage of because their risk of apprehension now exceeds the 35% apprehension risk maximum that criminals will tolerate.

This policing innovation will have the following distinct effects: First, by deterring criminals from taking advantage of what previously had been marginally favorable targets, the crime rate will be reduced from 50% to 12.5%. Second, by limiting criminal activity to the good opportunities, the clearance rate declines from 25% to 15% even though the police, in fact, have become 50% more effective in producing a threat of apprehension. Third, and most important for our purposes here, fewer actual apprehensions will occur not only because of the decline in the rate of apprehension at the criminal targets that actually are acted on (i.e., the good targets) but also because of the 50% decline in the crime rate; together, these two reductions combine to reduce the imprisonment rate under the new



regime to 1.875%. We emphasize that the reduction in prison population is not attributable to the ineffectiveness of the police. To the contrary, their increased effectiveness in deterring crime in the first place decreased the flow of captured criminals into the criminal justice system. This hypothetical case thus illustrates how a policy change, in theory, can reduce crime and imprisonment rates simultaneously.

Do policies with elasticities greater than 1 exist? The following section will assess the empirical evidence on severity and certainty, whereas the last section derives policy conclusions from the empirical literature. Our final section will advance the claim that although evidentiary support does not exist that any particular policy is associated with an elasticity greater than 1, one can identify high and low elasticity policies with confidence. The most likely candidates for policies with high elasticity policies involve the use of police to increase the risk of apprehension, which in turn increases  $p$ , whereas it seems that the elasticities with respect to severity are low. However, this result is not the end of the story. These two findings suggest that a change in the current sanction regime toward one with higher certainty and lower severity when combined can reduce both crime and imprisonment even if the certainty policy has an elasticity less than 1; all that is required is that the certainty policy have a larger elasticity than the severity policy.<sup>7</sup> It is for this reason that we believe the answer to our title question is a tentative “yes.”

#### *Potentially Criminogenic Effect of the Experience of Imprisonment*

Our discussion so far has accepted the conventional wisdom that increases in either  $p$  or  $L$  will decrease the crime rate. The third argument that we make is that good reasons exist to believe that this is not always the case.

In criminology, the term *general deterrence* is used to describe the behavioral response to the threat of punishment, whereas the term *specific deterrence* is used to describe the behavioral response to the experience of punishment. Because the mechanisms underlying general and specific deterrence are conceptually distinct, no inherent contradiction persists in one being operative and the other not. Indeed, as an empirical matter, this might be the case. Evidence of general deterrent effects is strong, whereas little evidence is found of specific deterrent effects. In fact, if anything, the evidence suggests that the experience of imprisonment might have a criminogenic rather than a specific deterrent effect.

The logic of specific deterrence is grounded in the idea that if the experience of imprisonment is sufficiently distasteful, then some of the punished might conclude that it is an experience not to be repeated. The structure of the law itself also might cause previously convicted individuals to revise upward their estimates of the likelihood and severity of punishment for future law breaking. The criminal law commonly prescribes more severe penalties for recidivists. For example, sentencing guidelines routinely dictate longer prison

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7. Note that we are not arguing that the change meets a cost–benefit test because we do not address the relative costs of severity and certainty policies.

sentences for individuals with prior convictions. Prosecutors also might be more likely to prosecute individuals with criminal histories. Additionally, the experience of punishment might affect the likelihood of future crime by decreasing the attractiveness of crime itself or by expanding alternatives to crime. While imprisoned, the individual might benefit from educational or vocational training that increases postrelease non-criminal income-earning opportunities (MacKenzie, 2002). Other types of rehabilitation are designed to increase the capacity for self-restraint when confronted with situations, like a confrontation, that might provoke a criminal act such as violence (Cullen, 2002).

However, several reasons exist 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. Although some individuals might conclude that 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 induced by imprisonment. Prisons might be "schools for crime" where inmates learn new crime skills even as their non-crime human capital depreciates. Associating with other more experienced inmates could lead new inmates to adopt the older inmate's deviant value systems or enable them to learn "the tricks of the trade" (Hawkins, 1976; Steffensmeier and Ulmer, 2005). Being punished also might elevate an offender's feelings of resentment against society (Sherman, 1993) or might strengthen the offender's deviant identity (Matsueda, 1992).

The experience of imprisonment also might increase future criminality by stigmatizing the individual socially and economically. Much of the evidence shows that an important part of the deterrent effect of legal sanctions stems from the expected societal reactions set off by the imposition of legal sanctions (Nagin and Paternoster, 1994; Nagin and Pogarsky, 2003; Williams and Hawkins, 1986). Prior research has found that individuals who have higher stakes in conformity are more reluctant to offend when they risk being exposed publicly (Klepper and Nagin, 1989a). Although the fear of arrest and stigmatization might deter potential offenders from breaking the law, those that have suffered legal sanctions might find that conventional developmental routes are blocked. In their work on the 500 Boston delinquents initially studied by Glueck and Glueck (1950), Sampson and Laub (1993) called attention to the role of legal sanctions in what they called the process of cumulative disadvantage. Official labeling through legal sanctions might cause an offender to become marginalized from conventionally structured opportunities, which in turn increases the likelihood of subsequent offending (Bernburg and Krohn, 2003). Sampson and Laub (1993) proposed that legal sanctions might amplify a "snowball" effect that increasingly "mortgages" the offender's future by reducing conventional opportunities. Several empirical studies support the theory that legal sanctions downgrade conventional attainment (Freeman, 1996; Nagin and Waldfogel, 1995, 1998; Sampson and Laub, 1993; Waldfogel, 1994; Western, 2002; Western, Kling, and Weiman, 2001) and increase future offending (Bernburg and Krohn, 2003; Hagan and Palloni, 1990).

A recent review of the literature on imprisonment and reoffending by Nagin et al. (in press) concluded that on balance the research findings pointed more to a criminogenic effect than to a preventive effect. Specifically, most studies find higher recidivism rates among individuals receiving custodial sentences regardless of sentence length than among individuals receiving non-custodial sentences even with extensive statistical controls for potentially confounding factors. They also report that evidence on the relationship between sentence length and recidivism is mixed. If the fact of imprisonment as opposed to the length of imprisonment is the relevant source of higher recidivism, then this fact would suggest an even more radical policy change than we propose, namely that criminal sanctions other than imprisonment should be used. We do not pursue this line of argument here.

From a theoretical perspective, the potentially criminogenic effect of the experience of imprisonment might serve as an additional deterrent to sufficiently farsighted would-be criminals. Although the large body of evidence on the present orientation of offenders leaves us skeptical that on the margin this additional source of deterrence is large, the point still stands that if the prison experience is criminogenic when deterrence fails, then ex-prisoners will be more, not less, crime prone because of their prison experience. Thus, sanction policies that reduce both crime and imprisonment might have the added benefit of averting the potentially criminogenic influence of the experience of imprisonment.

It is important to emphasize that the existing literature suggesting a criminogenic effect to prison is far from decisive. The literature has yet to be subjected to the sort of careful identification analysis that one observes, for example, in the study of social interaction effects. Blume, Brock, Durlauf, and Ioannides (2010) provided an extensive discussion of identification problems in social interactions; we believe it is fair to say that the literature on peer effects in prisons, for example, generally has not been subjected to a rigorous evaluation of the conditions studied by Blume et al., which can produce spurious evidence of social influences. Hence, our claim is that criminogenic effects are theoretically plausible and are consistent with several empirical studies.

## **Empirics**

In this section, we discuss the evidentiary support for our claims, focusing on the more recent literature that largely began emerging in the 1990s.<sup>8</sup> We consider this literature in two stages. First, we consider aggregate regressions studies. These studies come in two forms. One form examines the relationship between aggregate imprisonment rates and aggregate crime rates, and the other form examines the relationship between crime rates and aggregate

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8. The first wave of deterrence research that involved a substantial number of studies was conducted in the 1960s and 1970s. These studies suffered from numerous statistical flaws that are detailed in Blumstein, Cohen, and Nagin (1978). In our judgment, these flaws are so serious that this wave of research does not contain any empirical findings that might be used for formulating policy.

measures of police level, measured, for example, by per capita public expenditures on police. The level of aggregation for the imprisonment and crime studies is typically states, whereas the level of aggregation for police and crime studies is usually cities. We conclude that studies of the relationship of imprisonment rates to crime rates are deeply flawed for both statistical and theoretical reasons. Our conclusion about the usefulness of the aggregate regression literature on policing is less negative but still circumspect. We then consider studies that examine the deterrent effect of specific policies or interventions. It is this literature that most influenced our policy claims. Readers who are not interested in the technical reasons for our reservations about the aggregate regression studies might wish to move directly to the section titled Severity-Enhancing Policies.

### *Aggregate Imprisonment and Crime Studies*

A large literature exists that studies the relationship between aggregate imprisonment and crime rates. To provide a general assessment, we follow a recent important review by Donohue (2009: Table 9.1) that identifies six major published journal articles that examine the relationship between aggregate crime rates and imprisonment rates. Each of these studies finds a statistically significant negative association between imprisonment rates and crime rates, and each has been interpreted as implying that higher imprisonment rates result in lower crime rates. These studies would seem to represent a *prima facie* case against our view that it is possible to reduce imprisonment and crime simultaneously.

In fact, these studies should not be interpreted this way. A detailed critique of these studies appears in Durlauf and Nagin (in press); here, we highlight the main problems.

The first and perhaps most important problem with aggregate incarceration/imprisonment studies is that they fail to evaluate how alternative policies jointly affect crime and imprisonment. As such, the studies are not policy relevant. These studies generally ignore three points emphasized in the previous section. The first is that the prison population is an outcome of the overall sanction policy; the population is not a policy variable *per se*. Changes in the size of prison populations only can be achieved by changing policies that we have summarized through the certainty of punishment  $p$  and the severity of punishment  $L$ . Second, in choice-based theories of criminal behavior, the deterrence response to policy changes affecting either  $p$  or  $L$  generally will not be uniform and, instead, will depend on, among a range of factors, the current values of these variables. This heterogeneity in deterrent effects forms the basis for a third point emphasized in the previous section: A logically necessary inverse relationship does not exist between the imprisonment rate and the crime rate. Depending on the magnitude of the deterrence response evoked by a sanction policy, a declining crime rate might be associated with either a declining or an increasing imprisonment rate. Together, these three points illustrate the general idea that aggregate crime rate and aggregate imprisonment rates are equilibrium outcomes, so their relationship will depend on the way that the individual and the institutional factors that determine outcomes on an individual level aggregate across a population.

The exception to our broad claim that imprisonment/crime regressions are not policy relevant is Levitt (1996), which is the one aggregate crime/imprisonment study in Donohue's (2009) survey with a methodological approach that we endorse. This study is based on studying the effects of court orders requiring reductions in prison populations as an instrument, reasoning that such orders will cause a reduction in the imprisonment rate that is unrelated to the endogeneity of the imprisonment rate. He found that a prisoner reduction precipitated by a court order can lead to a short-term increase in the crime rate. Levitt's analysis, however, speaks to a different policy question than ours, namely the effect of court orders. In Durlauf and Nagin (in press), we discussed why his findings are not informative about the effect on the crime and imprisonment rates of a change in the certainty and severity of sanctions.

A second general problem with the imprisonment and crime literature follows from our argument that each is an equilibrium outcome, namely that the existing literature does not admit a causal interpretation between the variables under study. As discussed in the section titled *The Interrelationship of the Crime and Imprisonment Rates*, crime rates affect imprisonment rates even as imprisonment rates might be affecting crime rates. Statistically disentangling cause-and-effect relationships in this setting is challenging, and these studies suffer from basic limitations in establishing causal claims. One problem in many of these studies is the confusion of the word *causality* as is understood in an econometric sense (and involves the marginal predictive value of one variable with respect to another) with the "causality" in a substantive social-science sense, which involves manipulations of one variable in the context of a model of behavior. Four of the six analyses studied by Donohue (2009)<sup>9</sup> are based on the application of time-series analyses that in essence look for dynamic correlations between the levels of crime rates and imprisonment rates (or for changes in the two series). Any claim that these correlations imply a counterfactual-based causal relationship between imprisonment rates and crime rates has been recognized for a long time to be invalid. The fact that levels or changes in one variable help to predict additional levels or changes in another variable does not imply causality as the term is understood in social science. One obvious reason is that a third factor might be influencing each. A less obvious issue, known as the Lucas critique in economics (see Ljungqvist, 2008 for an introduction), is that the dynamic equilibrium statistical relationships between variables such as incarceration rates and crime rates are a function of the "structural" determinants of the sanction regime, such as the menu of potential penalties for a given crime, the rules by which police resources are employed, and so on.

The problem of spurious claims of causality from correlation also apply to Levitt (1996) and Spelman (2005), which are the two studies in Donohue's (2009) survey that

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9. The studies are Marvell and Moody (1994), Becsi (1999), Spelman (2000), and Liedka et al. (2006). Spelman (2008) is the state of the art in time-series analyses of imprisonment and crime. Although the study explores important issues of model specification, it also suffers from the criticisms we have made.

use instrumental variable analysis to address simultaneity bias. With respect to Levitt (1996), Liedka et al. (2006) argued that prison-overcrowding litigation is a function of the incarceration rate; hence, both could move positively as a result of a common factor. In Durlauf and Nagin (in press), we questioned whether this critique is particularly compelling in the absence of information on the political economy of overcrowding litigation. Spelman (2005), focusing on counties in Texas, regressed changes in county-specific crime rates against changes in public order, arrest and incarceration rates, and some set of controls. The arrest and incarceration rates then are instrumented using lagged values of variables such as police resources, republican voting, and jail capacity. No explanation is given as to why these instruments are valid (i.e., why they should not appear in the original crime regression). This issue is not an idle quibble. The error in a crime rate/incarceration rate regression is made up of every crime determinant that is omitted from the regression, which includes unmodeled dependence in the crime rate process. Republican voting, for example, is informative about values, which presumably directly affect individual crime choices. Instrumental variables are difficult to justify in a crime regression in which the determinants of crime are undertheorized. We consider the problem of reverse causality more serious for Spelman than for Levitt because Levitt uses such a narrowly defined instrument so that it is easier to think about its determinants (and so make a case for validity) as opposed to the ad hoc collection of instruments found in Spelman.

Third, basic statistical problems are found in these studies. Each study employs linear functional forms that do not represent aggregations of individual decisions except under special cases (see Durlauf, Navarro, and Rivers, 2008, in press, for discussion). These studies also fail to evaluate systematically the effects of assumptions about model specification on their findings. As delineated in Durlauf and Nagin (in press), these assumptions include the choice of which control variables to include in the crime model and the choice of the degree of parameter heterogeneity that is allowed across geographic units. These choices are known to matter in other contexts. These issues are examples of the problem of model uncertainty; the qualitative questions that one wishes to study, such as the imprisonment/crime relationship, do not provide guidance on the statistical model to employ. This reason is well known as to why different articles come to opposing conclusions using the same data set.

### *Aggregate Studies of Crime Rates and Police Levels*

The companion literature to the imprisonment and crime literature examines the relationship between resources committed to policing and crime rates. Studies include Corman and Mocan (2000), Evans and Owens (2007), Levitt (1997, 2002), Marvell and Moody (1994), as well as McCrary (2002). With the exception of McCrary (2002), these studies consistently found evidence that larger resource commitments to policing are associated with lower crime rates. Even for this exception, Levitt (2002) effectively argued that McCrary's findings did not overturn Levitt's general claim of police effectiveness.

The aggregate policing and imprisonment literatures share common features. Both rely on panel data sets tracking crime rates in heterogeneous locations over time—states for the imprisonment literature and cities for the police literature. Both also use similar econometric methods. As such, these studies are subject to many of the same criticisms that we have raised for incarceration and crime regressions. At the same time, the import of our criticisms is less severe in some respects. Unlike the imprisonment regressions, all studies reviewed in Durlauf and Nagin (in press) that employ aggregate police regressions address the following meaningful policy question: Does the level of resource commitment to policing affect crime rates?<sup>10</sup> Changes in the number of police or expenditures on police is subject to policy choice in a way that the imprisonment rate is not. Furthermore, Granger causality receives less emphasis in the police regressions literature than in the imprisonment literature, so although Marvell and Moody (1994) explicitly used Granger causality notions, whereas Corman and Mocan (2000) did so implicitly, neither Levitt (1997, 2002) nor Evans and Owens (2007) fell into the misinterpretation of marginal time-series predictive power as evidence of causality in a counterfactual sense. Read in isolation, our conclusion is that the evidentiary strength of aggregate police/crime studies is limited by inadequate attention to model uncertainty and to aggregation but not by asking an ill-posed question.

This criticism is far less damning than the absence of a well-posed policy question, which in our view places the imprisonment/crime literature in a different class than the police/crime literature. Given the statistical problems and the absence of a well-posed policy question that plague aggregate imprisonment/crime regressions, the statistical limitations of aggregate police/crime studies, and the nonexistence of any aggregate severity/crime studies, the evidentiary support for our general policy claims necessarily is limited if one is restricted to these studies. Simply put, the most favorable interpretation of the aggregate regression evidence is that some reason exists to believe that increased policing reduces crime. But this, by itself, does not imply that a shift from severity to certainty will be efficient. Fortunately, direct and strong evidence with respect to severity and certainty effects can be found in targeted studies of particular policy changes, which we describe in the next section.

### *Severity-Enhancing Policies*

Surprisingly few studies use specific policy changes to evaluate the deterrent effect of changes in severity. The earliest post-1970s attempts to measure severity effects analyzed the deterrent impact of sentence enhancement for gun crimes. A series of studies (Loftin, Heumann, and McDowell, 1983; Loftin and McDowell, 1981, 1984) examined whether sentence enhancements for gun use in committing another type of crime such as robbery

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10. To be fair, the way in which police resources are employed (e.g., more police vs. higher salaries) might be determined by the crime rate, political economy, and so on so that the comparison of particular measures of police activity are not necessarily strictly exogenous policy interventions; hence, the difference between aggregate police/crime regressions and aggregate imprisonment/crime regressions is not as black and white as we have described. We thank Richard Rosenfeld for raising this point.

deter gun use in the commission of crime. Although the findings are mixed, this body of research generally has failed to uncover evidence of a deterrent effect (but see McDowall, Loftin, and Wiersema, 1992).<sup>11</sup> One important caveat is found with respect to extrapolating these studies to understanding the link between deterrence and severity. The same literature that found that gun penalty enhancements were ineffective also found that these laws generally failed to increase the sentences actually received in gun-related crime prosecutions. Thus, gun-using criminals might not have responded because the real incentives were not changed.

Numerous studies have examined the deterrent effect of California's "Three Strikes and You're Out" law, which mandated a minimum sentence of 25 years after conviction for a third strike-eligible offense. Zimring, Hawkings, and Kamin (2001) concluded that the law reduced the felony crime rate by at most 2%, finding that only those individuals with two strike-eligible offenses showed any indication of reduced offending. Other studies by Stolzenberg and D'Alessio (1997) and by Greenwood and Hawken (2002) also examined before-and-after trends and found similarly little evidence of crime-prevention effects. These studies did not conduct a cost-benefit analysis of the trade-off between the benefits of this crime reduction and the attendant increases, which limits the policy relevance of their findings because the notion of a small effect is not compared with the cost of the policy.

In our judgment, the most persuasive study of the three strikes law is by Helland and Tabarrok (2007), who studied both the effects of the law on crime as well as assessed its cost effectiveness. This analysis focuses exclusively on whether the law deterred offending among individuals previously convicted of strike-eligible offenses. Helland and Tabarrok compared the future offending of individuals convicted of two previous strike-eligible offenses with that of individuals who had been convicted of only one strike-eligible offense but who, in addition, had been tried for a second strike-eligible offense and ultimately were convicted of a non-strike-eligible offense. The study demonstrated that these two groups of individuals were comparable on many characteristics such as age, race, and time in prison. Even so, it found that arrest rates were approximately 20% lower for the group with convictions for two strike-eligible offenses. The authors attributed this reduction to the greatly enhanced sentence that would have accompanied conviction for a third strike-eligible offense.

As is standard in studies of this type, the interpretation of the findings in terms of the marginal deterrence effects of the three strikes law is contingent on the comparability of two

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11. McDowall et al. (1992) combined data from the different locations they had studied previously for evidence of a deterrent effect of sentence enhancements. Although none of the individual site analyses produced evidence of a deterrent effect, the combined analysis did. For several reasons, we are skeptical of the combined analysis. First, it is vulnerable to many criticisms we have leveled at aggregate regression analyses. Second, their finding that at the individual sites the laws were ineffective in increasing sentence length suggests that the null findings at the individual sites were not a result of a lack of statistical power that might be remedied by combining data across sites. Third, the approaches taken to combining the studies contain numerous ad hoc assumptions that raise separate concerns about whether their findings are robust.



groups who are under study. Some reasons are available as to why unobserved individual differences might be present; for example, those individuals who were convicted of a second non-strike-eligible offense might have had better legal representation than those that were convicted of a second strike-eligible offense. In such a case, the incentives for additional crime commission might differ for reasons outside the penalty differential. Another reason for non-comparability might be that those convicted of a non-strike-eligible offense are simply better criminals than those convicted of a strike-eligible offense in the sense that they are better able to generate alibis, avoid leaving evidence, and so on. Our own view is that the concerns raised by these potential sources of unobserved heterogeneity are sufficiently speculative that we find the Helland and Tabarrok (2007) results persuasive. Helland and Tabarrok also conducted a cost-benefit analysis and concluded that the crime-reduction benefits likely fall far short of the aggregate cost of the increase in imprisonment induced by the law. They go on to argue that a financially comparable investment in policing that primarily affects the certainty of punishment are likely to yield far larger crime-reduction benefits. We return to this observation in the following discussion.<sup>12</sup>

Other sentence enhancement policies also have been examined to uncover possible deterrence effects. Kessler and Levitt (1999) examined the deterrent impact of another California sentence enhancement law—Proposition 8 passed in 1982. Proposition 8 anticipates the “three strikes” laws passed by many states in the 1990s. Their aim was to distinguish the deterrent effects from the incapacitation effects. Most state criminal statutes provide for a sentence enhancement for repeat offenders. Proposition 8 increased the severity and scope of those enhancements and mandated their application. For example, before Proposition 8, sentence enhancements pertained to persons with prior imprisonments, whereas after Proposition 8, enhancements were widened to pertain to prior convictions and were lengthened. Kessler and Levitt (1999) argued that before the enactment of Proposition 8, repeat offenders covered by the Proposition still were sentenced to prison, just not for as long. Thus, any short-term drop in crime rate should be attributed to deterrence rather than to incapacitation. They estimated a 4% decline in crime attributable to deterrence in the first year after enactment. Within 5 to 7 years, the effect grew to a 20% reduction. The longer term estimate includes incapacitation effects. Indeed, Kessler and Levitt acknowledged that the incapacitation effect might dominate the deterrent effect.

Webster, Doob, and Zimring (2006) challenged the basic finding of any preventive effects. Kessler and Levitt (1999) examined data from every other year. When all annual data are used, Webster et al. (2006) found that the decline in crime rates in the affected categories began before Proposition 8's enactment, and the slope of this trend remained

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12. Shepherd (2002) also found crime-prevention effects for California's three strikes law, mostly from a reduction in burglaries. The aim of the analysis was to estimate the total deterrent effect of the law as reflected in the article's title: “Fear of the First Strike. . .” The validity of the findings are difficult to judge because the statistical analysis rests on many questionable assumptions (e.g., that police and court expenditures are independent of the crime rate).

constant through implementation. But see Levitt (2006) for a response and commentary supportive of Webster et al. by Raphael (2006). Our assessment of the debate is that the evidence in Kessler and Levitt on deterrence is relatively weak as a result of issues concerning the comparability of the crime series used by Kessler and Levitt to uncover the effect of Proposition 8 via contrasts with the crime series for the Proposition 8 crimes but not for other reasons that have been alleged.<sup>13</sup>

A different class of studies tries to uncover deterrent effects by studying the effects of differences in punishment severity for minors versus adults. For most crimes, the certainty and severity of punishment increase discontinuously after reaching the age of majority when the jurisdictional authority 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) attempted to identify a discontinuous decline in the hazard of offending at age 18—the age of majority in Florida. Their point estimate of the discontinuous change is negative as predicted but is minute in magnitude and not even remotely close to achieving statistical significance. Similarly, Hjalmarsson (2009) found no evidence of reduced offending when juveniles reach the age of majority, but interestingly, the study did find evidence that perceptions of the risk of imprisonment increase.

The finding that the young fail to respond to changes in penalties associated with the age of majority is not uniform across studies. An earlier analysis by Levitt (1998) found a large drop in the offending of young adults after they reached the age of jurisdiction for the adult courts. For several reasons, we judge the null effect finding of Lee and McCrary (2009) more persuasive in terms of understanding deterrence. First, Levitt (1998) focused on differences in age measured at annual frequencies, whereas Lee and McCrary measured age in days or weeks. At annual frequencies, the estimated effect is more likely to reflect both deterrence and incapacitation; hence, Levitt's results might be driven by incapacitation effects rather than by deterrence per se. Second, the Lee and McCrary analysis is based on individual-level data and avoids problems that can result because of aggregation (Durlauf et al., 2008, in press). On its own terms, the individual-level data studied by Lee and McCrary are unusually informative because they also contain information on the exact age

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13. Levitt (2006) responded to Webster et al. (2006) by arguing that they failed to estimate the same model that he analyzed with Kessler. Specifically, Kessler and Levitt (1999) compared changes in crime rates before and after Proposition 8 for crimes affected by the proposition with changes before and after the Proposition in other crime rates in California and compared the Proposition 8-affected crime rates for the same crime rates outside of California. As such, Levitt, in our view, correctly faulted Webster et al. (2006), who focused on changes in the crime rates for the Proposition 8 crimes but not as compared with changes in others, which is the appropriate strategy. However, Raphael (2006) called into question the validity of the comparison groups used by Kessler and Levitt. Webster et al. also raised this issue. In his response, Levitt fairly noted that it is a matter of judgment and questioned whether Webster et al. have shown that it matters in the examples they raise. In our view, Raphael's criticism of comparability, when combined with the Webster et al. versus Levitt exchange, is persuasive in calling into question the Kessler and Levitt conclusions on the effects of Proposition 8.

of arrestees, which allows for the calculation of short-term effects of the discontinuity in sentence severity (e.g., effects within 30 days of turning 18).

In summary, the literature on whether increases in prison sentence length serves as a deterrent is not large, but several persuasive studies do exist. These studies suggest that increases in the severity of punishment have at best only a modest deterrent effect. We reiterate, however, the point emphasized in the section titled *The Interplay of Certainty and Severity in Producing Deterrence* that this conclusion concerns changes in the severity at margin. In this regard, it is important to note that most research on sentence length involve increases in already long sentences. Some evidence suggests that Massachusetts's Bartley–Fox gun law mandating a 1-year prison sentence for unlawful carrying of gun might have been a deterrent (Wellford, Pepper, and Petrie, 2005). Furthermore, we subsequently discuss experiments showing short but certain incarceration deters. We thus see a need for research on the likely non-linear relationship between deterrence and severity. But for our purposes, it seems that the marginal deterrent value of increased sentence length at current levels is small for contexts in which sentences are currently long.

### *Certainty-Based Policies*

Studies of certainty-enhancing policies typically focus on the deterrent effect of the police. Relatively little research is available on the deterrent effect stemming from the certainty of prosecution or sentencing to prison conditional on apprehension. So although much is known about how one of the primary determinants of certainty affects crime via specific policies, the effects of changes in policy with respect to the other primary actors, prosecutors, and judges have yet to be examined.<sup>14</sup>

The police might 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, then crime might be prevented by the incapacitation of the apprehended offender. The apprehension of active offenders also might deter would-be criminals by increasing their perception of the risk of apprehension and thereby the certainty of punishment. Many police tactics such as rapid response to calls for service at crime scenes or after crime investigation are intended not only to capture the offender but also to deter others by projecting a tangible threat of apprehension. However, as emphasized in the section titled *The Interrelationship of the Crime and Imprisonment Rates*, police might deter without actually apprehending criminals because their presence projects a threat of apprehension if a crime were to be committed.

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14. Several studies conducted in the 1970s examined the deterrent effect of conviction risk, usually measured by the ratio of convictions to charges (Avio and Clark, 1974; Carr-Hill and Stern, 1973; Sjoquist, 1973). These studies suffered several important methodological limitations; most importantly, they all treated conviction risk as exogenous.

Some of the most compelling evidence of deterrence because of police involves instances in which a complete or near-complete collapse of police presence occurs. In September 1944, German soldiers occupying Denmark arrested the entire Danish police force. According to Andeneas (1974), crime rates rose immediately but not uniformly. The frequency of street crimes like robbery, whose control depends heavily on visible police presence, rose sharply. By contrast, crimes such as fraud were less affected. See Sherman and Eck (2002) for other examples of crime increases after a collapse of police presence.

From a policy perspective, the important question is not whether the complete or near-complete absence of police will result in a large crime increase. Instead, what is interesting and important is whether marginal changes in police presence or different approaches to mobilizing police can affect crimes rates. Research on the marginal deterrent effect of specific police policies has taken two distinct directions. One set of studies examines the effects of abrupt changes in police presence. A second research program has focused on the crime-prevention effectiveness of different strategies for deploying police. We review these literatures separately.

Several targeted studies have involved changes in police presence as a result of local political and social conditions. 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 increases (decreases) in police presence and activity substantially decrease (increase) crime. By way of example, Shi (2009) studied 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 3 days of rioting, heavy media attention, the filing of a class action lawsuit, 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, especially in communities with larger proportional representation of African Americans out of concern for allegations of racial profiling. Shi demonstrated measurable declines in police productivity in the aftermath of the riot and documented a substantial increase in criminal activity. The estimated elasticities of crime to policing based on her approach were  $-.5$  for violent crime and  $-.3$  for property crime.

The ongoing threat of terrorism also has provided several 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, and Witt, 2008). The Klick and Tabarrok (2005) study examined the effect on crime of the color-coded alert system devised by the U.S. Department of Homeland Security in the aftermath of the September 11, 2001 terrorist attack to denote the terrorism threat level. The alert system's purpose was to signal federal, state, and local law enforcement agencies to occasions when it might be prudent to divert resources to sensitive locations. Klick and Tabarrok (2005)

is especially interesting because of its use of daily police reports of crime for the period of 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%. Their estimate of the elasticity of total crime to changes in police presence as the alert level rose and fell was  $-0.3$ .

These police manpower studies mainly speak only to the number and allocation of police officers and not to what police officers actually do on the street beyond making arrests. So, in this sense, they are something of a black box. We now turn to the question of how police are used. Much research has examined the crime-prevention effectiveness of alternative strategies for deploying police resources. This research has been conducted mostly by criminologists and sociologists. Among this group of researchers, the preferred research designs are quasi-experiments involving before-and-after studies of the effect of targeted interventions as well as true randomized experiments. The discussion that follows draws heavily on two excellent reviews of this research by Weisburd and Eck (2004) and by Braga (2008). As a preface to this summary, we draw the theoretical link between the police deployment and the certainty and severity of punishment. For the most part, deployment strategies affect the certainty of punishment through its impact on the probability of apprehension. However, notable examples are available in which severity also might be affected.

One way to increase apprehension risk is to employ police in a fashion that increases the probability that an offender is arrested after committing a crime. Studies of the effect of rapid response to calls for service (Kansas City Police Department, 1977; Spelman and Brown, 1981) found no evidence of a crime-prevention effect, but this outcome might be because most calls for service occur well after the crime event with the result that the perpetrator has fled the scene. Thus, it is doubtful that rapid response materially affects apprehension risk. Similarly, because most arrests result from the presence of witnesses or physical evidence, the general view of the criminology literature is that improvements in investigations beyond conventional canvassing for witnesses and collecting on-site physical evidence are not likely to yield material deterrent effects because, again, apprehension risk is not likely to be affected (National Research Council, 2004).

An alternative way to alter police employment after a crime is to change an officer’s discretion as to whether to arrest a wrongdoer. A series of randomized experiments were conducted to test the deterrent effect of rules implementing mandatory arrest for domestic violence. The initial experiment conducted in Minneapolis by Sherman and Berk (1984) found that mandatory arrest rules were effective in reducing domestic violence reoffending. Findings from follow-up replication studies (as part of the so-called Spouse Assault Replication Program, or SARP) were inconsistent. Experiments in two cities found a deterrent effect, but no such effect was found in three other cities (Maxwell, Garner, and Fagan, 2002). Berk, Campbell, Klap, and Western (1992) found that the response to arrest

in the SARP data differed across social background. Higher status individuals seemed to be deterred by arrest, whereas the assaultive behavior of lower status individuals seemed to be elevated. The heterogeneity in responses at both the citywide and the socioeconomic level is important because it illustrates a more general point; the response to sanction threats need not be uniform across or within the populations. Sherman (1993) proposed a theoretical explanation called defiance theory to explain the status-based heterogeneity in response to mandatory arrest. We are not aware of any theoretical explanation of the heterogeneity in cross-city effectiveness.

The second source of deterrence from police activities involves averting crime in the first place. In this circumstance, no apprehension takes place because no offense occurred. Thus, as discussed in the section titled Key Concepts, measures of apprehension risk based only on enforcement actions and crimes that actually occur, such as arrests per reported crime, are seriously incomplete because such measures do not capture the apprehension risk that attends criminal opportunities that were not acted on by potential offenders because the risk was deemed too high.

Cohen and Ludwig (2003) studied an example of a policing tactic deployed by the Pittsburgh Police Department that was designed to avert gun crimes from occurring in the first place. The tactic involved assigning additional police resources to selected high-crime communities within the city. These patrols were relieved from responding to citizen requests for service (911 calls) to work proactively to search for illegally carried guns. Police contacts were initiated mainly through traffic stops and “stop-and-talk” activities with pedestrians in public areas. Carrying open alcohol containers in public and traffic violations were frequent reasons for initiating contact. These targeted patrols were directed to two of Pittsburgh’s five police zones that had unusually high crime rates. Cohen and Ludwig found that this heightened enforcement activity was associated with significant declines in shots fired and assault-related gunshot injuries.

Two other examples of police deployment strategies that have been shown to be effective in averting crime in the first place are “hot spots” policing and POP. Weisburd and Eck (2004) proposed a two-dimensional taxonomy of policing strategies. One dimension is “level of focus,” and the other is “diversity of focus.” Level of focus represents the degree to which police activities are targeted. Targeting can occur in a variety of ways, but Weisburd and Eck gave special attention to policing strategies that target police resources in small geographic areas (e.g., blocks or specific addresses) that have high levels of criminal activity—so-called crime hot spots.

The idea of hot spots policing stems from a striking empirical regularity uncovered by Sherman, Gartin, and Buerger (1989). Sherman et al. found that only 3% of addresses and intersections (“places,” as they were called) in Minneapolis produced 50% of all calls to the police. Weisburd and Green (1995) found that 20% of all disorder crime and 14% of crimes against persons in Jersey City, New Jersey, originated from 56 drug crime hot spots. In a later study in Seattle, Washington, Weisburd and Eck (2004) reported that between 4% and 5%

of street segments in the city accounted for 50% of crime incidents for each year during a 14-year period. Other more recent studies finding comparable crime concentrations include Brantingham and Brantingham (1999), Eck, Gersh, and Taylor (2000), as well as Roncek (2000). Just like in the liquor store example, the rationale for concentrating police in crime hot spots is to create a prohibitively high risk of apprehension and thereby to deter crime at the hot spot in the first place.

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 with hot spots in the control group. Declines in total crime calls ranged from 6% to 13%. In another randomized experiment, Weisburd and Green (1995) found that hot spots policing was similarly effective in suppressing drug markets, and Weisburd et al. (2006) found no evidence that hot spots policing simply displaced crime to nearby locations.

Braga's (2008) informative review of hot spots policing summarized the findings from nine experimental or quasi-experimental evaluations. The studies were conducted in five large U.S. cities and in one suburb of Australia. Crime-incident reports and citizen calls for service were used to evaluate impacts in and around the geographic area of the crime hot spot. 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 studies found evidence of significant reductions in crime. Furthermore, 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" (Weisburd et al., 2006: 549) to non-targeted locales. We also note that the findings from the previously described econometric studies of focused police actions (e.g., in response to terror alert level) buttress the conclusion from the hot spots literature that the strategic targeting of police resources can be effective in reducing crime.

The second dimension of the Weisburd and Eck (2004) taxonomy is diversity of approaches. This dimension concerns the variety of approaches that police use to affect public safety. Low diversity is associated with reliance on time-honored law enforcement strategies for affecting the threat of apprehension (e.g., by dramatically increasing police presence). High diversity involves expanding beyond conventional practice to prevent crime. One example of a high-diversity approach is POP, which comes in so many different forms that (like pornography) it is regrettably hard to define, but the essence of POP is devising strategies for increasing the apprehension risk or for reducing criminal opportunities that are tailored to address the crime problem at a specific location (e.g., open-air drug market) or a specific type of activity (e.g., adolescents being victimized coming and going from school).

Weisburd, Telep, Hinkle, and Eck (2010) conducted a review of the POP evaluations and reported overwhelming support for its effectiveness. Although most evaluations are of low quality—little more than before-and-after studies—they identified ten studies with credible designs (i.e., randomized experiments or quasi-experiments with credible control comparisons). Eight of the ten studies reported statistically significant reductions in crime. Koper and Mayo-Wilson (2006) reviewed the evidence on the effectiveness of police crackdowns on illegal gun carrying and reported consistent evidence of the effectiveness of these efforts in reducing gun crime.

These findings are notable for our purposes. First, effect sizes vary considerably across interventions, which is a finding that reinforces our argument that police-related deterrent effects are heterogeneous; they depend on how the police are used and the circumstances in which they are used. A second and related point is that two interventions involved monitoring of probationers to avert probation revocation resulting from reoffending or from a violation of conditions of parole. This highlights the point that the police can be used effectively to deter crime not only at high-risk locations but also among high-risk individuals.

The observation that police can be used to affect the criminality of a high-risk individual brings us to another relevant literature—field interventions in which sanctions are focused specifically on high-risk groups. Like POP tactics, all interventions are multifaceted, but deterrence-based tactics are a core feature of each. In all cases, the deterrence component of the intervention involved an attempt to make sanction risk certain and salient to a selected high-risk group. In our judgment, these interventions deserve special attention because they provide a useful perspective on the promise and uncertainties of such focused deterrence-based interventions.

We begin by summarizing the findings of an underappreciated randomized experiment by Weisburd, Einat, and Kowalski (2008) that tested alternative strategies for incentivizing the payment of court-ordered fines. The most salient finding involves the “miracle of the cells,” namely, that the imminent threat of incarceration is a powerful incentive for paying delinquent fines. The common feature of treatment conditions involving incarceration was a high certainty of imprisonment for failure to pay the fine. However, the fact that Weisburd et al. labeled 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, namely incarceration in this experiment, for it to be a deterrent. The consequences need not be draconian, just sufficiently costly to deter 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), Hawken and Kleiman (2009), and Hawken (2010). 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 violations of conditions of probation. Thus, both the Weisburd et al. (2008) fine experiment and Project Hope show that highly certain punishment can be an effective deterrent to those for whom deterrence previously has been ineffective in averting crime.

The strategy of certain punishment is also a centerpiece of field interventions in Boston, Richmond, and Chicago that are aimed specifically at reducing gun violence. However, unlike Project Hope and the fine-paying experiment, the certain punishment is far more draconian—a lengthy prison sentence. For descriptions of the Boston intervention called Operation Ceasefire, see Kennedy, Braga, Piehl, and Waring (2001); the Richmond intervention called Project Exile, see Raphael and Ludwig (2003); and the Chicago-based intervention, see Papachristos, Meares, and Fagan (2007). A common feature of each intervention was commitment to federal prosecution for gun crimes that, on conviction, allowed for lengthy prison sentences. Notably, concerted efforts also were made to communicate the threat of certain and severe punishment to selected high-risk groups (e.g., members of violent gangs). All interventions claimed to have substantial success in reducing gun crime, but at least for Boston and Richmond, questions have been raised about whether the declines preceded the intervention or were no different than other comparable urban centers (Cook and Ludwig, 2006; Raphael and Ludwig, 2003). These concerns notwithstanding, each of these interventions illustrates the potential for combining elements of both certainty and severity enhancement to generate a targeted deterrent effect. Additional evaluations of the efficacy of this strategy should be a high priority.

Taken as whole, the literature on the preventive effect of policing contains much persuasive evidence that police prevent crime. It also makes clear that the effects of police on crime are heterogeneous. Not all methods for deploying police are comparably effective in reducing crime; indeed some deployment strategies seem to be completely ineffective. Thus, policy recommendations for increasing police resources to prevent crime are incomplete without more elaboration on how they should be used. We are thus sympathetic with the intellectual tradition in the police deployment literature of testing the effectiveness of alternative strategies for using police resources. We return to this observation in the conclusions.

### **Policy Implications and Future Research**

The key empirical conclusions of our literature review are that at prevailing levels of certainty and severity, relatively little reliable evidence of variation in the severity of punishment having a substantial deterrent effect is available and that relatively strong evidence indicates that variation in the certainty of punishment has a large deterrent effect, particularly from the vantage point of specific programs that alter the use of police. In this section, we discuss how to translate these two general findings into policy recommendations. We divide these recommendations into the following categories: general and specific.

With respect to broad conclusions, we believe that it is reasonably clear that lengthy prison sentences particularly in the form of mandatory minimum statutes such as California's three strikes law are difficult to justify on a deterrence-based, crime-prevention basis. They might be justifiable based on either incapacitation benefits or along retributive lines. Although we have not surveyed the evidence on incapacitation, we are skeptical of the incapacitative efficiency of incarcerating aged criminals. The empirical evidence on the negative relationship between crime and age is strong (Farrington, 1986; Hirschi and Gottfredson, 1983). Although we certainly recognize that a subset of the population persists for which incapacitation is appropriate, a crude law such as three strikes does not provide a plausible screening mechanism for identifying these individuals. For the general incarceration of aged criminals to be socially efficient, it must have a deterrent effect on younger criminals, and the theoretical arguments we have made on discounting as well as the evidence we have presented on severity call such a deterrent effect into question. Simply no reliable evidence is available that such an effect is sufficiently large to justify the costs of long prison sentences. Furthermore, we are skeptical that a convincing ethical argument can be advanced for imposing a 25-year or more prison sentence for even a third-strike offense unless it is serious. Thus, we conclude that mandatory minimum statutes requiring lengthy sentences for repeat offenders either be repealed or greatly narrowed in terms of applicable offenses so that the sanction is reserved for repeat offenders who also commit serious crimes involving violence or large property losses. See Tonry (2009) for an extended discussion of this conclusion.

If one takes the total resources devoted to crime prevention as fixed, then our conclusions about the marginal deterrent effects of certainty and severity suggest that crime prevention would be enhanced by shifting resources from imprisonment to policing. In 2006, nationwide expenditures on police and corrections totaled \$168 billion with policing receiving 59% of this total (BJS). Our analysis does not provide specific guidance on how much the police share should be increased, but it is a realistic possibility that even a modest shift in resources away from imprisonment could reduce both crime and imprisonment. This conclusion follows from a shift of resources toward policies that exploit the high values of  $e_p$  and away from policies associated with the low values of  $e_L$ . Another possible candidate beneficiary beside the police for a crime-reducing resource shift are enhanced probation and parole supervision services along the lines of Project Hope. According to a 2009 BJS report by Bonczar and Glaze, for the year 2008, nearly 4.3 million individuals were on probation and more than .8 million were on parole. The failure rates among these individuals were high. Glaze and Bonczar reported that in 2008 approximately 400,000 probationers and 200,000 parolees were admitted to state prisons or local jails for probation/parole violations or for new crimes. Thus, probation and parole monitoring systems that are effective in reducing failure rates potentially could result in large reductions in crimes committed by probationers and parolees and in jail and prison admissions.

However, even such apparently self-evident conclusions might be difficult to translate into a defensible operational plan beyond a strong recommendation against any additional escalation of sentence length for initially high sentences. We mention this because our recommendations leave open many questions about the way the resources should be used in the pursuit of high  $e_p$  policies. In the context of our discussion, a shift of resources toward policing can lead to a range of changes, including more police, better logistics, and so on. The statistical literature on police resources and crime rates provides little guidance on how those resources should be used. Likewise, no demonstration has been given that probation/parole-monitoring systems designed along the lines of Project Hope can be replicated generally in settings outside the small island state of Hawaii. The success of the monitoring system clearly depends on the support and coordinated efforts of judges, parole/probation officers, and the police. The failure of intensive supervision probation to reduce recidivism rates is an object lesson in the difficulties of designing effective probation/parole-monitoring systems (MacKenzie, 2002; Petersilia, 1998)<sup>15</sup> and should lead to circumspection in claiming that Project Hope can be extrapolated to the rest of the United States.

Our caveat on the difficulty of providing general policy advice from the existing literature is no deeper than the recognition that the details of any policy changes that simultaneously reduce sentences and shift the resource savings to policing, probation, and parole supervision matter. The literature on the crime-prevention effects of different strategies for mobilizing the police makes it clear that the way police resources are allocated is of first-order importance. This literature has assembled an impressive body of evidence that the so-called standard model of policing, which involves the non-strategic use of preventive patrols, rapid response to calls for service, and improved investigation methods, is not effective in deterring crime (National Research Council, 2004; Weisburd and Eck, 2004). A range of strategic uses of police (e.g., hot spot policing) have been shown to be effective. Also, certain forms of so-called POP have shown promise. At the same time, substantial heterogeneity in the specific policies that have been studied as well as the substantial heterogeneity is found in the effects of particular policies that the existing research has examined. This finding means that one cannot make a recommendation about the expansion of police resources that is as general as our recommendation that lengthy sentences be reduced and that large changes in penalties at the age of majority are undesirable. We thus close with a discussion of the type of research that in our judgment will be most effective in delineating the details of a policy that will achieve this policy objective.

We preface this discussion with an important caveat concerning our emphasis on identifying high-elasticity sanction policies, particularly those in which  $e > 1$ . Ultimately, a criminal justice policy, assuming it passes a priori justice considerations, should be judged

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15. In addition, the question of the mechanism by which the resources would be transferred has not been addressed. As mentioned, imprisonment is, by and large, a state and federal function, whereas policing is, by and large, a local function.

on whether its benefits exceed its costs, including broad social conceptions of the costs of imprisonment. Policies with elasticities less than 1 might pass a benefit–cost test even though they increase prison population. Likewise, policies with elasticities greater than 1 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-elasticity policies are, other things being equal, more desirable than low-elasticity 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.

We are skeptical that large numbers of  $e_L > 1$  severity policies exist and that many high-elasticity severity policies exist even if this threshold is not met. In contrast, we are optimistic that viable police deployment strategies might produce  $e_p > 1$  and strongly believe that the empirical evidence indicates high-elasticity, certainty-based policies exist. The identification of high-elasticity police deployment strategies thus should be a top priority. Although we know of no research that identifies policing strategies for which  $e_p > 1$ , the paucity of evidence does not imply the nonexistence of such policies. One issue might be research design. Assuming the postapprehension probability of imprisonment remains unchanged, a policing strategy that is effective in reducing both crime and imprisonment will reduce both the per capita crime rate and the per capita arrest rate. Police deployment research routinely measures effectiveness by the former measure but never measures effectiveness by the latter measure. Future research should measure both. Finally, we reiterate a point we made earlier; even if policing strategies with elasticities greater than 1 are scarce, substituting higher elasticity policing strategies for lower elasticity severity policies will reduce both crime and imprisonment.

What types of deployment strategies are good candidates for high-elasticity policies? 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 not only crime but also apprehensions. Hot spots policing might have this characteristic. More generally, the types of POP 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 the “carrot” component of the intervention. Sanction-related interventions do not have to consist entirely of negative incentives. Interventions can include opportunities for job training as in Papachristos et al. (2007) or for reduced monitoring as a reward

for compliance with program requirements in Project Hope. The effectiveness of positive incentives is an understudied topic. Also, as noted, a thorough evaluation of adaptations of the Project Hope program for probation-monitoring settings outside of Hawaii and for parole monitoring should be a similarly high priority.

Research on targeted enforcement tactics also should focus on intangible costs. A heightened police presence might aggravate long-standing grievances of community residents with the police if the tactics involve more aggressive policing tactics such as “stop and frisk” and more generally create tension and suspicion between the police and the residents.<sup>16</sup> Not only are such social costs important in their own right, but over the long term, they might erode any crime-control benefits that the tactics might induce initially. We also note that although little evidence indicates that increased severity is an effective deterrent, the literature is small and mostly focused on severity increments to already lengthy sentences. It is thus important to understand the circumstances better in which severity can be an effective deterrent. As we have noted, the fine payment experiment conducted by Weisburd et al. (2008) and the Project Hope experiment made 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 the sanction need not be draconian to deter proscribed behavior. As we discussed, a non-linear relationship might exist 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 (Nieuwbeerta, Nagin, and Blokland, 2009). Research based in European data on the deterrent effect of shorter sentence length should be a priority.

Another dimension of international research that potentially might be useful involves the identification of countries that have been successful in achieving a low crime rate and a low imprisonment equilibrium based at least in part on the strategic use of policing. Important issues that should be addressed are the ways in which police are used to achieve this equilibrium. Are proactive efforts made to reduce police–citizen frictions when more aggressive tactics are used? To what degree do police attempt to mobilize informal sources of social control within the community to prevent crime?<sup>17</sup>

We have made brief reference to a large literature on sanction risk perceptions. As emphasized in Nagin (1998), deterrent effects ultimately are determined by perceptions of sanction risk and severity. The literature on sanction risk perceptions shows that little correspondence takes place between perceptions and reality. For at least two reasons, this is

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16. See, for example, a recent newspaper account of tensions created by the New York City Police Department’s stop-and-frisk tactics in a high rate neighborhood (Rivera, Baker, and Roberts, 2010).

17. We thank an anonymous reviewer for this suggestion.

not surprising. First, for most people, knowledge of actual sanctions is not relevant because, for moral, social, or economic reasons, they are not even remotely close to the margin of committing crime. Second, sanction risks and severity are not posted like most market prices. Instead, for the criminally inclined, they must be learned from experience or by word of mouth. This is why the work of Lochner (2007), Hjalmarsson (2009), as well as Anwar and Loughran (2009) on Bayesian updating of sanction risk perceptions based on experience with detection and non-detection for crimes committed is so important and should be extended. Likewise, a small body of research examines how criminal opportunity characteristics affect sanction risk perceptions (Klepper and Nagin, 1989a, 1989b). This type of work should focus particularly on how police deployment tactics affect perceptions of apprehension risk. As emphasized in the section titled *The Interrelationship of the Crime and Imprisonment Rates*, the rate at which police apprehend the actual perpetrators of crime is an incomplete signal of the overall risk of apprehension posed by the police because it does not measure the apprehension risk the police pose for criminal opportunities that were not acted on because the perceived risk of apprehension was deemed too high. To understand better the mechanism by which police presence might deter, innovative approaches for how police tactics affect perceptions of apprehension risk are required. Ethnographic research methods might be helpful in doing this research, but the development of quantitative approaches also should be a high priority.

We also recommend additional research on the determinants of criminal decision making. Although much work has been done on the formation of beliefs by criminals, as far as we know, no studies exist of whether criminals or non-criminals near the margin of a criminal choice are described better by nonexpected utility decision making than by the standard expected utility theory. In Durlauf and Nagin (in press), we discussed the relevance of nonexpected utility models to studying deterrence. At the risk of oversimplifying a complex body of work, considerable evidence exists that many individuals tend to overweight small probabilities and underweight large probabilities relative to standard expected utility calculations. Furthermore, this probability weighting follows an inverse S shape, which means that larger changes are found in the weights for large and small probabilities than for others. This finding suggests that an additional candidate explanation for the relatively robust evidence that increases in certainty of punishment lower crime in contexts such as hot spot policing is that such policing tactics are being implemented in a circumstance in which standard policing practice projects only a small probability of apprehension, so although the probability might be overweighted, changes in the probability lead to relatively large changes in behavior. Berns, Capra, Moore, and Noussair (2007) found evidence of this type of behavior in an experiment in which the “rewards” were electric shocks, which suggests the relevance of this theory for adverse outcomes (i.e., punishments). These types of findings matter because they suggest that the way in which the probability of apprehension  $p$  affects crime choices might be more complicated than it seems in specifications such as the one described in footnote 3.

Research on the deterrent effect of sentence length and more generally on the effects of changes in sentencing statutes on crime rates and imprisonment rates seriously is hampered by the lack of data on the distribution of sentence lengths and time served by different types of offenders across states. Such evidence is crucial for studying the deterrent and incapacitative effects of prison sanctions and for projecting impacts on crime rates and imprisonment rates of changes in prison sanction policies. Such data can be assembled for selected states from prison census data. Prison census data should be expanded to include all 50 states and should be made available in an easily accessible and manipulable format.

Nagin et al. (in press) lay out key elements of a research program on the effects of the experience of imprisonment on reoffending. These elements include the following: (a) measuring the dose–response relationship between the length of imprisonment and the reoffending rate and between the number of times imprisoned and the reoffending rate; (b) understanding how the experience of punishment affects perceptions of sanction risk; (c) analyzing the mechanisms by which the experience of imprisonment might be criminogenic; and (d) estimating the effect on reoffending of different non-custodial sanctions. This program also should be an integral part of an overall policy-oriented research program of sanction effects on crime.<sup>18</sup>

We would add to Nagin et al.'s (in press) list two additional elements. First, policy research should be more sensitive to heterogeneity and move away from the idea that policy effects are constant across jurisdictions. Although one can name many studies that relax homogeneity assumptions, we believe this relaxation should be the norm. Evidence that a given policy is efficacious in one jurisdiction but not in another is not a mark against the policy. Rather, such evidence means that local context matters for policy efficacy. In our judgment, research should identify a portfolio of policies that have been demonstrated to be effective in well-defined sets of circumstances. The local actors in the criminal justice system possess information not available at a more aggregated level; this information should be exploited in the choices of particular policies because they will have superior information on local context. This outcome raises a second additional point. In our view, a neglected area of policy evaluation concerns the incentives of local actors such as the police and prosecutors under alternative criminal sanction policies. In other words, the design of sanction policies needs to ensure that the incentives of the police and others are such that they act in a way to maximize policy effectiveness. For example, the evidence amassed in Loftin et al. (1983) and Loftin and McDowell (1981, 1984) that sentence add-ons for gun use did not seem to

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18. One example of the relevance of this sanction experience research agenda for the policy conclusions of this article is that if the potentially criminogenic effects of imprisonment are mostly a result of sentence length, then this finding would reinforce our arguments for shorter sentences. However, if it is mostly a result of stigma, not sentence length, then this finding would call into question a policy of short but certain sentences. At this time, the empirical evidence is not sufficient to distinguish each of these two plausible alternative explanations for criminogenic effects.

increase sentence lengths suggests that judges and prosecutors for some reason were resistant to their application.

A final area where more research is needed concerns the sanction effect we have not addressed—incapacitation. As we have emphasized repeatedly, deterrence effects are necessary for it to be possible for a sanction policy to reduce both crime and punishment. This conclusion, however, does not imply that crime prevention by incapacitation does not have a role to play in crime-control policy. Furthermore, incapacitation, if strong enough, can lead to policy changes that reduce crime at the cost of greater imprisonment and so work against the spirit of our argument.

However, the fact that incapacitation might be appropriate for some criminals does not mean that imprisonment needs to be nearly so widespread as it is. An efficient use of incapacitation requires the technical capacity for prospectively identifying high-rate offenders based on legally defensible characteristics. We believe that the mass incarceration found in contemporary America is mixing prisoners with different sensitivities to deterrence, in particular, and with different crime proclivities, in general; hence, incapacitation can go hand in hand with a reduction of crime and imprisonment via an effective use of deterrence. Justice also requires that the identification technology not produce unacceptably large numbers of false positives. The incapacitation of false-positive, high-rate offenders not only wastes prison resources but also is a source of social injustice. To our knowledge, no proven technology exists for the *ex ante* identification of high-rate offenders with acceptable false-positive rates. However, this does not mean that such a technical capacity might not be feasible; recent work by Berk, Sherman, Barnes, Kurtz, and Ahlman (2009) is an example of efforts to use sophisticated statistical methods to achieve accurate predictions. Thus, we also recommend that more research be done on developing this prediction capacity. In addition, effective incapacitation policies will involve fairly intricate considerations of the sentencing structure so that sentence lengths efficiently use information on recidivism probabilities. It is not clear that such subtlety can be made operational. Nevertheless, we emphasize that any policy adjustments designed to reduce crime and imprisonment via deterrent effects should account for possible incapacitation effects. We believe these effects are implausible in the context of long sentences. But we could imagine that incapacitation might undermine a deterrent-based argument to reduce sentences for young offenders.

Although sound empirical evidence must be a core element of a crime-control policy based on science, policy cannot be based on empirical evidence alone. It also must be based on sound theory because, just as in medicine in which evidence on treatment effectiveness cannot cover all medical contingencies, evidence on sanction effectiveness cannot cover all crime contingencies related to sanction policy. Physicians must make judgments about treatment recommendations based both on evidence and on their theoretical knowledge of the functioning of the human body. Similarly, crime-control policy as it relates to criminal sanctions and the deployment of the criminal justice system (CJS) must combine discrete pieces of empirical evidence with theory on the response to the sanction threats



created by the CJS. To this end, in Durlauf and Nagin (in press), we laid out several proposals for generalizing the economic model of crime to account for psychological and sociological aspects of criminal behavior. Thus, we urge the reverse of this form of disciplinary generalization for noneconomic models of crime, namely that they incorporate aspects of the choice-based focus of the economic model.

Implementation of our policy and research recommendations poses significant institutional challenges. One concerns devising a system for transferring resources from corrections, which is primarily a state-level function, to policing, which is primarily a local-level function. Although states routinely make state-to-local-level transfers for other functions such as education, transportation, and community development, a transfer from corrections to policing poses some special challenges. In most states, variations in crime rates across local police jurisdiction are large. Thus, devising a politically feasible mechanism for transferring resources to the highest need locales likely will be difficult. A related problem is devising a mechanism for monitoring the use of the transfers to ensure that resources are used effectively to reduce crime. Designing such a system of monitoring is difficult both because of the large gaps in knowledge about what constitutes effective use and the importance of honoring local independence.

A second institutional challenge concerns research infrastructure. The research agenda that we outline is ambitious and will require the type of sustained and substantial resource commitment that only the federal government can provide. The National Institutes of Health are the model we have in mind for the way this research program should be administered. The obvious candidate for taking on this responsibility is the National Institute of Justice (NIJ). However, for the NIJ to manage such a research program effectively along the lines of an NIH institute, it is incumbent that it adopt the reforms outlined in the recently released National Research Council report *Strengthening Scientific Research and Development at the National Institute of Justice*. We, thus, lend our full support to the report's recommendations.<sup>19</sup>

Finally, we emphasize the importance of recognizing the limits to knowledge faced by policy makers. To some degree, gaps in empirical knowledge can be filled by more complete theory. However, even with better theory, substantial and irreducible empirical uncertainties will remain. In our judgment, far too many proposals for crime amelioration take a single study as their basis or use a subset of studies from a broader literature. Instead, we believe that policy recommendations should be based on cumulative evidence from statistically and scientifically sound research and should place particular value on evidence of the effectiveness of specific crime-control treatments. This emphasis has a strong analogy to the medical literature in which evidence of the efficacy of a particular drug regimen or a specific preventive measure is of the highest value. We also would conjecture that more

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19. In the interest of full disclosure, one of the authors (Nagin) was a member of the National Research Council committee responsible for this report.

attention should be paid to the effects of policies on particular types of crimes. Again, in the spirit of the medical analogy, policies that are effective for one type of crime might have little effect on others. For example, hot spots policing is unlikely to be effective in reducing crimes such as domestic violence or other crimes that generally occur in non-public places (most homicides occur outdoors). Our argument is that just as in medicine in which a portfolio of treatments is required to address a heterogeneous range of diseases, a well-designed crime-control policy requires a portfolio of crime-control treatments to address diversity in the type of crimes and in the people who commit them.

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