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BEHAVIORAL CRIMINAL LAW AND ECONOMICS

Richard H. McAdams and Thomas S. Ulen

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Abstract: A behavioral economics literature identifies how behaviorally-derived assumptions affect the economic analysis of criminal law and public law enforcement. We review and extend that literature. Specifically, we consider the effect of cognitive biases, prospect theory, hedonic adaptation, hyperbolic discounting, fairness preferences, and other deviations from standard economic assumptions on the optimal rules for deterring potential offenders and for regulating (or motivating) potential crime victims, legislators, police, prosecutors, judges, and juries.

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INTRODUCTION

The standard theoretical law-and-economics account of criminal behavior begins from the observation that potential criminals are rational decisionmakers. Becker (1969). The theory assumes that potential criminals compare the expected costs and benefits of criminal activity, where the expected benefits include the anticipated monetary and nonmonetary returns to the crime, discounted by their probabilities of realization, and the expected costs of the crime, which include formal and informal sanctions (the latter including loss of lawful employment opportunities, social stigma, and guilt), discounted by the probabilities of detection. If the expected benefits exceed the expected costs, then the rational potential criminal commits the crime; otherwise, he or she does not. Moreover, the rational potential criminal compares the expected costs and benefits of criminal activity with those of legitimate activity and rationally allocates her time and other resources between those alternatives so that the marginal net benefit is equated.¹

Similarly, the standard law-and-economics account of other participants in the criminal justice system—police, judges, prosecutors, defense attorneys, juries, and legislators—also presumes rational decisionmaking. So, the police—both individually and collectively—may choose to allocate their limited resources according to rational calculations about costs and benefits, choosing, for example, between the investigation of detected crimes and prevention of crimes so that the marginal productivity of additional resources devoted to either activity is equal.

Not only has this account received theoretical elaboration and extension, it has also been tested empirically. For a review, see Levitt & Miles (2007). The early empirical literature—that of the 1970s—was often done in alternating turns by those favorably disposed toward the rational-choice-theory account and those critical of that theory. In the late 1970s a panel of the National Academy of Sciences surveyed the empirical literature and reached the conclusion that “deterrence works”—that is, that the predictions of the rational-choice-theory explain observed patterns of criminal behavior.

These theoretical accounts of decisionmaking by criminals and other partici-

¹ Suppose that there is a negative marginal net benefit from legitimate activity from criminal activity and a positive marginal net benefit from criminal activity. The rational potential criminal should shift time and other resources from legitimate to criminal activity until the further reassignment of those resources yields no net gain in total net benefits—that is, until the marginal net benefit of resources used in criminal and legitimate activities is identical.

pants in the criminal justice system have had a profound influence on legal scholarship over the past 40 years and an equally important impact on criminal justice policy. For example, the United States Sentencing Commission, created by Congress in the early 1980s, was charged to rationalize federal criminal sentencing by, among other things, reducing the variability of sentences on the ground that indeterminate sentencing was not as deterring as determinate sentencing. And in the debates to explain the remarkable decline in crime that began in the early 1990s, some have argued that that decline is partly attributable to the deterrence-based policies of the 1980s and 1990s, such as the remarkable increase in the frequency with which criminals have been incarcerated. Levitt (2004).²

But at the same time as these rational-choice-theory-based arguments have become so important, a significant and broad criticism of rational choice theory and of its application to issues of criminal law has been made. That criticism is called “behavioralism.” Importantly, behavioralism is not a *theoretical* criticism of rational choice theory. Rather, it is a criticism based almost entirely on experimental and other empirical studies that find the predictions of rational choice theory to be inaccurate. To illustrate with one example, rational choice theory predicts that in making decisions under uncertainty, decisionmakers accurately ascertain the probabilities of the various alternatives open to them, apply those probabilities to payoffs of the alternatives, and choose that alternative that maximizes their expected subjective utility. But psychologists and economists have discovered that most decisionmakers facing an uncertain set of options use far simpler heuristics to make a decision, such as choosing that alternative that is most “salient.”

The findings of behavioralism have become so thorough and well-established as to make it difficult to begin any analysis of decisionmaking from the position of rational choice theory. This, of course, has profound implications for many areas of law and public policy, including criminal law. Many of the policy changes championed or implemented after the impact of Becker’s revolutionary insight stand or should stand on less firm foundations than had been previously thought to be the case. The central purpose of this chapter is to indicate how some of the central findings of the behavioral literature erode the rational-choice-theoretic foundations of criminal law and policy and to show how a recognition of the behavioral literature might lead to a rethinking of the legal and policy conclusions of the past 30 or so years.

In deciding what topics to consider, we are motivated by two desires—(1) to

² The number of persons incarcerated in jails and prisons in the United States increased from about 500,000 in 1980 to over 2 million by 2002.

give an accurate, positive account of human decisionmaking with respect to matters of criminal law and policy, and (2) to analyze legal and policy instruments in accordance with their ability to minimize the social costs of crime as committed by the real decisionmakers we identify in point (1).

This chapter proceeds as follows. In Section I we briefly summarize behavioral economics, citing some applications to show how those behavioral considerations might affect some standard law-and-economic analyses. Then, in Section II we focus on the behavioral analysis of the decision to commit a crime by an individual in order to show how behavioral considerations amend the standard, rational-choice-theory account. In Section III we extend this behavioral analysis to the decisionmaking of other actors in the criminal justice system (potential victims, prosecutors, judges, and others). Then we conclude and summarize.

I. BACKGROUND ON BEHAVIORAL ECONOMICS

Behavioral economics has its origins in experiments and empirical research addressed at testing the predictions of rational choice theory. The result of those experiments and empirical research is a body of findings that is highly critical of rational choice theory. In this section, we categorize and summarize those findings.³

A. *Deviations from Perfect Rationality*

The gist of the behavioral literature can be conveyed quickly. Rational choice theory holds, generally, that human decisionmakers are close calculators of the costs and benefits of the options open to them; that they do not make mistakes in choosing courses of action or goods and services that might maximize their well-being or profit unless they have been systematically misled. The findings of the behavioral literature are that human beings make *systematic* mistakes in their decisionmaking. These are not randomly distributed mistakes around a predictable and relatively constant mean but clear and persistent deviations away from the predictions of rational choice theory. To foreshadow some examples that we will discuss, human beings seem to attach far more value to the way things are (to the status quo) than we would have expected to have been the case; they are far more optimistic about themselves, their talents, and their prospects for the future than experience or the facts warrant; they rely on readily available evidence rather than

³ We recognize that our background on behavioral economics will be selective and, therefore, incomplete. For a general survey of these and other topics in the behavioral literature, see Korobkin & Ulen (2000).

investigation; they put more credence in evidence that confirms their prior beliefs than in an alternative belief; and they pay closer attention to fixed costs in making current decisions that rational calculation suggests that they should.

Let us consider some examples—overoptimism and the availability heuristic.

There is ample evidence that individuals are overoptimistic when it comes to assessing their own abilities, their prospects, or other matters associated with themselves. See Weinstein (1980); Plous (1993). For instance, researchers have asked those getting a marriage license to estimate the likelihood that their marriage will end in divorce, given that 50 percent of all US marriages end in divorce. Not surprisingly, the mean estimate is zero. Baker & Emory (1993).

Another example of a systematic deviation from the assumptions of rational choice theory is the “availability heuristic.” A “heuristic” is a decision rule; the “availability heuristic” describes the situation in which an actor overestimates the relevance of salient or memorable incidents at the expense of base rates. Tversky & Kahneman (1982: 164) explain: “A person is said to employ the availability heuristic whenever he estimates frequency or probability by the ease with which instances or associations could be brought to mind.” If memorable events are memorable precisely because they are common or representative, then this mental shortcut can often lead to estimates that approximate statistical probabilities. But memorable events can also be memorable for reasons having nothing to do with their general prevalence—for example, because they are vivid, well-publicized, or more prevalent among a particular actor’s friends and acquaintances. Actors often estimate these available events as being much more common than they actually are. For example, most people believe that words beginning with the letter “k” are more prevalent than words in which “k” is the third letter, although the latter set of words is actually twice as large as the former. Tversky & Kahneman (1982: 166-68). Presumably, this is because it is easier to bring to mind words that begin with the letter “k.” than those that have “k” as their third letter (such as “ark” and “ankle”). Similarly, most people believe that homicides and car accidents kill more Americans than diabetes and stomach cancer—presumably because of the greater media coverage provided to the former—although the two diseases kill far more people than do auto accidents.

The point, generally, is that criminals may not use objectively verifiable evidence of frequency and severity, as rational choice theory implicitly assumes that they do. E.g., Wilson & Abrahamse (1992). We explore the specific implications below.

B. *Deviations from Expected Utility Theory*

Rational choice theory has an extension for explaining and predicting decisionmaking under uncertainty: subjective expected utility (SEU) theory. According to that theory, decisionmakers make choices among uncertain courses of action so as to maximize their expected utility. This involves their estimating the probabilities of the various possible outcomes of a course of action, such as success and failure, multiplying each probability times the utility of the outcome, and summing all the possibilities:

$$E(U) = p_1U(O_1) + p_2U(O_2) + \dots + p_nU(O_n),$$

where the p 's sum to 1.

Decisionmakers facing uncertain actual outcome are thought to have three possible attitudes toward risk: (1) risk aversion, (2) risk neutrality, or (3) risk-preferring or seeking. Risk aversion means that the decisionmaker would be willing to pay to avoid assuming a risk; a person with that taste or preference would prefer a certain to an uncertain prospect of equal expected value. Risk neutrality means that the decisionmaker is indifferent to risk: he seeks to maximize expected value. Risk preferring means that the decisionmaker would pay to assume a risk; she prefers an uncertain to a certain prospect of equal expected value.⁴

Compound tastes are possible: a person may be risk-averse at low levels of income or for low-stakes gambles and risk-seeking at high levels of income or for high-stakes gambles. But it is more conventional in SEU theory to assume that a decisionmaker's risk attitude is consistent across different levels of income and size of gambles.

There is, however, ample psychological evidence to suggest that in making decisions under uncertainty, people behave in a manner that is predictable but systematically different from that suggested by SEU theory. Daniel Kahneman and Amos Tversky (1979) proposed an alternative to SEU called "prospect theory" that was consistent with the behavioral evidence. For our purposes, there are two aspects of this theory that are notable. The first is the notion of "framing": how a decisionmaker deals with an uncertain prospect depends not only on the absolute value of the possible outcomes but also on how it is perceived to deviate from a baseline or reference point. Subsequent research has shown that the "frame" with-

⁴ There is also an important connection between a decisionmaker's attitudes toward risk and her marginal utility of income. A risk-averse individual has declining marginal utility of income; a risk-neutral individual has a constant marginal utility of income; and a risk-seeking individual has an increasing marginal utility of income.

in which a decisionmaker operates is fluid and easily manipulable.⁵ See Tversky & Kahneman (1986); Korobkin & Guthrie (1994).

The second is that most people's attitudes toward uncertain gains is different from their attitude toward uncertain losses. In brief, when a decision option is perceived to be a "gain" from a baseline or reference point, people are risk averse, but when a decision option is perceived to be a "loss" from a baseline or reference point, people are risk-seeking. Below, we explain the significance of these findings to criminal law.

C. Hedonic Adaptation and Patterns of Remembering

Within the last two decades a new literature has appeared on the psychology and economics of happiness. See, e.g., Layard (2005); Gilbert (2006); Frey (2008). That literature has highlighted some aspects of decisionmaking that bear upon criminal law and punishment. Particularly, we are referring to literature that finds that humans adapt to changes in their circumstances relatively quickly and make predictable mistakes in recalling affective experiences.

1. Hedonic Adaptation

"Hedonic adaptation" refers to a process in which decisionmakers return to a "set point" of happiness when events push them away from that set point. The notion of a "set point" refers to the default level of happiness that a person has, analogous to the default setting of a thermostat. Just as a thermostat controls the environmental heating and cooling so as to bring the temperature back to the de-

⁵ Kahneman and Tversky illustrated the effects of framing through the "Asian disease" problem. Participants in a study were told that "the US is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people." Two alternative programs have been proposed to deal with the outbreak. Under Program A 200 people will die. Under Program B "there is a one-third possibility that 600 people will be saved, and a two-thirds possibility that no one will be saved." Kahneman and Tversky asked participants in an experiment to choose between A and B. 72 percent preferred A.

The investigators asked a second group of participants to choose between two other programs. Under Program C 400 people will die. Under Program D "there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die." 78 percent of participants preferred Program D.

This change in choice behavior is apparently due to the manner in which the choices were presented or framed because, using the expected value calculus, the choices between A and B and between C and D are functionally the same choices so that those who prefer A to B should prefer C to D.

fault setting, so, too, do the “set point” and hedonic adaptation theories of happiness suggest that we have a “default setting” of happiness to which we return if circumstances push us away from that set point. For example, very happy occurrences increase our happiness levels, but only temporarily. Within a relatively short period of time (a year), that increase will dissipate so that the person returns to their good-fortune level of subjective well-being.

The classic study that established this remarkable pattern appeared in 1978. Brickman, Coates, and Janoff-Bulman (1978) interviewed those who had won lotteries, those who had suffered significant accidental harm (quadriplegia or paraplegia), and a control group and found that all three groups had returned to their pre-experience levels of subjective well-being within a relatively short time. For a review, see Bagenstos & Schlanger (2007: 761-66). That is, those who had won lotteries experienced an increase in well-being but then drifted back down to their pre-winning state of well-being. And those who suffered horrible injuries experienced a significant decline in well-being but then rose back to their pre-accident level of well-being.

The strong implication of this literature is that the episodic circumstances of our lives play a transitory role in our long-term well-being. Our subjective well-being is deeply influenced by whatever factors determine our “set point” of well-being.

There have been many elaborations on the Brickman-Coates-Janoff-Bulman findings since that article appeared. For example, one strand has developed the idea, implicit in the adaptation finding, that human beings do not accurately forecast the things that will make them happy or sad. We are bad at what is referred to as “affective forecasting.” Wilson & Gilbert (2003); Blumenthal (2005). Our beliefs that we would be truly happy if only we could live in California rather than Ohio or that we would be miserable if we had to move from California to Ohio are simply not true. Schkade & Kahneman (1998). In both instances, we adapt back to our set-point level of happiness.

The most recent scholarship on hedonic adaptation – or the “hedonic treadmill”⁶ – has confirmed the basic findings but has added some important nuances. For example, recent experiments suggest that, among other findings, individuals may have multiple set points, that different individuals have different set points, that some individuals alter their set points in response to some life events, and that

⁶ The phrase “hedonic treadmill” refers to an implication of the adaptation finding: in order to rise to higher levels of well-being (or avoid returning to their set point), people must continually engage in ever-bigger or more stimulating consumption or experiences.

different individuals may adapt at different rates and to different extents. Diener, Lucas & Scollon (2006). It appears, to take but one example, that Germans do “not get lasting boosts in happiness from marriage,” and that “widows and widowers, people who were laid off from work, and individuals who divorced all reported long-lasting changes in life satisfaction after these life events.” Diener, Lucas & Scollon (2006: 312).

2. *Patterns of Remembering*

Daniel Kahneman (2000) and others have been exploring the difference between how people experience events as they are occurring and how people remember those same events later. The central conclusion of their work is that there are systematic differences between the actual experience of events and what people remember of them later. In brief, we tend to summarize our remembered experiences by averaging the peak (or bottom) event with what happened at the end during the remembered experience—called by Kahneman the “peak-end rule”—and by ignoring the duration of the experience. We do not remember experiences by recalling the moment-by-moment events and computing a running total of the good and bad aspects of those recollections.

To illustrate, suppose that you have recently gone on a vacation. While you were on vacation, suppose that the weather was delightful; your companions were relaxed and enjoyable; the food was good but not great; and you slept very well. However, on the return journey there was a violent thunderstorm, making the plane flights scarifying, and the airline lost your luggage. Kahneman and his co-investigators suggest that in recalling the vacation, we would average the best day and the unhappy occurrences at the end and ignore the facts that the duration of the apparently good days far outweighed that of the apparently bad homeward experience.

Kahneman first noticed these patterns in asking those who had just been through a colonoscopy to recall their experiences.⁷ He also did a series of brilliant experiments in which the subjects were asked to go through three tests. In the first test, the subject was to hold his hand in a bucket of very cold water until the experimenter instructed him to pull his hand out of the water. During the time that the hand was submerged, the subject was to use a dial calibrated from 1 (the lowest) to 10 (the highest) to indicate how much pain he was experiencing. Unknown to the subject the experiment would allow the immersion to continue for only 60

⁷ One of us can testify that these results would no longer be found because doctors routinely prescribe an amnesiac as a part of the procedure.

seconds. Almost all subjects found that by the end of the experiment the pain was intense. After the conclusion of the experiment, the subjects were allowed to dry and warm their hands.

The second experiment also involved the same subjects' submerging their hands in a bucket of very cold water and recording the pain they were feeling. There were, however, two important differences in the second experiment. First, the submersion was going to last 90 seconds, 30 seconds longer than in the first experiment, and, unknown to the subjects, after exactly 60 seconds the experimenter turned a valve that released slightly warmer water into the bucket. The temperature during the first 60 seconds was just as cold as it had been in the first experiment. But the introduction of the hotter water for the last 30 seconds raised the temperature by 2° C. The researchers found that the peak amount of pain was the same in both experiments and occurred near the end of the first 60 seconds of the experiment.

The third experiment consisted of the subjects' choosing to repeat either experiment 1 or 2. Even though the second experiment lasted longer than the first and, therefore, had a greater total amount of pain than the first experiment, almost three-quarters of the subjects chose to repeat the second experiment over the first one.

Kahneman and his co-authors hypothesized that "duration neglect" explains that people do not recall the duration of the experience as a key factor in remembering it. Rather, they remember the peak intense moment and what was happening to them at the end of the experience. The peak intensity of the two experiments was an identical level of pain, so that on that basis there was no reason to prefer one experiment to the other. But there was a difference in what the subjects remembered about the end of the experience. The end of the first experiment was a painful time. The end of the second experiment was, however, less painful and, therefore, more enjoyable.

One might hypothesize that if, in remembering an experience, people apply the peak-end rule and ignore the duration of the experience, then one might manipulate someone's likely remembrance of an event by keeping it short and making the end pleasant (if one would like the subject to have a happy remembrance) or unpleasant (if one would like the subject to have a distasteful remembrance).

D. Criticisms of the Behavioral Literature

Not all serious scholars have accepted the findings of the behavioral literature. Several believe that the legal and economic professions have been too quick to abandon the rational choice theory of human decisionmaking or that the behaviorists

have oversold their findings.

For example, John List (2003) has argued, on the basis of experimental results involving sports memorabilia and collector pins, that as participants gain experience in market transactions, some of the findings of the behavioral literature disappear. See also List (2006); Levitt & List (2006). Specifically, List found that the endowment effect, which holds that people place an irrationally higher value on the status quo than on a seemingly more attractive alternative, vanishes with increasing market experience.⁸ In a theoretical argument that reaches a similar conclusion, Alan Schwartz (2008) suggests that where there are two types of consumers—naïve and sophisticated—and where firms compete for consumer business by offering either exploitative or naïve contracts, competition can cause the number of exploitative contracts to decline or even vanish.

We think, however, that these criticisms have far less force in the context we explore here – criminal law. As Jolls, Sunstein & Thaler (1998: 1486-87) first observed, the market for crime gives far less feedback to participants than legal markets. “[T]he decision to enter a life of crime is not one that is made repeatedly with many opportunities to learn. Once a teenager has dropped out of high school to become a drug dealer, it is difficult to switch to dentistry.” Nor is “arbitrage . . . possible in this situation. If someone is unfortunate enough to commit a crime with a negative expected value, then there is no way for anyone else to profit directly from his behavior.” Thus, unlike the optimistic stock purchaser who sees very quickly his fortune decline, the optimistic criminal who underestimates the probability of his detection may offend for years before ever being detected and receiving contrary information. Even then, being caught once after several years may not be incompatible with his optimistic estimate of the detection probability.⁹

Mitchell (2002a; 2002b) has argued that behaviorists have not provided a comprehensive and empirically sound account of human decisionmaking that war-

⁸ List reports that “across all consumer types, marketlike experience and the magnitude of the endowment effect are inversely related. In addition, within the group of subjects who have intense trading experience (dealers and experienced nondealers), I find that the endowment effect becomes negligible.” *Id.* at 42-43. Kathy Zeiler and Charles Plott (2006) have also argued that both the endowment effect and the findings of prospect theory are misinterpretations of experimental evidence.

⁹ Amitai Aviram (2007) proposes that politicians and other opinion leaders can engage in a type of ‘bias arbitrage,’ gaining by exploiting the biased beliefs of the public. But the arbitrage here works through the political system, not an explicit price mechanism, so it does not really contradict the point in the text that criminal markets work less efficiently than others.

rants abandoning rational choice theory. Moreover, he argues, there is substantial empirical evidence that, at least with respect to some explicit economic decisions, people behave as rational choice predicts that they will. Oldfather (2007) makes the different point that, even if one takes behavioral biases to be true of the average member of the population, we know that criminals differ from the average in many ways; so, absent experiments focused on criminals, we cannot assume the applicability of the behavioral literature to this unusual subpopulation. Both points are well taken. We are still at an early stage of our knowledge of human decisionmaking—one might say that the behavioral findings are strong and suggestive but not complete. Noting this caveat, however, we believe there is enough consensus about some of the findings of the behavioral literature to warrant our taking the rational-choice-theory-based predictions and explanations of criminal behavior less seriously and in exploring alternative explanations and predictions. That is the task to which we now turn.

II. BEHAVIORAL ECONOMICS ANALYSIS OF POTENTIAL CRIMINAL OFFENDERS

Deterrence is a central concept in the economic theory of criminal law. This Part addresses two ways in which behavioral insights are important to this concept. First, we consider the challenge behavioral findings pose to deterrence theory, the claim that marginal changes in the severity of criminal punishment will not actually influence the decision to offend. Second, assuming that the challenge fails – that deterrence theory is essentially correct – we consider how behavioral research nonetheless recommends modifying the economic model of the decision to offend, which in turn affects the optimal use of criminal sanctions.

A. The Behavioral Challenge to Deterrence Theory

The empiricism on deterrence is surveyed elsewhere in this volume, but we briefly note how some behavioral work challenges the basic theory of deterrence. The empirical evidence supporting deterrence theory consists mostly of macro-level regressions between the inputs of certainty (arrest and conviction data) and severity (criminal sentencing data) and the output of crime rates. For reviews, see Levitt (2004); Nagin (1998); Pasternoster (1987).¹⁰ By contrast, some of the behavioral empiricism focuses on more specific causal steps necessary for deterrence. Robinson & Darley (2004) offer perhaps the most aggressive critique of deterrence in recent years. See also Darley (2005); Robinson (2006). They focus on three links in the theory: (1) that potential offenders know that the law punishes certain acts; (2) that they (at least implicitly) calculate the costs and benefits of those acts; and (3) that criminal sanctions make the costs outweigh the benefits. We identify the behavioral research relevant to each claim.

The first step in deterrence theory is a link between criminal sanctions and the perception of criminal sanctions. By hypothesis, the objective fact that the state punishes criminals causes people to update their beliefs about the probability of being punished for a future crime. Yet Robinson & Darley (2004) claim that “[p]otential offenders commonly do not know the legal rules, either directly or indirectly, even those rules that have been explicitly formulated to produce a behavioral effect.” For example, Robert MacCoun et al. (2008) report on survey data regarding sanctions for possession of small amounts (one ounce) of marijuana.

¹⁰ Some recent work, e.g., Kessler & Levitt (1999), carefully distinguishes this deterrent effect from the incapacitation effect.

Almost one-third of respondents say they do not know whether the maximum penalty is a fine or a jail term. Among those who provide a specific answer, respondents in states where the maximum penalty is a jail term were more likely to report that jail is the maximum than those who live in states where the offense is fine-only, but the magnitude of the difference is quite small – 30.7 percent of fine-only state residents (incorrectly) identify jail as the maximum while 33.1 percent of those in states authorizing jail identify (correctly) that maximum. Six percent report that there is a minimum jail sentence, though this is not true in any state. See also Roberts (1992).

Similarly, a major study by Gary Kleck, et al. (2005) examines the relationship between the perception of punishment practices and actual punishment for four crimes – homicide, aggravated assault, robbery, and burglary. The authors surveyed 1500 respondents in 54 urban counties, inquiring about five punishment variables for each crime – the probability of arrest, conviction, and incarceration, the maximum authorized punishment, and the swiftness of punishment. They then compared these estimates to actual punishment practices. Of the twenty possible correlations, there was no statistically significant relationship in seventeen cases, with or without controls, and even excluding the 15-20 percent of respondents who refused to give any estimate because they said they did not know. Of the remaining three cases, where the correlation was significant, two were positive but one was negative. Gary Kleck, et al. (2005: 647) Among respondents who had been arrested for a non-traffic offense, the correlations were even weaker (only one positive and significant correlation out of the twenty). Gary Kleck, et al. (2005: 647).

Deterrence theory also assumes that potential offenders rationally (though not necessarily consciously) consider and weigh the costs and benefits of committing a crime. Robinson & Darley's (2004) second criticism is their claim that individuals who commit crime do not rationally assess the costs and benefits of their criminal acts. Here, they avert to at least one of the behavioral biases noted above – that individuals are impulsive in the sense of having inconsistent discount rates that favor immediate consumption – along with a variety of other psychological points: that criminals do not appear to calculate, are under the influence of drugs at the time of their offense, and are driven principally by emotion or peer approval that frames their actions and not by rational calculation. Darley (2005: 195-96) reports:

One well-supported theory of criminal behavior holds that many crimes are committed by persons with somewhat disordered personalities who are characterized by a predilection for impulsive behavior. . . . These are the sorts of crimes that become semi-

humorous reports in newspapers. Like the bank robber who passes his demand for money on material that reveals his identity, prison inmates report that they were not thinking of the possibility of prison when they committed their offense.

Anderson (2002: 308) reports on a survey finding that, “[a]t the time of their offenses, 76% of the criminals in the sample and 89% of the most violent offenders were incognizant of either the possibility of apprehension or the likely punishments associated with the crime.”

Robinson & Darley’s third criticism is that the prospect of punishment is not likely to outweigh the perceived advantages of offending. Here, they rely on a number of behavioral observations described above: that people may perceive low probability of punishments, like other low probability events, as zero; that hedonic adaptation and duration neglect weakens or reverses the effect of severity of punishment; and that given hyperbolic discounting,¹¹ the delay in punishment severely weakens the effect of severity.

The second and third criticisms are significantly weakened by a key feature of deterrence theory: the success of deterrence is not measured by those who commit crimes but by those who do not. Perhaps the reason those who commit crimes appear to be irrational is that the expected sanctions are sufficient to deter the rational, which explains why most individuals are deterred from committing serious offenses. Thus, punishing individuals who commit crimes under various defects of rationality may work by enhancing the state’s credibility in threatening to punish more rational individuals if they commit an offense. By contrast, those studies that focus on prisoners are by definition focusing on individuals for whom deterrence failed, who may not be representative of those for whom it works.

Robinson & Darley might respond that some of their points apply not just to some special subset of the population – such as the imprisoned or the drug addicted – but to everyone. Consider the effect of hedonic adaptation and duration neglect. As explained above, happiness studies suggest that, after a major event, most people adjust back to their base rate of happiness more quickly than they expected; and when remembering positive or negative experiences, most people fail to account sufficiently for the duration of the experience (and unknowingly give special weight to its peak and end points).

¹¹ According to experimental findings, people experience “hyperbolic discounting” in that they prefer a smaller and sooner payoff to larger and later payoffs if the smaller payoffs are nearly immediate. But when the smaller and sooner payoff and the larger and later payoff are both fairly distant from the decision point, the larger and later payoff is preferable.

Yet the correct inference to draw from these points is complex. Robinson & Darley are correct that incarcerated individuals will adapt to prison more quickly than they anticipate and, after being released from prison, will not fully remember the duration of the pain of incarceration. Consequently, incarceration will produce less specific deterrence than a model of perfect rationality predicts. But these points need not affect general deterrence. At least for the majority of individuals who are never incarcerated, what matters for deterrence is their *anticipated* loss from prison. If individuals never have occasion to learn how quickly they will adjust to prison and how much they will forget its duration, then they remain as deterrable by the anticipation of long prison terms as someone not subject to these psychological effects. Their point has force principally with respect to recidivism: incarceration, once experienced, may not have the deterring effect that it might have for those who have never been incarcerated. Yet even here, the happiness literature finds not only that people fail to predict their adjustment to negative situations, but that they also fail to remember their adjustment later (when one compares contemporaneous accounts to later memory of the same events). See Brons-teen, Buccafusco, & Masur (2008).

In the end, however, the question is empirical and subject to further inquiry. Some economic work supports behavioral skepticism of the deterrence theory by studying the perceptions of juveniles upon reaching the age of majority. When an individual becomes an adult in the eyes of the criminal law, he is immediately subject to much higher punishments (being no longer eligible for the juvenile justice system). The advantage of studying such individuals is that it is unlikely that other variables change very much the week before and after an individual's 18th birthday. Yet Lee & McCrary (2005) find that this discontinuous jump in penalty levels has almost no effect on the teenager's willingness to offend. Looking at weekly Florida crime data from 1989 to 2001, they find that "the drop in arrests at [age] 18 is small in magnitude and statistically insignificant" across a range of specifications. They conclude that either teenagers are badly informed of the objective changes in punishment severity, are irrational, or are subject to hyperbolic discount rates, which makes them impulsive. Other studies, however, reach partially or entirely different conclusions. See Levitt (1998); Lochner (1997). For a more detailed discussion, see chapter [X] in this volume.

B. Behavioral Adjustments to Deterrence Theory

In this section, we assume that deterrence theory is basically correct and ask what adjustments behavioral findings imply for an economic model of crime. In other words, we assume that marginal changes in the expected sanction do affect the crime rate, but we ask how the “standard” economic model of crime changes if people are not perfectly selfish or rational. The critical variables in the baseline economic model of crime are the probability of being sanctioned, which requires detection of and conviction for the crime, and the magnitude of the sanction. Other standard variables are risk aversion and discount rate, since criminal penalties are imposed with some probability less than one and frequently at a time after the criminal receives the benefits of the crime. What happens to the standard model if we consider cognitive biases? We consider first the cognitive biases, then prospect theory, then motivational departures from simple selfishness.

1. Deviations from Perfect Rationality: The Effect of Cognitive Biases on the Decision to Offend

Optimism or Overconfidence. Nuno Garoupa (2003) and Christine Jolls (2005) observe that the optimism bias weakens deterrence by making potential offenders underestimate the probability of their violation’s being detected (arrested and convicted) and punished. One might add that the optimism bias would also cause criminals to overestimate the expected benefits of crime, such as the amount of money held by an intended robbery or fraud victim. In each case, instead of mistakes being randomly distributed around a mean, optimism skews the beliefs in one direction. Thinking that the costs are lower and the benefits are higher than they actually are, the overly optimistic potential criminal commits more offenses than the rational criminal. As a result, optimal deterrence requires higher sanctions or higher probabilities, unless there is some way to educate or “debias” the potential criminals.

Garoupa (2003), however, also notes a potentially offsetting effect. If the overly optimistic offender underestimates the probability of detection, he will reduce his investment in taking care to prevent detection, as by narrowing the timing or location of his crimes to avoid witnesses or cameras. Taking fewer precautions would bolster the true probability of detection, which partially offsets the dilution of deterrence excess optimism causes and enhances the incapacitation effect, as it will be easier to apprehend optimistic than rational offender. The stronger incapacitation effect could conceivably entirely offset or even reverse the effect of weakened deterrence, allowing for lower penalties. The issue is empirical, but the analysis illustrates the importance of considering *all* the ways that some bias could affect

the decision to offend. Indeed, we note below that the optimism bias could cause potential victims to underestimate their chances of being victimized and therefore to take too few precautions against crime.

The availability heuristic. Jolls (2005) also observes that the availability heuristic has two effects on the decision to offend. First, the perceived probability of detection will depend not only on how frequently offenses are detected but also on how salient or vivid the method of detection is. For example, if traffic cops issue bright orange tickets for illegal parking, they may generate more deterrence than beige tickets, holding constant the objective probability of detection, merely because their vividness of the orange tickets makes them easier to recall. See also Jolls, Sunstein & Thaler (1998: 1538).

Second, the actual frequency of detection may have non-linear effects on the perceived probability of detection. Some evidence suggests that people underestimate the probability of infrequent events, while other evidence suggests that people overestimate the probability of infrequent events. See, e.g., Kunruether (1982). Potentially, the availability bias changes the basic economic prescription because the evidence of a given context may suggest that people will underestimate the probability of detection if it is below some critical level, but correctly estimate it (or overestimate it) at some higher level, which means there may be efficiencies to raising the probability of detection.

In general, if criminals are biased by availability when calculating (no doubt in an informal sort of way) the expected costs of crime, the rational-choice-theory-based analysis of deterrence could change radically, depending on what types of events are more salient to potential criminals. In order to determine which deterrence mechanism will be most efficient, policymakers need to understand whether criminals are likely to over- or underestimate the frequency and the severity of punishment that is actually meted out. If punishments are so severe that some sentences become shocking and publicized, increasing severity could be the more efficient deterrence strategy. Otherwise, increasing the frequency of punishment is likely to be more efficient, under the assumption that if a criminal knows or knows of someone who has been imprisoned for a particular crime, this information is likely to be available and cause him to overestimate the likelihood that he will be arrested and convicted if he commits the same crime.

Pessimism and Projection. General biases may in turn lead to more specific biases. Cooter, Feldman & Feldman (2006) discuss two biases they term “pessimism” and “projection,” in each case a distortion arising from a more fundamental process. By pessimism, also known as the “uniqueness bias,” they refer to the fact that individuals” tend to overestimate the violation of social norms by other

people.” Pessimism might be the result of the availability bias, given that the news media gives more attention to, and makes more salient, stories of wrongdoing. Or pessimism might occur because of the fundamental attribution error [cite]: if people over-attribute observed bad behavior to the character of the actors (and under-attribute the cause to external circumstances), then they will expect more unobserved bad behavior than actually occurs. In other words, they will tend to overlook how much bad behavior is caused by people occasionally “lapsing.”

Projection bias – also known by the related term “false-consensus bias” [cite] – refers to the tendency of individuals to “over-estimate how many other people act [in] the same manner as he does.” Projection may occur because of the availability bias, if people tend to associate with like-minded individuals, they will find it easier to recall instances of behavior or statements like their own. In each case, there are possible emotive causes that are not linked to cognitive biases we are discussing.

In any event, pessimism and projection have effects on the perceived probability of detection. Although they also consider the opposite case, Cooter, Feldman & Feldman (2006) reasonably assume that the effect of believing there are more violations is to lower the perceived probability of detection. The pessimism bias causes all individuals to believe there are more violations than there actually are, which by assumption increases violations. The projection bias causes only *wrongdoers* to believe there are more violations, which increases their existing tendency to violate norms (either making them violate more frequently or merely pushing them farther away from the margin). But the projection bias causes *rightdoers* to believe there are fewer violations, which increases their existing tendency to obey norms (pushing them farther from the margin). Cooter, Feldman & Feldman then consider the combined effects. For rightdoers, pessimism and projection push in opposite directions and may cancel each other out or at least offset each other. For wrongdoers, however, both effects push in the same direction – believing there are more violations than there actually are, which lowers the perceived probability of detection and leads to more crime or at least making current crime levels more stable and crime harder to deter. Cooter, Feldman & Feldman’s paper illustrates the importance of considering the *combined* effects of different biases on one decision, rather than the easier work of identifying the effect of one bias across multiple decisions (as most papers do).

Framing. Some psychological evidence suggests that an individual’s choice between two options can be influenced by the presence of a third, unchosen option. The consumer’s choice between goods *A* and *B* may switch depending on whether the individual is also given the choice of good *C*, even though *C* is never chosen.

As explained above, option *C* somehow “frames” the other options by drawing attention to comparative advantages or disadvantages. Meares, Katyal, & Kahan (2004), have proposed that criminal sentences may have a similar effect. Where *A* is the choice of selling or using heroin and *B* is the alternative of committing no crime, the harsh punishment of *C* – selling or using crack cocaine – might make *A* look “cheaper” and therefore better by comparison. Substitution is always a concern of the economics of crime, but the framing point suggests that apparently irrelevant alternatives can affect the selection of substitutes for the criminal offense.

The Illusion of control. Some psychological evidence suggests that individuals suffer from an “illusion of control,” overestimating their ability to control risks and therefore distinguishing to a greater degree than is rational between risks that are and are not in their control. See Langer (1975). For example, Guttel & Harel (2008) point to studies finding that an individual tends to be willing to bet more on predicting the roll of dice that the individual rolls, than the same dice rolled by others. The same illusion causes individuals to be more willing to bet on the outcome of dice they have not yet rolled than the as-yet-unrevealed outcome of dice they have already rolled. The psychological literature shows this preference generalizes: people “have a strong preference for guesses of future contingencies over guesses of past contingencies,” or as Guttel & Harel put it, they have greater confidence in their *predictions* than their “*post-dictions*.” The illusion of control is probably connected to the self-serving bias, in which individuals tend to over-estimate their abilities. Because people believe they can still influence a future outcome but not the past, they are more confident about future than past outcomes.

Guttel & Harel (2008) then explore how the distinction matters to optimal public enforcement. One example is the choice between rules and standards. Suppose the actor knows there is a rule or standard but does not know of its exact content. Guessing whether one has violated a rule often involves postdiction because the rule specifies some specific fact that already does or does not exist. For example, the rule against drunk driving specifies a blood alcohol content that one either has or has not reached. Estimating the probability of detection here involves *postdicting* this specific fact. By contrast, a standard (for example, where “under the influence” means an influence imposing an “unreasonable” risk) may not identify any determinative fact. In this case, estimating whether one has violated a standard may involve *predicting* how the enforcer will apply the standard (that is, what fact will turn out to be determinative). Rules therefore have a greater deterrent than standards, though the true probability of being punished is the same.

Guttel & Harel’s (2008) second example is the difference in certain law enforcement strategies. Consider IRS enforcement policy. Current IRS policy is to

select tax returns for an audit *after* the return is filed. Thus, individuals complete their tax forms while *predicting* whether they will be audited. But if the IRS announced that it had already selected the tax-payers it would audit *before* the returns were filed, then individuals would complete their tax forms while *postdicting* whether they would be audited. Given the bias, the policy of announcing that certain taxpayers have been selected for auditing before any returns have been submitted would generate more deterrence than the policy of selecting auditees only after the returns have been submitted, holding constant the actual probability of an audit.

Guttel & Harel's (2008) final example involves sentencing facts. Making a sentence depend on facts that exist only after the crime occurs, such as whether an attempt succeeds or what degree of bodily harm the crime causes, involves prediction. By contrast, making a sentence depend on facts that existed at the time the crime was committed, such as the value of the item stolen or the age of the victim, involves postdiction. Holding constant the actual probabilities, the individual will be less confident and therefore more deterred in the latter case than the former.

2. *Deviations from Expected Utility Theory (Prospect Theory)*

Jolls (2005) describes two consequences that prospect theory has on the standard economic model of crime. First, "agents exaggerate the difference between a small probability of a particular event and a zero probability of that event." This appears to work as if people overestimate infrequent events (although it is alternatively possible they misperceive the effect of zero probability events). If so, then it would appear that, contrary to the optimism bias, individuals will be more deterred by a low probability of detection than under expected utility theory.

Second, "changes far from an individual's reference point matter relatively little." Thus, "the deterrent effect of increasing the magnitude of penalties will have a strongly diminishing effect." For example, "the difference between a fine of \$8000 and \$10,000 . . . will be far less than the difference between a fine of \$0 and \$2000." See also Lattimore & Witte (1986).

Harel & Segal (1999) describe how prospect theory affects the optimal use of uncertainty in criminal punishment. The state would seem to gain the most deterrence by selecting the types of certainty or uncertainty that are most dispreferred by potential criminals. There are two policy instruments, the magnitude of punishment and the probability of punishment.

Regarding the magnitude of punishment, expected utility theory is consistent with potential criminals' being risk-neutral, risk-averse, or risk-preferring. Pros-

pect theory more definitively says that most people are risk-preferring regarding losses, so potential criminals may be risk-preferring regarding criminal sanctions. If so, then they would prefer that the magnitude of sanctions be uncertain, as where the punishment is allowed to vary randomly around some mean. Therefore, holding constant the expected punishment, the state generates more deterrence by making the magnitude of sanctions certain. Harel & Segal observe that this result favors the use of sentencing guidelines that render the magnitude of fines or imprisonment as predictable as possible.

Yet, Harel & Segal (1999) note, this recommendation is complicated by the idea of ambiguity, as distinct from risk. Risk involves future contingencies whose probabilities are known, whereas ambiguity (or uncertainty) involves future contingencies whose exact probabilities are unknown. Empirical evidence suggests that even those individuals who prefer risk are averse to ambiguity. What we don't know is whether their aversion to ambiguity is so great that they would prefer determinate sentence to an ambiguous sentencing lottery, in which case the latter would be a more efficient deterrent than the former (contrary to the prior paragraph). We require additional empirical evidence to assess whether the preference for risk is larger or smaller magnitude than the aversion to ambiguity.

In addition to the magnitude of punishment, the state selects a probability of punishment (which depends on the probability of detection and conviction). Presumably there is no practical way to remove risk from the system because that would require the expense of detecting all violations or detecting none of them. Because risk is inherent in any practical detection policy, the potential criminal's aversion to ambiguity provides a determinate policy recommendation: introduce ambiguity by preventing the potential criminal from knowing the precise probability of punishment. Harel & Segal (1999) note that society does in fact introduce ambiguity by constantly changing the enforcement priorities in a way that obscures the exact probability of detection at any given time. One might add that the discretionary interaction between different types of law enforcers – local and national police, local and national prosecutors – also obscures the exact probabilities.

3. Deviations from Perfect Self-Control: Inconsistent Discount Rates and Impulsiveness

Jolls, Sunstein & Thaler (1998) use criminal law as their main example of

“bounded self-control,” where poor impulse control leads to crime. The relatively new economic literature on “hyperbolic discount rates” (e.g., Frederick, Loewenstein & O’Donoghue 2002; Laibson 1997; O’Donoghue & Rabin 1999) finds dynamic inconsistency of discount rates over time, specifically, that individuals apply a different and higher discount rate when choosing whether to defer immediate consumption by a certain time than when comparing two future consumption choices by the same amount of time. Crime usually has immediate benefits for the criminal, while most costs are delayed, so the effect of impulsiveness is more crime.

Even before much of the behavioral literature existed, Robert Cooter (1991) modeled the problem of “weakness of will” or impulsiveness by assuming that an individual’s discount rate fluctuates. He begins his model with preferences for risk rather than discount rates. For each time period, an individual draws a risk preference for that period from a probability distribution of risk preferences for that individual (which models mood fluctuations). The farther from one’s mean preference, the lower the probability one draws a particular rate. Thus, there will be a set of risky decisions where most of an individual’s possible risk preferences will cause him to avoid the risk. Yet where the individual, with low probability, draws a preference unusually favorable to risk, he “lapses” by taking the gamble. Cooter then notes that the model works identically if we substitute “discount rates” for “risk preferences” and imagine the individual chooses between present and future consumption. An individual may usually draw discount rates that favor future consumption, but on occasion may draw an unusually high discount rate and “lapse” by deciding in favor of immediate consumption. In either case, when such an individual later draws a more common risk preference or discount rate, he experiences costly “regret” of his prior decision.

Cooter (1991) then applies this model to the decision to commit a crime (or a tort). Where one’s discount rate fluctuates, one may “lapse” into committing the crime because the benefits from crime are enjoyed immediately, while the potential sanctions are delayed. The policy implication here is that the advantage of narrowing the time between the crime and the punishment. To some degree, this simply points to the obvious advantage of having police solve crimes sooner rather than later. But Cooter (1991) observes that this point and the original model on risk preferences may also justify *ex ante* criminal regulation rather than *ex post* criminal liability. Rather than create criminal (or tort) liability only after a harm occurs, intervening before harm occurs may narrow the temporal gap between the benefit and the cost and make it more likely that punishment would occur. Cooter does not give an example, but consider the use of criminal sanctions for mislabeling of over-the-counter drugs. There might be a considerable delay after labeling

before the drugs are put in commerce and could cause harm, so punishing for the mislabeling (in addition to harms caused by mislabeling) narrows the relevance of the discount rate. Also, it may be easier to detect mislabeling or resulting injuries than to detect only resulting injuries, which narrows the importance of risk preferences. As an extension, one might use Cooter's model to justify attempt liability and punishment for other forms of criminal preparation. Punishing speeding and drunk driving allows the law to intervene more quickly and with greater certainty than punishing only negligent driving that causes death or injury. See also Utset (2007).

No discussion of hyperbolic discounting's role in crime should ignore its relevance to the problem of addiction. See Garoupa (2003:7-8); Bowers (2008); Ainslie (2000); Corrado (2006); Bickel & Marsch (2001). Addiction is important to crime for at least two reasons. First, the possession and distribution of certain addictive substances (e.g., heroin and cocaine) are among the most significant modern crimes. Second, addicts are often unable to hold lawful jobs and therefore commit a significant amount of property crime to finance their addiction. The theory of hyperbolic discounting (perhaps along with the optimism bias) provide perhaps the only economic theory of addiction other than Becker & Murphy's (1988) theory of "rational addiction." The benefits of drug use are immediate; because purchase often precedes use by only a short time, one can also say that the benefits of purchase are fairly immediate to the purchaser. Yet, excepting the purchase price (which may not exist when people get the drug as a gift or on credit), the costs of addictive substances are deferred: not only the health consequences of long term use but the risk that use will lead to addiction and all the costs that entails. Thus, if there is hyperbolic discounting (and/or optimism), then addiction may occur despite the individual perceiving the costs as exceeding the benefits.

One particularly interesting implication of hyperbolic discounting is the alternative to criminal prohibition that Leitzel (2008) calls "self-exclusion." Leitzel addresses the practice primarily in the context of gambling, where some casinos and lotteries allow individuals to sign up for exclusion, which bars them from entering gambling facilities and sometimes permits the facility or the state to confiscate any winnings, should they manage to gamble anyway. This form of self-control mechanism – metaphorically, Ulysses tying himself to the mast – makes sense given hyperbolic discounting: when focused on the distant future, one prefers to exclude oneself from gambling even though one knows that when the time comes, one would prefer to gamble. Leitzel also explores whether "self-exclusion" could be used as an alternative to criminal drug prohibition.

4. Deviations from Perfect Selfishness: Concern for Others and for Fairness

What difference would it make for criminal law if individuals have other-regarding preferences or preferences for fairness? The issue receiving the most attention is the effect of the public's fairness preferences on optimal punishment. There is evidence that people believe people view proportionate punishments as fair and disproportionate punishments as unfair. If individuals incur costs from their state imposing "unfair" punishments, then there are new costs to implementing what might otherwise be efficient punishment, such as those minimizing the probability of detection and maximizing the sanction. See Polinsky & Shavell (2000).

More generally, however, any preference for the welfare of others will increase the costs of behavior that is harmful to others, which should work to decrease crime. At the same time, a preference for fairness may underlie certain crimes of "self-help" retaliation against others. Garoupa (2003) notes that much of the recent work suggests that people are reciprocators who gain utility by acting altruistically toward those who treat them fairly but also by acting spitefully against those who treat them unfairly. If so, then when individuals feel themselves treated unfairly by another, including not only being the victim of a crime but being offended by, say, insulting behavior, the aggrieved individual will perceive new benefits to harming their tormentor. Retaliation of this sort is frequently the cause of crime, such as vandalism and assault (e.g., Black 1983), though this is generally ignored by economists.

Moreover, preferences for fairness suggest an entirely different basis for legal compliance that psychologists emphasize: that the perceived fairness or legitimacy of a legal rule or legal regime determines how much individuals will defer to and act in conformity with the rules or regime. The literature on this claim is broad and deep, but somewhat outside the scope of this chapter. See, e.g., Meares, Katyal & Kahan (2004); Murphy (2004); Pasternoster, et al. (1997); Tyler (1990); Tyler & Fagan (2006).

Funk (2005) offers what might be thought of as an economic account of these legitimacy claims by examining how deviations from perfect selfishness interact with bounded rationality. She posits that there are internal, moralistic costs to committing crimes, such as guilt, shame, or remorse. One incurs these costs only if one believes oneself to have acted badly. Yet self-serving biases and cognitive dissonance allow people to believe, to some degree, "what they want to believe." Consequently, the moralistic costs are "state dependent" so that they are lower in

the state of one's being a criminal than in the state of one's being a law abider. As a result, there are multiple equilibria and "there may be greater and longer-lasting effects of crime-enhancing shocks than of crime-reducing shocks."

An increase in the external conditions for crime causes more crime, which works via cognitive dissonance and self-serving biases to lower the actual moralistic costs of crime, so the norm against crime has less effect for the new criminals, making the crime increase more severe and stable. A decrease in the conditions for crime causes a decrease in crime, but does not have the reverse effect. Because there is no general moral norm favoring crime, there is no "dissonance" created by not committing a crime and no need to engage self-serving biases. There is therefore no change in beliefs that increase the moralistic costs of crime. As a result, the best policy may be a "big bang" shock in the direction of greater enforcement, rather than incremental increases.

III. BEHAVIORAL ECONOMIC ANALYSIS OF OTHER DECISIONMAKERS IN THE CRIMINAL JUSTICE SYSTEM

Garoupa (2003: 12) notes the fundamental point that, "once criminals are not fully rational, so are not victims, enforcers, and politicians." In this section, we consider the effect of behavioral assumptions on the economic analysis of the other actors involved in crime and public law enforcement. Specifically, we address the behavioral economics of potential crime victims, legislators, prosecutors (and defendants), judges, and juries.

A. *The Behavior of Potential Victims and Legislators*

To our knowledge, no one has yet systematically considered the effect of the behavioral findings we have discussed on potential crime victims. The optimal level of precaution by potential victims is itself a complex subject, even if victims are rational.¹² But consider what changes if potential victims are not rational. What happens to our predictions if victims are subject to the behavioral patterns dis-

¹² Some precautions displace crime rather than decrease it. If the car thief sees an alarm system or steering wheel lock on a car, he may just move on to another vehicle. Such devices mostly redistribute crime, so their social costs may exceed their social benefit. By contrast, other precautions primarily decrease crime. For example, "Lojack" allows electronic tracking of a stolen car and because the device is not visible to the thief, its presence enhances the deterrence of all car theft. Ayres & Levitt (1998).

cussed in this chapter?

The optimism bias may obviously cause potential victims to underestimate the odds of being victimized and therefore to take fewer precautions against crime than a purely rational actor. Yet optimism might itself have offsetting effects if optimism makes a potential victim think that a given precaution will generate more protection from crime than it actually will. By contrast, the availability heuristic might cause potential victims to overestimate the odds of being victimized – because examples of crime are often vivid and easy to recall, especially given media attention to the issue – and therefore to take more precautions than a purely rational actor. The evidence of crime “scares” or “panics” is more consistent with this availability effect. See Burns & Crawford (1999); Thompson (1998).

The literature on victim precautions refers to private actions as distinct from public law enforcement. But we can think of precautions as including political action favoring candidates who will take stronger (more costly) measures to fight crime. If so, then the availability heuristic implies that biased members of the public will fear crime more and demand stronger anti-crime measures than a purely rational member of the public. Some evidence suggests (e.g., Hipp 2007) that the public’s estimates of the amount of crime in an area are largely determined by the amount of one vivid type of crime – robbery – in that area. Other citizen beliefs about crime are influenced by local television news. Gilliam & Iyengar (2000). Many specific legislative actions seem to respond to vivid examples of crimes rather than any broader defect in existing laws. For example, Congress enacted laws against ‘car-jacking’ even though the behavior at issue already consisted of several crime (theft, robbery, kidnapping, etc.) subject to serious punishment. See Aviram (2007). If the effect of optimism dominated availability, however, then these effects are reversed: the optimistic citizen expects less crime than the rational citizen.

B. The Behavior of Police

The most obvious concern for police is the confirmation bias, the tendency of individuals to search for new evidence and to interpret ambiguous evidence in a way that confirms their existing beliefs (all without consciously aiming to do so). Nickerson (1998); Friedrich (1993); Simon et al. (2001). This bias makes police errors more likely, as police continue to focus attention on their initial suspect even when a rational observer would find new evidence or interpret old evidence to suggest the suspect’s innocence. O’Brien & Ellsworth (2006). The error not only leads to the arrest and possible conviction of an innocent individual, but the focus on the innocent makes it unlikely that the police will ever apprehend the guilty.

O'Brien & Ellsworth (2006) ran two experiments finding evidence of confirmation bias in the context of mock police investigations. Stating a hypothesis early in the review of evidence in a mock police file led to more errors.

Psychologists also find the confirmation bias affects the course of police interviews or interrogations, where those who believe in guilt will fail to ask the kind of questions that might uncover evidence of innocence, as well as to interpret ambiguous evidence consistently with the guilt hypothesis. Most recently, Hill, Memon, & McGeorge (2008) find similar results in their study of interrogation – that independence of actual guilt, interrogators with a hypothesis of guilt frame questions the answers to which seem more corroborative of guilt. See also Kassin, Goldstein, & Savitsky (2003); Meissner, & Kassin (2004). Findley & Scott (2006) examine how institutional pressures and legal rules magnify the effect of confirmation bias.

A behavioral approach might also be relevant to assessing and understanding claims of racial profiling or, more generally, race discrimination in the criminal justice system. The psychological literature on “implicit bias” claims that bias exists at a subconscious level, as measured by studies showing that many white people take longer to perform classification tasks if those tasks run counter to negative stereotypes of black people than if they conform to such stereotypes. Jolls & Sunstein (2006a) provide a review. One study finds, for example, that in a computer simulation of the decision to fire a weapon, where the goal is to shoot at armed individuals but not unarmed individuals, white participants made the decision to shoot armed black individuals faster than the decision to shoot armed white individuals and were more likely to err by shooting unarmed black individuals than unarmed white individuals. Correll, et al. (2002). These results have been linked to implicit bias or stereotyping, but there are also implicit restraints – a negative attitude towards prejudice – that may operate to control the behavioral effects of the bias. Glaser & Knowles (2008). Implicit bias might also explain findings that police tend to enforce the law more stringently – making more arrests or searches – when the enforcement target is a different race (black or white) than the police officer. Antonovics & Knight (2004); Donohue & Levitt (2001).

C. The Behavior of Prosecutors and Defendants

Most criminal cases are resolved by a guilty plea negotiated between the prosecutor and the defendant (note the shift here from the language of a “potential offender;” the defendant is either an actual offender or, if innocent, a non-offender). Consider how behavioral effects influence this negotiation.

On the civil side, many scholars have noted that optimism bias may impede

settlement, as each party believes it is more likely to win at trial than is actually the case, thus shrinking or eliminating any settlement range. Rachlinski (1996) uses prospect theory and loss aversion to suggest another way that behavioral bias may impede settlement. For the plaintiff, the choice between suit and settlement is between the uncertain value of a trial and a certain outcome (the settlement amount). This being a choice involving a sure gain against a probabilistic gain, the plaintiff is likely to be risk averse and to find the sure gain (the settlement) more attractive than trial. By contrast, the defendant sees the choice between suit and settlement as one between an uncertain loss (trial) and a certain loss (the settlement amount). The experimental results suggest that people choosing between a certain and uncertain loss of roughly equal value will prefer the uncertain loss—that is, will behave in a risk-preferring manner. As a result, defendants may prefer trial to settlement.

For criminal law, we may use Rachlinski's insight to help understand plea bargaining between prosecutors and criminals. Prosecutors may be analogous to plaintiffs in Rachlinski's model and prefer a plea bargain to trial (assuming all other incentives facing the prosecutor are held constant), while defendants may be analogous to the defendants in Rachlinski's civil trials and prefer a criminal trial to a sure criminal sanction. These preferences may produce different plea bargains than would occur between rational prosecutors and rational defendants. Other things equal, loss aversion would require that prosecutors offer better deals than they would offer rational defendants in order to induce a guilty plea.

Birke (1999) notes the tension between loss aversion causing defendants to favor trial and the fact that more than 90 per cent of cases are resolved by a guilty plea. Burke (2007) notes also that biases such as optimism may also affect prosecutors and also make them less inclined to accept settlement rather than trial. So how do we explain high plea bargaining rates? Birke (1999) notes but rejects the most obvious account – that prosecutors offer sufficiently good deals that even loss averse defendants are better off accepting the deal. He claims instead that defendants are making mistakes and would gain utility from rejecting most of the agreements they accept. Bibas (2004) also suggests that various biases prevent criminal defendants from making choices that maximize their utility.

Covey (2007) agrees that loss aversion, optimism bias, and other limitations on rationality all work against defendants accepting plea bargains. Unlike Birke and Bibas, however, Covey believes criminal defendants do generally advance their interests by accepting pleas, given the features of the criminal justice system designed to overwhelm the natural reluctance of defendants to accept guilty pleas. Indeed, Covey says we can understand the function of these features better as de-

vices to overcome the impediment to plea bargaining that defendant biases otherwise create: (1) very high plea discounts and trial penalties offset loss aversion; (2) informal “open-file” discovery practices and sentencing guidelines minimize the uncertainty of trial and sentencing outcomes, thus giving less room for the optimism bias to operate; (3) pre-trial detention re-frames prison as the baseline and the plea discount as a gain rather than a loss; (4) defense lawyers can provide information and perspectives that “de-bias” the defendant’s decisions. The third point is particularly interesting, but as Burke (2007) notes, if pre-trial detention reverses the frame for defendants, it may also do so for prosecutors, who may then perceive the defendant’s release from incarceration as a loss and prefer the uncertain loss of trial to the certain loss of a plea bargain.

Most of the analysis here has focused on the ways that cognitive bias or other behavioral findings affect the actors at issue. But Aviram (2008) notes that bias might matter not because it infects prosecutorial decisions, but because prosecutors aware of cognitive bias should allow that fact to influence their enforcement decisions. Regarding corporate securities fraud, Aviram notes that investors subject to the availability bias will underestimate the risk of fraud when the market is doing well but overestimate the risk of fraud when the market is doing badly. If so, then prosecutors should offset the bias by counter-cyclical enforcement, bringing more prosecutions during booms than immediately after busts. Conspicuous enforcement when the market is up may also offset the availability bias by providing vivid examples of fraud. By contrast, prosecutions are less useful when investors already overestimate the probability of being defrauded both because conspicuous enforcement exacerbates the availability bias. In general, conspicuous enforcement provides information that can exacerbate or ameliorate the availability bias and the prosecutor should adjust his or her actions to account for this effect. Aviram’s point might be extended to other crimes if the availability bias causes potential victims to take too much or too little private precaution and enforcement decisions can reduce the bias.

D. The Behavior of Judges in Criminal Cases

One group of scholars has systematically investigated the degree to which judges exhibit the biases that psychologists have found in other populations. See Guthrie, Rachlinski, & Wistrich (2001; 2007); Wistrich, Guthrie & Rachlinski (2005). One particularly relevant finding is the hindsight bias – “the well-documented

tendency to overestimate the predictability of past events.” (Guthrie, Rachlinski, & Wistrich 2007: 24). This bias may figure in criminal cases when judges are asked to decide whether the police had probable cause (or in some cases reasonable suspicion) at the time of a search, when the judge knows that the search produced incriminatory evidence. The assessment should be made solely on the basis of evidence known at the time the search commenced, which could not include the results of the search. But in the vast majority of cases the judge decides the issue only when evidence is discovered and the defendant moves to suppress it from the criminal prosecution. If the judge is subject to the hindsight bias, he or she will overestimate the predictability of finding the evidence, which means finding probable cause (or reasonable suspicion) when the rational judge would find otherwise.¹³

Some scholars have justified the warrant requirement on these grounds – it requires the judicial assessment of probable cause *before* the search, thus avoiding hindsight bias. Such a theory might help to explain when courts require warrants. For example, the Supreme Court generally requires a warrant to search a house, but not for a public arrest (although it does require judicial assessment of the probable cause determination for arrest within forty-eight hours after the arrest). Note that former searches are more likely to be subject to the hindsight bias than the public arrest. One expects the search of a house to reveal itself as warranted (evidence is discovered) or unwarranted (no evidence is discovered). By contrast, the failure to find evidence on a person arrested does not prove the arrest invalid, but leaves the probable cause determination just as it was before the arrest. Of course, there is the possibility that the search of the body of the arrestee will produce incriminating evidence, which then could induce the hindsight bias. But this risk is less than with a house search, arguably providing a weaker need for a warrant.

In any event, it remains uncertain if the hindsight bias is a genuine problem. Although Guthrie, Rachlinski, & Wistrich (2001: 801-803) find evidence that judges exhibit the hindsight bias, when they employed criminal scenarios involving searches, Wistrich, Guthrie, & Rachlinski (2005: 1313-1318) find no hindsight bias. One possibility is that judges manage in some kinds of familiar cases to structure their reasoning so as to avoid the bias, although the authors speculate about various alternative explanations. More empirical research would be useful.

¹³ The less common cases are civil rights actions for damages. In these cases, if the search revealed no incriminating evidence, the hindsight bias produces the opposite problem -- overestimating the lack of probable cause.

E. The Behavior of Criminal Juries

There are only a few law and economics models of jury behavior (e.g., Schrag & Scotchmer 1994) and no standard theory of jury behavior, so we cannot systematically examine the way that behavioral findings vary economic analysis. But several scholars have examined how the behavior literature predicts mistakes that juries will likely make in criminal cases. Sunstein, et al. (2002) examine how bounded rationality causes decision-makers such as juries to make predictably incoherent or inconsistent judgments. Rachlinski & Jourden (2003) apply this to the criminal jury, studying the role of “contrast effects,” where logically irrelevant contrasts produce different decisions. Interestingly, their experimental study finds contrast effects in jury sentencing for a term of years, but not for death penalty determinations. Prescott & Starr (2006) discuss behavioral effects – such as framing, anchoring, and deliberative polarization – on jury sentencing determinations.

CONCLUSION

As with other areas of law, the effect of behavioral assumptions on the economic analysis of criminal law is substantial. The empirical testing of behavioral claims continues, but the best available evidence at this point it demands some revision on the positive description and normative recommendations economics makes for criminal law.

REFERENCES

Ainslie, G. (2000), ‘A Research-Based Theory of Addictive Motivation,’ *Law & Phil.* **19**, 77.

Antonovics, K. and B.G. Knight (2004), ‘A New Look at Racial Profiling: Evidence from the Boston Police Department,’ NBER Working Paper No. W10634.

Aviram, A. (2007), ‘Bias Arbitrage,’ *Wash. & Lee L. Rev.*, **64**, 789-828.

----- (2008), ‘Counter-cyclical Enforcement of Corporate Law,’ *Yale J. on Regulation*, **25**, 1-33.

Ayres, I. and S.D. Levitt (1998), 'Measuring Positive Externalities from Observable Victim Precaution: An Empirical Analysis of Lojack,' *Quart. J. Econ.*, **113** (1), 43-77.

Anderson, D.A. (2002), 'The Deterrence Hypothesis and Picking Pockets at the Pickpocket's Hanging,' *Amer. Law & Econ. Rev.*, **4**, 295.

Bagenstos S., and M. Schlanger (2007), 'Hedonic Damages, Hedonic Adaptation, and Disability,' *Vand. L. Rev.*, **60**, 745.

Baker, L.A. and R.E. Emery (1993), 'When Every Relationship Is Above Average: Perceptions and Expectations of Divorce at the Time of Marriage,' *Law & Hum. Behavior*, **17**, 439 (1993).

Becker, G. (1969), 'Crime and Punishment: An Economic Analysis,' *J. Pol. Econ.* **76**, 169.

Becker, G.S. and K.M. Murphy (1988), 'A Theory of Rational Addiction,' *The Journal of Political Economy*, **96** (4), 675-700.

Bibas, S. (2004), Plea Bargaining Outside the Shadow of Trial, *Harv. L. Rev.*, **117**, 2463-2547.

Bickel, W.K. and L.A. Marsch (2001), 'Conceptualizing Addiction: Toward a Behavioral Economic Understanding of Drug Dependence: Delay Discounting Processes,' *Addiction* **96**, 73.

Birke, R., (1999), Reconciling Loss Aversion and Guilty Pleas,' *Utah L. Rev.*, **1999**, 205-254.

Black, D. (1983), 'Crime as Social Control,' *American Sociological Review*, **48**, 34-45.

Blumenthal, J.A. (2005), 'Law and the Emotions: The Problem of Affective Forecasting,' *Ind. L.J.*, **80**, 155.

Bowers, J. (2008), 'Contraindicated Drug Courts,' *UCLA Law Rev.* **55**, 783.

- Brickman, P., D. Coates, and R. Janoff-Bulman (1978), 'Lottery Winners and Accident Victims: Is Happiness Relative?,' *J. Pers. & Soc. Psychol.*, **36**, 917.
- Bronsteen, J., C. Buccafusco, and J. Masur (2008), 'Happiness and Punishment,' forthcoming *Columbia L. Rev.* 108.
- Burke, A.S. (2007), 'Prosecutorial Passion, Cognitive Bias, and Plea Bargaining,' *William & Mary L. Rev.*, **91**, 183-211.
- Burns, R. and C. Crawford (1999), 'School shootings, the media, and public fear: Ingredients for a moral panic.' *Crime Law & Social Change*, **32** (2) 147-168.
- Cooter, R.D. (1991), 'Lapses, Conflict, and Akrasia in Torts and Crimes: Towards an Economic Theory of the Will,' *Int'l Rev. Law & Econ.*, **11**, 149-64.
- Cooter, R.D., M. Feldman, and Y. Feldman (2006), 'The Misperception of Norms: The Psychology of Bias and the Economics of Equilibrium,' unpublished manuscript.
- Corrado, M.L. (2006), 'Behavioral Economics, Neurophysiology, Addiction and the Law' (UNC Legal Studies Research Paper No. 892007).
- Correll, J., B. Park, C.M. Judd, and B. Wittenbrink (2002), 'The Police Officer's Dilemma: Using Ethnicity to Disambiguate Potentially Threatening Individuals,' *J. Personality & Soc. Psych.*, **83**, 1314-1329.
- Covey, R. (2007), Reconsidering the Relationship between Cognitive Psychology and Plea Bargaining, *Marq. L. Rev.*, **91**, 213-247.
- Darley, J.M. (2005), 'On the Unlikely Prospect of Reducing Crime Rates by Increasing the Severity of Prison Sentences,' *J. Law & Policy* **13**, 181-247.
- Diener, E., R.E. Lucas, and C.N. Scollon (2006), 'Beyond the Hedonic Treadmill: Revising the Adaptation Theory of Well-Being,' *Am. Psychologist*, **61**, 305.
- Donohue, J.J. III and S.D. Levitt (2001), 'The Impact of Race on Policing and Arrests.' *Journal of Law & Economics* 44: 367-394.

Findley K.A. and Michael S. Scott (2006), 'The Multiple Dimensions of Tunnel Vision in Criminal Cases,' *Wis. L. Rev.*, **2006**, 291.

Frederick, S., G. Loewenstein, and T. O'Donoghue (2002), 'Time Discounting and Time Preference: A Critical Review,' *Journal of Economic Literature*, **40**, 351-401.

Frey, B. (2008), *Happiness: A Revolution in Economics*.

Friedrich, J. (1993), 'Primary error detection and minimization (PEDMIN) strategies in social cognition: A reinterpretation of confirmation bias phenomena,' *Psychological Review*, **100** (2), 298-319.

Funk, P (2005), "Government Action, Social Norms and Criminal Behavior," forthcoming *J. Inst. & Theoret. Econ.* (**2005 -- check**)

Garoupa, N. (2003), 'Behavioral Economic Analysis of Crime: A Critical Review,' *European J. Law & Econ.*, **15**, 5-15.

Gilbert, Daniel (2006), *Stumbling on Happiness*.

Gilliam, Jr., F.D., and S. Iyengar (2000), 'Prime Suspects: The Influence of Local Television News on the Viewing Public,' *Amer. J. Pol. Sci.*, **44**, 560-573.

Glaser, J. and E.D. Knowles (2008), 'Implicit Motivation to Control Prejudice,' *J. Exper. & Soc. Psych.*, **44**, 164-172.

Guthrie, C., J.J. Rachlinski, and A.J. Wistrich (2001), 'Inside the Judicial Mind,' *Cornell L. Rev.*, **86**, 777-829.

----- (2007), 'Blinking on the Bench: How Judges Decide Cases,' *Cornell L. Rev.* **93**, 1-43.

Guttel E. and A. Harel (2008), 'Uncertainty Revisited: Legal Prediction and Legal Postdiction,' unpublished manuscript.

Harel, A. and U. Segal (1999), 'Criminal Law and Behavioral Law and Economics: Observations on the Neglected Role of Uncertainty in Detering Crime,' *Amer.*

Law & Econ. Rev., **1**, 276-312.

Hill, C., A. Memon, and P. McGeorge (2008), 'The role of confirmation bias in suspect interviews: A systematic evaluation,' *Legal and Criminological Psychology*, **13** (2), 357-371.

Hipp, J.R. (2007), 'Resident Perceptions of Crime: How Similar are They to Official Crime Rates?,' CES Paper 07-10.

Jolls, C. (2004), 'On Law Enforcement With Boundedly Rational Actors,' Harvard L&E Discussion paper No. 494.

Jolls, C. and C.R. Sunstein (2006a), 'The Law of Implicit Bias,' *Cal. L. Rev.*, **94**, 969-996.

----- (2006b), 'Debiasing Through Law,' *J. Legal Stud.* **35**, 199-241.

Jolls, C., C.R. Sunstein, and R. Thaler (1998), 'A Behavioral Approach to Law and Economics,' *Stan. L. Rev.*, **50**, 1471.

Kahneman, D.A. (2000), 'Experienced Utility and Objective Happiness: A Moment-Based Approach,' in D. Kahneman & A. Tversky, eds., *Choices, Values, and Frames*.

Kahneman, D. and A. Tversky (1979), 'Prospect Theory: An Analysis of Decision Under Risk,' *Econometrica*, **47**, 263.

Kassin, S. M., C.J. Goldstein, and K. Savitsky (2003), 'Behavioral confirmation in the interrogation room: On the dangers of presuming guilt,' *Law and Human Behavior*, **27**, 187-203.

Kessler, D. and S. Levitt (1999), 'Using Sentence Enhancements to Distinguish between Deterrence and Incapacitation,' *42 Journal of Law and Economics* **42**, 343-363.

Kleck, G., B. Sever, S. Li & M. Gertz (2005), 'The Missing Link in General Deterrence Research,' *Criminology* **43**, 623-60.

Korobkin, R.B. and C. Guthrie (1994), 'Psychological Barriers to Litigation Settlement: An Experimental Approach,' *Mich. L. Rev.*, **93**, 107.

Korobkin, R.B. and T.S. Ulen (2000), 'Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics,' *Cal. L. Rev.* **88**, 1251.

Laibson D. (1997), 'Golden Eggs and Hyperbolic Discounting,' *Q.J. Econ.*, **112**, 443.

Langer, E.J. (1975), 'The Illusion of Control,' *J. Pers. & Soc. Psych.*, **32**, 311.

Lattimore, P. and A. Witte (1986), 'Models of Decision-Making Under Uncertainty: The Criminal Choice,' in D.B. Cornish & R.V. Clarke (eds), *The Reasoning Criminal: Rational Choice Perspectives on Offending*, Springer-Verlag.

Layard, Richard (2005), *Happiness: Lessons from a New Science*.

Lee, D.S. and J. McCrary (2005), 'Crime, Punishment, and Myopia,' NBER Working Paper.

Leitzel, J. (2008), 'Self-Exclusion,' unpublished manuscript.

Levitt, S.D. (1998), 'Juvenile Crime and Punishment,' *The Journal of Political Economy*, **106**(6).

----- (2004), 'Deterrence,' in James Q. Wilson and Joan Petersilia (eds), *Crime: Public Policies for Crime Control* 435–450.

----- (2004), 'Understanding Why Crime Fell in the 1990s: Four Factors that Explain the Decline and Six that Do Not,' *Journal of Economic Perspectives*, **18** (1), 163–190.

Levitt S.D. and J.A. List (2006), 'What Do Laboratory Experiments Measuring Social Preferences Reveal About the Real World?,' *J. Econ. Persp.* **21**, 153.

Levitt S.D. and T.J. Miles (2007), 'The Empirical Study of Criminal Punishment,' in A. Mitchell Polinsky and Steven Shavell (eds), *The Handbook of Law and Economics* 453-495.

Levitt, S.D. and Thomas J. Miles (2006), 'Economic Contributions to the Understanding of Crime,' *Annual Review of Law and Social Science*, Vol. 2: 147-164.

List, J.A. (2003), 'Does Market Experience Eliminate Market Anomalies?,' *Q.J. Econ.*, **118**, 41.

List, J.A. (2006), 'The Behavioralist Meets the Market: Measuring Social Preferences and Reputation Effects in Actual Transactions,' *J. Pol. Econ.* **114**, 1.

Lochner, L. (1997), 'Individual Perceptions of the Criminal Justice System,' *American Economic Review* **97**(1).

MacCoun, R., R.L. Pacula, J. Chriqui, K. Harris and P. Reuter (2008), 'Do Citizens Know Whether Their State Has Decriminalized Marijuana? A Test of the Perceptual Assumption in Deterrence Theory' (4/15/08 draft).

Meares, T.L., N. Katyal and D.M. Kahan (2004), 'Updating the Study of Punishment,' *Stan. L. Rev.*, **56**, 1171-1210.

Meissner, C. A., and S.M. Kassin (2004), 'You're Guilty, So Just Confess! Cognitive and Behavioral Confirmation Biases in the Interrogation Room,' in G. D. Lassiter (Ed), *Interrogations, Confessions, and Entrapment*, New York: Kluwer Academic, pp. 85-106.

Mitchell, G. (2002a), 'Why Economists' Perfect Rationality Should Not Be Traded For Behavioral Economics' Equal Incompetence,' *Geo. L.J.*, **91**, 67.

Mitchell, G. (2002b), 'Taking Behavioralism Too Seriously?: The Unwarranted Pessimism of the New Behavioral Analysis of Law,' *Wm. & Mary L. Rev.* **43**, 1907.

Murphy, K. (2004), 'The Role of Trust in Nurturing Compliance: A Study of Accused Tax Avoiders,' *Law & Human Behavior*, **28**, 187.

Nagin, D. (1998), 'Criminal Deterrence Research at the Outset of the Twenty-First Century,' *Crime and Justice: A Review of Research* **23**, 1-42.

Nickerson, R. S. (1998), 'Confirmation bias: A ubiquitous phenomenon in many guises,' *Review of General Psychology*, 2(2), 175-220.

O'Brien, B. and P.C. Ellsworth (2006), 'Confirmation Bias in Criminal Investigations' (Sept. 19, 2006), last accessed 10/17/08 at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=913357.

O'Donoghue, T. and M. Rabin (1999), 'Doing It Now or Later,' *American Economic Review*, 89, 103-24.

Oldfather, C.M. (2007), 'Heuristics, Biases, & Criminal Defendants,' *Marquette Law Review*, 91, 249-62.

Paternoster, R. (1987), 'The deterrent effect of the perceived certainty and severity of punishment: A review of the evidence and issues,' *Justice Quarterly* 4, 173-217.

Paternoster, R., R. Bachman, R. Brame and L.W. Sherman (1997), 'Do Fair Procedures Matter? The Effect of Procedural Justice on Spouse Assault,' *Law & Soc'y Rev.*, 31, 163.

Plous, Scott (1993), *The Psychology of Judgment and Decisionmaking*.

Polinsky, M. and S. Shavell (2000), 'The Fairness of Sanctions: Some Implications for Optimal Enforcement,' *Amer. Law & Econ. Review*, 2, 223-37.

Prescott, J.J. and S. Starr (2006), 'Improving Criminal Jury Decision Making After the Blakely Revolution,' *U. Ill. L. Rev.* 2006, 301-356.

Rachlinski, J. (1996), 'Gains, Losses, and the Psychology of Litigation,' *S. Cal. L. Rev.*, 70, 113.

Rachlinski, J.J. and F. Jourden (2003), 'The Cognitive Components of Punishment,' *Cornell Law Review*, 88, 457-85.

Robinson, P. and J. M. Darley (2004), 'Does Criminal Law Deter? A Behavioral Science Investigation,' *Oxford J. Legal Studies*.

Roberts, J.V. (1992), 'Public opinion, crime, and criminal justice,' in Michael

Tonry (ed), *Crime and Justice: A Review of Research*, **16**.

Robinson, P. (2006), 'How Psychology is Changing the Punishment Theory Debate,' in Belinda Brooks-Gordon and Michael Freeman (eds), *Law & Psychology: Current Legal Issues*, **9**, 94-104.

Robinson, P. and J.M. Darley (2004), 'Does Criminal Law Deter? A Behavioral Science Investigation,' *Oxford J. Legal Studies*.

Schkade, D.A. and D. Kahneman (1998), 'Does Living in California Make People Happy?: A Focusing Illusion in Judgments of Life Satisfaction,' *Psychol. Sci.*, **9**, 340.

Schrag, J. and S. Scotchmer (1994), *Crime and Prejudice: The Use of Character Evidence in Criminal Trials*, *J.L. Econ. & Org.*, **10**, 319-342.

Schwartz, A. (2008), 'How Much Irrationality Does the Market Permit?,' *J. Legal Stud.* **37**, 131.

Simon, D., L.B. Pham, Q.A. Le, and K.J. Holyoak (2001), 'The emergence of coherence over the course of decision making,' *Journal of Experimental Psychology: Learning, Memory, & Cognition*, **27** (5), 1250-1260.

Sunstein, C.R., D. Kahneman, D. Schkade & I. Ritov (2002), 'Predictably Incoherent Judgments,' *Stan. L. Rev.* **54**, 1153.

Thompson, K. (1998), *Moral Panics* (London: Routledge).

Tversky, A. and D. Kahneman (1982), 'Availability: A Heuristic for Judging Frequency and Probability,' in Daniel Kahneman et al. (eds), *Judgment Under Uncertainty: Heuristics and Biases*.

----- (1986), 'Rational Choice and the Framing of Decisions,' *59 J. Bus.*, **59**, 251.

Tyler, T.R. (1990), *Why People Obey the Law*.

Tyler, T.R. and J. Fagan (2006), 'Legitimacy and cooperation: Why do people

help the police fight crime in their communities?,' unpublished manuscript.

Utset, M.A. (2007), 'Hyperbolic Criminals and Repeated Time-Inconsistent Misconduct,' *Hous. L. Rev.* **44**, 609-676.

Weinstein, N. (1980), 'Unrealistic Optimism About Future Life Events,' *J. Pers. & Soc. Psych.* **39**, 806.

Wilson, J.Q. and A. Abrahamse (1992), 'Does Crime Pay?,' *Justice Q.*, **9**, 359.

Wilson, T. and D. Gilbert (2003), 'Affective Forecasting,' in Mark Zanna (ed), *Advances in Experimental Social Psychology*.

Wistrich, A.J., C. Guthrie, and J.J. Rachlinski (2005), 'Can Judges Ignore Inadmissible Information? The Difficulty of Deliberately Disregarding,' *U. Pa. L. Rev.* **153**, 1251-1345.

Zeiler C. and C. Plott (2006), 'Exchange Asymmetries Incorrectly Interpreted as Evidence of Endowment Effect Theory and Prospect Theory?,' California Institute of Technology Social Science Working Paper 1230.

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