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Identifying Criminals' Risk Preferences

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There is a 250-year-old presumption in the criminology and law enforcement literature that people are deterred more by increases in the certainty rather than increases in the severity of legal sanctions. We call this presumption the Certainty Aversion Presumption (CAP). Simple criminal decision-making models suggest that criminals must be risk seeking if they behave consistently with CAP. This implication leads to disturbing interpretations, such as criminals being categorically different from law-abiding people, who often display risk-averse behavior while making financial decisions. Moreover, policy discussions that incorrectly rely on criminals' risk attitudes implied by CAP are ill informed, and may therefore have unintended negative consequences.

In this Article, we first demonstrate, contrary to most of the existing literature, that CAP-consistent behavior does not imply risk-seeking behavior. A host of considerations that are unrelated to risk attitudes can generate behavior that is consistent with CAP, including stigmatization, discounting, judgment proofness, the forfeitability of illegal gains, and the possibility of being punished for unsuccessful criminal attempts. Next, we discuss empirical methods that can be employed to gain a better understanding of criminals' risk attitudes and responsiveness to various punishment schemes. These methods focus on the various non-risk-related-considerations that may be responsible for CAP-consistent behavior. Finally, we discuss the importance of gaining a better understanding of criminals' attitudes for purposes of designing optimal law enforcement methods, punishment schemes for repeat offenders, plea bargaining procedures, and standards of proof.

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INTRODUCTION

There is a presumption in the law and economics literature that criminals are more deterred by the certainty of punishment than by the severity of punishment,[1] leading many legal scholars to infer that criminals are risk seeking.[2] Scholars of law and economics may find this inference disturbing; criminals would thus make decisions in an intrinsically different way than noncriminals, who are assumed to be risk averse.[3] Of more fundamental importance is the fact that legal scholars make

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1. CESARE BECCARIA-BONESANA, AN ESSAY ON CRIMES AND PUNISHMENTS 93 (Edward D. Ingraham trans., 2d Am. ed., Academic Reprints 1953) (1819) ("Crimes are more effectually prevented by the *certainty* than the *severity* of punishment." (emphasis in original)); JOSHUA DRESSLER, CASES AND MATERIALS ON CRIMINAL LAW 36 (5th ed. 2009) (citing Raymond Paternoster, *The Deterrent Effect of the Perceived Certainty and Severity of Punishment: A Review of the Evidence and Issues*, 42 JUST. Q. 173 (1987)).

2. *E.g.,* Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169, 207–08 (1968) (implying that criminals are risk seeking because the greater deterrent effect of certainty shows that criminals would prefer a risky punishment scheme); Talia Fisher, *Constitutionalism and the Criminal Law: Rethinking Criminal Trial Bifurcation*, 61 U. TORONTO L.J. 811, 820 (2011) (arguing for comparative sentencing and observing that the argument rests on risk-seeking attitudes); s*ee also* Michael K. Block & Vernon E. Gerety, *Some Experimental Evidence on Differences Between Student and Prisoner Reactions to Monetary Penalties and Risk*, 24 J. LEGAL STUD. 123, 138 (1995) (attempting empirically to determine criminal risk attitudes); James Foreman-Peck & Simon C. Moore, *Gratuitous Violence and the Rational Offender Model*, 30 INT'L REV. L. & ECON. 160, 161 (2010) (putting forth the inference from certainty aversion to risk seeking as one of two paradoxes confronting the rational-offender model when considering risk preferences).

3. FRANKLIN E. ZIMRING & GORDON J. HAWKINS, DETERRENCE 106 (1973) ("'[T]he offender may differ from his law-abiding neighbor simply in being prepared to violate the law

recommendations and observations that rely on assumptions about criminal risk preferences.[4] Is this inference that criminals are risk seekers truly justified? In this Article, we demonstrate that there are numerous reasons for why this conclusion may be wrong, propose empirical methods to better understand criminal risk attitudes, and discuss how important the issue is in light of its direct effect on criminal policy. We start with a brief introduction of the concepts and presumptions central to our analysis.

Risk aversion, one of the focal concepts in our analysis, refers to a person's reluctance to invest in assets with uncertain payoffs, even if such investment would on average benefit that person.[5] Conversely, a person who is risk seeking would invest in assets with uncertain payoffs even if the expected returns from those assets are slightly negative.

Economic analysis of crime suggests that a 250-year-old presumption might be at odds with the generalization that people are usually risk averse.[6] Cesare Beccaria

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untroubled by the uncertainties which alone deter his neighbor.'" (quoting JOHN COHEN, CHANCE, SKILL, AND LUCK: THE PSYCHOLOGY OF GUESSING AND GAMBLING 39 (1960))); William S. Neilson & Harold Winter, *On Criminals' Risk Attitudes*, 55 ECON. LETTERS 97, 97 (1997) (observing that if criminals are risk seeking, they would be distinct from law-abiding citizens).

    4. *See* Alon Harel & Uzi Segal, *Criminal Law and Behavioral Law and Economics: Observations on the Neglected Role of Uncertainty in Deterring Crime*, 1 AM. L. & ECON. REV. 276, 298–99 (1999) (assuming that criminals are risk seeking with respect to imprisonment and thus justifying uniform sanctions); *see also* Fisher, *supra* note 2; Oren Gazal-Ayal & Avishalom Tor, *The Innocence Effect*, 62 DUKE L.J. 339, 384 (2012) (stating that defendants are generally risk seeking but that innocent defendants may exhibit more risk-seeking behavior than guilty defendants (citing Richard Birke, *Reconciling Loss Aversion and Guilty Pleas*, 1999 UTAH L. REV. 205, 209 (1999) ("[T]he most convincing basis for why defendants plead guilty despite loss aversion is that defendants *are* risk seeking in the domain of losses . . . ." (emphasis in original)))); Stephen J. Schulhofer, *Harm and Punishment: A Critique of Emphasis on the Results of Conduct in the Criminal Law*, 122 U. PA. L. REV. 1497, 1552 (1974) (citing William Breit & Kenneth G. Elzinga, *Antitrust Penalties and Attitudes Toward Risk: An Economic Analysis*, 86 HARV. L. REV. 693, 705–06 (1973) (claiming on grounds of risk preferences that raising the severity of fines has more deterrent effect than raising enforcement probability in the antitrust setting)). *But see* Stephanos Bibas, *Plea Bargaining Outside the Shadow of Trial*, 117 HARV. L. REV. 2464, 2495 (2004) ("Prosecutorial bluffing is likely to work particularly well against innocent defendants, who are on average more risk averse than guilty defendants.").

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       A decision maker is said to be *risk averse* if that person starting from a position
       of certainty rejects the addition of any fair gamble to that certain starting position.
       Adding a fair gamble to a nonrandom starting position yields a gamble whose
       mean value is the same as the initial nonrandom starting value. Thus, a certain
       starting position is converted to a random one with the same mean. Risk aversion
       is always avoiding such a change.

Jack Meyer, *The Theory of Risk and Risk Aversion*, *in* 1 HANDBOOK OF THE ECONOMICS OF RISK AND UNCERTAINTY 99, 106 (Mark J. Machina & W. Kip Viscusi eds., 2014) (italics in original) (footnote omitted).

    6. BECCARIA-BONESANA, *supra* note 1, at 93; Becker, *supra* note 2, at 207–08; Isaac Ehrlich, *Participation in Illegitimate Activities: An Economic Analysis*, *in* ESSAYS IN THE

published *Dei delitti e delle pene* (*On Crimes and Punishment*) in 1764, in which he claimed that certainty rather than severity of punishment has a greater deterrent effect.[7] Gary Becker, in his famous article titled *Crime and Punishment: An Economic Approach*, published in 1968, first endorsed Beccaria's presumption and then demonstrated that it implies that criminals, contrary to the rest of the population, must be risk seeking.[8]

Are criminals really different from the rest of the population in their risk attitudes? If not, is there something wrong with Beccaria's presumption or Becker's analysis? Answering these questions requires an analysis of Becker's theory of crime and deterrence, as well as empirical studies investigating Beccaria's presumption. These questions deserve attention, not only because of their academic value in understanding criminal decision-making processes, but also because their answers are crucial to identifying cost-effective policies to reduce crime. If criminals' risk attitudes can be identified, they can be used to design more effective law enforcement methods.

The primary goal of this Article is to identify potential empirical methods to identify criminals' risk attitudes. To do this, we review previous commentaries as well as theoretical and empirical studies that relate to the topic. We show that Becker's analysis and its later interpretations abstract from a number of potentially important considerations. We demonstrate that when these considerations are taken into account, Beccaria's presumption does not imply that criminals are risk seeking. This observation allows us to form testable hypotheses concerning the relevance of various considerations that Beckerian models abstract from and discuss various empirical methods that can be employed to test such hypotheses. We begin by considering Becker's seminal piece on the economics of crime and deterrence.

In 1968, Gary Becker applied modern economic theory to analyze crime and criminal decision making.[9] After his seminal contribution, a very broad literature on the economics of deterrence and law enforcement emerged.[10] A crucial assumption in the Beckerian approach is that criminals react to incentives and that they can potentially be deterred from committing crime.[11] In the simplest Beckerian framework, deterrence is achieved through the threat of punishment. This threat consists of two components: certainty and severity of punishment. These two components generate a perceived threat of punishment. If a potential criminal's expected benefit from crime outweighs this perceived threat, then he commits the

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ECONOMICS OF CRIME AND PUNISHMENT 68, 75 (Gary S. Becker & William M. Landes eds., 1974).

    7. BECCARIA-BONESANA, *supra* note 1, at 93.

    8. Becker, *supra* note 2, at 207–08.

    9. *Id.*

    10. *See generally* Nuno Garoupa, *The Theory of Optimal Law Enforcement*, 11 J. ECON. SURVS. 267 (1997) (reviewing the law and economics literature on optimal law enforcement); A. Mitchell Polinsky & Steven Shavell, *The Economic Theory of Public Enforcement of Law*, 38 J. ECON. LITERATURE 45 (2000).

    11. Most theory articles take this assumption for granted. However, there are exceptions in the literature, where *some* criminals are assumed to be nondeterrable. *See, e.g.*, Thomas J. Miceli & Catherine Bucci, *A Simple Theory of Increasing Penalties for Repeat Offenders*, 1 REV. L. & ECON. 71 (2005). In these alternative settings, nondeterrable individuals can be thought of as gaining extremely high benefits from crime.

crime. The aggregate level of deterrence is simply the number of potential criminals whose criminal benefits are offset by the perceived threat of punishment.

After this simple framework was developed, it was used to test many hypotheses. In particular, it was used to discuss the validity of Beccaria's assertion that "[c]rimes are more effectually prevented by the *certainty* than the *severity* of punishment."[12] This presumption was accepted by influential scholars, as it appears to be intuitive.[13] The presumption continued drawing attention from economists and criminologists. Empirical studies, which reported results that support it, were conducted to investigate its validity.[14] We refer to this presumption as the "Certainty Aversion Presumption" (CAP).

Some interpretations of CAP are somewhat disturbing; within the simple Beckerian model of crime and deterrence, criminals must be risk seeking if they behave in a manner consistent with CAP.[15] "This would make criminals different from the rest of the population, because the other types of analysis have established that law-abiding citizens tend to be risk averse."[16] Various scholars responded by offering alternative explanations of CAP that do not rely on inherent differences between criminals and noncriminals. Existing studies that provide such explanations include Neilson and Winter (1997), Block and Lind (1975), and Mungan and Klick (2014).[17]

Neilson and Winter use tools from decision theory[18] that are capable of conveniently incorporating fixed costs associated with convictions. Such fixed costs

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12. BECCARIA-BONESANA, *supra* note 1, at 93 (emphasis in original).

13. *See, e.g.*, Becker, *supra* note 2, at 178 ("This approach also has an interesting interpretation of the presumed greater response to a change in the probability than in the punishment. . . . The widespread generalization that offenders are more deterred by the probability of conviction than by the punishment when convicted turns out to imply in the expected-utility approach that offenders are risk preferrers . . . ."); *see also* JAMES Q. WILSON & RICHARD J. HERRNSTEIN, CRIME AND HUMAN NATURE 397–401 (1985) (citing various studies conducted in the 1970s and early 1980s to discuss the deterrent effects of increases in the certainty and severity of punishment). The main point made by Wilson and Herrnstein is that an increase in the severity, if not accompanied by an increase in the probability of punishment, does not have a great deterrent effect.

14. *See, e.g.*, Block & Gerety, *supra* note 2; Jeffrey Grogger, *Certainty vs. Severity of Punishment*, 29 ECON. INQUIRY 297 (1991).

15. A proof of this result is provided by many economists, and in different settings. *See, e.g.*, Becker, *supra* note 2, at 178; Ehrlich, *supra* note 6, at 77–78; Neilson & Winter, *supra* note 3, at 98.

16. Neilson & Winter, *supra* note 3, at 97.

17. *See id*.; Michael K. Block & Robert C. Lind, *An Economic Analysis of Crimes Punishable by Imprisonment*, 4 J. LEGAL STUD. 479 (1975); Murat C. Mungan & Jonathan Klick, *Forfeiture of Illegal Gains, Attempts, and Implied Risk Preferences*, 43 J. LEGAL STUD. 137 (2014).

18. In particular, the authors use state-dependent and rank-dependent expected utilities to demonstrate their points. State-dependent utilities are used to capture the idea that a person's enjoyment of wealth (or other things) can be affected by factors that are not directly related to his wealth. A convict may enjoy his wealth less, for instance, if the stigma attached to his conviction reduces his ability to share and enjoy his wealth with others (who upon his conviction have distanced themselves from him). Rank-dependent expected utilities, on the

are present when a person is stigmatized for being convicted, or if an ex-convict can simply no longer enjoy his wealth as much as he could before conviction. Block and Lind develop a model where criminals are risk averse in wealth, but risk seeking in sentences, and still obey CAP.[19] Block and Lind's article highlights the fact that risk attitudes have different meanings in different contexts, and that criminals need not be different from the rest of society simply because they are risk seeking in sentences. As demonstrated in their paper, behavior that is consistent with risk seeking in sentences can be the product of something that is commonly assumed of noncriminals, namely discounting of future sentences.[20]

The explanations offered by Neilson and Winter and Block and Lind rely mainly on the sanction being nonmonetary. When sanctions are, to the contrary, monetary, fixed costs of conviction (stigmatization or loss of the ability to enjoy wealth) and discounting of future sentences are not as relevant. We recently offered a new and separate explanation as to how CAP and the presumption that criminals are risk averse can be reconciled.[21] We make the observation that simple crime-and-deterrence models ignore the possibilities of forfeiture of illegal gains and being caught while attempting a crime. When elimination of illegal gains to the criminal through these possibilities is a real concern,

> increasing the probability of detection leads to an increase in the expected monetary fine as well as a reduction in expected benefits. In contrast, an increase in the sanction increases only the expected monetary fine but does not affect the expected benefits of crime. Therefore, it is only natural that potential offenders contemplating such crimes are more sensitive to increases in the probability of detection rather than an increase in monetary fines, even if they are risk-averse expected-utility maximizers.[22]

Each of the briefly reviewed explanations as to why criminals may appear to be risk seeking relies on different aspects of the criminal's decision-making process. Determining which, if any, of these aspects are truly relevant requires an empirical analysis capable of generating evidence that can be used to support or refute the explanations provided in the literature. Having a better understanding of which explanations are relevant is important for enabling a discussion of policy

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other hand, are used to formalize the idea that people can attach different weights to increases in the probability of an event based on the initial probability of that event. A person may heavily discount very low probabilities and may therefore be unresponsive to increases in such probabilities. For instance, a person may not be able to tell the difference between 0.000001 and 0.000002, and therefore may be almost indifferent between catastrophic events that happen with these two probabilities, despite the fact that the second probability is twice as large as the first one.

19. Block & Lind, *supra* note 17.

20. *See id.* at 481; *see also* A. Mitchell Polinsky & Steven Shavell, *On the Disutility and Discounting of Imprisonment and the Theory of Deterrence*, 28 J. LEGAL STUD. 1, 6–7 (1999) (demonstrating that discounting implies risk seeking in sentences).

21. Mungan & Klick, *supra* note 17.

22. *Id.* at 141.

implications. Once criminals' preferences are better understood, it will be easier to identify cost-effective strategies in deterring crime.[23]

In this Article, we identify hypotheses capable of distinguishing between the various assumptions identified in the previous literature and propose empirical strategies to test these hypotheses. For example, the hypotheses suggest different effects of increasing the certainty of punishment across property and violent crimes. While many empirical papers on criminal deterrence have noted differential effects between property and violent crimes, virtually no one has linked this effect heterogeneity to a structural model of criminal decision making. This Article provides a starting point for a more complete understanding of the behavioral mechanisms through which deterrence works.

The remaining parts of this Article are structured as follows. Part I reviews the development of CAP and how it implies risk-seeking behavior in standard crime-and-deterrence models. In this Part, to avoid any ambiguity in the definition of CAP and its implications, we also provide a brief review of technical concepts related to risk and risk attitudes.

Part II reviews ideas that have been presented in the existing law and economics literature that challenge the proposition that CAP implies risk-seeking behavior. In particular, it presents simplified versions of models proposed by Neilson and Winter, Block and Lind, and us. We highlight the assumptions that each model relies on, provide intuitive interpretations of each, and demonstrate that they are different. In particular, Neilson and Winter rely on stigmatization costs and/or a reduction in ex-convicts' ability to enjoy wealth, Block and Lind assume discounting of future sentences, and in our previous articles we focus on the forfeitability of illegal gains and the discounting of monetary benefits. Distinguishing between these assumptions allows us to design empirical methods (discussed in Part III) that can potentially reveal which of these three models may reconcile CAP with the belief that even criminals are risk averse. This Part also discusses the meaning of risk preferences in detail. We emphasize that special attention should be paid to the domain over which risk is defined when interpreting risk. As such, we draw a distinction between risks over monetary outcomes versus risks over nonmonetary outcomes.

In Part III we propose empirical methods to test whether (1) criminals discount outcomes in the future, (2) stigma is an important concern for potential offenders, and (3) criminals are risk seeking over monetary outcomes. Each of these behavioral hypotheses suggests effect heterogeneity when it comes to the effects of changing criminal policy variables with respect to the type of crime committed as well as observable attributes of the criminal himself.

Part IV discusses the importance of having a better understanding of criminals' risk preferences. In particular, we demonstrate that optimal enforcement strategies

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23. *See e.g.*, Polinsky & Shavell, *supra* note 20 (demonstrating how more effective deterrent sanctions can be designed if we have knowledge on criminals' responsiveness to certainty versus severity of punishment); A. Mitchell Polinsky & Steven Shavell, *The Optimal Tradeoff Between the Probability and Magnitude of Fines*, 69 AM. ECON. REV. 880 (1979) (showing how information on criminals' risk aversion can be used to design sanction schemes that achieve greater deterrence); *see also infra* Part IV and the sources cited therein for other contexts in which knowledge about criminals' risk preferences can be used to design punishment schemes and procedures that enhance deterrence.

depend crucially on various assumptions concerning criminal behavior. The issues that we consider include (1) the optimal probability and punishment for various offenses, (2) optimal plea-bargain offers, (3) optimal punishments for repeat offenders, and (4) discretion in sentencing.

I. THE CERTAINTY AVERSION PRESUMPTION

A. A Short History of CAP

Cesare Beccaria's comments concerning the effects of the severity and certainty of punishment form the basis for what we term CAP:

> Crimes are more effectually prevented by the *certainty* than the *severity* of punishment. Hence in a magistrate the necessity of vigilance, and in a judge of implacability, which, that it may become an useful virtue, should be joined to a mild legislation. The certainty of a small punishment will make a stronger impression than the fear of one more severe, if attended with the hopes of escaping; for it is the nature of mankind to be terrified at the approach of the smallest inevitable evil, whilst hope, the best gift of Heaven, hath the power of dispelling the apprehension of a greater, especially if supported by examples of impunity, which weakness or avarice too frequently afford.[24]

Modern social scientists have speculated about the potential historical and institutional reasons for why thinkers of the classical school in criminology, such as Beccaria, Bentham, and Montesquieu, might have subscribed to this view. In particular, as Professor van den Haag states:

> Bentham and Beccaria thought that the certainty of punishment (of paying) is most important if the punishment (the price) is to deter. This stress on certainty is sometimes used to question the comparative effectiveness of severity. But Bentham and Beccaria meant to correct a contemporary situation: in the eighteenth century penalties were still extremely severe, but they were, perhaps for this reason, haphazardly applied and therefore uncertain. Uncertainty reduced or even nullified the deterrent effect.[25]

Whether the "contemporary situation" that allegedly pushed Bentham and Beccaria to form CAP has changed is debatable. It appears, however, that CAP has continued to be accepted by social scientists. Professor Mendes suggests that in the twentieth century, social scientists continued to show interest in CAP and "insisted on distinguishing the relative importance of the certainty and severity of punishment."[26] This trend continued in the field of economics, as is best exemplified by Gary Becker's seminal article on crime and punishment:

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24. BECCARIA-BONESANA, *supra* note 1, at 93 (emphasis in original).
25. ERNEST VAN DEN HAAG, PUNISHING CRIMINALS 115 (1975).
26. Silvia M. Mendes, *Certainty, Severity, and Their Relative Deterrent Effects: Questioning the Implications of the Role of Risk in Criminal Deterrence Policy*, 32 POL'Y

> [A] common generalization by persons with judicial experience is that a change in the probability has a greater effect on the number of offenses than a change in the punishment,[27] although, as far as I can tell, none of the prominent theories shed any light on this relation.[28]

Gary Becker's last sentence reflects the fact that in the late 1960s, the presumption was not yet explained through economic theory. Furthermore, to the best of our knowledge, by then no empirical studies sought to test its validity. Becker's seminal work published in 1968, which will be reviewed in the end of this Part, focused on providing a theoretical rationale as to why certainty, rather than severity, has a greater effect in deterring crime. Soon thereafter, empirical studies were conducted to test CAP.[29]

In 1991, economist Jeffrey Grogger published a paper titled "Certainty vs. Severity of Punishment," which is cited frequently as providing strong evidence supporting the validity of CAP.[30] Grogger estimated criminals' responsiveness to increases in the severity and certainty of punishment by employing an empirical model that used official arrest records from the California Department of Justice.[31] Later, in 1995, Block and Gerety conducted a study by inviting students and criminals to participate in laboratory experiments.[32] Block and Gerety concluded that students responded more to increases in severity; whereas, criminals responded more to increases in the certainty of punishment.[33]

Reexamining Grogger's results, however, it appears that they probably do not provide strong evidence of CAP. Essentially, Grogger used a sample of California criminals and simply ran regressions of the number of times these individuals were arrested in 1986.[34] To measure the expected probability of punishment, Grogger took the number of times the individual was convicted of a crime prior to 1986 and divided

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STUD. J. 59, 62 (2004).

27. "For example, Lord Shawness [sic] (1965) said, 'Some judges preoccupy themselves with methods of punishment. This is their job. But in preventing crime it is of less significance than they like to think. Certainty of detection is far more important than severity of punishment.'" Becker, *supra* note 2, at 176 n.12 (quoting Lord Shawcross, *Crime* Does *Pay Because We Do Not Back Up the Police*, N.Y. TIMES MAG., June 13, 1965, at 44).

28. Becker, *supra* note 2, at 176.

29. *See e.g.*, Block & Gerety, *supra* note 2; Klára Faragó, Orhidea Kiss & János Boros, *Risk-Taking in Entrepreneurs, Compared to Criminals and Students: The Role of Uncertainty and Stakes*, 37 J. SOCIO-ECON. 2231 (2008); Thorsten Pachur, Yaniv Hanoch & Michaela Gummerum, *Prospects Behind Bars: Analyzing Decisions Under Risk in a Prison Population*, 17 PSYCHONOMIC BULL. & REV. 630 (2010); David S. Lee & Justin McCrary, *The Deterrence Effect of Prison: Dynamic Theory and Evidence* (Princeton Univ. Griswold Ctr. for Econ. Policy Studies, Working Paper No. 189, 2009), *available at* https://www.princeton.edu /ceps/workingpapers/189lee.pdf [https://perma.cc/PZ3M-EF5C].

30. Michael Cain, *Is Crime Giffen?*, 16 J. FIN. CRIME 80, 81 (2009); Isaac Ehrlich, *Crime, Punishment, and the Market for Offenses*, 10 J. ECON. PERSP. 43, 62 (1996); Neilson and Winter, *supra* note 3, at 97; Polinsky & Shavell, *supra* note 20, at 7 n.18.

31. Grogger, *supra* note 14, at 298.

32. Block & Gerety, *supra* note 2.

33. *Id.* at 138.

34. Grogger, *supra* note 14, at 299.

it by the number of times the individual was arrested.[35] For the expected severity of the punishment, Grogger used the average prison sentence the individual had previously served.[36] Examining count data models, Grogger found that the severity measure generated a small negative coefficient that was not statistically significant.[37] In contrast, he found a negative coefficient for the probability of punishment measurement that was both larger in magnitude than the coefficient on the severity variable and was statistically significant.[38] Based on these results, Grogger concludes, "This evidence suggests that increased certainty of punishment provides a much more effective deterrent than increased severity and calls into question the wisdom of relying on lengthier prison sentences as a means to decrease crime."[39]

Upon reflection, it is clear that both of these metrics are problematic. It is not at all clear that individuals simply use their own private experience in determining their expectations of the probability and severity of punishment. Furthermore, the Grogger study suffers from deeper problems. First, it is simply not possible to conclude that one variable has a stronger effect than another based simply on whether one is statistically significant while the other is not. All sorts of things can lead to one estimate being less precise than another[40] (and therefore being less likely to be statistically significant) that have little to do with the "true" effect of a variable on an outcome. Second, in neither case is there a reasonable claim that the research design allows for a credible identification strategy wherein the probability or severity measures can be treated as if they were randomly assigned, allowing for confidence in the causal inferences being made.[41,42] Nonetheless, the Grogger paper is frequently cited as evidence of CAP.

Block and Gerety's work comes closer to demonstrating CAP and provides some direct comparisons between criminal and noncriminal populations. They implemented a contract-bidding experiment in which there was the opportunity to increase profits through bid rigging (i.e., collusion).[43] However, the researchers provided a potential punishment for such collusive behavior, manipulating both the

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35. *Id.*

36. *Id.*

37. *Id.* at 303 tbl.3.

38. *Id.*

39. *Id.* at 304.

40. For example, sampling variation may be larger for one variable than for another. Additionally, the effects of omitted variable bias may lead one variable to generate a statistically significant effect while another does not, even if the insignificant factor is actually more important.

41. *See generally* Jonah B. Gelbach & Jonathan Klick, *Empirical Law and Economics* (Univ. of Pa. Law Sch. Inst. for Law & Econ., Research Paper No. 14-39, 2014), *available at* http://ssrn.com/abstract=2507324 [https://perma.cc/E8BG-JFPY].

42. Even if these problems did not exist, however, valid direct comparisons of the effects are not provided, as Grogger never presents elasticity estimates. Thus, his conclusion is based on a comparison of the percentage change in the number of arrests for a unit change in the likelihood of being convicted (which is a probability), versus a percentage change in the number of arrests for a unit change in severity (measured in months). An elasticity calculation would examine the changes in the policy variables in their percentage change forms, eliminating the difference in the units being used.

43. Block & Gerety, *supra* note 2, at 125–26.

likelihood that the punishment would be applied and the size of the punishment.[44] They ran the experiment on two groups of people: (1) a presumably noncriminal group of college students from the University of Arizona and (2) a group of inmates from an Arizona state prison.[45]

Block and Gerety found that while the student group was more responsive to changes in the severity of the punishment, the prisoner group actually appeared to be more likely to engage in collusion as the severity of the punishment increased, suggesting that the prisoners were risk loving.[46] Interestingly enough, in response to hypothetical survey questions, the student and prisoner groups looked much more similar, with both exhibiting risk aversion.[47] However, the results from the experiments, which involved decision making with real financial consequences and which are not subject to the omitted-variable bias problems raised in the context of the Grogger paper, provide the strongest empirical evidence for CAP among criminals.[48]

These empirical and experimental results received great attention, because in the Beckerian model of crime and deterrence CAP seems to imply that criminals must be risk loving. This would separate criminals from the rest of the society, which appears to consist mainly of risk avoiders.[49] If true, this would mean that criminals are different from the rest of the population in an important and identifiable way—one that does not have much to do with the actual pleasure that they derive from illegitimate activity, namely their risk attitudes.

B. Risk & Lotteries

To analyze and identify risk attitudes, economists make use of what they call *lotteries*.[50] Consider for instance a lottery that results in an award of $50 with a

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44. *Id.* at 126.

45. *Id.* at 124.

46. *Id.* at 134–35.

47. *See id.* at 136 tbl.5.

48. That said, one may always question the external validity of experiments like these. Presumably, none of the prisoners was arrested for antitrust violations. This raises the question of whether one can simply extrapolate decision-making tendencies in one criminal context to the domain of the more relevant criminal context the individual is likely to be involved in when it comes to real life.

49. *See* Neilson & Winter, *supra* note 3, at 97.

50. One may also use utility functions to represent risk attitudes. In particular, let U be a potential offender's utility function and let w be the monetary equivalent of his initial position. In the Beckerian framework, this person will commit crime if:

$$U(w) < pU(w + b - s) + (1 - p) U (w + b),$$

where b is the monetary equivalent of his gain from crime, s is the criminal sanction, and p is the probability of being punished. Utility functions capture potential offenders' risk attitudes by allowing a representation of their marginal benefit from an additional unit of income. If a person has diminishing marginal returns, then it is said that U is concave and that he is risk averse. If, to the contrary, he has increasing marginal returns, then it is said that U is convex, or equivalently that the person is risk loving. *See* Moin A. Yahya, *Deterring* Roper*'s Juveniles: Using a Law and Economics Approach To Show That the Logic of* Roper *Implies That Juveniles Require the Death Penalty More Than Adults*, 111 PENN ST. L. REV. 53, 66 n.96

probability of 0.7 and an award of $100 with a probability of 0.3. If we call this lottery L, it can be compactly expressed as $L = (0.7, 0.3 ; 50, 100)$. The expected returns from lottery L would be given by $(0.7 \times 50) + (0.3 \times 100) = 65$, which can compactly be expressed as $E[L] = 65$.

Using this notation, certain risk attitudes can be conveniently identified and studied. A person is risk averse if he prefers the expected return of the lottery to the lottery itself.[51] Alternatively, a risk-averse individual is one who prefers the lottery with the smallest variance[52] among lotteries that have the same expected values. This definition of risk aversion conforms to the intuitive meaning conveyed by the term; a risk-averse person prefers certain outcomes over uncertain outcomes, hence, avoiding risk.

To exemplify, consider two lotteries: $A = (0.5, 0.5 ; 70, 30)$ and $B = (0.5, 0.5 ; 80, 20)$. Although both lotteries have the same expected value (i.e., $E[A] = E[B] = 50$), they have different variances.[53] B has a greater variance, because the possible awards are distributed more extremely than they are distributed in A. Accordingly, a risk-averse individual would prefer A.

A risk-seeking individual, on the other hand, would prefer B over A, and exactly for the opposite reason for why risk-averse individuals prefer A over B. One should, however, be careful in interpreting the meaning of risk-seeking attitudes. Risk seekers are not assumed to derive pleasure from the mere existence of a probable loss. The reason that they prefer B over A is that they place more value on the prospect of winning an additional $10 in B's good state of the world (A would pay $70, and B would pay $80 in this state of the world, making the difference $10) than they place on not winning an additional $10 in B's bad state of the world (A would pay $30, and B would pay $20 in this state of the world).

It is also worth clarifying the meaning of risk neutrality. A risk-neutral person would be equally happy with either lottery (A or B), because a risk-neutral individual ranks lotteries only based on their expected values, and A and B have the same expected value of $50.

(2006) (providing a simple explanation of utility functions and risk attitudes as relevant to this debate).

51. This is the Arrow-Pratt definition of risk aversion, which is equivalent to the Rothschild-Stiglitz definition of risk aversion under expected utility. The Rothschild-Stiglitz definition of risk aversion would require an individual to prefer the lottery with the lower variance between two lotteries that share the same expected value. Conversely, a risk-preferring individual would choose the lottery with greater variance. *See, e.g.*, Jan Werner, *Risk and Risk Aversion When States of Nature Matter*, 41 ECON. THEORY 231 (2009) (explaining the Arrow-Pratt definition, the Rothschild-Stiglitz definition, and other definitions of risk aversion).

52. "If X is a random variable with expected value $E(X)$, the variance of X is

$$\text{Var}(X) = E\{[X - E(X)]^2\}$$

provided that the expectation exists." JOHN A. RICE, MATHEMATICAL STATISTICS AND DATA ANALYSIS 131 (3d ed. 2007).

53. In particular, let $V[A]$ and $V[B]$ denote the variance associated with each lottery. It follows that $V[A] = [0.5 \times (70 - 50)^2] + [0.5 \times (30 - 50)^2] = 400 < V[B] = [0.5 \times (80 - 50)^2] + [0.5 \times (20 - 50)^2] = 900$.

C. CAP Implies Risk-Seeking Behavior in Becker's Model

The definition of risk provided in Part I.B is convenient for demonstrating why CAP implies that criminals must be risk seeking in Beckerian models. Before we proceed, however, it is useful to provide a more precise definition of CAP to eliminate ambiguities and to provide a simple notation explaining the Beckerian model.

1. CAP and Percentage Increases

To demonstrate how CAP implies risk-seeking behavior[54] it is useful to give a more precise definition of what is meant by certainty having a greater deterrent effect than severity. To ensure a meaningful analysis, we must consider increases in severity and certainty that have similar magnitudes. In economics and statistics, this is done by comparing equal percentage increases.[55] For instance, if the certainty of punishment is 50%, and if the punishment is monetary and equal to $500, then an increase of 10% in certainty and an increase of $100 in the sanction would be equal percentage increases (since both are 20% increases). We can now give a more precise definition of CAP: the presumption is that a percentage increase in the certainty of punishment has a greater deterrent effect than an equal percentage increase in the severity of punishment.[56]

2. Simple Notation for the Beckerian Model

In Becker's model, potential criminals benefit from committing crime, and dislike being punished.[57] Therefore, they commit crime if their benefit is sufficiently high,

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54. *See generally* Becker, *supra* note 2, at 178 n.19 (providing the first proof that under general assumptions of the expected-utility model, CAP implies risk-seeking preferences); Ehrlich, *supra* note 6, at 77 (noting that "[t]he deterrent effect of a 1 per cent increase in the marginal or average penalty per offense can be shown to . . . fall short of that of a similar increase in the probability of apprehension and punishment if the offender is a . . . risk preferrer"); Mungan & Klick, *supra* note 17, at 138 n.5 (citing Becker's proof, then modifying the analysis to include forfeiture of illegal gains); Neilson & Winter, *supra* note 3, at 98 (proving that under normal assumptions CAP implies risk-seeking preferences, then modifying the analysis to include state-dependent preferences).

55. *See, e.g.*, Mungan & Klick, *supra* note 17, at 137–38; Polinsky & Shavell, *supra* note 20, at 2. Mathematically, if U is the utility function, this corresponds to comparing

$$-\frac{\partial U}{\partial p}\frac{p}{U} \text{ and } -\frac{\partial U}{\partial s}\frac{s}{U}.$$

56. Mathematically, the CAP corresponds to the presumption that

$$-\frac{\partial U}{\partial p}\frac{p}{U} > -\frac{\partial U}{\partial s}\frac{s}{U}.$$

57. *See* Becker, *supra* note 2, at 176–77 (characterizing this approach as a "usual analysis of choice").

or if the expected punishment associated with that crime is sufficiently low. This idea can conveniently be represented by making use of simple algebra.

Denote with b the monetary equivalent of the benefit a potential offender gets from committing a certain crime, and with p and s, respectively, the likelihood and severity of punishment associated with that crime. This notation can be used to determine under what conditions potential criminals with various risk attitudes find it in their best interest to commit crime. We begin with the simplest case, namely risk neutrality.

3. Risk-Neutral Potential Criminals

Risk neutrality requires a person to base his decision only on his expected net benefit. In other words, a risk-neutral person is an expected value maximizer. Using the previous notation, expected net benefits are given by $b - (p \times s)$. Since b is unaffected by the severity and certainty of punishment, the effectiveness of punishment schemes in deterring risk-neutral individuals will depend only on the expected sanction, which is the product of the probability and severity of the sanction, symbolically $p \times s$.

In the previous example,[58] $p = 50\%$ and $s = \$500$, and therefore the expected sanction is given by $p \times s = \$250$. Increasing the probability of conviction from 50% to 60% leads to an expected sanction of $(60\%) \times (\$500) = \$300$. Similarly, increasing the punishment from \$500 to \$600 leads to an expected sanction of $(50\%) \times (\$600) = \$300$. As this example demonstrates, equal percentage increases in severity and certainty have the same effect on the expected punishment (i.e., on $p \times s$).[59] And since risk-neutral individuals make decisions based only on the size of the expected punishment, equal percentage increases in the certainty and severity of punishment have equal deterrent effects on risk-neutral potential criminals.

4. Risk-Averse and Risk-Seeking Potential Criminals

To demonstrate how risk-averse and risk-seeking individuals differ in their behavior, consider the following three lotteries: $L = (0.5, 0.5 ; b - \$500, b)$, $L_1 = (0.6, 0.4 ; b - \$500, b)$, and $L_2 = (0.5, 0.5 ; b - \$600, b)$, where b is a criminal's benefit from crime, and the first value in each lottery (in the form of $b - \$X$) is the criminal benefit net of punishment costs. It follows that L_1 and L_2 are obtained by increasing by 10% the certainty and severity of punishment in the lottery L, respectively. Hence, lotteries L_1 and L_2 share the same expected values, namely $b - \$300$.[60]

As discussed earlier,[61] when a risk-averse individual has to make a choice between two lotteries with the same expected value, he prefers the one with less variance. Conversely, a risk-preferring individual chooses the lottery with greater variance. It

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58. *See supra* Part I.C.1 (expounding this example).
59. *See* sources cited *supra* note 54.
60. This can easily be demonstrated by calculating the respective expected values:
$E[L_1] = (0.6 \times (b - \$500)) + (0.4 \times b) = 0.6b - \$300 + 0.4b = b - \$300$
$E[L_2] = (0.5 \times (b - \$600)) + (0.5 \times b) = 0.5b - \$300 + 0.5b = b - \$300$.
61. *See supra* Part I.B.

is relatively easy to verify that L_1 has less variance than L_2.[62] This follows because L_1 results in a small penalty often, whereas L_2 results in a large penalty less frequently. Hence, L_2 involves a more extreme distribution of events. Accordingly, a risk-averse individual would prefer L_1 over L_2, and a risk-loving individual would prefer L_2 over L_1.

What does this imply in terms of the effectiveness of certainty versus severity in deterring risk-averse/loving potential criminals? Recall that L_1 is obtained by increasing the certainty of punishment, and is disliked by risk-loving potential criminals. Conversely, L_2 is obtained by increasing the severity of punishment, and is disliked by risk-averse potential criminals. This observation leads us to the Beckerian conclusion: an increase in certainty is more effective in deterring potential criminals if and only if they are risk loving.[63]

D. Tensions Arising from the Implications of CAP

CAP was first proposed over 250 years ago. Since then, it has been supported—rather than challenged—by modern social scientists, and there is some empirical and experimental evidence supporting it.[64] This leads us to be reluctant in challenging the validity of CAP. A puzzling implication of CAP in Beckerian models, however, is that criminals must be risk loving.

This conclusion is in tension with the implicit belief reflected in many studies that even criminals are risk averse to some degree. Furthermore, it is interpreted as suggesting that criminals are "different from the rest of the population," who are considered to be risk averse.[65] Hence, CAP's implications are puzzling, if not disturbing, and this raises at least two important questions.

First, should we not rely on results and conclusions derived from economics and criminology studies that assume criminals are risk averse (or risk neutral)? Second, are criminals really *different* from the rest of the society on a dimension that has nothing to do with their actual illegitimate benefits from crime?

While the second question is of great academic interest, the first question is extremely important for designing policies to deter crime at the lowest cost to society. Hence, resolving this puzzle is not only of academic value but is important for practical concerns. Therefore, we must first investigate the following question: Can risk aversion and CAP coexist in frameworks that incorporate broader approaches

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62. To demonstrate this, let $V[L_1]$ and $V[L_2]$ represent the variances of each lottery. It follows that:

$$V[L_1] = 0.6 \times ((b - \$500) - (b - \$300))^2 + 0.4 \times (b - (b - \$300))^2$$
$$= 0.6 \times 200^2 + 0.4 \times 300^2 = 24{,}000 + 36{,}000 = 60{,}000$$

and

$$V[L_2] = 0.5 \times ((b - \$600) - (b - \$300))^2 + 0.5 \times (b - (b - \$300))^2$$
$$= 0.5 \times 300^2 + 0.5 \times 300^2 = 90{,}000.$$

Hence, $V[L_1] < V[L_2]$.

63. *See* Becker, *supra* note 2, at 178 (using expected-utility theory to prove, under his assumptions, that certainty is more effective in deterring potential criminals if and only if they are risk loving).

64. *See supra* Part I.A (providing a brief review of the historical development of CAP).

65. *See* Neilson & Winter, *supra* note 3, at 97.

than simple Beckerian models? If yes, then it is perhaps the over-simplicity of traditional Beckerian models that pushes us to falsely conclude that criminals are risk loving. If no, then we must either accept the conclusion that criminals are risk loving, or find a fundamental flaw common to all crime-and-deterrence models which pushes us to falsely conclude that criminals are risk loving. In Part II, we answer this question affirmatively.

II. RECONCILING CAP WITH RISK AVERSION

Beckerian models, just like every other economic model, make simplifying assumptions. These assumptions may lead to abstractions from considerations that may affect conclusions regarding criminals' implied risk attitudes. Various scholars have investigated the implicit assumptions in Becker's model to determine whether they may be responsible for the conclusion that CAP implies risk aversion. In this Part, we review three extensions of Becker's crime-and-deterrence model that may reconcile CAP and risk aversion. More specifically, we review three theoretical frameworks that demonstrate that CAP can be observed in a world where risk-averse criminals make rational criminal decisions.

A. Domains of Risk: Imprisonment Versus Monetary Prospects and Time Preferences

In Becker's model, as discussed in Part I.C.2, a potential offender decides to commit crime if his illegitimate benefit b is high, and the severity of punishment s and/or the certainty of punishment p are low. An implicit assumption here is that b and s are measured with the same metric. If the benefit from crime is monetary, and if the associated punishment is also monetary, this implicit assumption may not be harmful.

If, however, b is measured in dollars, but s is measured in years in prison, then the criminal cannot directly compare these two values. Before he can compare these two values, he must convert the expected punishment (which is measured in years in prison) to dollars, or convert the monetary benefit from crime into years in prison.

There are many conceivable ways in which a unit can be converted into another. In the case of monetary currencies, for instance, we use conversion rates. One converts American dollars to euros by multiplying the number of dollars by the exchange rate between dollars and euros. In this case, the conversion is simple; one unit is a scalar product of another.

In other instances, conversion requires a more complicated calculation. Consider, for instance, the conversion of future income into its present discounted value.[66] In this case, future earnings are discounted based on how far in the future they are expected to be earned. As such, one cannot simply use a constant exchange rate

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66. *See, e.g.*, R. CHARLES MOYER, JAMES R. MCGUIGAN, RAMESH RAO & WILLIAM J. KRETLOW, CONTEMPORARY FINANCIAL MANAGEMENT 158–60 (12th ed. 2012); STEPHEN A. ROSS, RANDOLPH W. WESTERFIELD & BRADFORD D. JORDAN, FUNDAMENTALS OF CORPORATE FINANCE 130–33 (10th ed. 2013) (explaining the concept of discounting and present values in further detail).

between future income and current income; the exchange rate depends on another variable, namely time.

So how do criminals convert time in prison for purposes of comparing expected punishment with expected illegitimate monetary gains? This is inherently an empirical question. However, scholars point out several reasons as to why future time in prison, just like future income, would probably be discounted by criminals.[67] A short list of such reasons:

i. *s* usually refers to the "length of the sentence decreed by the court and not the length of the sentence that is actually served."[68] This implies that one puts less weight on future sentences, because a person's probability of being alive to serve his sentence in the future decreases in time.

ii. "[S]ince most individuals have a positive time preference for increments of wealth they will have a negative time preference for decreases in wealth. Since imprisonment usually implies a decrease in wealth, an individual will be most concerned with the wealth effects in the early years of a prison term."[69]

iii. "[T]he first years of imprisonment may create special disutility due to brutalization of the prisoner."[70]

iv. A person might become "accustomed to prison life or … cease[] to care as much about those he knew from the outside."[71]

If, as advocated in the existing literature, criminals discount future time spent in prison, is it not only natural that they appear to be risk seeking over outcomes that involve imprisonment? To answer this question, consider the extreme case where future imprisonment is very heavily discounted by a potential criminal. Assume the criminal faces two choices, (i) a year in prison with certainty, versus (ii) two years in prison with a probability of 50% and no punishment with a probability of 50%. Since the second year is heavily discounted, option (ii) is more desirable because it involves a 50% chance of punishment that is almost only as bad as the certain punishment in (i).[72] The two choices in (i) and (ii) share the same expected punishment of one year in prison, yet the criminal chooses the one that is more uncertain.[73] Hence, the criminal appears to be risk loving.

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67. *See, e.g.*, Block & Lind, *supra* note 17, at 481; A. Mitchell Polinsky & Steven Shavell, *The Theory of Public Enforcement of Law*, *in* 1 HANDBOOK OF LAW AND ECONOMICS 403, 419 (A. Mitchell Polinsky & Steven Shavell eds., 2007).

68. Block & Lind, *supra* note 17, at 481.

69. *Id.*

70. Polinsky & Shavell, *supra* note 67, at 419 n.27.

71. Polinsky & Shavell, *supra* note 20, at 3.

72. This can be demonstrated through a simple utility function over sentences that discount imprisonment in the future. Consider, for example, $U(s) = -\sqrt{s}$.

73. When we use the utility function in the previous note, option (i) results in a net disutility of 1, whereas option (ii) results in a net expected disutility of $(0.5 \times 0) + (0.5 \times \sqrt{2})$ ≈ 0.71. Hence, the second option is preferred by the criminal.

The important thing to note here is that the criminal appears to be risk loving over uncertainties involving time in prison. The economics literature that establishes that individuals are, in general, risk averse relies on lotteries over monetary outcomes, not over time in prison. There is no reason, a priori, to think that people evaluate uncertainties concerning imprisonment the same way that they evaluate uncertainties over monetary outcomes.

In 1975, Michael K. Block and Robert C. Lind, in an article in the *Journal of Legal Studies*, presented a theoretical model that essentially formalizes this idea.[74] Block and Lind point out that people can have different risk attitudes over different domains.[75] In particular, they can be risk averse over monetary fines, but risk seeking over prison sentences, and behave in a manner consistent with CAP.[76] As such, CAP does not necessarily imply that criminals are different from noncriminals in their risk preferences.[77]

B. Sentences and Stigma: Implications for Risk Attitudes

Block and Lind's argument relies on discounting of future sentences as the rationale for criminals' risk attitudes over sentences. Another reason as to why criminals may display risk-seeking behavior over sentences is related to the labeling effect that is generated by imprisonment. "A convicted criminal suffers not only from public penalties but from stigma, the reluctance of others to interact with him economically and socially."[78]

Stigmatization, from a theoretical perspective, produces effects similar to those produced by discounting of future jail time on criminals' implied risk preferences. Stigma can be thought of as simply adding what economists call *fixed costs* to the psychic and physical costs of imprisonment. As such, a person would be willing to pay a very high price for avoiding conviction, even if the punishment attached to such conviction is a single day in prison. Hence, a person can prefer a 50% chance of a week in jail and 50% chance of no conviction, to conviction with certainty requiring imprisonment for a single day.[79] It is easy to verify that such a choice is consistent with risk-neutral (and risk-averse) preferences over sentences.[80]

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74. Block & Lind, *supra* note 17.

75. *Id.* at 480–81.

76. *Id.* at 480–83.

77. *Id.* at 479 ("Using this framework we are able to explain the relative deterrent effects of certainty and severity in punishment without imputing any special behavioral characteristics to the class of individuals who commit offences.").

78. Eric Rasmusen, *Stigma and Self-Fulfilling Expectations of Criminality*, 39 J.L. & Econ. 519, 519 (1996).

79. To demonstrate this point, let σ denote the stigma attached to conviction. A risk-neutral individual's expected utility from committing crime is therefore $EU = b - p(s + \sigma)$ when his disutility from imprisonment is proportional to his sentence. The expected utility of the first option is $b - 0.5(7 + \sigma) = b - 3.5 - 0.5\sigma$, and his expected utility from the second option is $b - 1 - \sigma$. He prefers the first option if $\sigma > 5$, that is, if the stigma associated with conviction is greater than the variable cost of going to prison for five days.

80. The previous note demonstrates that a risk-neutral individual prefers the first option, if $\sigma > 5$. This implies that slightly risk-averse individuals prefer the first option, too, when $\sigma > 5$. *See* Mungan & Klick, *supra* note 17, at 142–43 (proving that if a risk-neutral person strictly

The effect of stigmatization on criminals' risk preferences over imprisonment seems, at first glance, indistinguishable from the effect of discounting of future time in prison. This is, however, not true. We just demonstrated that a person who fears stigmatization may behave in accordance with CAP when he compares a prospect that may result in no conviction to another prospect where all outcomes involve conviction. But, when all outcomes in all lotteries being compared involve conviction, a risk-neutral individual who does not discount future time in prison cannot act in accordance with CAP. The reason is simple: all outcomes involve the same costs of stigmatization, and since the person values each year in prison equally, he is indifferent between two years in prison with certainty and a lottery that results in three years in prison with 50% chance and one year in prison with 50% chance.[81]

This distinction between the effects of time preferences versus the effects of stigmatization can be exploited when designing empirical methods to distinguish between the competing (or complementary) theories as to how CAP may be reconciled with risk aversion over monetary outcomes.[82]

This distinction is particularly important when one considers the incentives of two broad groups of offenders: first-time offenders and repeat offenders. There is a priori no reason to believe that the members of the two groups have, on average, different discount rates for sentences in the distant future. However, members of the first group are much more likely to suffer from stigmatization than members of the latter group.[83] This is because repeat offenders have already been stigmatized after their first offense, and therefore the marginal stigmatization effect of the second offense is much smaller. This distinction, too, can be exploited in empirical studies to isolate the effect of stigma on criminals' differential responsiveness to the certainty rather than the severity of punishment.[84]

C. Monetary Sanctions, Forfeiture of Illegal Gains, and Judgment Proofness: Implications for Risk Attitudes

As discussed in Parts II.A and II.B, uncertainties over sentences are fundamentally different from uncertainties over monetary outcomes, and there are reasons to believe that the revealed risk preferences over sentences do not provide much information about criminals' risk attitudes over monetary outcomes. But what if we discover that CAP holds also when we only consider crimes that are punishable solely through monetary fines? Are we to conclude that criminals must be risk seeking over monetary outcomes? There are at least two reasons to be cautious about jumping to this conclusion.

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prefers option A to option B, slightly risk-averse people will also prefer A to B).

81. To see this, consider the expression for expected utility, *supra* note 79. The person's expected utility is $b - 2 - \sigma$ from the first option, which equals his expected utility of $b - 0.5(1 + \sigma) - 0.5(3 + \sigma) = b - 2 - \sigma$ from the second option.

82. *See infra* Part III (discussing how empirical methods can distinguish between these two effects).

83. *See, e.g.*, Patricia Funk, *On the Effective Use of Stigma as a Crime-Deterrent*, 48 EUR. ECON. REV. 715, 719–21 (2004).

84. *See infra* Part III (discussing how empirical studies can isolate the stigmatization effect of convictions).

Recall that CAP implies that criminals are risk seeking in Beckerian models, and that these models make many simplifying assumptions. Two particular assumptions are that (i) sanctions are payable by all offenders, and (ii) the size of criminals' benefits does not depend on whether or not they are convicted. In other words, people, upon being convicted, are assumed to be capable of paying severe fines and also collecting criminal benefits. Not surprisingly, these two simplifying assumptions have similar effects on conclusions regarding criminals' risk attitudes.

First, a criminal that is judgment-proof[85] will be unaffected by an increase in the severity of the monetary sanction simply because he does not have sufficient assets to pay the monetary sanction in full. As such, if a large proportion of criminals are judgment-proof, it would be only natural for increases in monetary sanctions to have little deterrent effects. Hence, CAP would hold regardless of criminals' risk attitudes.

Second, criminals' illegitimate benefits can be disgorged upon conviction, which may generate additional costs of convictions that are not accounted for via monetary sanctions. A similar effect will be observed in cases where preventive law enforcement methods are used. In such cases a criminal is prevented from obtaining the illegal benefit that he seeks through crime. Therefore, in both cases,

> increasing the probability of detection leads to an increase in the expected monetary fine as well as a reduction in expected [criminal] benefits. In contrast, an increase in the sanction increases only the expected monetary fine but does not affect the expected benefits of crime. Therefore, it is only natural that potential offenders contemplating such crimes are more sensitive to increases in the probability of detection rather than an increase in monetary fines, even if they are risk-averse . . . .[86]

The second observation, but not the first, is valid in the context of crimes punishable by imprisonment as well. It should be noted, however, that by focusing on crimes punishable only through monetary sanctions, one can potentially isolate the effects of forfeiture of criminals' illegal gains, because considerations such as criminals' time preferences and stigmatization effects should be irrelevant in the context of offenses punishable by monetary sanctions only.

D. Are Simplifying Assumptions Important?

The existing literature points out at least three abstractions in simple Beckerian models which *may* be responsible for the (perhaps false) conclusion that CAP implies that criminals must be risk seekers. Although these theoretical models are important for demonstrating caveats in existing economic arguments, it is impossible to determine whether such caveats are important by studying theories. Theoretical models simply point out certain possibilities. Whether these possibilities are realities is inherently an empirical question. This is why, to determine whether abstractions in Beckerian models lead us to false conclusions, we must form testable hypotheses.

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85. *See generally* S. Shavell, *The Judgment Proof Problem*, 6 INT'L REV. L. & ECON. 45 (1986).

86. Mungan & Klick*, supra* note 17, at 141.

III. WHY DO CRIMINALS APPEAR TO BE RISK LOVING, AND HOW CAN WE KNOW?

We have suggested that the conventional wisdom regarding criminals' risk preferences may be incomplete, if not misguided. Specifically, we reviewed alternate hypotheses proposed by us and by others that could account for the standard claim that criminals are more responsive to increases in the probability of punishment than they are to proportionate increases in the severity of punishment without concluding that criminals are risk loving. In this Part, we sketch out some empirical strategies that could be used to sort these various hypotheses from the hypothesis implied by the conventional wisdom (i.e., that criminals are more readily deterred by an increase in the certainty or probability of receiving a punishment than they are by a proportionate increase in the severity of a punishment).

Before we commence in laying out some potential ways to test the various hypotheses, it is useful to note that the existing empirical evidence is somewhat weak relative to the degree to which the conventional wisdom is held among many scholars of crime. In the economics literature, as we already suggested, Grogger's influential empirical article on the topic[87] actually falls short of providing credible evidence that criminals are more responsive to increases in certainty than to increases in severity. Block and Gerety[88] come closer to providing this evidence; however, skepticism could be warranted based on the artificial context that is often a concern about experimental designs. Further, even in that article, there is conflicting evidence in that their survey results suggest that both criminals and noncriminals alike appear to be deterred by increasing the severity of the expected punishment.[89]

There are at least two studies that provide evidence against the general idea that criminals exhibit CAP to a greater degree than do noncriminals. Avner Bar-Ilan and Bruce Sacerdote examine the effect of increasing the fines for running red lights in San Francisco and Israel.[90] They find that individuals with criminal records and individuals with no prior criminal history exhibit the same elasticity to the increase in the fines for the traffic infractions.[91] Also, Joanna Shepherd examines the effect of the adoption of state sentencing guidelines, finding that reduced sentencing discretion under the guidelines is associated with more crime.[92] She argues that this is consistent with criminals being risk averse as guidelines reduce the variance of the expected punishment.[93] While the Shepherd paper does not examine the comparison of elasticities between responses to changes in severity and certainty, it does at least cut against the idea that criminals are risk loving. That said, David Lee and Justin McCrary provide evidence that the elasticity of crime with respect to increasing the

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87. Grogger, *supra* note 14.

88. Block & Gerety, *supra* note 2.

89. *Id.*

90. Avner Bar-Ilan & Bruce Sacerdote, *The Response of Criminals and Noncriminals to Fines*, 47 J.L. & ECON. 1 (2004).

91. *Id.* at 15–16.

92. Joanna Shepherd, Blakely*'s Silver Lining: Sentencing Guidelines, Judicial Discretion, and Crime*, 58 HASTINGS L.J. 533, 586 (2007).

93. *Id.* at 587.

probability of arrest may exceed the elasticity of crime with respect to sentence severity by as much as an order of magnitude.[94]

Although we have concerns that crime scholars have been too quick to deduce from the empirical record that criminals are more responsive to changes in the probability of punishment than to changes in the severity of punishment,[95] we are not willing to ignore the consensus of such scholars either. With this in mind, we lay out some approaches that could be used to better examine any evidence that probability elasticities exceed severity elasticities.

A. Stigma

The potential role of stigma in generating CAP-consistent behavior could be examined by exploiting heterogeneity at the individual level. Namely, the mechanisms through which stigma works are primarily a one-shot cost.[96] Once one is known as a criminal, the stigma attaches, leading to a loss of status, reputation, job opportunities,[97] and a host of other psychic and economic benefits. Given this, any elasticity differential should be substantially smaller for previously convicted individuals.

In individual-level micro data, a researcher could differentially examine the effect of changes in the probability of punishment and the severity of punishment on the likelihood that an individual commits a crime among those who have no previous record and those who do have a record. In aggregate (say, state- or city-level) data, one could interact the effects of changes in the probability of punishment and the severity of punishment with an indicator capturing the share of the population with a criminal record. If stigma is driving any elasticity differential, the interaction effect between the severity indicator and the fraction of the population with a criminal record should lead to a reduction of the direct differential between the elasticities.

Another approach might exploit heterogeneity across the stigma associated with different crimes. For example, in communities where a drug arrest is taken to be

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94. *See* Lee & McCrary, *supra* note 29, at tbl.5.

95. *See* Mungan & Klick, *supra* 17, at 147–48. It seems, at least in some cases, crime scholars have been too quick to equate an absence of evidence regarding the effect of increasing severity with evidence of an absence of such an effect. Arguably, the research designs regarding elements affecting the probability of punishment (such as policing) have been much better than the research designs examining the elements of severity (such as prison sentences). For more on this point, see Gelbach & Klick, *supra* note 41.

96. *See* Funk, *supra* note 83, at 719–21; Murat C. Mungan, *Reducing Crime Through Expungements* 5 (Fla. State Univ. Coll. of Law, Pub. Law Research Paper No. 786, 2016), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2711024# [https://perma.cc/C8WZ-M3VK].

97. *See generally* Harry J. Holzer, Paul Offner & Elaine Sorensen, *Declining Employment Among Young Black Less-Educated Men: The Role of Incarceration and Child Support*, 24 J. POL'Y ANALYSIS & MGMT. 329 (2005) (loss of current employment); John R. Lott, Jr., *An Attempt at Measuring the Total Monetary Penalty from Drug Convictions: The Importance of an Individual's Reputation*, 21 J. LEGAL STUD. 159 (1992) (loss of reputation); John R. Lott, Jr., *Do We Punish High Income Criminals Too Heavily?*, 30 ECON. INQUIRY 583 (1992) (loss of future earning power); Devah Pager, *The Mark of a Criminal Record*, 108 AM. J. SOC. 937 (2003) (loss of future employment opportunities).

indicative of little more than membership in the community, initial differentials in elasticities should be smaller than arrests for more stigmatized crimes, and they should be smaller than differentials observed in communities where drug crimes are more stigmatized. If these effects are not observed, it is less likely that stigma is playing much of a role in explaining any CAP-consistent findings.

B. Forfeiture

If the possibility of forfeiture is driving any CAP-consistent findings, essentially the researcher is failing to adequately measure the punishment, which should include the forfeited criminal gains in the calculation of expected loss.[98] Put this way, it becomes clear that crimes where any gain is immediately enjoyed (and, hence, not subject to forfeiture) should not exhibit a differential between the elasticity of crime with respect to the likelihood of punishment and the severity of punishment. More concretely, if concerns regarding forfeiture are driving the appearance of CAP, there should be a larger difference for crimes where any enjoyment of gains is delayed (theft, robbery, etc.) than for crimes where any gains are more immediate (assault, destruction of property, etc.). Along the same lines, within crime categories such as theft, any differential should be larger for thefts where the stolen object will take some time to use (e.g., stealing durable goods either to use or resell) as opposed to thefts where the object can be consumed quickly (e.g., cash or drugs).

The extent to which jurisdictions engage in asset forfeiture could also be leveraged to test the possibility that forfeiture concerns drive CAP-consistent findings. Crimes subject to forfeiture laws and crimes occurring in jurisdictions with more active forfeiture practices should exhibit a greater probability-/severity-elasticity differential than crimes not subject to asset forfeiture or crimes in jurisdictions where asset forfeiture practices are limited.

C. Discounting

In our article on the effect of discounting on criminal decision making, we use a motivating example where a thief must wait until after his time in jail to enjoy his booty.[99] In such a context, longer jail sentences have declining marginal effects on the criminal's evaluation of the net benefit of committing a crime.[100] For example, if part of what deters an individual from committing a crime is the thought of having to wait for a number of years to spend the loot, increasing the prison sentence and the likelihood of going to prison will both reduce the likelihood of the crime being committed. However, while a doubling of the likelihood will have a relatively large effect, a doubling of the sentence will have less of an effect.[101] This immediately

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98. Mungan & Klick, *supra* note 17, at 141–44.

99. Murat C. Mungan & Jonathan Klick, *Discounting and Criminals' Implied Risk Preferences*, 11 REV. L. & ECON. 19 (2015).

100. *Id.*

101. To see this, imagine a thief who buries his $100 of loot in the fear that he will soon be apprehended. For a jail term of 25 years and an annual discount rate of 10%, if his likelihood of getting sent to jail (such that he must wait to enjoy his spoils) increases from 25% to 50%, the expected value of his criminal gains drops from $77.31 to $54.62, a 29% reduction. If

suggests an implication similar to that arising from the forfeiture concern. If discounting is driving CAP-consistent findings, the likelihood-/severity-elasticity differential should not arise for crimes where the gain is enjoyed immediately such as assault or destruction of property. While this poses a problem with respect to distinguishing the forfeiture hypothesis and the discounting hypothesis, the discounting hypothesis only applies when the punishment involves a delay in consumption (i.e., when jail time is part of the punishment), whereas the forfeiture effect occurs independently of any jail time served.

D. Judgment-Proof Criminals

Using individual-level data, it may be possible to identify the extent to which the fact that a criminal may be judgment-proof[102] drives any differential between the probability/severity elasticities. Namely, in the case of fines, individuals with more assets should exhibit less of a differential than individuals with fewer assets. For example, if an individual has $10,000 in assets, doubling a fine from $10,000 to $20,000 should have no effect, while increasing the probability of punishment from 10% to 20% may have a large effect. For an individual with assets of $100,000, both increases may have large implications for the criminal's evaluation of the attractiveness of the crime. For jail terms, the parallel issue involves the criminal's age. Increasing a jail term from 20 to 40 years may make no difference for someone who is 60 years old, but it may have a large effect on a 20-year-old criminal.

IV. POLICY RELEVANCE

We have identified empirical approaches to disentangle the effects of stigmatization from criminals' time preferences over sentences, and methods to distinguish between criminals' risk preferences over monetary versus nonmonetary sanctions. Next, we discuss specific reasons as to why it is important to have such information, and how cost-effective and deterrent procedures can be designed by relying on such information.

A. Optimal Law Enforcement

There is a very broad law and economics literature on optimal law enforcement.[103] A brief examination of this literature suggests that criminals' risk preferences play a central role in the determination of optimal law enforcement strategies. In particular, Polinsky and Shavell provide a brief and very informative survey of the existing literature on law enforcement where they point out the effects of risk attitudes on optimal law enforcement.[104] They find it useful, as do we, to analyze separately the

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instead, he faces a fixed 25% likelihood of arrest but his sentence doubles from 25 years to 50 years, the expected value of his criminal gains drops from $77.31 to $75.21, a 3% decline.

   102. *See generally* Shavell, *supra* note 85.

   103. *See* Polinsky & Shavell, *supra* note 67 (reviewing the existing literature).

   104. Polinsky & Shavell, *supra* note 20 (reviewing how different risk attitudes affect criminals' choices over different lotteries); Polinsky & Shavell, *supra* note 23 (providing an analysis of risk aversion); Polinsky & Shavell, *supra* note 67, at 413–19 (giving an excellent

effects of criminals' risk attitudes on effective law enforcement strategies for crimes punishable by imprisonment and for crimes that are not.

When an offense is punishable only via monetary sanctions, "the risk aversion of individuals tends to lower the level of the optimal fine" under a general set of assumptions.[105] This follows from two main reasons when one considers a situation where the likelihood of punishment is fixed[106]: "First, lowering the fine reduces the bearing of risk by individuals who commit the harmful act. Second, because risk-averse individuals are more easily deterred than risk-neutral individuals, the fine does not need to be as high to achieve any desired degree of deterrence."[107] A similar result is obtained when the probability and magnitude of sanctions are determined together:

> In effect, when individuals are risk averse, fines become a socially costly sanction (reflected in an increase in taxes) rather than a mere transfer of wealth. The more risk averse individuals are, the better it is to control their behavior by using a lower fine and a higher probability of detection, even though this raises enforcement costs.[108]

As explained in Part II, individuals may have different risk attitudes over different domains. For crimes that are punished by imprisonment, the relevant risk concept is criminals' risk attitude over imprisonment sentences. When criminals discount future punishments they appear to be risk seeking over sentences.[109] The risk seekingness of criminals may reduce the optimal sentence. This follows because the deterrent effect of lengthy sentences is low, but the cost of imprisonment is substantial.[110]

The ideas presented in this subpart summarize only a very small fraction of the observations made in the existing law and economics literature on optimal law

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review of optimal law enforcement strategies).

105. *See* Polinsky & Shavell, *supra* note 67, at 420 (demonstrating that this conclusion holds regardless of whether there is a fixed or endogenous probability of detection in the law enforcement model).

106. There are a few reasons as to why enforcement costs might be fixed, or where it would be harmless to assume that they are. *See generally* Steven Shavell, *Specific Versus General Enforcement of Law*, 99 J. POL. ECON. 1088 (1991) (demonstrating that the certainty of punishment for various crimes may be jointly determined through "general enforcement" efforts. A good example is a police officer patrolling a neighborhood. This investment in enforcement not only increases the probability of detecting theft but also the probability of detecting battery, murder, rape, etc.).

107. Polinsky & Shavell, *supra* note 67, at 415. *But see* Louis Kaplow, *The Optimal Probability and Magnitude of Fines for Acts That Definitely Are Undesirable*, 12 INT'L REV. L. & ECON. 3 (1992). As Polinsky and Shavell state, Kaplow demonstrates: "It is possible, however, that the optimal fine is higher in the risk-averse case than in the risk-neutral case, for the following reason. A way to reduce the bearing of risk is to deter more individuals from committing the harmful act, for then fewer individuals will be subject to the risk of the fine." Polinsky and Shavell, *supra* note 67, at 415 n.22).

108. Polinsky & Shavell, *supra* note 67, at 416.

109. *See supra* Part II.A.

110. *See* Polinsky & Shavell, *supra* note 20 (discussing in greater detail the effect of lengthy sentences).

enforcement. Yet they demonstrate the central role risk preferences play in the determination of optimal law enforcement strategies, and the importance of disentangling the effects of time preferences from criminals' risk attitudes over monetary outcomes.

B. Optimal Plea-Bargaining Procedures

It is often stated that over 90% of convictions in criminal cases in the United States are obtained through plea bargains.[111] This statistic alone should demonstrate the importance of plea-bargaining procedures and also explain why plea bargaining has received much attention from academics.

The existing law and economics literature has identified multiple reasons as to how plea-bargaining procedures can be designed to further social goals.[112] Reduction in case loads and litigation costs appears to be the most preferred explanation as to why criminal justice systems should make use of plea bargains.[113] Another potential and important gain from using plea bargains is that they can be used to screen out guilty defendants from innocent defendants in a cost-effective way.[114] There are, of course, many critiques of plea bargaining, some related to an increased role for tactics and a reduced role for actual or demonstrable culpability in the conviction and/or the punishment of suspects in criminal trials.[115]

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111. *E.g.*, Gazal-Ayal & Tor, *supra* note 4, at 341; Gene M. Grossman & Michael L. Katz, *Plea Bargaining and Social Welfare*, 73 AM. ECON. REV. 749, 749 (1983); Avishalom Tor, Oren Gazal-Ayal & Stephen M. Garcia, *Fairness and the Willingness To Accept Plea Bargain Offers*, 7 J. EMPIRICAL LEGAL STUD. 97, 99 n.5 (2010) (noting the approximately 95% guilty plea rate in small Texas counties in 2001).

112. *See, e.g.*, Murat C. Mungan & Jonathan Klick, *Reducing False Guilty Pleas and Wrongful Convictions Through Exoneree Compensation* (Univ. of Pa. Law Sch. Inst. for Law & Econ., Research Paper No. 14-34, 2015), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2490518 [https://perma.cc/8GEY-SCVQ]; sources cited *supra* note 111.

113. For this and similar explanations, see, e.g., David Bjerk, *On the Role of Plea Bargaining and the Distribution of Sentences in the Absence of Judicial System Frictions*, 28 INT'L REV. L. & ECON. 1, 1 (2008); Bruce H. Kobayashi, *Deterrence with Multiple Defendants: An Explanation for "Unfair" Plea Bargains*, 23 RAND J. ECON. 507, 507 (1992); Gabriel Kahn & Chester Mirsky, *Special Report: The Crime Debate*, THE AMERICAN PROSPECT (May-June 1997), http://prospect.org/article/special-report-crime-debate [https://perma.cc/F574-V2TP].

114. *See, e.g.*, Grossman & Katz, *supra* note 111, at 749−50 ("The legal system is fundamentally characterized by asymmetric information; the accused know whether they are guilty, while the prosecutor never can be certain about a given defendant's guilt or innocence. In this environment, the plea bargain often can be chosen to serve as a self-selection mechanism. By doing so, it contributes simultaneously to the accuracy of the legal process (by inducing the guilty to identify themselves) and to ensuring that violators of the law are indeed punished.").

115. *See, e.g.*, Albert W. Alschuler, *Implementing the Criminal Defendant's Right to Trial: Alternatives to the Plea Bargaining System*, 50 U. CHI. L. REV. 931, 932 (1983) ("Plea bargaining makes a substantial part of an offender's sentence depend, not upon what he did or his personal characteristics, but upon a tactical decision irrelevant to any proper objective of criminal proceedings. In contested cases, it substitutes a regime of split-the-difference for a judicial determination of guilt or innocence and elevates a concept of partial guilt above the

Whether or under what conditions plea bargaining is a socially desirable legal practice is a question that we do not aim to answer in this Article, as an attempt at answering this question would warrant multiple articles. One thing is clear, however. The answer to this question depends in part on criminals' risk attitudes. This is demonstrated in one of the relatively early works on plea bargaining by Grossman and Katz, where the authors, under many simplifying assumptions, "show that if either the defendant or society is risk averse, then the plea bargain is socially beneficial as an insurance device."[116]

Although formal economic models, such as that used by Grossman and Katz, abstract from many relevant issues, they demonstrate the marginal impact of criminals' preferences on the desirability of using plea bargains. A recent article by David Bjerk takes this approach and demonstrates the implications of criminals discounting future sentences, and therefore being risk seeking over sentences. He states:

> [T]his can preclude the possibility of a mutually acceptable plea bargain even when prosecutors are risk-averse. However, when plea bargains can be struck, the plea bargain sentences will necessarily fall short of the expected sentence from going to trial, especially for those defendants with only moderate evidence against them. This can result in sentencing distributions that appear far more lenient than would be implied by the statutory sentence from conviction at trial and the relevant probabilities of conviction at trial.[117]

As these articles demonstrate, the way criminals evaluate future sentences and, accordingly, their risk preferences over sentences must be taken into account when designing plea-bargaining procedures. Furthermore, as demonstrated in Part II, criminals may appear to be risk seeking over sentences due to a second reason, namely stigmatization costs of convictions.[118] Incorporating this possibility in future research may reveal that repeat offenders, who presumably suffer less from stigmatization compared to first-time offenders,[119] should be offered different plea bargains. As such, having a better understanding of criminals' risk attitudes and the factors contributing to their risk attitudes is important for designing plea-bargaining procedures that are socially desirable.

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requirement that criminal responsibility be established beyond a reasonable doubt. This practice also deprecates the value of human liberty and the purposes of the criminal sanction by treating these things as commodities to be traded for economic savings—savings that, when measured against common social expenditures, usually seem minor." (footnotes omitted)).

116. Grossman & Katz, *supra* note 111, at 750.

117. Bjerk, *supra* note 113, at 2.

118. There is an expanding law and economics literature on stigmatization and how it affects optimal law enforcement strategies. *See, e.g.*, Alon Harel & Alon Klement, *The Economics of Stigma: Why More Detection of Crime May Result in Less Stigmatization*, 36 J. LEGAL STUD. 355 (2007); Rasmusen, *supra* note 78; Mungan, *supra* note 96; Murat C. Mungan, *Stigma Dilution and Over-Criminalization* (Fla. State Univ. Coll. of Law, Law, Bus. & Econ. Paper No. 14-16, 2015), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2534828 [https://perma.cc/E4QH-E6WT].

119. *See, e.g.*, sources cited *supra* note 96.

C. Punishment of Repeat Offenders

Sentencing guidelines call for increased punishments for repeat offenders.[120] One among many reasons as to why this practice may be justifiable on utilitarian grounds relates to the differential stigmatization effect of conviction on repeat offenders versus first-time offenders.[121]

An intuitive assumption employed in the existing literature is that ex-convicts are less attractive employees in the labor market.[122] This being the case, crime becomes a more attractive option for ex-convicts who are unable to find legal means of employment. As such, deterring recidivism requires relying on increased penalties for repeat offenders.[123]

Increasing the punishment for recidivists is, however, socially costly.[124] This is especially true for crimes punishable by imprisonment.[125] Therefore, a trade-off emerges between achieving higher deterrence rates for recidivists and lowering costs of imprisonment.[126] Hence, disentangling the effect of stigmatization on criminal behavior from the effects associated with criminals' time preferences over sentences is important for designing optimal sentence enhancements for repeat offenders.

D. Discretion in Sentencing

One effect of giving judges broad discretion over sentencing is creating uncertainty by increasing the variation in sentences. The deterrent effect of such uncertainty, and therefore the deterrent effect of indeterminate sentencing, depends to a great extent on criminals' risk attitudes and, in particular, criminals' time preferences regarding imprisonment.

If criminals discount future sentences, due to reasons discussed in Part II, one would expect the creation of such uncertainty to reduce deterrence. If, to the contrary,

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120. U.S. SENTENCING GUIDELINES MANUAL § 4A1.1 (2014).

121. Funk, *supra* note 83; Kaku Furuya, *A Socio-Economic Model of Stigma and Related Social Problems*, 48 J. ECON. BEHAV. & ORG. 281 (2002) (justifying escalating punishment schemes based on stigmatization concerns); Miceli & Bucci, *supra* note 11; *see also* C.Y. Cyrus Chu, Sheng-cheng Hu & Ting-yuan Huang, *Punishing Repeat Offenders More Severely*, 20 INT'L REV. L. & ECON. 127 (2000) (justifying escalating punishment schemes when the justice system can lead to erroneous convictions); Murat C. Mungan, *Repeat Offenders: If They Learn, We Punish Them More Severely*, 30 INT'L REV. L. & ECON. 173 (2010) (justifying escalating punishment schemes based on the idea that repeat offenders learn to evade detection); George J. Stigler, *The Optimum Enforcement of Laws*, 78 J. POL. ECON. 526 (1970) (justifying escalating punishment schemes based on the possibility of accidental commission of crimes).

122. Funk, *supra* note 83, at 715; Miceli & Bucci, *supra* note 11, at 71; Rasmusen, *supra* note 78, at 519.

123. Funk, *supra* note 83, at 715.

124. *See* sources cited *supra* note 121.

125. *See* Polinsky & Shavell, *supra* note 67, at 409–11 (discussing and reviewing how imprisonment costs are incorporated in the economic analysis of law enforcement).

126. *See* Murat C. Mungan, *The Law and Economics of Fluctuating Criminal Tendencies and Incapacitation*, 72 MD. L. REV. 156, 206–09 (2012) (identifying this trade-off and discussing ways to optimally address it).

criminals are risk averse over sentences, then one would expect high variation over sentences to increase deterrence.

Furthermore, because people may have different risk attitudes when the sanction is monetary versus nonmonetary, the desirability of giving decision makers discretion may depend on whether or not the offense or crime in question is punishable by imprisonment. If, as commonly stated in the literature, people behave in accordance with CAP when the sanction is imprisonment, but not when it is monetary, then it may be cost-effective to give decision makers discretion when, and only when, the sanction is nonmonetary.

In sum, determining the deterrent effect of determinate punishment requires the identification of criminals' responsiveness to the certainty and severity of punishment in different contexts; and most importantly, when the sanction is monetary versus nonmonetary.

E. Standard of Proof

One frequently discussed issue in the economics of law enforcement literature is the optimal standard of proof in criminal trials.[127] Most of these studies focus on risk-neutral potential offenders who are affected by the standard of proof applicable in trials.[128] The researcher is generally interested in identifying the standard of proof that optimally trades off wrongful convictions for false acquittals.[129] In fact, the discussion is often related to the famous Blackstone ratio,[130] which stems from his statement that it is "better that ten guilty persons escape, than that one innocent suffer."[131] Most of these studies provide justifications for the use of high standards of proof due to a variety of reasons, including: preventing the chilling of socially

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127. *See* James Andreoni, *Reasonable Doubt and the Optimal Magnitude of Fines: Should the Penalty Fit the Crime?*, 22 RAND J. ECON. 385 (1991); Kevin M. Clermont & Emily Sherwin, *A Comparative View of Standards of Proof*, 50 AM. J. COMP. L. 243 (2002); Dominique Demougin & Claude Fluet, *Deterrence Versus Judicial Error: A Comparative View of Standards of Proof*, 161 J. INSTITUTIONAL & THEORETICAL ECON. 193 (2005); Louis Kaplow, *Burden of Proof*, 121 YALE L.J. 738 (2012) [hereinafter Kaplow A]; Louis Kaplow, *On the Optimal Burden of Proof*, 119 J. POL. ECON. 1104 (2011) [hereinafter Kaplow B]; Louis Kaplow, *Optimal Proof Burdens, Deterrence, and the Chilling of Desirable Behavior*, 101 AM. ECON. REV. 277 (2011) [hereinafter Kaplow C]; Henrik Lando, *Prevention of Crime and the Optimal Standard of Proof in Criminal Law*, 5 REV. L. & ECON. 33 (2009); Thomas J. Miceli, *Optimal Criminal Procedure: Fairness and Deterrence*, 11 INT'L REV. L. & ECON. 3 (1991); Murat C. Mungan, *A Utilitarian Justification for Heightened Standards of Proof in Criminal Trials*, 167 J. INSTITUTIONAL & THEORETICAL ECON. 352 (2011); Matteo Rizzolli & Margherita Saraceno, *Better That Ten Guilty Persons Escape: Punishment Costs Explain the Standard of Evidence*, 155 PUB. CHOICE 395 (2013); Okan Yilankaya, *A Model of Evidence Production and Optimal Standard of Proof and Penalty in Criminal Trials*, 35 CANADIAN J. ECON. 385 (2002).

128. *See, e.g.*, Kaplow B, *supra* note 127, at 1111; Mungan, *supra* note 127, at 359; Rizzolli & Saraceno, *supra* note 127, at 400.

129. *See, e.g.*, Kaplow B, *supra* note 127, at 1105; Mungan, *supra* note 127; Rizzolli & Saraceno, *supra* note 127, at 395.

130. *E.g.*, Rizzolli & Saraceno, *supra* note 127.

131. 4 WILLIAM BLACKSTONE, COMMENTARIES *358.

desirable behavior,[132] reducing punishment costs,[133] and minimizing public choice related concerns.[134]

A question not frequently asked is whether the implications of previous research are equally valid when one considers offenders who have behavior consistent with CAP. In a recent article, Professor Fisher relaxes the assumption of risk neutrality, and argues that "[o]ne factor that justifies lowering the standard of proof to sub-maximal levels is risk-loving tendencies."[135] Fisher's arguments are derived from numerical examples that assume that offenders are risk seeking.[136] The assumption of risk-seeking attitudes, in turn, is based on the idea that criminals perceive diminishing marginal costs associated with time in prison. [137]

As we have discussed earlier, there are many reasons to be cautious about making broad statements regarding risk preferences of individuals. Moreover, it is unclear whether the effects identified by Fisher are sufficient to weaken the justifications offered in the previous literature for maintaining high standards of proof in criminal trials. Nevertheless, Fisher's study, at a minimum, demonstrates that relaxing the assumption of risk neutrality has important consequences regarding the way we think about the optimal standard of proof in criminal trials, and potentially other pro-defendant rules in criminal procedure.

CONCLUSION

Criminals' risk attitudes significantly impact the Beckerian analysis of many punishment policies. A true understanding of such attitudes would provide lucid policy implications concerning optimal law enforcement, plea bargaining, repeat-offender punishment, discretion in sentencing, and even standards of proof. A misunderstanding of criminal risk attitudes would lead to misinformed policies in these arenas. Furthermore, because most people are assumed to be risk averse, the conclusion that criminals are risk seekers is profoundly disturbing. For these reasons, it is imperative to acknowledge that CAP-consistent behavior does not necessarily imply risk-seeking attitudes.

In the face of multiple theories that reconcile CAP and risk aversion, the question becomes one solvable solely through empirical scrutiny of these hypotheses. If stigma drives CAP-consistent behavior, then the elasticity differential between certainty and severity should be less observable in those who have been stigmatized than those who have not. If forfeiture of illegal gains drives this behavior, then the elasticity differential should be practically nonexistent for crimes where the criminal benefit is immediately enjoyed. A similar finding when imprisonment is involved could also support the theory that discounting causes CAP-consistent behavior. Additionally, a study that compares the elasticity differentials exhibited by

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132. Kaplow A, *supra* note 127; Kaplow B, *supra* note 127; Mungan, *supra* note 127.

133. Rizzolli & Saraceno, *supra* note 127.

134. Keith N. Hylton & Vikramaditya Khanna, *A Public Choice Theory of Criminal Procedure*, 15 SUPREME CT. ECON. REV. 61 (2007).

135. Fisher, *supra* note 2, at 830.

136. *See id.* at 825–27.

137. *Id.* at 823 ("[P]rospective offenders may exhibit risk-loving tendencies in light of a diminishing marginal cost of each additional year of incarceration.").

individuals of different wealth concerning fines could shed light on whether judgment proofness drives CAP-consistent behavior.

While we have largely questioned the conclusion that criminals are risk seeking, we do not foreclose such a result. Rather, we recognize that any conclusion regarding criminal risk attitudes would have far-reaching theoretical implications and, thus, must be observed through precise empirical studies that account for these other hypotheses.