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The Virtues of Uncertainty in Law: An Experimental Approach

Tom Baker
University of Connecticut School of Law

Alon Harel
Hebrew University of Jerusalem - Felt Center for Legal Studies

Tamar Kugler
Hebrew University of Jerusalem - Department of Psychology

THE VIRTUES OF UNCERTAINTY IN LAW: AN EXPERIMENTAL APPROACH[*]

Tom Baker,[**] Alon Harel,[***] & Tamar Kugler[****]

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[**] Connecticut Mutual Professor of Law, University of Connecticut.

[***] Professor of Law, The Hebrew University of Jerusalem. Faculty Fellow, Center for Ethics and the Professions, Harvard University (2002–03).

[****] Department of Psychology and the Center for Rationality, The Hebrew University of Jerusalem.

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ABSTRACT

Predictability in civil and criminal sanctions is generally understood as desirable. Conversely, unpredictability is condemned as a violation of the rule of law. This paper explores predictability in sanctioning from the point of view of efficiency. It is argued that, given a constant expected monetary sanction, deterrence is increased when either the size of the sanction or the probability that it will be imposed is uncertain. This conclusion follows from earlier findings in behavioral decision research and the results of an experiment conducted specifically to examine this hypothesis. The findings suggest that, within an efficiency framework, there are virtues to uncertainty that may cast doubt on the premise that law should always strive to be as predictable as possible.

INTRODUCTION

Legal scholars generally assume that law should strive towards coherence.[1] The ideal of coherence is regarded as particularly important in the context of criminal sanctions, where it is argued that "[d]isparity [in sentencing] is a manifest form of injustice, which may bring a sentencing system into public disrepute."[2] This ideal has had many consequences, ranging from the drafting of sentencing guidelines in the United States in the 1970s to the current effort to limit jury discretion over punitive damages in tort law (which is gaining momentum both among scholars and in the courts).[3]

This Article investigates coherence from an efficiency framework. Using insights from behavioral economics and a simple experiment, we conclude that predictability in punishment may be inefficient. In keeping with Bentham's principle of frugality—the principle that a sanction should be as small as necessary to achieve its goals—we argue that uncertain sanctions may be preferable on efficiency grounds because they achieve more deterrence than certain sanctions of the same expected value. As we acknowledge, this argument is two-edged. On the one hand, it suggests that there may be substantial benefits to uncertainty in sanctioning. On the other hand, the serious objections to uncertainty in sanctioning—objections which we acknowledge and explore—also suggest important limits on efficiency as a guide in designing legal rules governing punishment.

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1. *See, e.g.*, Cass R. Sunstein, et al., *Predictably Incoherent Judgments*, 54 STAN. L. REV. 1153 (2002).

2. *See* Andrew Ashworth, *Four Techniques for Reducing Sentence Disparity*, *in* PRINCIPLED SENTENCING: READINGS ON THEORY AND POLICY 227, 236 (Andrew Von Hirsch & Andrew Ashworth eds., 1999).

3. *See generally* Cass R. Sunstein et al., PUNITIVE DAMAGES (2002); State Farm Mut. Auto. Ins. Co. v. Campbell, 123 S. Ct. 1513 (2003) (reversing award of punitive damages under the Due Process clause of the 14th Amendment).

Traditionally understood, legislators and policy makers have two ways to increase the deterrence of wrongful activity: increasing the size of the sanction imposed or increasing the probability of detection. In combination, these two variables constitute the expected sanction, and the expected sanction is what determines the rate of crime or wrongful behavior.[4] Some law and economics scholars have pointed out the relevance of a third variable, attitudes toward risk, explaining that the deterrent effect of a sanction depends on the *subjective* value of the sanction to the individual in question.[5] This subjective value depends, not only on the size and probability of a sanction, but also on an individual's aversion to risk and discount rate (i.e., the relative value assigned to initial and subsequent sanction units).[6]

We extend this attention to risk aversion by incorporating insights from behavioral analysis regarding the effect of uncertainty in decision-making. We learn from and extend the results obtained in research on taxpayer compliance[7] to begin to develop a more general understanding of the role of uncertainty in deterring violation of legal norms.

Part I of this Article reports the results of a decision-making experiment that explored how uncertainty regarding the size of a fine and uncertainty regarding the probability of detection affect the choice to violate a norm. In the experiment, participants were asked to decide whether to take an action that would result in a monetary payoff but would expose them to a risk of being caught and required to pay a fine. The participants were given real money and assessed real fines, in amounts that varied according to their decisions. Over the course of the experiment, we varied the certainty of the information provided to the participants about the size of the fine and the chances of being caught, while holding constant the expected value of the sanction and the

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4. This is the observation of Gary Becker in his seminal article. Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169 (1968). *See also*

5. *See* Steven Shavell & A. Mitchell Polinsky, *The Optimal Tradeoff Between the Probability and Magnitude of Fines*, 69 AM. ECON. REV. 880 (1979). Becker considered attitudes toward as well, but in less detail. *See* Becker, *supra* note 4, at 178.

6 *See* Shavell & Polinksy, *Optimal Tradeoff*, *supra* note 5. *See also* Steven Shavell & A. Mitchell Polinsky, *On the Disutility and Discounting of Imprisonment and the Theory of Deterrence*, 28 J. LEGAL STUD. 1, 1–13 (1999).

7. *See* Dipanker Ghosh & Terry L. Crain, *Structure of Uncertainty and Decision Making: An Experimental Investigation*, 24 DECISION SCIENCES 789 (1993); Jeff T. Casey & John T. Scholz, *Boundary Effects of Vague Risk Information on Taxpayer Decisions*, 50 ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES 360–94 (1991); Jeff T. Casey & John T. Scholz, *Beyond Deterrence: Behavioral Decision Theory and Tax Compliance*, 25 LAW & SOC'Y REV. 821–43 (1991); Michael W. Spicer & J. Everett Thomas, A*udit Probabilities and the Tax Evasion Decision: An Experimental Approach*, 2 J. ECON. PSYCHOLOGY 241 (1982).

average probability of being caught. In general, the greater the uncertainty regarding the size of the fine or the chance of being caught, the more unlikely participants were to take the action. This result is not an obvious one. Indeed, one of us predicted on the basis of existing literature on uncertainty that individuals would prefer uncertain sanctions to certain sanctions.[8] Hence, after describing these results, Part I reconciles these results with prior behavioral decision research.

While certainly preliminary and exploratory, the experiment advanced on the very limited prior behavioral decision research on compliance with norms by framing the decision in a manner that allows the results to be generalized to a wider array of situations and by using monetary rewards and punishments to make the decision more realistic. Although any conclusions drawn from this research must be quite tentative, the results suggest that uncertainty with regard to either the size of the sanction or the probability of detection increases deterrence, *ceteris paribus*.

With regard to criminal law, research of this sort may provide a reason to question the deterrent value of determinate sentencing. With regard to tort law, such research suggests for example that tort reform efforts aimed at making non-economic and punitive damages more predictable may decrease the deterrent effect of tort law (even if the average size of the damages were to remain constant). In both fields, this research suggests that policymakers also may be able to increase deterrence by manipulating the uncertainty regarding probability of detection. Examples of policies directed at uncertainty in detection include publicizing short term, intensive random stops for drunk driving, random audits for securities fraud, or periodic, intensive review of patient records for medical malpractice. As we will explain, it is this finding regarding the deterrence value of uncertainty regarding the probability of detection that is most inconsistent with traditional expected utility analysis (and, thus, demonstrates most persuasively the "value added" of a behavioral approach).[9]

Part II of this Article explores the treatment of uncertainty in criminal and tort law. We begin by pointing out that the legal system does not consistently pursue predictability in sanctioning. Consider the following two hypothetical situations. In the first situation, two individuals commit identical wrongs and both are caught. The first is assessed a fine or damages of $10,000, while the second is assessed a

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[8] *See* Uzi Segal & Alon Harel, *Criminal Law and Behavioral Law and Economics: Observations on the Neglected Role of Uncertainty in Deterring Crime*, 1–2 AMER. LAW ECON. REV. 276–312 (1999).

9. *See* TAN 56-59, *infra*.

fine or damages of $5000. If the disparity between these two individuals is due only to chance (for example, a sentencing lottery conducted after the two criminals were caught),[10] it provides cause for concern. The person who received the harsher sanction has a legitimate moral and perhaps even legal complaint: "Why was I punished more harshly than she was?"[11]

In the second situation, two individuals commit identical wrongs but face different probabilities of detection. The difference in the probability of detection follows from a policy, endorsed by police officers, of thoroughly investigating 50% of the reported crimes (chosen randomly), while conducting only a cursory investigation of the other half. As a result of this "detection lottery," the first individual has a 10% chance of being caught and punished while the second has only a 5% chance. Our intuition is that the disparity in the likelihood of detection between the two criminals does not raise the same moral resentment as the disparity in the size of the sanction. The moral concern of the person who asks: "Why me?" seems compelling in the case of a sentencing lottery, but not in the case of a detection lottery.[12] A number of well-established legal doctrines and institutional practices in both the criminal and tort fields reflect these differences in moral intuition.

After describing some of these doctrines and practices, Part II goes on to explore how criminal law and tort law treat uncertainty as well as ways in which uncertainty can be manipulated—without violating foundational doctrinal principles—even in contexts in which it is perceived as undesirable. Examples of doctrines and institutional practices that create uncertainty in the criminal law field include prosecutorial discretion to charge crimes up or down, sanctions that vary according to the results of the crime, and the *Pinkerton* rule (pursuant to which members of conspiracies are liable for the acts of others). Examples in the tort law field include the practice of setting damages according to the harm to the victim, the "randomizing" effect

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10. The idea of a sentencing lottery is borrowed from David Lewis, *The Punishment that Leaves Something to Chance*, 18 PHILOSOPHY & PUB. AFFAIRS 53 (1989).

11. In 1982, a judge in New York City flipped a coin to determine whether to sentence an individual to twenty or thirty days in jail. The public was outraged, and the judge was censured. *See* Judith Resnick, *Precluding Appeals*, 70 CORNELL L. REV. 603 (1985). The aversion to sentencing lotteries is part of a broader phenomenon, namely the aversion to luck in criminal law. *See* Omri Ben Shahar & Alon Harel, *The Economics of the Law of Criminal Attempts: A Victim Centered Perspective*, 145 U. PA. L. REV. 299, 321 (1996).

12. *See* Segal & Harel, *Supra* note 8. The legitimate moral concern of the victims of the two crimes seems likely to be quite different, however.

of relying on private parties to enforce the law, and the ability of liability insurance to reduce or magnify the uncertainty in tort sanctions. These examples are in addition to the very substantial discretion granted to criminal and civil enforcement bodies regarding the allocation of resources to the detection and prosecution of criminal and civil wrongs.

Part III of this Article addresses a number of important potential objections to manipulating uncertainty and deterrence. We examine objections based on morality, cost, effectiveness, and the potential risks of over and under deterrence, in addition to objections based on research showing that uncertainty has differential effects on people according to their aversion to risk. While all of these objections raise important qualifications that may limit the practical application of our analysis in certain situations, none fundamentally undercut our project. Indeed, even if all of the objections were otherwise insurmountable, our research would nevertheless suggest that policy makers could accomplish greater deterrence by focusing public attention on already existing, highly uncertain aspects of civil and criminal sanctioning.

The primary purpose of this Article is not to establish, once and for all, that increasing uncertainty with respect to the size of the sanction and the probability of detection is desirable, or even the more modest goal that increasing uncertainty necessarily is desirable from an efficiency-based perspective. Instead, our aim is to expand the traditional paradigm beyond the exclusive focus on the size of the sanction and the probability of detection as the means by which law can deter wrongful behavior. There is an additional important tool at the disposal of policy makers and legislators: the power to manipulate the certainty of the size of sanctions and the certainty of the probability of their imposition.

I. AN EXPERIMENTAL INVESTIGATION OF THE DETERRENT EFFECTS OF UNCERTAINTY

This part describes and presents the results of an experiment conducted in order to investigate the effects of uncertainty. Section A provides the theoretical foundations for the experiment, explaining the different meanings of uncertainty and the ways in which manipulating uncertainty could promote deterrence. Section B sketches in more detail the purposes of the experiment as well as its limitations. Section C describes the experiment itself. Section D presents the results.

A. Theoretical Foundations

Within an efficiency framework, individuals comply with legal norms based on an evaluation, implicit or otherwise, of the costs and benefits of compliance. One of the benefits of compliance with legal

norms is avoiding the legal sanctions that follow from violation of those norms. Hence, actors make at least an implicit judgment regarding (a) the probability that norm-violating behavior will be detected and (b) the nature (or the size) of the sanction that will be imposed in the event of detection. Because even the best informed, utility maximizing actor is unlikely to have precise information about either the probability of detection or the size of the sanction, such judgments are necessarily made under conditions of uncertainty. Accordingly, a realistic account of the deterrent effect of legal norms should address the effect of uncertainty both with respect to the nature and size of legal sanctions and with respect to the probability of detection on decision-making.[13]

What it means for the *size* of a sanction to be more or less certain is intuitively clear and, thus, needs little explanation. A fixed fine for a given wrong is more certain than a fine in an amount that depends on the flip of a fair coin. Similarly, a fine in an amount based on the flip of a fair coin is more certain than a fine in an amount that depends on one or more factors that are less predictable than the flip of a fair coin, such as a fine that depends on the temperature next week.

Certainty in detection is more complicated. With regard to certainty in detection we need to make a crucial distinction between the

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13. Behavioral decision research has already been used in numerous areas of law to describe how individuals make decisions under conditions of uncertainty as well as to suggest how legal rules should be adjusted in light of this research. Researchers have examined the behavior of juries, (*see* punitive damages articles *infra* note 20; *see also* Edward J. McCaffery et al., *Framing the Jury: Cognitive Perspectives on Pain and Suffering Awards*, 81 VA. L. REV. 1341 (1995)), the behavior of judges (*see* Chris Guthrie, Jeffrey J. Rachlinski & Andrew J. Wistrich, *Inside the Judicial Mind*, 86 CORNELL L. REV. 777 (2000)), and the behavior of lawyers and litigants (*see,e.g.,* Russell Korobkin, *Aspiration and Settlement,* 88 CORNELL L. REV. 1 (2002); Chris Guthrie, *Framing Frivolous Litigation: A Psychological Theory*, 67 U. CHI. L. REV. 163 (2000); Russell Korobkin & Jeffrey Rachlinski, *Psychology, Economics, and Settlement: A New Look at the Role of the Lawyer*, 76 TEX. L. REV. 77 (1997-98)). Yet, surprisingly, this research has not yet examined how uncertainty influences the deterrent effects of criminal sanctions or civil remedies. The sole apparent exceptions are in the field of taxpayer compliance. *See supra* note 7. *See also* Segal & Harel, *supra* note 8. For reviews of the potential applications of behavioral decision research to law and economic analysis, see, e.g., Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998); Russell B. Korobkin and Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CALIF. L. REV. 1051 (2000). *See also* Colin Camerer, *Individual Decision Making*, *in* HANDBOOK OF BEHAVIORAL ECONOMICS: BEHAVIORAL DECISION MAKING 587 (Stanley Kaish et al. eds., 1991) (reviewing behavioral decision research); David Cohen and Jack L. Knetch, *Judicial Choice and Disparities Between Measures of Economic Values*, 30 OSGOODE HALL L. J. 737 (1992) (using behavioral decision research findings to explain a variety of common law doctrines).

probability of detection and the *precision of the probability of detection*. In everyday speech, the concept of certainty in detection could refer to both. For example, it would be entirely reasonable to say that one kind of crime, which is 50% *more likely* to be detected than another, is *more certain* to be detected.

This "probability of detection" aspect of certainty, however, is not what concerns us here. Instead, we are investigating the deterrent effect of varying information about the precision of the probability of detection. In order not to confound the effects of "likelihood" and "precision," our experiment holds constant the overall probability of detection (at least insofar as that is possible). The experiment varies, however, the precision with which participants are able to know the probability of detection. For example, the experiment compares decisions in situations in which there is a defined risk of 30% of being fined to decisions in situations in which there are equal chances that the probability of being fined will be either 20% or 40%. Similarly, the experiment compares decisions in situations in which there is a defined risk of 30% of being fined to decisions in situations in which the probability of being fined is either 20% or 40% and there is no information regarding the chances of the probability being one or the other. The situations in which the probability of being fined can be either 20% or 40% involve greater uncertainty in the sense that interests us here than the situation in which the probability is a definite 30%.[14]

Some prior research in law and economics has begun to explore the possibility that risk and uncertainty may be harnessed to enhance deterrence. For example, some torts theorists have raised the possibility that uncertainty could produce over-deterrence.[15] Others

14. From the perspective of expected utility theory, the distinction drawn here may seem peculiar. Expected utility theory does not distinguish between lotteries and compound lotteries (lotteries in which the outcomes themselves are lotteries). For example if a person believes that there is an equal chance that the enforcement probability is detection is 5% and 15%, then effectively she believes that the probability of detection is 10% (0.5 X 5% + 0.5 X 15%). But the literature on ambiguity suggests that very often decision makers do not treat uncertain probabilities in the way they treat known probabilities. *See* Harel & Segal, *supra* note 8, at 304.

15. *Cf.*, John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 VA. L. REV. 965 (1984) (arguing that uncertainty over legal standards will produce sub-optimal compliance because risk averse individuals will "over-comply."). Although this and related later work, Richard Craswell & John E. Calfee, *Deterrence and Uncertain Legal Standards*, 2 J.L. ECON. & ORG. 279 (1986), are significant exceptions to the general tendency to ignore uncertainty, the uncertainty addressed is that of the content of the legal standard in question, not the probability of detection or size of the sanction. *See also* Jason S. Johnston, *Bayesian Fact-Finding and Efficiency: Toward an Economic Theory of Liability Under Uncertainty*, 61 S. CAL. L. REV. 137 (1987); Mark F. Grady, *A New*

have pointed out that attitudes towards risk are relevant to understanding the deterrent effects of increasing the probability of detection as compared to increasing the size of a sanction.[16] Yet, more complex forms of uncertainty such as the concept of sentencing lotteries, detection lotteries or even the relevance of ambiguity (i.e. uncertainty about the relative risk)[17] as a tool to increase deterrence have not been investigated either theoretically or empirically, outside the field of taxpayer compliance.[18]

Two areas in which this omission seems quite striking are determinate sentencing in criminal law and punitive damages in tort law. During the fierce debates over sentencing guidelines, no serious consideration appears to have been given to the possibility that increasing certainty might undercut deterrence.[19] While this omission

Positive Economic Theory of Negligence, 92 YALE L. J. 799 (1983). **Tom Baker will provide citation to Gillian Lester early 1990's Cal. L. Rev. article.**

16. *See* Polinsky & Shavell *supra* notes 4 and 5.

17. Ambiguity represents the lack of confidence, or lack of reliability of the information one has concerning the relative likelihood of events. If a person knows that there are fifty black balls and fifty white balls in an urn, a person knows that the probability that a white ball be picked up at random is 50%. If a person knows that there are 100 balls some of which are white while others are black, a person faces ambiguity—ambiguity which is founded on ignorance with respect to the relevant probabilities. The classical experiment suggested by Ellsberg illustrates the concept of ambiguity. Suppose an urn contains ninety balls, thirty of which are known to be yellow, while each of the other sixty is known to be either blue or red, but the exact composition of these sixty balls is unknown. In each of the next four lotteries, one ball will be picked at random, and the decision maker will be paid according to its color. The four lotteries are: \$100 if yellow, zero otherwise; \$100 if blue, zero otherwise; \$100 if yellow or red, zero if blue; and \$100 if blue or red, zero if yellow. Ellsberg suggests that most decision makers prefer the first lottery to the second, but the fourth to the third. This preference violates standard probability theory, since a decision maker who prefers the first lottery to the second reveals that he believes "yellow" to be more likely than "blue." On the other hand, preferring the last lottery to the third reveals that, for this decision maker, "blue or red" is more likely to happen than "yellow or red," hence blue is more likely than yellow, a contradiction. Daniel Ellsberg, *Risk, Ambiguity and the Savage Axioms*, 75 Q. J. ECON. 643–69 (1961). These and similar results were repeated in many experiments. *See, e.g.*, K.R. MacCimmon & S. Larson, *Utility Theory: Axioms Versus "Paradoxes"*, *in* EXPECTED UTILITY HYPOTHESES AND THE ALLAIS PARADOX (M.Allais & O. Hagen eds., 1979).

18. The taxpayer compliance literature is listed in note 7, *supra*.

19. For a thorough survey of the history of the sentencing guidelines, see Kate Smith and Jose A. Cabranes, FEAR OF JUDGING: SENTENCING GUIDELINES IN THE FEDERAL COURTS 38–77 (1998); Spohn, HOW DO JUDGES DECIDE: THE SEARCH FOR FAIRNES AND JUSTICE IN PUNISHMENT 219–262 (2002). The initial aspiration of the guidelines was a mistrust of judicial discretion. At a later stage the sentencing bill (the bill which establishes the sentencing guidelines) became "tougher" on crime and its "toughness" was also justified in terms of deterrence. Yet, the dimension which interests us here, namely the reduction of uncertainty and disparity appear to have been justified exclusively in terms of justice rather than in terms of deterrence.

may be understandable, given that the sentencing guidelines debate was conducted in moral rather than economic terms, the corresponding omission in discussions of punitive damages is more difficult to explain. Quite recent studies on punitive damages, some of which explicitly incorporate developments in behavioral decision research, assume without questioning that uncertainty in sanctions is undesirable.[20] This assumption is especially troubling because the researchers use their findings regarding the uncertainty of jury decision making to argue for legal reforms limiting jury discretion. Yet, the more foundational question, whether uncertainty is indeed undesirable (at least within the efficiency-based framework in which the research is conducted), typically is discussed only summarily in an introductory paragraph—a paragraph which reiterates the conviction that uncertainty with respect to the size of punitive damages is both unjust and inefficient.[21]

Efficiency considerations suggest that deterrence should be maximized for a given level of expenses. After all, the goal of deterrence is harm prevention; reducing the cost of preventing harm clearly is desirable from an efficiency perspective. If uncertainty enhances the deterrent effect of a given set of legal rules and enforcement procedures, it may be possible to reduce the expected sanction, without decreasing its deterrent effects, by increasing the uncertainty. Uncertainty could be used to implement the principle of

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20. *See* David Schkade, Cass R. Sunstein & Daniel Kahneman, *Deliberating About Dollars: The Severity Shift*, 100 COLUM. L. REV. 1139, 1142–43 (2000); Cass R. Sunstein, Daniel Kahneman & David Schkade, *Assessing Punitive Damages (with Notes on Cognition and Valuation in Law),* 107 YALE L. J. 2071, 2075–76 (1998); Daniel Kahneman, David Schkade & Cass R. Sunstein, SHARED OUTRAGE AND ERRATIC AWARDS: THE PSYCHOLOGY OF PUNITIVE DAMAGES, 16 J. RISK & UNCERTAINTY 49 (1998); Kip Viscusi, *The Social Costs of Punitive Damages Against Corporations in Environmental and Safety Torts*, 87 GEO. L. J. 285, 288–99 (1998).

21. Thus, for example Sunstein et al. argue:

> Whatever their ultimate purposes, the most widespread concern about punitive damages has been that they are unpredictable, even "out of control." . . . It is not hard to understand the widespread concern with erratic punitive damage awards. If similarly situated people—plaintiffs and defendants alike—are not treated similarly, erratic awards are unfair. . . . [A]s a practical matter, a risk of extremely high awards is likely to produce excessive caution in risk-averse managers and companies. Hence unpredictable awards create both unfairness and (on reasonable assumptions) inefficiency, in a way that may overdeter desireable activity.

Supra note 20, at 2075–76. On the other hand, Viscusi argues that "punitive damages have no significant deterrent effect" (and are therefore inefficient) in significant part because they are unpredictable. *See supra* note 20, at 288–99.

parsimony—the principle that sanctions should be as small as possible.[22] For example, if individuals are risk averse to punishment lotteries, then greater deterrence could be obtained for the same sanctions or alternatively the same level of deterrence could be obtained from a smaller sanctions.

This consideration seems evident in criminal law. Imposing sanctions in criminal law is expensive. If the average length of imprisonment can be reduced, this may save costs that would otherwise be incurred by the state. In addition, if the average size of fines can be reduced, this would lower the risk bearing costs of people potentially subject to the fine.[23] Alternatively, if the average detection rate can be lowered, there will be savings in enforcement costs. Similar considerations also apply to tort law. In the standard law and economic account, the primary purpose of tort damages is deterrence.[24] If uncertainty serves as a "force multiplier," then a smaller number of tort actions can provide the same deterrent effect as a larger number of more certain actions, at a lower combined cost. Indeed, it may be that the widely condemned "lottery" aspects of tort litigation enforcement increases the deterrent effects of a tort law regime characterized by rampant under-enforcement.[25]

B. Behavioral Decision Research on Uncertainty

Prior behavioral decision research suggests that uncertainty has predictable effects on decision making, depending on the way that a choice is framed. For example, research participants in a wide variety of settings tend to be risk averse with respect to gains and risk seeking with respect to losses. Faced with a choice between a certain gain, say $5, and a 25% chance to get four times that amount, more subjects prefer to take $5 despite the fact that the expected value of both options is exactly the same. Conversely, faced with a choice between a certain loss and a 25% chance of losing four times that amount, more subjects prefer to take their chances, once again despite the fact that the expected value of both options is exactly the same. Behavioral decision

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22. *See* Norval Morris, *Desert as a Limiting Principle*, *in* PRINCIPLED SENTENCING: READINGS ON THEORY AND POLICY 180, 182 (Andrew Von Hirsch & Andrew Ashworth eds., 1998).

23 *See* Shavell & Polinsky, *Optimal Tradeoff*, *supra* note 4 at 880-81 (explaining that because of risk aversion fines also impose social costs).

24. *See* Steven Shavell, ECONOMIC ANALYSIS OF ACCIDENT LAW (1987).

25. For a summary of empirical research suggesting that most people injured by tortious behavior do not bring a tort action, see Michael J. Saks, *Do We Really Know Anything About the Behavior of the Tort Litigation System—And Why Not?*, 140 U. PENN. L. REV. 1147 (1992). *Cf.* P.S. Atiyah, THE DAMAGES LOTTERY (criticizing the lottery aspects of tort-based compensation).

researchers refer to this phenomenon as the reflection effect or the gain/loss framing effect, and they explain this effect in terms of loss aversion.[26] People are so averse to actually incurring a loss that they are willing to risk a larger loss in order to avoid a certain smaller loss.[27] In other words, when all the options present the possibility of loss, loss aversion leads to a taste for risk.

Three main findings from behavioral decision research guided our experimental design. First, both uncertainty in probability and uncertainty in outcome have similar, predictable effects on decision-making (along the lines of the reflection effect discussed above, i.e. risk aversion with gains, risk seeking with respect to losses, subject to boundary effects).[28] Second, the degree of precision with which the probability or outcome can be stated also has predictable effects: the greater the uncertainty, the greater the effect.[29] Third, within a given range of probabilities or outcomes, individuals are "ambiguity averse," meaning that they dislike uncertain choices more intensely when they do not know the odds that the probability or outcome will be at any given point in the range.[30]

Our experiment tests these findings in the context of uncertainty regarding the consequences of a violation of a legal norm. The experiment examines the preferences of participants regarding two aspects of uncertainty: uncertainty regarding the probability of detection and uncertainty regarding the size of the sanction. With

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26. Daniel Kaheneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk*, 47 ECONOMETRICA 263 (1979); Amos Tversky and Daniel Kahneman, *The Framing of Decisions and the Psychology of Choice*, 211 SCIENCE 453 (1981); Amos Tversky & Daniel Kahneman, *Rational Choice and the Framing of Decisions*, 59 J. BUS. L. 251 (1986). See generally Daniel Kahneman and Amos Tversky (eds.), CHOICES, VALUES AND FRAMES (2000) (collecting leading essays growing out of Twersky and Kahneman's research on prospect theory). There is a boundary effect that explains the appeal of lotteries and slot machines, however. Subjects appear to be risk-seeking when there is a small possibility of a very large gain. Conversely, subjects appear to be risk avoiding when there is a small probability of a very large loss. This latter phenomenon may help to explain what may seem to be inordinate public concern about low frequency high damage events such as nuclear accidents. *Cf.* Howard Margolis, DEALING WITH RISK: WHY THE PUBLIC AND THE EXPERTS DISAGREE (1997).

27 *See* Amos Tversky and Daniel Kahneman, *Loss Aversion in Riskless Choice*, 106 Q. J. Econ. 1039 (1991) (reviewing previous findings regarding loss aversion in risky choices and extending theory to account for loss aversion in riskless choices).

28. *See, e.g.*, David V. Budescu, et al., *Modeling Certainty Equivalents for Imprecise Gambles,* ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES, (in press 2003).

29. *See, e.g., id*.

30. *See, e.g*. Ellsberg, *supra* note 17; MacCimmon & Larson, *supra* note 17. *See also* Budescu et al, *supra* note 28.

respect to the size of the sanction, the experiment tests participants' preferences under three different conditions: certainty (in which the sanction is fixed), risk (in which there are two equally possible sanctions) and uncertainty (in which there are two possible sanctions but no information about their relative likelihood).[31] With respect to the probability of detection, the experiment tests participants' preferences under three corresponding conditions: certain probability (in which the probability of detection is a fixed percentage), risky probability (in which there are two possible probabilities of detection, the relative likelihood of which is known) and uncertain probability (in which there are two possible probabilities of detection but no information about their relative likelihood).[32]

For ease of discussion, we call these three conditions "certain," "risky," and "uncertain" when referring to both the size of sanction and the probability of detection. A certain sanction is therefore a fine of X dollars. A risky sanction is a fine of either Y or Z dollars when the probability of Y and Z are known, for example, when they depend on the outcome of tossing a fair coin. An uncertain sanction is a fine of either Y or Z when the probabilities are unknown. Similarly, the probability of detection is certain when it is X%. The probability is risky when it is either Y% or Z% and the probability that it is either Y% or Z% is known, for example, when the probability depends on the results of tossing a fair coin. The probability of detection is uncertain when it is either Y% or Z% but the probability that it is Y% or Z% is unknown. In table form the combinations resulting from these conditions can be represented as follows:

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31. This distinction between probabilistic and true uncertainty corresponds to that between risk and uncertainty most famously associated with Knight. *See* Frank H. Knight, RISK, UNCERTAINTY AND PROFIT (1921). Thus, probabilistic uncertainty involves a case of a person who conducts a lottery with known probabilities, for example, tossing a fair coin while "true" uncertainty involves a case of a person who conducts a lottery with no known probabilities.

32. It is worth noting that we did not test a condition of complete uncertainty—in which either the amount of the sanction or the probability of detection is completely unknown—because such a condition would not have allowed us to isolate the effect of uncertainty as compared to expected value.

Table A: Size of Sanction

Likelihood of Detection	Certain	Risky	Uncertain
Certain probability	1	4	7
Risky probability	2	5	8
Uncertain probability	3	6	9

There are few preliminary observations to be made with respect to this table and its applicability outside the laboratory. First, certainty or uncertainty refers to the subjective convictions of individuals. A sanction is certain if the potential criminal or tortfeasor *believes* she or he knows its magnitude. Second, different individuals have different information and therefore the control of the legal system over the certainty or uncertainty of the relevant parameters is limited. Sometimes, the very same scheme of rules will appear more certain to some actors than others. For instance, it is likely that the same rules may be seen as falling within our "certain" or "risky" cells by more experienced offenders while they will be seen as falling within our "uncertain" cells by less experienced offenders. Third, as this suggests, each box in the table represents an idealization that is not fully realizable in the context of a modern legal system. Although a legal system may adopt rules or practices that influence the degree of certainty regarding sanction or the probability of detection, the manipulability of certainty is limited. Finally, the treatment of uncertainty is likely to depend in practice on an almost infinite and diverse set of factors, including contextual factors that cannot always be examined experimentally. For example, people may treat uncertainty differently depending on whether it involves small or high probabilities[33] or whether it involves fines or imprisonment,[34] or depending on their subjective understandings of the legitimacy of the legal norm in question[35] or the existence of extra-legal sanctions such as shame.

As a result of these and other limitations on this kind of research, there are difficulties in classifying neatly "real world" situations into these somewhat idealized nine combinations and, conversely, in creating realistic situations in the laboratory. Nevertheless, the

33. For a review of the literature on the problem of high impact, low frequency risks, *see* Margolis, *supra* note 26.

34. For reasons why people may be risk seeking with respect to imprisonment, see Harel & Segal *supra* note 8, at 295–97.

35. Cf. Casey & Scholz, *supra* note 7 (discussing their decision to frame a potential tax deduction as being one that the IRS disallowed for reasons that some accountants did not agree with).

experimental approach has great advantages in that it allows for the isolation of relevant variables in ways that are not possible outside of the laboratory.

C. The Experiment

Participants and Design: Forty four undergraduate students from The Hebrew University of Jerusalem participated in the experiment. The participants were recruited through a campus advertisement promising a monetary reward for participating in a decision making task. The design was a "within subject" design, so that each of the subjects participated in all the experimental conditions.

Procedure: Upon arrival to the laboratory, the subjects were seated in front of a personal monitor and given instructions concerning the task. All questions concerning the experiment were answered and instructions were repeated until the participants indicated that they fully understood the instructions.

The experiment was fully computerized. During the instructions, the participants learned that they would be asked to make decisions in twenty-seven rounds of the experiment, and that they would be paid on the basis of their decisions in two of the rounds, which would be selected randomly after they completed the decisions in all the rounds.[36] Participants were encouraged to think carefully about each of the decisions.

In each round, participants were asked to choose between option A and option B. In each case, option A was a decision to do nothing and therefore keep the NIS 40 (about $8)[37] that they were paid for participating. In each case, option B was a decision to receive an additional NIS 30 (about $6) that would expose them to a risk of "being caught and required to pay a fine." In each case the potential fine was larger than the additional NIS 30 the participant would receive if she or he chose option B. The potential fines ranged from NIS 35 (about $7) to NIS 70 (about $15). The probabilities of detection ranged from 5% to 60%.

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36. The practice of paying subjects on the basis of a random selection among multiple rounds is a common practice in behavioral decision research because it keeps each choice risky and, thus, prevents participants from framing all the rounds as one game, thereby realizing the benefits of the law of large numbers. In addition, this practice allows a greater number of trials with limited amount of resources. Because the subjects only learned at the end of the experiment whether they were "caught" and "fined" in the two rounds that were selected, there should not have been significant learning effects over the course of the experiment.

37. At the time of the experiment a New Israeli Shekel (NIS) was worth slightly more than twenty cents.

The twenty-seven rounds included the nine types of logically possible combinations presented in table A above, with each of three different expected values. Thus, for each of the nine combinations there were three rounds with the same structure but different expected value. In order to prevent effects of order, the sequence in which the twenty-seven choices appeared on the screen was arbitrary and changed from one participant to another. Table B summarizes the different choices offered to the participants. Recall that, in each case, the participant faced a choice between doing nothing (and keeping the NIS 40) or taking an additional NIS 30, subject to the risk of being caught and required to pay a fine. Table B summarizes the different chances of being caught and the different fines faced in each of the twenty-seven possibilities.

Table B: Summary of Experimental Combinations
(Expected values: D=NIS 24; E=NIS 15; F=NIS 7.5)

LIKELIHOOD OF DETECTION:	SIZE OF SANCTION: Certain	Risky	Uncertain
Certain Probability	D: 10%/NIS 60 E: 30%/NIS 50 F:50%/NIS 45	D: 10%/NIS 70 or 50 E:30%/NIS 60 or 40 F: 50%/NIS 55 or 35	D: 10%/NIS 70 or 50 E:30%/NIS 60 or 40 F: 50%/NIS 55 or 35
Risky Probability	D: 5% or 15%/ NIS 60 E:20% or 40%/ NIS 50 F: 40% or 60%/NIS 45	D: 5% or 15%/ NIS 70 or 50 E:20% or 40%/ NIS 60 or 40 F: 40% or 60%/NIS 55 or 35	D: 5% or 15%/ NIS 70 or 50 E:20% or 40%/ NIS 60 or 40 F: 40% or 60%/NIS 55 or 35
Uncertain Probability	D: 5% or 15%/ NIS 60 E:20% or 40%/ NIS 50 F: 40% or 60%/NIS 45	D: 5% or 15%/ NIS 70 or 50 E:20% or 40%/ NIS 60 or 40 F: 40% or 60%/NIS 55 or 35	D: 5% or 15%/ NIS 70 or 50 E:20% or 40%/ NIS 60 or 40 F: 40% or 60%/NIS 55 or 35

The expected values of all the D combinations are identical in every cell; likewise with the E and F combinations. The expected values are the expected value of the additional NIS 30 the participants received for taking the action, minus the expected value of the sanction. Thus, the expected value of each of the D combinations was NIS 24, the expected value of each of the E combinations was NIS 15, and the

expected value of each of the F combinations was NIS 7.5.[38] Thus, the expected value of option B (taking a risk) was always better than option A (doing nothing).

The difference between "risky" and "uncertain" was as follows. For the "risky" factor, the participants were told that there was a 50% chance of each of the two possible conditions. For the "uncertain" factor, the participants were told that there were two possible conditions, but that they could not know the chances that it would be either of the two. [39] This is an option which involves what behavioral economists label ambiguity.[40] The complete instructions (translated from Hebrew) appear in Appendix 1.

After each participant completed the twenty-seven rounds, the computer selected two rounds at random. For those rounds in which option B was selected, the participants carried out the lotteries, using a coin to determine the outcome of 50/50 lotteries and a ten-sided die to determine the outcome of lotteries involving other probabilities. By being asked to toss a coin or a die, participants were given a sense that they were not being manipulated or misled. In addition, the use of the coin and the die (which were shown to the participants at the outset of the experiment) gave the participants a concrete sense of the probabilities involved. The participants were then paid according to the results and debriefed concerning the goals of the experiment (and

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38. As a review of Table B shows, we varied the expected values by manipulating both the size of the sanction and the probability of detection. We did this in order to produce a strong test of the effect of uncertainty within an experiment of manageable duration. If we had varied the expected value by manipulating only the size of the sanction we would be unable to say with any confidence whether uncertainty would have a similar effect at different probability levels. Similarly, if we had varied the expected value by manipulating only the probability of detection we would be unable to say with any confidence whether uncertainty would have a similar effect at different sanction levels. Separately manipulating the size of the sanction and the probability of detection would have required doubling the duration of the experiment, doubling the cost and increasing the potential fatigue of the participants. As a result, although we can say that sanction size, probability of detection and uncertainty all effect participants' decisions, we cannot compare the size of the effects of these three variables. All experimental research involves trade-offs of this sort.

39. Please note that for the combinations involving an uncertain sanction size or probability of detection we calculated the expected value by following the Bernoullian principle of equally weighting all the possibilities. In simple, intuitive terms that means treating a range as if it were the midpoint of the range. Thus, for instance, option D on the lower left cell involved a lottery which gave participants either 5% or 15% probability of losing NIS 60. Yet, participants did not know what the probability that it would be 5% or 15%. Under the Bernoullian principle, the probability they faced is calculated as 10%. Under this approach the expected values of the "risky" and "uncertain" combinations are identical. [**Need citation for Bernoullian principle**]

40. *See supra* note 17.

promised that their identities and the choices they made would remain confidential).

Our null hypothesis was that the legal ethos (according to which uncertainty in sanction is avoided and uncertainty with regard to the probability of detection is tolerated)[41] promotes efficient deterrence. This hypothesis would predict that participants would be neutral or averse to uncertainty in detection while preferring uncertainty in sanction. We also predicted that participants would be averse to the transition from risk to uncertainty. This conjecture was based on the rich literature establishing that individuals are ambiguity averse.[42]

Framing. By design, the experiment did not include a very detailed or "thick" framing. Participants were not asked to imagine themselves committing a particular crime or a civil wrong. Instead, the instructions simply gave the participants an understanding that choosing the risky alternative involved committing a wrong for which they could be "caught" and made to pay a "fine." Thus, the instructions stated that "if you choose option B you will get an additional 30 NIS. But you face a risk of being caught and required to pay a fine." If anything, the Hebrew words used for "caught" and "fine" suggestion punishment for a wrong even more strongly than the English translation. These terms were repeated in the instructions preceding each round. The intent was to frame, in as open-ended a form as possible, choice B as a wrongful choice.

We chose such thin framing because there is so little prior research on the effect of uncertainty on deterrence. We wished to isolate as much as possible the effect of uncertainty, recognizing that thicker framing could produce different results. For example, if choice B were framed so that it involved a very serious wrong that would strongly violate the moral sensibilities of research participants and expose anyone who was caught to substantial shame, it seems quite possible that participants would have been more reluctant to choose option B even in a laboratory context. The effect of thicker framing remains unexplored for further research.

Of course, this choice of framing is one reason for caution in drawing strong conclusions from our research. Nevertheless, it is precisely this need for caution that emphasizes the significance of this kind of research to enriching law and economic analysis. If it is important to exercise caution when drawing conclusions from analysis that is sensitive to the effects of uncertainty, but consciously ignores the

41. A detailed discussion of this legal ethos appears in Part II, TAN 62-65 and 77-84.

42. *See supra* notes 17 & 28.

consequences of thick framing, how much more important it is to exercise caution when drawing conclusions from analysis that ignores both framing *and* uncertainty.

In our experiment, the decision was analogous to the gain/loss gambles studied by behavioral decision researchers.[43] Participants considered whether to take the chance involved in choosing to accept an additional 30 shekels. If they took the chance, they would either receive a gain (the 30 shekels) or be subject to a loss (a fine that would be greater than 30 shekels).

This gain/loss research design sharply distinguishes our experiment from prior behavioral decision research on compliance with norms. Experiments in prior research have been carefully designed so that decisions are obviously and unambiguously framed as involving either a loss or a gain.[44] This prior research has confirmed the gain/loss framing effect in the context of compliance with legal norms, namely, people are risk-preferring when choosing among options that involve only losses and risk-avoiding when choosing among options that involve only gains.[45] While important, these findings are difficult to apply to choices that present the possibility of gains and losses -- which we believe to be the case in very many situations involving the choice to violate a legal norm. Indeed, the earlier research left open the following very important question. When people face a decision that presents the possibility of either a gain or a loss, do they evaluate the "gain" and "loss" outcomes separately, so that they are risk avoiding with respect to gain possibilities and risk preferring with respect to loss possibilities, or do they evaluate the gains and losses together, so that

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[43] *See, e.g.,* Matthew Rabin & Richard Thaler, *Anomalies: Risk Aversion*, 15 J. ECON. PERSPECTIVES 219, 228 (2001) (discussing the implications of small stakes gain/loss gambles for the role of marginal utility of wealth to risk aversion).

44. *See, e.g.*, Casey & Scholz, *supra* note 9 (comparing taxpayer compliance in situations in which the decision to take an improper deduction produces a larger refund—and, thus, involves a gain—as opposed to situations in which the decision to take an improper deduction produces a smaller additional tax payment—and, thus, involves a smaller loss).

[45] When deciding whether to take a possibly illegal tax deduction in an experimental situation, participants who had had insufficient taxes withheld (and thus would have to make a larger tax payment if they did not take the deduction) were more likely to take the deduction than participants who had enough taxes withheld that they would receive a tax refund either way. The researchers concluded that the participants who would have to make a tax payment framed the decision as involving only losses made the decision in the risk-preferring manner that prospect theory would suggest in the realm of losses. The participants who would receive a refund either way framed the decision as involving only gains and then made the decision in the risk averse manner that prospect theory would suggest in the realm of gains. *Id*

their risk attitude depends on whether they perceive the sum of gains and losses as positive or negative?

D. Results

Table C summarizes the results. As described above, participants were asked to choose between option A (in which they stop with NIS 40) and option B (in which they get an additional NIS 30 but are subjected to the risk of incurring a fine). The numbers in table C denote the number of times option B was chosen (i.e., the choice to take a risk). Every participant faced each combination with three different expected values. Given that there were forty-four participants, the maximum number of choices B is 132 in each box.

Table C: Combined frequency of B choices (out of possible 132)

	SIZE OF SANCTION			
LIKELIHOOD OF DETECTION:	Certain	Risky	Uncertain	Sum
Certain probability	75 (56%)	53 (40%)	49 (37%)	177
Risky probability	60 (45%)	44 (33%)	38 (29%)	142
Uncertain probability	52 (39%)	44 (33%)	31 (23%)	127
Sum	187	141	118	

Table C shows clearly that the number and percentage of B choices increases with the certainty of the fine and the certainty of the probability of being caught. Thus, the experiment rejected the null hypothesis in part. Participants were averse to uncertainty in both sanction and the probability of detection. Indeed, comparing the certain/certain cell of Table C with the risky/risky and uncertain/uncertain cells, the results are quite striking, particularly in light of the fact that choice B always had a higher expected value than choice A.

Tables D, E and F show the same data separately for each expected value (Tables D, E and F correspond to the D, E and F combinations in Table B). Again, the general pattern remains, though the reversal of the expected result in the shift from risky to uncertain probability in Table D suggests (as the statistical analysis confirmed) that the difference between the risky and uncertain combinations was less robust than the difference between the certain and risky combinations.[46]

46. Although we cannot offer a definitive explanation for the reversal of the expected result in Table D, two possibilities are as follows. First, it is possible that

Table D: Frequency of B choices (out of 44) with expected value NIS 24[47]

	SIZE OF SANCTION			
Likelihood of Detection:	Certain	Risky	Uncertain	Sum
Certain Probability	37	26	29	92
Risky Probability	30	26	22	78
Uncertain Probability	32	27	23	82
Sum	99	79	72	

Table E: Frequency of B choices (out of 44) with expected value NIS 15

	SIZE OF SANCTION			
Likelihood of Detection:	Certain	Risky	Uncertain	Sum
Certain probability	24	17	17	58
Risky probability	24	14	9	47
Uncertain probability	15	13	4	32
Sum	59	44	30	

Table F: Frequency of B choices (out of 44) with expected value NIS 7.5

	SIZE OF SANCTION			
Likelihood of Detection:	Certain	Risky	Uncertain	Sum
Certain probability	14	10	3	27
Risky probability	6	4	7	17
Uncertain probability	5	4	4	13
Sum	25	18	14	

Examining the data demonstrates that both the level of uncertainty and the expected value of the decision appear to have made a difference

participants weighted the possibilities in the "uncertain" table using the Bernoullian method of treating equally unknown possibilities equally. This seems unlikely in light of the robust results in other experiments regarding ambiguity aversion and the fact that the expect result is observed in Tables E and F. Second, it is more likely that we are observing a preference reversal in some of the participants at a "boundary" in the sense discussed *supra* note --. Recall that the D choices involved the highest expected value, which was the product of the smallest chance of detection (10% in the "certain" cells and 5% or 15% in the "risky" and "uncertain" cells) and the largest possible fine (NIS 60 in the "certain" cells and NIS 50 or 70 in the "risky" and "uncertain" cells). As Rabin and Thaler have discussed, subjects differ in their aversion to risk across potential losses of different sizes and probabilitites. *See* Rabin & Thaler, *supra* note 42 at 228 (2001). It seems plausible that there might be different "boundaries" for risky and uncertain choices involving. This would be a worthy subject for further research.

47. As discussed *supra* note 39, we calculated the expected value of the "uncertain" combinations as the mean of the two possibilities.

in the decisions. The more important result for our purposes, of course, was the effect of uncertainty. The more uncertainty associated with option B, the less likely participants were to choose it. In addition, the higher the expected value of option B, the more likely participants were to choose it. Although this latter relationship is obvious and unsurprising, it is nevertheless important to the analysis of our results because it strongly suggests that participants took their decision seriously and attempted to make rational decisions.

We submitted the data to a two-way repeated ANOVA,[48] with one factor distinguishing among the three levels of certainty for the sanction, and another factor distinguishing among the three levels of certainty for the probability of being caught[49]. We find a significant effect of sanction certainty ($F_{2,86}$=8.65, p<0.001), and a significant effect of probability certainty ($F_{2,86}$=13.82, p<0.001).[50]

There is a strong, significant difference between the certain sanction and the two uncertain sanctions (risk and uncertainty) pooled together ($F_{1,43}$=10.62, p<0.01) and only a marginally significant difference between risky sanctions and uncertain sanctions ($F_{1,43}$=2.9, p=0.10). The result is similar for the certainty of the probability: namely, there is a strong, significant difference between certain probabilities and the two uncertain probabilities pooled together ($F_{1,43}$=22.19, p<0.01) and only a marginally significant difference between risky and uncertain ($F_{1,43}$=3.34, p=0.07). Overall, the findings suggest that behavior is influenced by certainty (both certainty with respect to the sanction and certainty with respect to the probability of detection), while the difference between risk and uncertainty is smaller and only marginally significant.

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48. ANOVA (analysis of variance) is a statistical technique designed to check whether differences in means between experimental conditions are significant (i.e. whether it is reasonable to assume that there are real differences in the population) or whether one is able to reject with confidence the hypothesis that the means are equal (i.e. that the differences we see are just "noise" in the sample).

49. ANOVA requires a continuous dependent variable. As our measurements are categorical (binary), we summed the values of the 3 different questions (expected values) in each cell, and performed ANOVA on the resulting measurements. Alternatively, a LOGIT regression analysis for repeated measures can be adopted. This analysis is more complicated, and therefore not reported in detail. Nevertheless we performed it, and the results are essentially similar: significant effects of sanction ($\chi^2_{(2)}$=12.2, p<0.01), probability ($\chi^2_{(2)}$=29.6, p<0.01) and expected value ($\chi^2_{(2)}$=103.6, p<0.01), with no significant pair-wise interactions.

50. There is no significant interaction between the effects ($F_{4,172}$=0.84). The level of certainty in the sanction does not influence the magnitude of influence of the certainty of probability, and vice versa.

E. Interpretation of results

According to our results, uncertainty with regard to either the size of a sanction or the probability of detection increases deterrence. To differing degrees, these results pose a challenge to interpretation in light of both prospect theory and expected utility theory. In the end, the results can be entirely reconciled with prospect theory, but only partially reconciled with expected utility theory.

We discuss separately the transitions from certain to risky sanctions, risky to uncertain sanctions, certain to risky probabilities, and risky to uncertain probabilities.

The transition from Certain to Risky Sanctions (1 to 4, 2 to 5 and 3 to 6 in Table A). This transition increases uncertainty with regard to losses. Thus, consistent with the reflection effect observed in prospect theory research, we might expect participants to be risk-preferring. Indeed, this was the prediction made by one of us in an earlier article.[51] Yet, our results show risk aversion, and risk aversion is the result that would be predicted by expected utility theory,[52] which prospect theory research has demonstrated to be deficient in important respects.[53]

The apparent contradiction can be resolved through the recognition that the B options in our experiment involved gains as well as losses, and that the potential for gain consistently outweighed the potential for loss. Prior experimental research on compliance with legal norms has carefully constructed so that there were no mixed gain/loss options.[54] In that context, the researchers found that, consistent with the gain/loss framing effect explained by prospect theory, participants were risk preferring when options involved only losses and risk avoiding when options involved only gains. By contrast, our experiment presented the more complex (and realistic) situation in which both gains and losses are possible outcomes of the violation of a legal norm.

This design raised the question whether participants would frame the loss and gain possibilities separately, behaving in a risk-preferring manner with regard to uncertainty over losses and a risk-avoiding manner with regard to uncertainty over gains, or whether the participants would frame the losses and gains together.[55] The strong pattern of risk aversion suggests that the participants framed the

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[51] *See* Harel and Segal, *supra* note 8 (using prospect theory to argue that criminals would prefer uncertain punishments).

[52] See Shavell and Polinksy, *Optimal Tradeoff*, supra note 4

[53] *See* Daniel Kahneman, *Preface*, in Kahneman & Tversky (eds.), *supra* note 26.

[54] *See* note 44, supra.

[55] We are grateful to Avi Tabach for discussions that sharpened our appreciation of this point.

sanction, not as a loss, but rather as a component of a benefit. It appears that the participants did not evaluate the sanction in isolation, but rather in conjunction with the benefit derived from making the risky choice. In other words, in deciding whether to choose option B, the participants discounted the value of the additional 30 shekels according to chance of being caught and fined. The more certain they could be about the chance of being caught and fined, the more certain they could be about the gain from option B. In this way, the participants appear to have framed option B as presenting the possibility of a gain, with the resulting risk averse behavior that prospect theory predicts with regard to gains.[56] Of course, more research is necessary before drawing strong conclusions regarding the framing of such gain/loss decisions.

The transition from Risky to Uncertain Sanctions (4 to 7, 5 to 8, 6 to 9 in Table A). In contrast, this transition can be easily explained. The results here reflect ambiguity aversion, a well documented preference for known over unknown probabilities.[57]

The transition from Certain to Risky Probabilities (1 to 2, 4 to 5, and 7 to 8 in Table A). The deterrent effect of the transition from certain to risky probabilities of detection is the experimental result that

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[56] This aspect of our results has to be considered a somewhat weak finding because it is possible that the participants collapsed the initial grant of 40 shekels with the chance to get an additional 30 and, thus, treated all the possible outcomes as gains, notwithstanding our efforts to frame the B option as a gain/loss gamble. In other words, they may have evaluated the choice between A and B, not as we framed it (i.e. between (A) "keeping" 40 shekels and (B) "getting" an additional 30 shekels), but rather as a choice between (A) "getting" 40 shekels and (B) "getting" a less certain amount that would be no more than 70 shekels and no less than X shekels (with X being a different amount in each round of the experiment). In other words, it is possible that they reframed a two step process consisting of an initial grant of money and a subsequent gain/loss decision into a one step, pure gain decision. We are inclined to discount this possibility because behavioral decision research strongly supports the hypothesis that participants accept the frame that they are offered. *See* Kahneman, supra note 53 at *xv* (2000) ("decision makers are generally quite passive and therefore inclined to accept any frame to which they are exposed"). As shown in the instructions in Appendix A, the participants were told:

> At the beginning of each round you will be given 40 NIS. Then you will be asked to choose between two alternatives: alternative A or alternative B. The decision will be conducted by clicking a button with the mouse.
>
> If you choose A you will keep the 40 NIS and the round will end.
>
> If you choose B you will be given an extra Y NIS, but you will run the risk of being caught and required to pay a fine. In this case you will have to return money to the experimenter.

This framing issue remains to be explored in subsequent research.

[57] **Need to pull citation out of Harel & Segal.**

is most inconsistent with the expected utility analysis.[58] Prior work in economics has taken risk aversion into account, and risk aversion may explain the preference for certain sanctions over risky sanctions (because there is a broader range of sanctions in the risky case), but it cannot explain the preference for greater certainty with regard to the probability of detection.[59]

Increasing uncertainty about the probability of detection does not increase the range of sanctions or, *ex ante*, the chance of detection. Before rolling the ten sided die that determines the probability of detection, an individual choosing B in our "risky" cells faces exactly the same probability of detection as an individual choosing B in our "certain" cells. Thus the shifts in the results that occur in moving from the "certain" detection to the "risky" detection cells are results that cannot be explained within the traditional expected utility framework.

Another way of emphasizing the potential significance of our detection finding is that prior theoretical analysis improved on the expected utility approach by recognizing that, because of risk aversion, individuals' behavior is not dictated solely by the expected value of the sanction.[60] Uncertainty with respect to the size of the sanction makes a difference because of risk aversion. Our analysis makes a further improvement by recognizing that individuals' behavior may also differ systematically from expected value when there is uncertainty over the probability of detection.

The transition from Risky to Uncertain Probabilities (2 to 3, 5 to 6, and 8 to 9 in Table A). The increased deterrent effect of moving from "risky" to "uncertain" is less inconsistent with expected utility analysis because one cannot with confidence state that the "expected value" in the "risky" and "uncertain" cells is equivalent. It might be or it might not be, depending on the way that the lottery is conducted in the "uncertain" cells, and we did not tell our participants anything about

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58. We are grateful for discussions with Oren Bargill, Robert Bones and Stephen Marks, and correspondence with Peter Siegelman that sharpened our appreciation of this point.

59 *See, e.g.,* Shavell & Polinsky, *Optimal Tradeoff*, *supra* note 4 We write "may provide" because a range provides more deterrence than its midpoint only if there is a declining marginal utility of money and, as Matthew Rabin has conclusively demonstrated, the declining marginal utility of money cannot explain risk aversion in decisions involving such small amounts of money. *See* Matthew Rabin, *Diminishing Marginal Utility of Wealth Cannot Explain Risk Aversion*, in Kahneman & Tversky (eds.), *supra* note 26 at 202 (2000) (explaining that the "risk aversion" observed in behavioral decision research is attributable to "loss aversion," not to the declining marginal utility of money).

60. *See* Shavell & Polinsky, *supra* note 4; Calfee & Craswell and additional sources *supra* note 15.

how that lottery would be conducted. Moreover, as noted in connection with the transition from risky to uncertain sanctions, prior research on ambiguity would predict that individuals would be more reluctant to tolerate unknown probabilities of this type than known ones.[61]

* * *

The importance of attitudes toward risk suggests a further reason for caution in generalizing from our results. There are findings that suggest that the degree of risk-tolerance with respect to small risks such as small monetary losses differs from the attitudes to large risks.[62] As a result, one cannot lightly generalize the results from behavior involving small stakes to behavior involving large gambles. As these cautions make clear, we do not claim that our research and analysis are conclusive with respect to the effects of uncertainty. Rather, we highlight the importance and relevance of uncertainty and begin to explore the ways uncertainty could be manipulated to reduce the costs of the legal system without reducing its deterrent effects. Toward that end, the next part analyzes the treatment of uncertainty in tort and criminal law and suggests ways that policy makers could use uncertainty to increase deterrence.

II. UNCERTAINTY IN CRIMINAL AND TORT LAW

Our experimental results suggest that uncertainty in sanctioning increases deterrence, at least within the conditions that we investigated. In this part we address the treatment of uncertainty under existing tort and criminal law, beginning with the anomaly that we noted in the introduction: namely, that criminal and tort law both attempt to reduce uncertainty with respect to the size of the sanction and largely ignore uncertainty in detection. This anomaly reflects a discernable legal ethos that, nevertheless, leaves substantial room for policy makers to exploit the deterrent possibilities of uncertainty even in setting sanctions.

A. Uncertainty in Criminal Law

Criminal law differentiates sharply between certainty with respect to the size of the sanction and certainty with respect to the probability of detection. Criminal law has mechanisms designed to increase certainty with respect to the size of the sanction, but it typically does not regulate certainty with respect to the probability of detection.

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61. *See supra* notes 17 & 28.

62. *See* Rabin & Thaler, *supra* note 43, at 228. Indeed, as explored in note 45, this may explain the reversal in Table D.

1. Uncertainty Regarding Sanction in Criminal Law

There are many rules in criminal law that are explicitly designed to address uncertainty with respect to the size of a sanction. These rules follow in part from the fundamental principle that an individual is entitled to know in advance the content of criminal prohibitions as well as the sanctions for violating them. The prohibition on retroactive changes in the criminal sanctions provides a paradigmatic example. International documents, such as section 11(2) of the Universal Declaration of Human Rights and section 7 (1) of the European Convention of Human Rights, prohibit the imposition of retroactive sanctions for new offences, or retroactively increasing the sanctions for existing offences. Similar provisions can be found in numerous constitutions including in article I sections 9 and 10 of the United States Constitution, Article 103(2) of the German Constitution, and section 11 (g) of the Canadian Charter of Rights and Freedoms.[63] A related principle of criminal law—the principle of lenity—also increases the certainty of the criminal sanction. According to the principle of lenity, a criminal statute must be strictly constructed and any doubt regarding the size of the sanction must be resolved in favor of the defendant.[64] Finally, one of the stated objectives of the Model Penal Code (section 1.02(2)(d)) has been: "to give fair warning of the nature of the sentences that may be imposed on conviction of an offense." This objective was a central reason for the move in the United States toward determinate sentencing exemplified by the adoption of detailed sentencing guidelines.[65]

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63. These provisions prohibit both the retroactive imposition of new prohibitions and the retroactive increase in the sanction. Our article deals only with the latter aspect.

64. United States v. Wiltberger, 18 U.S. 76 (182). In some jurisdictions, the common law rule of strict construction has been codified. *See, e.g.*, FLA. STATS. ANN. § 775.021(1) ("The provisions of this code . . . shall be strictly construed; when the language is susceptible of different constructions it shall be construed most favorable to the accused."). The rule of lenity is often justified on the grounds that citizens have a right to be notified of the content of criminal prohibitions as well as the size of the sanctions imposed for violating these prohibitions. *See* United States v. Bass, 404 U.S. 336, 347 (1971); Liparota v. United States, 471 U.S. 419, 427 (1985). For a discussion of the rule of lenity, see Dan M. Kahan, *Lenity and Federal Common Law Crimes*, SUP. CT. REV. 345–428 (1994).

65. *See* Roger W. Haines et al., FEDERAL SENTENCING GUIDELINES HANDBOOK (1995); Michael Tonry, SENTENCING MATTERS 54–58 (1996). The United States sentencing commission itself (the commission that is in charge of drafting the sentencing guidelines) emphasized the importance of certainty. In explaining its objectives, it stated that: "A sentencing system tailored to fit every conceivable wrinkle of each case would quickly become unworkable and seriously compromise the certainty of punishment and its deterrent effect." *See* U.S. Sentencing Comm'n, Fed. Sentencing Manual ch. 1 pt. A-3. Yet, other voices have argued that the primary aim of sentencing

2. Uncertainty Regarding Detection in Criminal Law

We do not observe the same attention to reducing uncertainty regarding the probability of detection in criminal law. In large part, this may be attributable to institutional factors. The criminal justice system separates institutional responsibility for different aspects of the detection of criminal acts. Police and other law enforcement agencies are responsible for surveillance and arrest; prosecutors are responsible for deciding whether and how to prosecute; and judges and juries are responsible for deciding whether the evidence is sufficient to convict. While overly simplistic,[66] this description highlights the fact that a variety of institutions are involved in detecting crime and that, while courts are hardly peripheral to the detection process, they do not play as central role in detection as they do in sentencing. This lesser role of courts is important because, in general, the more removed an actor is from the inside of a courtroom, the less the legal system tends to constrain action. Thus, as a matter of institutional reality, certainty in detection will tend to be affected more by "policy" than "law" (recognizing that we are drawing to some degree an artificial distinction), as least as compared to certainty in sanction.

guidelines is not to promote certainty but to reduce disparity in sentencing. Echoes to this view can also be found in the sentencing guidelines manual which states that: "one of the "three objectives Congress sought to achieve in enacting the Sentencing Reform Act of 1984" was "reasonable uniformity in sentencing by narrowing the wide disparity in sentences imposed for similar criminal offense committed by similar offenders." *Id*.

These two objectives are distinct. It is possible to have certain sanctions, and at the same time maintain disparity among different individuals. If individual A knows that if he is convicted he will be sentenced to X years in prison and individual B knows that if she is convicted she will be sentenced to Y then the sanctions are "certain" and yet the system maintains disparity. Yet, these two objectives (certainty on the one hand and eliminating disparity on the other hand) are often interdependent. The Sentencing Reform Act of 1984 recognizes this interdependence and mentions both of them together as primary objectives. 28 U.S.C.A. § 991(b)(1)(B) states that one of the objectives of the Act is to "provide certainty and fairness in meeting the purposes of sentencing, avoiding unwarranted sentencing disparities among defendants with similar records who have been found guilty of similar criminal conduct . . . ."

There is of course a separate dispute as to whether the sentencing guidelines indeed achieve the goals they aim at achieving. *See, e.g.*, Kate Stith & Jose Cabranes, FEAR OF JUDGING: SENTENCING GUIDELINES IN THE FEDERAL COURTS (1998); Cassia C. Spohn, *supra* note 21 at 236–39. One interesting finding that raises doubts about the success of the sentencing guidelines is the fact that prosecutors and defendants circumvent the restrictions by engaging in more pre-charging charge bargaining. *See* Ahmed Essam Taha, The Effects of the Federal Sentencing Guidelines on the Disposition of Criminal Cases 100–03 (1996) (Unpublished dissertation submitted to the Department of Economics and the Committee on Graduate Studies, Stanford University).

66. Prosecutors are in fact often involved in surveillance and arrest and, through plea bargaining, they can also become judge and jury.

The existence of agencies specifically responsible for detecting crime makes it possible for the criminal justice system to address explicitly public perception regarding certainty in detection in a way that, at least potentially, distinguishes criminal law from tort law. It is our impression, however, that, on the whole, law enforcement agencies' deterrence strategy focuses more on (increasing) the probability of detection than on the certainty of the probability of detection. Thus, the efforts invested in generating certainty with respect to the size of the sanction are not matched by similar efforts to address certainty with respect to the probability of detection. The former dimension—certainty with respect to the size of the sanction—falls within the ambit of concerns about the "rule of law" while the latter dimension is merely a matter of "policy." While this differential treatment of certainty with respect to these two dimensions may seem natural to some and puzzling to others, all would agree that the lack of certainty with respect to the probability of detection receives little or no attention.

3. Manipulating Uncertainty in Criminal Law

Given that we are suggesting that policymakers should consider manipulating certainty in order to increase deterrence, the onus is on us to demonstrate that this is possible. Hence, in this section we will suggest some ways in which certainty in sanction size and detection can be manipulated without subverting legal doctrine, or betraying the legal ethos.[67]

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67. While this section focuses on the certainty of the sanction and the precision of the probability of detection what is ultimately crucial for deterrence is not certainty itself but the beliefs of potential criminals regarding certainty. Yet, assuming that there is a correlation between certainty and beliefs of potential criminals with respect to certainty, this section focuses on the mechanisms for manipulating certainty.

In addition to manipulating beliefs concerning the certainty of the sanction and beliefs concerning the precision of the probability of detection, the legal system can also manipulate the beliefs concerning the average size of the sanction and the average probability of detection. In a classic article, Meir Dan-Cohen argued that the legal system contains two separate systems of norms: one addressed to the criminals and the second addressed to judges. Meir Dan-Cohen, *Decision Rules and Conduct Rules: On Acoustic Separation in Criminal Law*, 97 HARV. L. REV. 625 (1984). Under his view, judges operate a more lenient and forgiving system of norms than those that are believed by the public to guide judicial decisions. An "acoustic separation" between these two systems of norms guarantees that the norms which are actually operated by judges will not be the ones known to the public at large. A similar scheme could perhaps be established with respect to the probability of detection. The police could perhaps create "acoustic separation" between the actual probability of detection and the one used by individuals to guide their behavior. In other words, the police could manipulate a false belief that the rate of detection is much higher than it is in reality.

Some advocates of behavioral law and economics have suggested ways to create false beliefs concerning the probability of detection. More specifically, it was pointed

Sanction size. Criminal law often authorizes officials to use their discretion in setting sanctions. How officials use this discretion can increase or decrease certainty with respect to the size of the legal sanction. Although determinate sentencing reduces the discretion of judges, it does not reduce the discretion of police and prosecutors. Most notably, prosecutors retain discretion to charge offenses up or down.[68] In addition, broad grants of federal criminal jurisdiction in the United States can expose defendants who commit identical crimes to disparate sentences depending on whether they are prosecuted by the state or by the federal government. When Rudolph Giuliani was the United States Attorney in New York, he used the concurrent jurisdiction to create a sentencing lottery. His plan involved a program in which one day was chosen at random each week in which all street level drug dealers apprehended by local authorities would be prosecuted in federal court and consequently be subjected to harsher sanctions. Rudolph Giuliani explicitly embraced the deterrent possibilities of sentencing lotteries when he stated that: "the idea was to create a Russian roulette effect."[69]

Legal doctrine can also increase or decrease certainty. For example, if sanctions are smaller for attempts than completed crimes, there is uncertainty, *ex ante*, with respect to the size of the sanction. When a person starts committing a crime, she cannot know in advance whether the crime will be completed successfully or not. Thus, she faces a "sentencing lottery" of sorts.[70] Similarly sentences sometimes

out that individuals tend to judge the likelihood of uncertain events (such as getting caught for a crime) by how available such instances are to the human mind. This analysis suggests the desirability, from a prescriptive standpoint, of making law enforcement highly visible and thereby creating false beliefs with respect to the probability of detection. Consequently, it was claimed that the practice of sticking large, brightly-colored tickets that read "VIOLATION" in large letters on the drivers' side window, where they are particularly noticeable to drivers passing by is better than the less costly approach (putting small, plain tickets under the windshield wiper on the curb side of the street, convenient for the parking officer to reach). *See* Christine Jolls et al., *Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1473, 1538 (1998). Judge Posner countered that the large sticker may have the opposite effect, by drawing attention to how infrequently detection actually occurs. *See* Richard Posner, *Rational Choice, Behavioral Economics and the Law*, 50 STAN. L. REV. 1551, 1553 (1998).

68. This power appears to be used often to evade the sentencing guidelines. *See* Gerald W. Heaney, *Revisiting Disparity: Debating Guidelines Sentencing*, 20 Am. CRIM. L. REV. 771–93 (1992).

69. *See* Sara Beale, *Too Many and Too Few: New Principles to Define the Proper Limits for Federal Crime Jurisdiction*, 46 HASTINGS L. J. 979, 1000 (1995).

70. A simple example can illustrate how a legal system can manipulate certainty by changing its treatment of attempts in a way that is conducive to efficiency. Assume that 50% of the criminals who start to commit a crime complete the crime successfully. Assume that 10% of all criminals are detected and successfully convicted. There are

depend on the degree of success of the person in committing the crime. Some penal provisions impose differential sanctions in accordance with the amount of money or property stolen or other factors unknown to the perpetrator of the crime at the time the crime is committed.[71] Finally, the "Pinkerton rule," which makes criminals liable for the acts of their co-conspirators, similarly imposes a sanction according to factors that are not known to the perpetrator at the time the crime is committed. More particularly each co-conspirator bears the risk that other co-conspirators will commit further unplanned crimes.[72] It is interesting perhaps to note that uncertainty and arbitrariness are typically the reasons provided by criminal law theorists to reject both the differential treatment of completed crimes and attempts and the Pinkerton rule.[73] These rules are often considered to leave the fate of offenders to contingencies that are beyond their powers and therefore are considered unjust.[74]

Probability of detection. The ability of law enforcement agencies to manipulate the certainty of the probability of detection varies according to context. One arena in which it seems quite possible to manipulate the certainty of the probability of detection is taxpayer compliance. Tax law enforcement is based largely on investigating a representative sample of potential offenders. The more the criteria for auditing and the size of the sample are publicized, the more certain the detection rate. Prior behavioral decision research on taxpayer compliance suggests that, provided that sufficient taxes have been

two ways to impose an expected sanction of one year in prison. Under the first scheme, both those who commit complete crimes and those who failed to complete them receive ten years in prison. Under the second scheme, those who attempt to commit a crime receive five years while those who completed the crime receive fifteen years. In both schemes, the criminal faces a sanction of the same expected value (tech years). The desirability of each one of these schemes depends, however, on the attitude of the criminals to uncertainty. If criminals are risk averse, the second scheme may be better than the first.

71. *See* Harel & Segal, *supra* note 8. *Cf.* United States v. Feola, 420 U.S. 671 (holding that one can violate a statute criminalizing assaults on federal officers even if one does not know that the victim is a police officer); Model Penal Code § 2.02 (stating that the mens rea requirements apply only to the material elements of a crime).

72. *See* Neal Kumar Katyal, *Conspiracy Theory*, 112 YALE L. J. 101, 156–57 (2003) (using the deterrent effect of uncertainty as a justification for the *Pinkerton* rule).

73. *See id*. at n. 5.

74 The case of the *Pinkerton* rule is even more disturbing in that the fate of one offender is at the hands of others. We may be willing to tolerate some circumstances in which contingencies are beyond the power of offenders and yet resist circumstances in which these contingencies are controlled by other agents.

withheld from wages, reducing the certainty of the probability of detection would increase taxpayer compliance.[75]

Enforcement of parking laws (or perhaps other traffic violations) is another arena in which certainty could be affected similarly. Many citizens are exposed on a daily basis to the enforcement of traffic and parking laws and can develop expertise with respect to their enforcement. For example, a municipality could decide to send parking inspectors regularly to all neighborhoods or it could decide to concentrate its efforts on different neighborhoods on different, randomly selected, days. The latter system creates greater uncertainty with respect to the probability of detection. A parking enforcement agency could change the certainty of detection by announcing (and then following through on the announcement) that it was going to adopt a less (or a more) predictable parking ticket enforcement pattern.

Certainty can also be manipulated in other areas through the use of enforcement campaigns. In an enforcement campaign, a law enforcement agency targets its resources in a specific geographic area, or on a specific type of offense. If increasing uncertainty increases deterrence, a policy of enforcement campaigns would produce greater deterrence than a policy that allocated a constant stream of resources to enforcement by geographic area or type of offense.[76] An enforcement campaign increases the uncertainty of the probability of detection by publicizing the fact that, sometimes, the probability of detection will be very high. Although the public presumably is aware that law enforcement officials cannot consistently maintain a high probability of detection in every time and place, the fact that sometimes the probability will be very high means that there is a wider range of potential probabilities of detection in any particular time and place.

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75. *See* Casey & Scholz, *supra* note 7. Interestingly, this research suggests that, when not enough money has been withheld from income to pay taxes, uncertainty may decrease taxpayer compliance, due to the loss/gain framing effect. *See supra* note 26. When enough money has been withheld, cheating produces a "gain"—i.e. a larger refund; when not enough money has been withheld, cheating produces a smaller "loss"—i.e. a smaller additional tax payment. This research suggests that taxing authorities can increase compliance by extending withholding rules and by announcing that they will focus audits on taxpayers likely to have income that is not subject to withholding.

76. Uncertainty with respect to the probability of detection is also affected, albeit to a less significant extent in practice to be sure, by rules affecting the retroactivity of changes in procedure and evidential rules. If the rules can be applied retroactively, a person who commits a crime would therefore face increased uncertainty with respect to the probability of conviction given that the evidential and procedural rules are subject to changes. A legal system could therefore increase certainty if it required a "prior warning" with respect to procedural and evidential rules.

Thus, enforcement campaigns have the potential to increase deterrence, given fixed resources, not only by publicizing the *fact* of law enforcement activity (thus recruiting the "availability heuristic" to support law enforcement efforts)[77] but also by increasing the uncertainty regarding the probability of detection.

B. Uncertainty in Tort Law

Tort law also differentiates between the treatment of uncertainty with respect to the sanction on the one hand and uncertainty with respect to the probability of detection on the other. Uncertainty with regard to sanction is addressed directly by the law of tort damages and, indirectly, by liability insurance. Although tort law's compensatory purpose introduces an inescapable element of uncertainty into the expected value of tort sanctions, liability insurance substantially reduces that uncertainty. In contrast, uncertainty with regard to detection is not addressed at all.

1. Uncertainty Regarding Sanction in Tort Law

In tort law, questions of sanction are addressed under the general heading of "damages." At the level of legal doctrine, tort law appears less concerned with reducing uncertainty in sanction than criminal law. This doctrinal difference follows from the compensation and victim-centered focus of tort damages (as opposed to criminal sanctions). Because of the focus on the harm to the victim, it is often quite difficult for a potential tortfeasor to know in advance the amount of damages that would be assessed in the event of detection. One dramatic example of this is the "eggshell skull" rule, pursuant to which the defendant is responsible even for unforeseeable harm to a foreseeable victim.[78] A second dramatic example comes from the liability provisions of the statutory tort created by CERCLA, pursuant to which a person who shipped only a small amount of hazardous waste to a site can be jointly and severally liable for the clean-up of the entire site, even if the person reasonably believed that the waste was not hazardous.[79]

Notwithstanding this doctrinal difference between tort and criminal law, in practice tort sanctions ordinarily are much more certain than criminal sanctions—at least from the perspective of the defendant—because of liability insurance. If liability insurance is available, it nearly eliminates uncertainty in tort sanctions from the perspective of

77. *See, e.g.*, Jolls, *supra* note 67.

78. *See, e.g.*, Benn v. Thomas, 512 N.W. 2d 537 (Iowa 1994).

[79] *See* 42 U.S.C. §§ 9601-9674. Thank you to Kurt Strasser for alerting us to the environmental law implications of our research.

an insured tort defendant. Provided that he or she has purchased adequate liability insurance, the cost to the defendant of a tort judgment will always be the approximately the same: the opportunity costs of the time spent cooperating in the defense, along with the associated aggravation and inconvenience. [80] Of course, liability insurance does not entirely eliminate uncertainty from the defendant's perspective. There are other costs to being a tort defendant, and it is always possible that the insurance company will partially recoup the damages paid in the form of higher premiums in the future. Nevertheless, in practice, liability insurance very substantially reduces uncertainty regarding sanction, at least from the perspective of potential tort defendants.

In addition to the uncertainty-reducing effect of liability insurance, there are also aspects of tort doctrine that reduce the uncertainty of tort law remedies. For example, in tort law there is an implicit, but very strong, relationship between the objective measurability of categories of tort damages and the degree of difficulty of obtaining those damages. The easiest elements of a tort damages case are the out of pocket losses (sometimes called economic losses) such as medical expenses and lost wages. It is more difficult to collect the more difficult to calculate categories of damages such as pain and suffering or loss of enjoyment of life. Indeed, tort law only grudgingly permitted such "non-economic" damages, and their continued availability remains under constant threat from tort reform efforts to place caps on non-economic damages.[81]

Punitive damages are perhaps the most uncertain of all damages, since they are not necessarily tied to the amount of harm inflicted on

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80. Liability insurance typically covers the costs of defense as well as settlement or judgment. Even punitive damages are insurable in many jurisdictions. *See generally* Tom Baker, *Reconsidering Insurance for Punitive Damages*, 1998 WIS. L. REV. 101 (1998). In jurisdictions in which punitive damages are not insurable, the prohibition on insurance makes a punitive damages case more likely to settle, which reduces the uncertainty that is otherwise created by the public policy against insurance for punitive damages. *See* Tom Baker, *Transforming Punishment Into Compensation: In the Shadow of Punitive Damages*, 1998 WIS. L. REV. 211 (1998). It is worth noting that large corporations are able to purchase insurance products that provide insurance that covers punitive damages assessed even in jurisdictions in which such damages are, as a formal matter, not insurable. *See* John Cartafalsa [need title and date] (LL.M. thesis on file in the Insurance Collection of the University of Connecticut School of Law Library). Even if the defendant has not purchased adequate insurance, the chances that the defendant will be required to pay any money from his or her own pocket in an ordinary negligence tort case are small. *See* Tom Baker, *Blood Money, New Money and the Moral Economy of Tort Law in Action*, 35 LAW & SOC'Y REV. 275 (2001).

81. *See, e.g.*, W. Kip Viscusi & Patricia Born, *Medical Malpractice Insurance in the Wake of Liability Reform*, 24 J. LEGAL STUD. 463, 484 (1995).

any particular plaintiff.[82] For that reason (among others), punitive damages are a very controversial feature of the American tort law.[83] Features of tort law that reduce the uncertainty regarding punitive damages include frequent decisions by trial courts to remit (i.e. reduce) the amount of punitive damages. In addition, the propensity for appellate courts to carefully scrutinize and with some frequency reverse punitive damages judgments encourages litigants to settle punitive damages cases between trial court and appeal.[84]

2. Uncertainty Regarding the Probability of Detection in Tort Law

Outside of courts, tort law does not directly address uncertainty with regard to detection. With the limited exception of statutory torts, there are no public agencies charged with detecting tort law violations (except to the extent that tort law overlaps with criminal law). Where such public agencies exist, it is our impression that, like criminal justice institutions, their focus is on (increasing) the probability of detection, not the certainty of the probability of detection.[85] An additional factor compounding the uncertainty of detection in tort law as compared to criminal law is that, in contrast to criminal law, "attempts" are not actionable in tort. A breach of the relevant tort law standard is grounds for legal action only if that breach causes harm. In many, perhaps most, cases of negligence (or other civil wrongs), there is at least some probability that the breach will not cause any harm, and it seems quite likely that this probability will be uncertain.

3. Manipulating Uncertainty in Tort Law

To a degree, the compensation goal of tort law limits the ability to manipulate the certainty with respect to the size of the sanction. On the one hand, the compensation goal prevents sanctions from being certain, because tort damages depend on contingent factors, such as the characteristics of the victim and the nature of the harm caused by the wrongful behavior. On the other hand, the compensation goal prevents

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82. There is a lively debate about the uncertainty of punitive damages. *See, e.g*. Theodore Eisenberg et al., *Judges, Juries and Punitive Damages: An Empirical Study*, 87 CORNELL L. REV. 743; A. Mitchell Polinsky, *Are Punitive Damages Really Insignificant, Predictable and Rational? A Comment on Eisenberg et al.*, 26 J. LEGAL STUD. 663 (1997).

83 *See, e.g.,*, sources cited in note 20, *supra.*

84. *See, e.g*., Michael J. Rustad, U*nravelling Punitive Damages: Current Data and Further Inquiry*, 1998 WIS. L. REV. 15.

85. Examples of such agencies in the United States include consumer protection divisions of states' attorney generals, the Federal Trade Commission, the Environmental Protection Agency, and the Food and Drug Administration.

sanctions from being radically uncertain, once again because the amount of tort damages depends on the harm.

Yet, despite these limitations there are numerous ways by which one can manipulate certainty in tort damages. One obvious mechanism is punitive damages. In general, punitive damages are imposed in order to punish defendants, not compensate victims, so there is no theoretical reason why punitive damages need bear any particular relationship to compensatory damages.[86]

Another obvious mechanism is liability insurance. When liability insurance is less available, tort sanctions are more uncertain. For example, a lack of insurance for punitive damages in some jurisdictions makes the practical impact of punitive damages more uncertain. Similarly, the relative lack of insurance for environmental harm makes the impact of environmental liability more uncertain.[87] In addition, the increasingly common practice of excluding coverage for claims relating to "criminal acts" turns insurance companies into criminal law enforcement agencies of a sort and at the same time makes tort sanctions more uncertain in cases involving criminal norms.[88] Finally, closely tying the future costs of liability insurance to tort settlements or judgments paid (known as "experience rating" in the insurance trade) would also increase the uncertainty of tort damages.

Certainty in tort damages may also be affected by rules regarding tort damages. Many "tort reform" efforts are addressed at reducing the upper bound of tort damages and, thus, may make tort damages more certain. Examples include restrictions on joint and several liability and caps on non-economic or punitive damages.[89] In addition, the U.S. Supreme Court is gradually developing constitutional limits on punitive damages that limit the jury's discretion regarding the size of punitive

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86. *Cf.* Shavell and Polinsky, *Punitive Damages: An Economic Analysis*, 111 HARV. L. REV. 869 (1998) (arguing that punitive damages should be based on a formula that takes into account compensatory damages and the likelihood of under-enforcement); *State Farm Mut. Auto. Ins. Co. v. Campbell*, 123 S. Ct. 1513 (2003) (stating that Due Process considerations mandate that punitive damages must bear a reasonable relationship to compensatory damages).

87. *See* Kenneth Abraham, ENVIRONMENTAL LIABILITY INSURANCE LAW (1991).

88. *See* Tom Baker, INSURANCE LAW AND POLICY 500-505 (2003); Jonathan Simon, GOVERNING THROUGH CRIME 1965-2000 (unpublished manuscript on file with author).

89. Because of liability insurance, it is difficult to know how the resulting decrease in uncertainty affects potential tort defendants. Prior research suggests that tort reform efforts do not necessarily reduce liability insurance rates, so it is possible that tort reform does not in fact decrease uncertainty for tort defendants. *See, e.g.*, Viscusi & Born, *supra* note 81, at 463–90 (finding that malpractice reform increased insurer profitability but did not reduce insurance premiums).

damages awards.[90] One of the most important implications of our research in the tort arena is that the reduction in uncertainty from these tort reforms may well magnify the expected loss in deterrence from the decline in the amount of damages.

Manipulating uncertainty in detection is less straightforward in the tort arena than in criminal justice because of the importance of "private" law enforcement in torts and the lesser role of public agencies. To the extent that public agencies are charged with enforcing tort and related statutory norms, these agencies should be able to use all of the techniques addressed in the criminal context, above. For example, an agency charged with increasing patient safety in hospitals could conduct random, highly intensive audits of patient records to identify adverse events, many of which would be unlikely ever to result in a private tort action because of historically very low claiming rates in the medical malpractice arena.[91] With regard to classic tort claims brought by individual plaintiffs, however, there appears to be little that can be done, directly, to manipulate the certainty of detection. Even with concerted efforts by members of the personal injury bar, intensive short term "enforcement campaigns" seem unlikely to be effective in increasing the uncertainty of detection.

On the other hand, publicity highlighting the "lottery" or "random" nature of tort enforcement may increase the deterrent effects of tort law in fields in which the actual probability of detection is quite small. Medical malpractice may be one such example. Despite the fact that (1) a very small percentage of adverse medical events result in a medical malpractice claim,[92] (2) that doctors prevail in the majority of cases that actually go to trial,[93] (3) that medical malpractice insurance is

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[90] *See State Farm v. Campbell*, 123 S. Ct. 1513 (2003).

91. *See, e.g.*, Paul Weiler et al., A MEASURE OF MALPRACTICE 125–26 (1993):

> Malpractice law seems to function in a manner akin to income tax audits. Only a small fraction of potentially valid malpractice claims ever ripen into lawsuits. However, doctors' inflated perceptions of the prospect of suit greatly magnify the deterrent leverage that litigation can exert over medical malpractice, at least by comparison with what would be expected from a simply calculation of the true risks of suit.

See also Localio et al., *Relation Between Malpractice Claims and Adverse Events Due to Negligence*, 325 NEW ENG. J. MED. 245 (1991) (reporting that less than 2% of negligently injured patients pursue litigation).

92. *See* Weiler et al, *supra* note 90..

93. *See* Patricia A. Danzon, MEDICAL MALPRACTICE: THEORY, EVIDENCE AND PUBLIC POLICY 38 (1985) (reporting that plaintiffs won in only 28% of medical malpractice cases).

not experience rated,[94] and (4) that doctors almost never have to pay money out of their own pockets,[95] the threat of malpractice liability allegedly produces a great deal of "defensive medicine," in which doctors perform additional tests and take other precautions to create a favorable record in the event of a lawsuit.[96] Thus, the medical malpractice arena suggests that uncertainty can, indeed, be a "force multiplier" and therefore a potentially useful tool in deterring harm, particularly in situations in which it is difficult to increase significantly the average probability of detection.

Environmental enforcement also exploits the deterrent effects of uncertainty, though with exactly the opposite combination of certainty and uncertainty in sanctioning and detection. Because of the extensive record keeping and manifest system imposed by RCRA, hazardous wastes are easily be traced back to their source.[97] If we think of producing the hazardous waste as the "wrong," then the detection of that wrong is virtually certain for businesses that operate within the law. What is radically uncertain, however, is the sanction for that wrong. The sanction could be as small as the additional costs of using EPA-approved disposal services or as great as the costs of cleaning up a future waste site using a very expensive, not yet discovered technology.[98]

C. Summary

From this brief analysis we reach the following conclusions. First, criminal law has a strong, well-established aspiration, embedded in doctrine, that sanctions should be known in advance. A similar, although perhaps less strongly held, aspiration can also be found in tort law.

Second, despite this aspiration for certainty in sanctioning there are ways to manipulate uncertainty. For example, in criminal law—the legal field in which certainty may be most cherished—certainty in sanctioning could be manipulated by rejecting the sentencing guidelines

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94. See Frank A. Sloan, *Experience Rating: Does it Make Sense for Medical Malpractice Insurance?*, 80 AMER. ECON. REV. 128 (1990). Experience rating is the practice of basing premiums in part on the claims history of individual insureds.

95. *See* Tom Baker, *Blood Money*, *supra* note 80.

96. *See* Patricia Danzon, *Liability for Medical Malpractice*, in HANDBOOK OF HEALTH ECONOMICS, VOL I. 1339 (2000).

97. *See* 42 U.S. C. §§ 6991-6992k.

98. CERCLA imposes joint and several liability on generators and transporters of wastes as well as owners of sites in which wastes are deposited. *See* 42 U.S.C. §§ 9601-9674. Compliance with government regulations regarding disposal of hazardous waste is not a defense to a CERCLA action.

or by introducing a larger range of permissible sanctions in the existing sentencing guidelines. Alternatively, uncertainty could be created by reducing the penalties for attempts as opposed to completed crimes or by borrowing from the victim-centered approach of tort law and increasing the penalties for completed crimes that cause greater harms. In addition, prosecutors could borrow Rudolph Guliani's sentencing lottery idea and apply it to decisions to charge up or down, or to decisions about what kinds of plea bargains to entertain. In tort law, uncertainty could be increased through efforts directed at reducing the dampening effect of liability insurance or by efforts directed at increasing the significance of the less predictable aspects of tort damages, such as non-economic or punitive damages as well as joint and several liability.

Whether in the end such deliberate attempts to manipulate uncertainty ought to be encouraged in the face of the aspiration for certainty is of course an important question, one to which we do not propose an answer. We propose more modestly that the potential deterrence effects of uncertainty should be investigated and considered—a process that does not seem to have occurred in the context of the heated debate in the 1970s and 1980s over sentencing guidelines or in the context of the contemporary heated debate concerning punitive damages.

Third, while criminal and tort law embody a strong aspiration for certainty in sanctioning, they do not appear to have the same aspiration for certainty regarding the probability of detection. This absence is perhaps stronger in tort law than criminal law because tort law enforcement depends to a greater extent on the decisions of uncoordinated private plaintiffs rather than, at least potentially coordinated government agencies.

Fourth, given the lack of consistent, principled objection to uncertainty in detection, deliberately manipulating that uncertainty ought to be more acceptable. Thus, if uncertainty in fact promotes deterrence, the indifference of tort and criminal law to this particular kind of uncertainty may present an opportunity. Of course there may be situations in which the probability of detection is already so uncertain that deliberate efforts to increase the uncertainty will have little or no effect. Nevertheless, it seems likely that there are other situations in which the probability of detection is not as uncertain and, therefore, the potential benefits of short term, intensive enforcement campaigns should be considered. Bringing public attention to the relatively high probability of detection during these campaigns, while withholding information about their location and duration, could have the effect of expanding the range of uncertainty regarding the probability of detection.

Finally, this reference to public attention has an additional important implication. Even if other considerations such as fairness (for example, in the context of the certainty of the criminal sanction) or practical limits on the ability of enforcement agencies to detect wrongdoing (in the context of the certainty with respect to the probability of detection) dictate legal rules and institutional procedures, it is still the case that certainty or uncertainty could be manipulated to enhance deterrence. This is because it is not certainty or uncertainty *per se* that produces the deterrent effects of the legal system, but rather beliefs concerning certainty or uncertainty. Thus, by highlighting existing uncertainty-producing aspects of the system (which presumably exist for practical or other reasons and are not manufactured in order to increase deterrence), the legal system could enhance deterrence. For example, if juries have discretion over the size of punitive damages sanctions because of a commitment to democratic ideals, emphasizing the resulting uncertainty could appropriately and fairly be used to promote deterrence even if it would be immoral to deliberately introduce the same level of uncertainty into punitive damages solely on deterrence grounds.

III. OBJECTIONS

There are at least five significant objections to the suggestion that certainty should be manipulated to increase deterrence:

1. Manipulation of certainty is immoral;
2. Manipulation of certainty is costly;
3. Manipulation of certainty is not effective;
4. Manipulation of certainty is inefficient because it may lead to over/under-deterrence; and
5. Manipulation of certainty may have unpredictable consequences because subpopulations differ in their aversion to risk.

We address each in turn.

A. Morality

It could be argued that manipulating certainty either with respect to the size of the sanction or with respect to the probability of detection is inherently wrong. It may be wrong because uncertainty itself is wrong or, even if uncertainty is not inherently wrong, creating uncertainty deliberately in order to increase deterrence may be wrong. The reluctance to manipulate certainty for the sake of increasing deterrence may be founded on one of two moral explanations. It may for instance

rest on the intuition that such an uncertainty involves differential treatment of people who are similarly situated and therefore violates principles of equality.[99] Alternatively it may rest on the belief that the size of the sanction should reflect the degree of wrong committed and, consequently, that people who commit the same wrongs should be treated in the same way.[100] These two moral intuitions are distinct.[101] The first is grounded in the ideal of equality while the second is grounded in retributive justice.

These moral intuitions seem particularly compelling when individuals who committed an identical wrong under identical circumstances receive different sanctions based on a system deliberately structured to promote uncertainty. These intuitions seem less compelling, however, in circumstances in which the disparity is a byproduct of a legal system that authorizes legal decision makers to weigh numerous factors and make a decision on the basis of an overall judgment of the culpability or wrongfulness of the relevant behavior. In other words, there seems to be a substantial difference between (a) a sentence that ranges between five and ten years determined by the flip of a dice; and (b) a sentence that ranges between five and ten years according to the discretion of a judge.

Although both systems lead to uncertainty, the former system violates a sense of justice because it is designed to bring about uncertainty and because it also introduces playfulness into the process in which people's fate is determined—a process which is perceived to be one of serious deliberation. The latter system leads to uncertainty, but it is not designed to bring about disparity in sanctioning; the disparity is simply an unintentional byproduct of a scheme designed to take seriously the particularities of each case. These particularities are so complex that they inevitably lead to uncertainty even if this disparity is grounded in relevant differences between the different cases.

This raises the possibility that existing uncertainty, which is justified on other grounds, could be emphasized or publicized in order

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99. Disparity in sentencing is often condemned as a "manifest form of injustice, which may bring a sentencing system into public disrepute. *See* Ashworth, *supra* note 2 at 236. Others however believe that disparity in sentencing can be justified. *See, e.g.*, Norval Morris, MADNESS AND THE CRIMINAL LAW 179–209 (1982). For a discussion of the importance of considering fairness and equality in criminal law, see Alon Harel and Gideon Parchamovsky, *On Hate and Equality*, 109 YALE L. J. 507 (1999).

100. The principle of "proportionality," namely the principle that sanctions be proportionate in their severity to the gravity of offences is regarded as a basic requirement of justice. For a philosophical justification of this principle by one of its most loyal advocates, see Andrew von Hirsch, CENSURE AND SANCTIONS ch. 2.

101. *See* Joseph Raz, THE MORALITY OF FREEDOM ch**.**

to increase deterrence without violating moral concerns about deliberately increasing uncertainty. Some purists may resist this conclusion, however, arguing that, although certainty brought about unintentionally may be legitimate, uncertainty may never be used to promote deterrence. In this view, uncertainty could be maintained without violating our sense of justice only if it is not intentionally used to promote deterrence, but is designed for other legitimate purposes.[102]

This concern for certainty seems more compelling with respect to the size of the criminal or civil sanction than it is with respect to the probability of detection. Consequently, even if one believes that a system which imposes uncertain sanctions is morally abhorrent, one can still approve of generating uncertainty with respect to the probability of detection for the sake of promoting deterrence.

Last, it is perhaps worth emphasizing that the ideal of equal sanctions for equal wrongs is not as entrenched as may seem. In his meticulous analysis of legal sanctions, Bentham has argued that: "The last object [of criminal law] is, whatever mischief is guarded against, to guard against it at as cheap a rate as possible: therefore the punishment ought in no case to be more than what is necessary to bring it into conformity with the rules here given."[103] In contemporary literature this principle has been labeled the principle of parsimony. The principle of parsimony often overrides the principle of equality.[104] If by manipulating certainty, the legal system can reduce the average size of the sanction, it follows the dictates of the principle of parsimony—a central principle entrenched in the contemporary legal system.

B. Cost

One could argue that the manipulation of certainty may have its own costs. It is possible for instance that conducting enforcement

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102. Admittedly however the latter system in which uncertainty is not designed to enhance deterrence may have less deterrent effects. This is because if the sanction depends on the discretionary powers of a judge the offender may believe they can influence the use of this discretion. The process seems therefore less arbitrary and therefore more certain than the arbitrary toss of a coin. Arguably therefore introducing arbitrariness in sanctioning presents the policy maker with the following dilemma. Either uncertainty is introduced in a way which is blatantly unjust (such as by tossing a coin) or it is introduced in legitimate ways which have lesser deterrent effects because they are perceived to be less arbitrary. We are grateful to Bethany Berger for raising this point.

103. Jeremy Bentham, AN INTRODUCTION TO THE PRINCIPLES OF MORALS AND LEGISLATION ch. WIV § 3 (J.H. Burns & H.L.A. Hart eds., 1970).

104. *See* Norval Morris, *Desert as a Limiting Principle*, *in* PRINCIPLED SENTENCING: READINGS ON THEORY AND POLICY 180, 182 (Andrew Von Hirsch & Andrew Ashworth eds., 1998).

campaigns is more costly than maintaining a constant degree of enforcement. If the costs of manipulating certainty (either increasing certainty or decreasing it) are high, these costs may override the deterrence-based benefits of such a manipulation. Some methods of manipulating certainty could be costly. Yet, other methods are not. An examination of the overall costs and benefits of manipulating certainty can be made only after a more thorough investigation of the effects of uncertainty on deterrence and this is precisely what our experiment begins to do.

C. Effectiveness

It may be argued that certainty with respect to the size of the sanction or with respect to the probability of detection are such marginal factors in the decision to violate a legal norm that policies targeted at uncertainty will not be effective. This ineffectiveness objection may be based on an intuitive sense that actors operate on the basis of the expected value of their action and, thus, certainty plays little role in their calculations. This objection is exactly what our experiment is designed to test.

Alternatively, the ineffectiveness objection may be based on the conviction that the detection of criminal or tortious behavior is already so highly uncertain that the effects of manipulating certainty further for the sake of increasing deterrence can at most be marginal. This is perhaps the most powerful objection to the analysis provided in this Article. Nevertheless, even with regard to cases in which detection is already so uncertain, the analysis is this Article suggests that there are may be law enforcement benefits to be gained by highlighting this uncertainty in order to reap its deterrence benefits. Moreover, there undoubtedly are circumstances in which the probability of detection at least appears less uncertain—such as violations of parking regulations, traffic offenses, tax crimes, health and safety regulations, and the like.

In the end, this objection, although very important, requires detailed empirical research that is beyond the limited scope of our project. Whether it is worth conducting that research turns, in significant part, on whether uncertainty can have a deterrent effect. For that question our experiment provides the beginnings of an answer.[105]

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105. A final, less substantial, ineffectiveness objection applies only to repeat players in enforcement games. This objection asserts that increasing uncertainty in individual rounds of the game will not change the behavior of people who play often enough so that their sanctions are based on the average probability of detection. If true, this objection would demonstrate the deterrent power of uncertainty, because the repeat players would be making decisions from the perspective of certainty, not uncertainty.

D. Over/Under-Deterrence

It is sometimes argued that, if sanctions are otherwise set optimally, then uncertainty can cause inefficient over-compliance.[106] If uncertainty in fact increases the deterrent effects of some criminal or civil sanctions, then increasing uncertainty would increase the costs associated with committing the crime/wrong. Given the (heroic) assumption that a particular sanction is otherwise set optimally, increasing uncertainty would lead to over-deterrence. On the other hand, with at least some combinations of average size of sanction and average probability of detection, increasing uncertainty beyond a certain point may reduce deterrence through a response that may be similar to that of "learned helplessness" (the term in the psychological literature for the apathy that results when punishments do not appear to be related to behavior).[107] Thus, depending on the circumstances, increasing uncertainty could lead to over or under deterrence.

While significant, these concerns do not undercut our analysis. Indeed, they support our effort to investigate the deterrent effects of uncertainty. If uncertainty in fact increases deterrence, then increasing uncertainty may be a cost-effective way to increase deterrence in situations in which there is reason to believe the existing level of deterrence is not optimal. Alternatively, if existing sanctions are optimal, policymakers may be able to reduce the costs of deterrence by reducing the average sanction and increasing uncertainty (leading to, for example, lower incarceration costs in the criminal context and smaller average punitive damages awards in the civil context).

Polinsky and Shavell have argued that over-deterrence is particularly likely to result from uncertainty concerning the amount of the sanction because of the risk bearing cost borne whenever the sanction is set higher than the external costs of the activity that the sanction is intended to discourage.[108] The intuition here is that within the economic analysis of law the optimal (objective) expected value of a sanction should be set so that is matches the external costs that the activity imposes on society, and that any time a potential sanction is higher than that amount, the people who "should" engage in that activity (because their private gains from the activity exceed the external costs) will be subject to the risk that they will have to pay a

The quintessential repeat players in enforcement games are liability insurance companies.

106. *See* Calfee and Craswell *supra* note 15.

107. *See, e.g.*, Martin Seligman *et al*, *Alleviation of Learned Helplessness in the Dog*, 73 J. ABNORMAL PSYCHOL. 256 (1968); Lenore E. Walker, THE BATTERED WOMAN SYNDROME 87 (1984) (using the concept of learned helplessness to explain the battered woman syndrome).

[108] See Shavell & Polinksy, *Optimal Tradeoff*, supra note 4.

sanction that exceeds the optimal sanction. Because of risk aversion, the risk of a larger sanction will lead individuals to assign a subjective expected value to the sanction that will exceed the objective expected value of that same sanction. At the margin, some people who "should" engage in the activity will not, and all people who do engage in the activity will bear a higher risk than they "should." For this reason, Shavell and Polinsky conclude that, subject to the costs of enforcement, it is more efficient to increase deterrence by increasing the probability of detection than by increasing the size of the sanction.

Although this concern is also significant, it does not undercut our analysis. Instead, it suggests that in some circumstances there are competing considerations in favor of reducing certain kinds of uncertainty. Moreover, within their theoretical framework our analysis adds an additional tool to increase deterrence that can be traded off against sanction size, namely uncertainty regarding the probability of detection.[109]

E. Variations in Risk Aversion

The final objection is one that is not in fact addressed by our experiment. This is the objection that increasing uncertainty may have unpredictable results due to systematic variations in the risk aversion of subpopulations. For example, there is research that suggests that people in prisons are significantly less risk averse on average – and more likely to be risk seeking – that the undergraduate students who typically participate in behavioral decision research experiments.[110] Thus, if we want to deter at least some kinds of serious criminal activity, increasing uncertainty might be counter-productive. Similarly, there is research suggesting that the most safety-conscious and law abiding people might also be the most risk averse.[111] As a result, increasing, uncertainty could in some circumstances have the perverse

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[109] To the extent that uncertainty regarding the size of a sanction also increases deterrence, increasing that uncertainty would increase risk bearing costs in much the same manner as increasing the sanction size. Thus "trading" increased uncertainty regarding the size of the sanction for reduced average sanction size would not decrease the risk bearing cost with which Shavell and Polinsky are concerned.

110. *See, e.g.* --- Block and --- Gerety, *Some Experimental Evidence on Differences Between Student and Prisoner Reactions to Monetary Penalties and Risk*, 24 J. Leg. Stud. 123 (19--). *But see* Joanna M. Shepherd, Are Criminals Like Us? Risk Attitudes, Sentencing Guidelines, and Increased Crime, working paper (February 2003) (available at www.ssrn.com) (using sentencing data to conclude that criminals are risk averse with regard to imprisonment and that, as a result, determinate sentencing increases crime).

111. This research is reviewed in Peter Siegelman, *Adverse Selection: A Critique* (unpublished manuscript). *See, e.g.*, David Hemenway, *Propitious Selection*, 105 Q. J. ECON. 1063 (1990).

result of over-deterring those who are already complying with legal norms while increasing the under-deterrence problem among those who are already more casual about complying with legal norms.

It is very important to note, however, that this objection can also be raised with regard to efforts to increase deterrence using the more traditional tools of sanction size and probability. Thus, this objection is not unique to efforts to use uncertainty to increase deterrence. Accordingly, although variations in aversion to uncertainty are important and worthy of further investigation, that investigation is worth pursuing only if one is first persuaded of the potential deterrent effects of uncertainty. That, of course, was the primary object of this research.

CONCLUSION

Traditionally, legal scholarship in criminal law and in tort law has focused attention on the amount of, and the procedure for determining, sanctions. Law and economics analysis expanded that traditional focus by demonstrating the importance of considering the probability of detection and risk aversion. As that analysis has demonstrated, it is the *expected sanction* that matters, not the absolute size of the sanction. Indeed, higher sanctions could in some circumstances lead to a lower probability of detection, with a resulting decrease in deterrence, and vice versa.

Using the insights of behavioral decision research, this Article has emphasized yet another factor that affects the deterrence value of civil and criminal sanctions. It is not only the expected sanction that counts, but also the certainty with which that expected sanction can be known in the individual case. Varying the certainty of the size of the sanction or the probability that it will be imposed also affects the deterrence value of the sanctioning system.

The conclusions drawn from our research and analysis are likely to depend, at least in part, on perspective. Staunch believers in law and economics may conclude that legal thinkers should rethink their traditional hostility towards uncertainty. Other legal scholars may conclude that this Article provides yet another demonstration that legal institutions do not rest on economic rationales. Perhaps the most reasonable conclusion to draw, however, is that in contexts that do not raise serious concerns of injustice and unfairness, uncertainty could indeed be manipulated in order to increase deterrence without compromising the ideals underlying legal institutions.

APPENDIX A

When the participants arrived for the experiment they first viewed the following screen:

Welcome to a decision making experiment.

The experiment consists of 27 decision rounds. The money will be paid to you in cash according to the rules that will be explained shortly.

At the beginning of each round you will be given 40 NIS.[112] Then, you will be asked to choose between two alternatives: alternative A or alternative B. The decision will be conducted by clicking a button with the mouse.

If you choose A you will keep the 40 NIS and the round will end.

If you choose B you will be given extra Y NIS, but you will run the risk of being caught and required to pay a fine. In this case you will have to return money to the experimenter. The size of the fine and the probabilities of detection will change in every round, and will be explained in each round.

During the experiment you will be asked to choose between alternative A and alternative B using the information you get. After you complete all the decisions the computer will randomly select 2 rounds. You will be paid "real money" for only those two rounds. The payoff will be determined on the basis of your choices, and, in case you choose alternative B, also according to the results of the lottery.

Note: The experiment will be conducted exactly according to the rules. The money will be paid to you in cash at the end. Remember, you will be paid only for 2 of the rounds. You do not know which 2 rounds (they will be randomly selected after you complete all decisions). Therefore, each round could be one that will be selected. Think carefully before you decide.

Under alternative A in all screens, the participants were told the following: If you choose alternative A, you will keep the NIS 40 (which they received at the outset) and the round will end. In this appendix we will list the instructions given for option B separately for each one of the 27 possible combinations, adding also, for the convenience of the

112. Forty new Israeli Shekels (NIS) were worth approximately $8 at the time of the experiment.

reader, the expected value (which was not given to the participants during the experiment).

CERTAIN SANCTION/CERTAIN DETECTION

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides.[113] In thirty percent of the cases, you will be caught and required to pay a fine of NIS 50 (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In fifty percent of the cases, you will be caught and required to pay a fine of NIS 45 (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In ten percent of the cases, you will be caught and required to pay a fine of NIS 60 (expected value NIS 24).

RISKY SANCTION/CERTAIN PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In 30% of the cases, you will be caught and required to pay a fine. The size of the fine will be determined by tossing a coin and will be either NIS 60 or NIS 40 (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In 50% of the cases, you will be caught and required to pay a fine. The size of the fine will be determined by tossing a coin and will be either NIS 55 or NIS 35 (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In 10% of the cases, you will be caught and required to pay a fine. The size of the fine will be determined by tossing a coin and will be either NIS 70 or NIS 50 (expected value NIS 24).

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113. Participants were shown the die to help them visualize the percentages. If the probability was 30%, then the participant would be "detected" if the die landed on any of three specified sides of the ten-sided die. Similarly, if the probability was 50%, there would be five specified sides, and if the probability was 10%, there would be only one specified side. This ten-sided die is regarded as an effective way to present probabilities in terms that people easily understand.

UNCERTAIN[114] SANCTION/CERTAIN PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In 30% percent of the cases, you will be caught and required to pay a fine. The size of the sanction will be either NIS 60 or NIS 40, but you do not know how the size of the fine is determined. There is no reason to assume that it will be NIS 60 in 50% of the cases, and NIS 40 in the rest of the cases (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In 50% of the cases, you will be caught and required to pay a fine. The size of the fine will be either NIS 55 or NIS 35, but you do not know how the size of the sanction is determined. There is no reason to assume that it will be NIS 55 in 50% of the cases, and NIS 35 in the rest of the cases (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a die with 10 sides. In 10% of the cases, you will be caught and required to pay a fine. The size of the fine will be either NIS 70 or NIS 50, but you do not know how the size of the sanction is determined. There is no reason to assume that it will be NIS 70 in 50% of the cases, and NIS 50 in the rest of the cases (expected value NIS 24).

CERTAIN SANCTION/RISKY PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 20% or 40%. In accordance with this probability you will be asked to toss a die with 10 sides. If you are caught you will pay a fine of NIS 50 (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 40% or 60%. In accordance with this probability you will be asked to toss a die with 10 sides. If you are caught you will pay a fine of NIS 45 (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 5% or

114. The expected values we provide for the scenarios involving uncertain sanctions or uncertain probabilities are based on the Bernoullian principle of equally weighting possibilities in situations in which probabilities are unknown. An alternative approach would be to present the expected values as a range.

15%. In accordance with this probability you will be asked to toss a die with 10 sides. If you are caught you will pay a fine of NIS 60 (expected value NIS 24).

RISKY SANCTION/RISKY PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 20% or 40%. In accordance with this probability you will be asked to toss a die with 10 sides. The size of the fine will be determined by tossing a coin and will be either NIS 60 or NIS 40 (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 40% or 60%. In accordance with this probability you will be asked to toss a die with 10 sides. The size of the fine will be determined by tossing a coin and will be either NIS 55 or NIS 35 (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 5% or 15%. In accordance with this probability you will be asked to toss a die with 10 sides. The size of the fine will be determined by tossing a coin and will be either NIS 70 or NIS 50 (expected value NIS 24).

UNCERTAIN SANCTION/RISKY PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 20% or 40%. In accordance with this probability you will be asked to toss a die with 10 sides. The size of the fine will be either NIS 60 or NIS 40, but you do not know how the size of the fine is determined. There is no reason to assume that it will be NIS 60 in 50% of the cases, and NIS 40 in the rest of the cases (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 60% or 40%. In accordance with this probability you will be asked to toss a die with 10 sides. The size of the fine will be either NIS 55 or NIS 35, but you do not know how the size of the fine is determined. There is no reason to assume that it will be NIS 55 in 50% of the cases, and NIS 35 in the rest of the cases (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then you will be asked to toss a coin in order to determine the probability with which you will be caught. The probability will be either 5% or 15%. In accordance with this probability you will be asked to toss a die with 10 sides. The size of the fine will be either NIS 70 or NIS 50, but you do not know how the size of the fine is determined. There is no

reason to assume that it will be NIS 70 in 50% of the cases, and NIS 50 in the rest of the cases (expected value NIS 24).

CERTAIN SANCTION/UNCERTAIN PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 20% or 40% but you do not know what it is. There is no reason to assume that it will be 20% in 50% of the cases, and 40% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 10 sides. If you are caught you will be required to pay a fine of NIS 50 (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 40% or 60% but you do not know what it is. There is no reason to assume that it will be 40% in 50% of the cases, and 60% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 10 sides. If you are caught you will be asked to pay a fine of NIS 45 (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 5% or 15% but you do not know what it is. There is no reason to assume that it will be 5% in 50% of the cases, and 15% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 20 sides. If you are caught you will be required to pay a fine of NIS 60 (expected value NIS 24).

RISKY SANCTION/UNKNOWN PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 20% or 40% but you do not know what it is. There is no reason to assume that it will be 20% in 50% of the cases, and 40% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 10 sides. If you are caught you will be required to pay a fine. The size of the fine will be determined by tossing a coin and will be either NIS 60 or NIS 40 (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 40% or 60% but you do not know what it is. There is no reason to assume that it will be 40% in 50% of the cases, and 60% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 10 sides. If you are caught you will be required to pay a fine. The size of the fine will be determined by tossing a coin and will be either NIS 55 or NIS 35 (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 5% or 15% but you do not know what it is. There is no reason to assume that it will be 5% in 50% of the cases, and 15%

in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 20 sides. If you are caught you will be required to pay a fine. The size of the fine will be determined by tossing a coin and will be either NIS 50 or NIS 70 (expected value NIS 24).

UNCERTAIN SANCTION/UNCERTAIN PROBABILITY

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 20% or 40% but you do not know what it is. There is no reason to assume that it will be 20% in 50% of the cases, and 40% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 10 sides. If you are caught you will be required to pay a fine. The size of the fine will be either NIS 60 IS or NIS 40, but you do not know how the size of the fine is determined. There is no reason to assume that it will be NIS 60 in 50% of the cases, and NIS 40 in the rest of the cases (expected value NIS 15).

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 40% or 60% but you do not know what it is. There is no reason to assume that it will be 40% in 50% of the cases, and 60% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 10 sides. If you are caught you will be required to pay a fine. The size of the fine will be either NIS 55 or NIS 35, but you do not know how the size of the fine is determined. There is no reason to assume that it will be NIS 55 in 50% of the cases, and NIS 35 in the rest of the cases (expected value NIS 7.5).

If you choose alternative B you will get an additional NIS 30. Then the probability with which you will be caught will be determined. This probability is either 5% or 15% but you do not know what it is. There is no reason to assume that it will be 5% in 50% of the cases, and 15% in the rest of the cases. In accordance with the probability, you will be asked to toss a die with 20 sides. If you are caught you will be required to pay a fine. The size of the fine will be either NIS 70 or NIS 50, but you do not know how the size of the fine is determined. There is no reason to assume that it will be NIS 70 in 50% of the cases, and NIS 50 in the rest of the cases (expected value NIS 24).