

UNCERTAINTY REVISITED: LEGAL PREDICTION AND LEGAL POSTDICTION

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Legal scholarship, following rational choice theory, has traditionally treated uncertainty as a single category. A large body of experimental studies, however, has established that individuals treat guesses concerning the future differently than guesses concerning the past. Even where objective probabilities and payoffs are identical, individuals are much more willing to predict a future event (and are more confident in the accuracy of their predictions) than they are willing to postdict a past event (and are also less confident in the accuracy of their postdiction). For example, individuals are more willing to bet on the results of a future die toss than they are willing to bet on the results of a past toss.

After presenting the robust psychological and experimental-economic literature, this article demonstrates the relevance of the behavioral differences concerning past and future uncertainties for legal policy. It shows that the prediction-postdiction findings are important for the design of legal norms, for the choice among competing law-enforcement strategies and for the application of various sentencing practices. The making of legal norms, the detection of violators and the infliction of sanctions, it is shown, may generate different types of uncertainty involving predictions and postdictions, and those can be exploited by policymakers in order to provide optimal incentives.

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Earlier versions of this paper were presented at the American Law & Economics Association Annual Meeting (Harvard Law School, May 2007), This Article was made possible by the generous support of the Milton and Miriam Handler Foundation and the Israel Science Foundation (grant No. 731/04 and 136/05).

I. Introduction

Uncertainty is prevalent in legal contexts. Parties to a contract often face uncertainty regarding the value of the goods they buy; criminals often face uncertainty with respect to the probability of detection; potential tortfeasors often face uncertainty regarding the possibility that their behavior will inflict harm. Uncertainty in such cases can be placed in the future as well as in the past. For example, when purchasing a used car, the uncertainty of the buyer can relate to the date that the manufacturer will terminate the production of this model (future) or to the maintenance history of the vehicle (past). In the context of law enforcement, a burglar might be uncertain concerning the likelihood that the owners will return early (future) or whether a hidden camera has been installed in the house (past). In torts, a doctor can be uncertain if his patient will use (future) or has used (past) drugs that prevent the prescription of possible medication. In the legal context, therefore, individuals are often required to predict the future as well as to “postdict” the past.

Legal scholarship, following rational choice theory, has traditionally treated uncertainty as a single category in which decisions are governed by the pertinent probabilities and payoffs.¹ Under this approach—since the actual source of uncertainty (past or future) has no effect on the likelihood of the possible outcomes— the

¹ For some representative examples of the conventional analysis concerning the effects of uncertainty, see, for example, Gillian Hadfield, *Weighing the Value of Vagueness: An Economic Perspective on Precision in the Law*, 82 CAL. L. REV. 541 (1987) (discussing the possible benefits of uncertainty in encouraging legal compliance); Jason S. Johnston, *Bayesian Fact-Finding and Efficiency: Toward an Economic Theory of Liability under Uncertainty*, 61 S. CAL. L. REV. 137 (1987) (examining how the legal system can provide incentives for optimal behavior where parties are uncertain about liability); Richard Craswell & John E. Calfee, *Deterrence and Uncertain Legal Standards*, 2 J.L. ECON. & ORG. 279 (1986) (exploring the effects of uncertainty under various penalty regimes); John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 VA. L. REV. 965 (1984) (showing how uncertainty may influence parties' incentives to invest in harm prevention); Mark F. Grady, *A New Positive Economic Theory of Negligence*, 92 YALE L.J. 799 (1983) (discussing the risk of inefficient precautions if parties are uncertain about the standard of care). These articles assume that the specific source of uncertainty is insignificant, and that individuals who face uncertainty consider their alternatives only on the basis of expected costs and benefits.

question whether an uncertain event precedes or succeeds one's decision has been perceived to be irrelevant. Legal analysis has thus assumed that as long as probabilities and payoffs are identical, future uncertainties and past uncertainties induce similar behavior.²

Against this conventional assumption, rich experimental literature establishes that individuals treat postdictions very differently than predictions. In a series of studies, participants were required to determine whether to, and to what extent they wish to engage in a risky activity either before or after the occurrence of an event the results of which were unknown. Most importantly, these studies have demonstrated that parties have a strong preference for guesses of future contingencies over guesses of past contingencies. Individuals playing games with probabilistic outcomes, for example, were shown to consistently bet more money and take more risk if they initially wage and then play (a prediction condition) than if they play first and only then wage (a postdiction condition). Although objective probabilities and payoffs were manifestly identical, individuals exhibited more confidence and greater willingness to take risks when uncertainty referred to the future rather than to the past.³

This Article explores the implications of these behavioral findings to legal theory. It shows that the prediction-postdiction distinction cuts across several domains of legal uncertainty and thus requires careful investigation of the actual influence it exerts on conduct. More specifically, the following analysis demonstrates how

² Professors Calfee and Craswell, for example, note that “uncertainty occurs whenever people cannot be sure what legal consequences will attach to each of their possible courses of action” and that “[s]uch uncertainty arises from a number of sources.” Professors Calfee and Craswell then provide examples of uncertainties that can result from either past or future contingences (the size of damages, the likelihood a plaintiff files a claim, or the availability of witnesses), without distinguishing between the two types of uncertainty. See John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, *supra* note 1 at 986. See also, Gillian Hadfield, *supra* note 1 at 541-42, explaining that “...each person attaches a certain probability of being held liable for violating the law to a given behavior or activity... these probabilities might range between one and zero for numerous reasons, including imperfect enforcement (not all violators are caught or convicted), mistakes in the determination of factual issues, and errors in the identification of the applicable legal rule.” As the following analysis shows, such uncertainties can involve both predictions and postdictions.

³ See *infra* Part II.A (presenting the results of the prediction-postdiction experiments).

the prediction-postdiction literature can bear on the constitutionality and design of legal norms, on the choice among competing law-enforcement strategies and on the application of various sentencing practices. The making of legal norms, the detection of violators and the infliction of sanctions, it is shown, may generate different types of uncertainty involving predictions and postdictions and those can be exploited by policymakers in order to provide optimal incentives.

Attempting to bring the conventional framework closer to the real world, legal scholarship is recently paying increasing attention to the contributions of social science studies concerning the ways in which individuals form their choices and preferences.⁴ Scholars have supplemented the traditional rational choice assumption with models that take into account the results of empirical and experimental studies concerning actual conduct.⁵ In the context of uncertainty, legal analysis has already addressed the important ramifications of several such behavioral findings. For example, scholars have shown that the observed difference in attitudes towards probabilistic gains and probabilistic losses, or in the perception of small and large probabilities, can be an important factor in the application of various legal doctrines.⁶ While this analysis has advanced our understanding

⁴ See, e.g., Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998) (emphasizing the importance of incorporating the results of experimental and empirical studies into the conventional analysis); Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CAL. L. REV. 1051 (2000) (demonstrating the contributions of behavioral studies to the understanding of decision making).

⁵ For an overview of legal scholarship that draws from behavioral studies, see, for example, Donald C. Langevoort, *Behavioral Theories of Judgment and Decision Making in Legal Scholarship: a Literature Review*, 51 VAND. L. REV. 1499 (1998); Christine Jolls, *Behavioral Law and Economics*, forthcoming in ECONOMIC INSTITUTIONS AND BEHAVIORAL ECONOMICS, (Peter Diamond, ed., 2008), available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=960453.

⁶ Experimental studies pioneered by Amos Tversky and Daniel Kahneman have established a widely accepted model of decision making under conditions of uncertainty called “prospect theory.” The most important finding of this theory is that individuals exhibit a “fourfold pattern of risk attitudes” when making risky decisions: (1) risk aversion for moderate-to-high-probability gains, (2) risk seeking for moderate-to-high-probability losses, (3) risk seeking for low-probability gains, and (4) risk aversion for low-probability losses. See Amos Tversky and Daniel Kahneman, *Advances in Prospect Theory: Cumulative Representation of Uncertainty*, 5 J. RISK & UNCERTAINTY 297, 306 (1992). Legal scholarship has

of the actual affects of legal uncertainty, this Article demonstrates it has overlooked important behavioral findings concerning the difference between past and future uncertainties.

The remainder of this Article unfolds as follows. Part II first presents the robust experimental literature on the prediction-postdiction distinction, and then discusses the explanations for differences in conduct when faced with future and past uncertainty. As shown, attitudes towards predictions and postdictions appear to be deeply rooted in human psychology. Part III explores the legal relevance of the behavioral findings by discussing their bearing on three related contexts: Part III.A establishes that the distinction between predictions and postdictions is relevant to the optimal design of legal norms, in particular to the choice between rules and standards. Part III.B examines the effects of uncertainty in the area of law enforcement. It demonstrates that law-enforcement authorities may manipulate the type of uncertainty that would be faced by potential criminals in order to maximize deterrence. Finally, Part III.C explores the implications of these behavioral results on the application of criminal sanctions. It shows that some sentencing practices result in future uncertainty while others result in past

applied prospect theory across many areas of law. *See. e.g.*, Jeffrey J. Rachlinski, *Gains, Losses, and the Psychology of Litigation*, 70 S. CAL. L. REV. 113 (1996) & Chris Guthrie, *Framing Frivolous Litigation: A Psychological Theory*, 167 U. CHI. L. REV. 163 (2000) (civil procedure); Gail D. Hollister, *Using Comparative Fault To Replace the All-or-Nothing Lottery Imposed in Intentional Tort Suits in Which Both Plaintiff and Defendant Are at Fault*, 46 VAND. L. REV. 121, 170-72 (1993) (torts); Larry T. Garvin, *Disproportionality and the Law of Consequential Damages: Default Theory and Cognitive Reality*, 59 OHIO ST. L.J. 339 (1998) (contracts); Kent W. Smith & Karyl A. Kinsey, *Understanding Taxpaying Behavior: A Conceptual Framework with Implications for Research*, 21 LAW & SOC'Y REV. 639, 649 (1987) (taxation); Henry T.C. Hu, *Risk, Time, and Fiduciary Principles in Corporate Investment*, 38 UCLA L. REV. 277, 330-31 (1990) & Donald C. Langevoort, *Selling Hope, Selling Risk: Some Lessons for Law from Behavioral Economics About Stockbrokers and Sophisticated Customers*, 84 CAL. L. REV. 627, 628-29 (1996) (corporate law); Robert B. Thompson, *Securities Regulation in an Electronic Age: The Impact of Cognitive Psychology*, 75 WASH. U. L.Q. 779, 782 (1997) (securities law); John M. A. Dipippa, *How Prospect Theory Can Improve Legal Counseling*, 24 U. ARK. LITTLE ROCK L. REV. 81, 114 (2001) (legal ethics). For a comprehensive survey, see Chris Guthrie, *Prospect Theory, Risk Preference, and the Law*, 197 NW. U. L. REV. 1115 (2003).

uncertainty, thus having different effect on incentives to engage in crime.

II. Behavioral Findings

This Part presents the experimental literature exploring risk perception concerning prediction and postdiction. It establishes the robustness of findings concerning differences in attitudes with respect to past and future guesses, and shows that these differences are grounded in deep-rooted behavioral dispositions.

A. Experimental Research

In a well known study by Rothbart and Snyder, participants divided into two groups were required to bet on the results of a die toss.⁷ In the first group, participants initially rolled the die (to a distance out of sight) and were then asked to guess the outcome. In the second group, participants first made their prediction, and only then was the die tossed. Participants were shown that the toss was fair and that the experimenters could not affect the results. Except for the sequence of the game (toss and then bet or bet and then toss) the procedure of the experiment was identical in both groups.

The conventional rational-choice paradigm would not predict any difference in the behavior of the participants. Since the level of risk and the likelihood of success were equal for both groups, participants' behavior was expected to be similar. The results of the experiment, however, showed that participants in the second group (bet and then toss) reported more confidence in being correct and were willing to bet almost as twice as much as participants in the first group (toss and then bet). Using the same experimental setting, Strickland, Lewicki & Katz similarly found that participants who first rolled a die and then guessed manifested "apparent

⁷ Myron Rothbart & Mark Snyder, *Confidence in the Prediction and Postdiction of an Uncertain Outcome*, 2 CANADIAN JOURNAL OF BEHAVIORAL SCIENCE 38 (1970).

conservatism” and were more risk-averse as compared to participants who first guessed and then tossed.⁸

In another study by Ladouceur and Mayrand, postdiction and prediction were compared and examined in a roulette game.⁹ At the beginning of the experiment, participants were awarded \$10 and were randomly assigned to one of two experimental groups, either betting before or after the throw (in the latter case, a piece of cardboard was immediately placed on the roulette section hiding the slot into which the ball fell). Participants in the roulette game could decide not only the size but also the *type* of wager. They could choose, for example, to bet on an exact number (a likelihood of 1:38), a column (likelihood of 1:4), a color (1:2), or a combination of several bets with different likelihoods of winning. The results showed that participants in the prediction condition (bet first) both invested significantly more money and took more risky wagers.¹⁰

The experiments by Rothbart & Snyder, and by Ladouceur & Mayrand, involved only a positive payoff (a reward for a correct guess) and applied a “between-subjects” design.¹¹ Later studies replicated these experiments using a “within-subjects” design and included the possibility of a negative payoff for an incorrect guess.¹² In an experiment conducted by Brun and Teigen, for example, participants were given the option to *choose the format* of the bet. They could guess the outcome first and then throw the die or throw first and guess the outcome afterwards. Participants were randomly assigned to three groups. In the “Reward Condition,” a positive reward was given for a correct guess. In the “Punishment Condition,” a negative payoff was awarded for an incorrect guess. Finally, in the

⁸ Lloyd H. Strickland, Roy J. Lewicki & Arnold M. Katz, *Temporal Orientation and Perceived Control as Determinants of Risk-Taking*, 2 JOURNAL OF EXPERIMENTAL SOCIAL PSYCHOLOGY 143 (1966).

⁹ Robert Ladouceur & Marie Mayrand, *The Level of Involvement and the Timing of Betting in Roulette*, 121 THE JOURNAL OF PSYCHOLOGY 169 (1987).

¹⁰ *Id.*, at 173-76.

¹¹ A “between-subject” design is based on the co-existence of groups which face different tasks. Thus, in our context some individuals were engaged in predictions while others were engaged in postdictions. A “within-subject” design confronts all subjects with different tasks. Thus, in our context all subjects confronted both predictions and postdictions.

¹² Wibecke Brun & Karl H. Teigen, *Prediction and Postdiction Preferences in Guessing*, 3 JOURNAL OF BEHAVIORAL DECISION MAKING 17 (1990).

“Neutral Condition,” no rewards were conferred or sanctions imposed for correct/incorrect guesses. The results of the experiment indicated that in all groups a majority of participants preferred prediction over postdiction, thus providing “clear evidence for a guess-first preference.”¹³

Tossing a die and betting on roulette are rather artificial environments. Additional studies have demonstrated that “prediction preference” also occurs in more realistic settings. For example, in an experiment by Heath and Tversky, participants were presented with a choice of selecting between two possible bets:

1. A stock is selected at random from the *Wall Street Journal*. You guess whether it will go up or down *tomorrow*;
2. A stock is selected at random from the *Wall Street Journal*. You guess whether it went up or down *yesterday* (and you cannot check the paper).¹⁴

From a group of more than 180 participants, nearly 70% “preferred to bet on tomorrow’s closing price.”¹⁵ Similar results were obtained in a study involving guessing the sex of a baby. Participants were asked to choose between betting on the sex of a child *before* or *after* delivery had taken place. Although under both alternatives the prospects of correct guess were equal, a substantial majority (79%) preferred to bet on the child’s sex before rather than after birth.¹⁶

Divergent attitudes about postdiction and prediction have been further established in contexts in which factors other than sheer luck determine outcomes. For example, Friedland, Keinan, and Regev asked participants to bet on the performance of basketball players. Participants were asked to choose whether to guess the outcome of an NBA game either before or after the game was held

¹³ *Id.*, at 21.

¹⁴ Chip Heath & Amos Tversky, *Preference and Belief: Ambiguity and Competence in Choice under Uncertainty*, 4 JOURNAL OF RISK AND UNCERTAINTY 5 (1991).

¹⁵ *Id.*, at 8-9.

¹⁶ Wibecke Brun & Karl H. Teigen, *supra* note 12 at 22-23.

(while the actual result would only be known later).¹⁷ Friedland et al used a 9-point scale, where the low end indicated a preference for betting *after* the game and the high end a preference for betting *before* the game. Participants' average score was around 7, thus indicating a desire to bet on the future rather than on the past.¹⁸ Similar results were obtained by Brun and Teigen in a similar experiment, involving betting on a soccer match. Of 93 participants, 82 individuals (88%) preferred to bet *before* the game, 9 individuals (10%) chose to bet *after* the game, and 2 individuals (2%) expressed no preference.¹⁹

Similar patterns of risk-taking behavior have been observed in experiments involving interactive decisions. As the results of such experiments have shown, whether a participant decides before or after other participants have made their decisions often affects her actual choice. Budescu, Suleiman and Rapoport have demonstrated this phenomenon in experiments investigating "resources dilemmas games."²⁰ In these experiments, a group of participants is given an opportunity to win a fixed amount of money, to be distributed among the group members. The game requires each participant to first determine her relative share, without knowing what the demands of the other participants are. Then, participants' decisions are revealed and aggregated. If the total sum of the participants' demands is lower than the fixed amount, each participant receives the sum she has claimed. If the total is higher than the fixed amount, participants receive nothing.²¹ From a strict economic perspective, whether the game is played such that participants decide simultaneously or one

¹⁷ Nehemiah Friedland, Giora Keinan & Yechiela Regev, *Controlling the Uncontrollable: Effects of Stress on Illusory Perceptions of Controllability*, 63 JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY 923 (1992).

¹⁸ *Id.*, at 928.

¹⁹ Wibecke Brun & Karl H. Teigen, *supra* note 12 at 22-23.

²⁰ David V. Budescu, Amnon Rapoport & Ramzi Suleiman, *Resource Dilemmas with Environmental Uncertainty and asymmetric players*, 20 EUROPEAN JOURNAL OF SOCIAL PSYCHOLOGY 475 (1990); David V. Budescu, Amnon Rapoport & Ramzi Suleiman, *Simultaneous vs. Sequential Requests in Resource Dilemmas with Incomplete Information*, 80 ACTA PSYCHOLOGICA 297 (1992).

²¹ Participants in resources dilemmas games thus face conflicting interests. On the one hand, a participant who wishes to maximize her payoff should demand a large share. On the other hand, such behavior increases the likelihood that the total sum of participants' demands will exceed the fixed amount.

after another should not affect their choices. Given that other participants' demands are unobservable in both cases, the level of uncertainty each participant faces in either format of the game is equal. Experiments exploring this issue, however, have indicated otherwise. Participants in the sequential format who played first demanded more, and participants who played last demanded less, than participants playing the game simultaneously.²²

Such behavior was also observed in other coordination games. In a recent study, Webber, Camerer and Knez examined to what extent the order of "ultimatum game" affects parties' behavior.²³ In their experiment, Webber et al gave every two participants \$10, and pairs were then divided into three groups, differing only in the sequence in which participants were required to make their choices.²⁴ In the simultaneous condition, "proposers" and "responders" were requested to make their offers / demands at the same time. In the other two groups, offers and demands were taken sequentially, where either the proposers or the responders move first. In all of these experiments, participants were informed of the actual sequence at the beginning of the game. Analysis of the results has shown that parties who played first in the sequential conditions were more "risk taking" than participants who played second as well as more risk taking than participants playing simultaneously. For example, for low offers (around \$1-\$3), the rejection rates vary from

²² David V. Budescu, Ramzi Suleiman & Amnon Rapoport, *Positional Order and Group Size Effects in Resource Dilemmas with Uncertain Resources*, 61 ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES 225 (1995).

²³ The ultimatum game is a much investigated experimental economics game with two players, the "proposer" and the "responder." In the basic form of the game, a sum of money is given to the proposer, who must "propose" how to divide this sum with the responder. Simultaneously, the responder must indicate the minimum amount he is prepared to accept. Neither party knows the other's offer/demand. If the responder's demand exceeds the proposer's offer, neither participant receives anything; if the responder's demand is within the proposer's offer, the responder receives the amount of the offer, with the proposer receiving the remaining amount. See generally Güth, W., Schmittberger, and Schwarze, *An Experimental Analysis of Ultimatum Bargaining*, JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION 3 (4) 367-388 (1982).

²⁴ Roberto A. Weber, Colin F. Camerer and Marc Knez, *Timing and Virtual Observability in Ultimatum Bargaining and "Weak Link" Coordination Games*, 7 EXPERIMENTAL ECONOMICS 25 (2004).

about 60% to 65% to 80% when responders move, respectively, after, at the same time, or before proposers.²⁵

These results suggest that players in interactive games are sensitive to the temporal dimension of their choices, even when the actual sequence has no bearing on their chances or expected payoffs. Players in ultimatum and resource-dilemmas games who make their decision at the beginning are required to bet on the future behavior of other participants. In contrast, players who act last wager on what other participants have already done. Consistent with the earlier findings, the former players manifest greater risk-taking behavior than the latter players.

B. The Psychology of Risk Perception in Prediction v. Postdiction

Psychologists have proposed two theories for the apparent differences in attitudes concerning past and future bets. The first theory is based on the “illusion of control.” Behavioral studies show that individuals often believe they can influence the likelihood of stochastic outcomes. Since this “illusion of control” implies a causal process, it may operate proactively but not retroactively. To this extent, future bets are associated with a *higher probability* of success. Other studies have suggested that wagers with respect to future events result in more satisfaction (when correct) and less regret (when incorrect) as compared to such bets regarding past events. Under this theory, predictions are more attractive because they result in *higher psychological payoffs* than identical postdictions.

1. Illusion of Control

Experimental and empirical research indicates that individuals often assume that they possess at least some control over purely probabilistic outcomes.²⁶ For example, subjects who are actively

²⁵ *Id.*, at 34.

²⁶ See e.g., Ellen J. Langer, *The Illusion of Control*, in JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES (DANIEL KAHNEMAN ET AL. EDS., 1982). For a detailed survey of the experimental literature, see Paul K. Presson & Victor

involved in chance-determinant games (e.g., deciding the color of the winning marble) have been found to risk more money and report greater confidence than subjects who play the same game yet take a more passive role (winning marble is decided by the experimenter).²⁷ Similarly, it has been shown that when rolling dice in craps, individuals tend to execute a soft, easy throw if they need a low number but choose a hard, fast throw when they desire a high number.²⁸ But “although subjects act as if they could control outcomes to which they have no causal connection ... they apparently accept the limitation that an event in the past is a ‘sealed fate’ that they cannot control.”²⁹

Some findings provide evidence that this illusion of control underlies the preference for prediction over postdiction. In their die rolling study, Brun and Teigen requested that participants explain their choice between the two available formats of the game. Although the question was open-ended, more than a quarter of the participants who wished to guess first explained that they “imagined themselves to be able to influence the throw.” No other explanation reached a similar level of support.³⁰ In another study, Burger and Cooper used a test (The Desirability of Control Scale) designed to measure “participants’ desire for control over the events in one’s life.”³¹ Participants were then divided into two groups, betting either before or after a toss of a die. The results showed that while there is a general tendency to bet more in the prediction condition (bet before), it especially characterizes participants who manifested high desirability of control.³²

A. Nenassi, *Illusion of Control: A Meta-Analytic Review*, 11 JOURNAL OF SOCIAL BEHAVIOR AND PERSONALITY 493 (1996).

²⁷ Camille B. Wortman, *Some Determinants of Perceived Control*, 31 JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY 282 (1975).

²⁸ James M. Henslin, *Craps and Magic*, 73 AMERICAN JOURNAL OF SOCIOLOGY 316 (1967).

²⁹ Michael W. Morris et al., *Time of Decision, Ethical Obligation, and Causal Illusion*, in NEGOTIATION AS A SOCIAL PROCESS: NEW TRENDS IN THEORY AND RESEARCH 209–239 (R.M. Kramer & D.M. Messick, ed., 1995)

³⁰ Wibecke Brun & Karl H. Teigen, *supra* note 12 at 20.

³¹ Jerry M. Burger & Harris M. Cooper, *The Desirability of Control*, 3 MOTIVATION AND EMOTION 381 (1979).

³² Burger and Cooper awarded participants \$50 as an endowment. Among participants who manifested “low desirability of control,” the average total bet in the postdiction condition was \$20.90 as compared to \$25.30 in the prediction

Nevertheless, the “illusion of control” seems to be only a partial explanation. In their study, Brun and Teigen allowed either the participants or experimenters to perform the process of tossing the die. If the “guess-first” preference is explained in terms of a subjective feeling of control, one could expect that this preference would decline where tossing is conducted by another agent (the experimenters). However, no such effect was found. Furthermore, as indicated by several experiments in which outcomes are clearly not subject to control (e.g., stock performance or the gender of a newborn), “the preference to bet on future rather than past events is observed even when the illusion of control does not provide a plausible explanation.”³³

2. Information Availability

A second theory for the differences between postdiction and prediction involves the availability of information, and the consequences of that availability in our perception of uncertainty. In prediction, uncertainty is objective; it is faced by everybody. Only in retrospect it is possible to determine whether the wager was correct. In contrast, at the time in which postdiction is made the relevant information exists and some agents may already have access to this information. As such, uncertainty with respect to events that have already occurred is subjective.

Whether uncertainty is subjective or not has been shown to affect choices in the context of chance.³⁴ In Ellsberg’s famous experiment, for example, individuals were found to prefer betting on the color of a bead drawn from an urn with 50 red and 50 blue beads, than betting on the color of a bead drawn from an urn containing 100

condition; among participants who showed “high desirability of control,” the average total bet was \$22.80 in the postdiction condition and \$37.20 in the prediction condition. *Id.*, at 390.

³³ Chip Heath & Amos Tversky, *supra* note 14 at 8.

³⁴ For the difference in behavior in the context of subjective and objective uncertainty, see, for example, Karl J. Teigen, *Variants of Subjective Probabilities: Concepts, norms and Biases* in SUBJECTIVE PROBABILITY 211-238 (G. WRIGHT AND PAYTON EDS, 1995). In fact, recent neural research has shown that decision making involving subjective and objective uncertainties takes part in different areas of the brain. See Kirsten G. Volz et al., *Variants of Uncertainty in Decision-Making and their Neural Correlates*, 67 BRAIN RESEARCH BULLETIN 403 (2005).

blue and red beads with unknown proportions. The first situation models a state of objective uncertainty, in which it is clear to all that the chances of pulling a specific color are 50%. The second situation, however, is one of subjective uncertainty, in which the actual proportions of the beads – though unknown to the picker – may well dictate a specific guess (betting on the color with the higher proportion of beads). Although from the perspective of probability theory both bets are identical, individuals sense more dissatisfaction when making incorrect guesses involving subjective uncertainty.³⁵ Psychologists have suggested such perception makes postdiction psychologically unattractive as compared to similar prediction.³⁶

Miller and Gunasegaram have demonstrated the role that blame assignment plays in explaining the difference between future and past bets.³⁷ In their first experiment, Miller and Gunasegaram asked a group of 88 participants to consider a “matching-pennies” game with two individuals – Jones and Cooper – who are each requested to toss a coin. Jones and Cooper are told that if both coins come up the same (two heads or two tails) they will be awarded \$1000; if the coins do not match, neither receives anything. Jones tosses first and comes up with heads. Cooper goes next and gets tails. Jones and Cooper thus do not win. Miller and Gunasegaram requested the participants to predict who “will experience more guilt – Jones or Cooper? And will Jones blame Cooper more or will Cooper blame Jones more for their failure to win \$1000?”³⁸ Since the outcome of the game depends only on chance, statistics provides no reason to attribute the actual result to either of the players. Nevertheless, nearly 90% of the participants predicted that Cooper

³⁵ Daniel Ellsberg, *Risk, Ambiguity and the Savage Axioms*, 75 QUARTERLY J. ECON. 643 (1961).

³⁶ See, e.g., Wibecke Brun & Karl H. Teigen, *supra* note 12 at 26 (explaining that “the contrast between an incorrect answer and an already existing fact may appear greater than to be mistaken about results not yet established. In prediction, no guess is *wrong*, at least not at the time it is issued ...”); Chip Heath & Amos Tversky, *supra* note 14 at 8 (arguing that the difference between bets with respect to future and past events is that “in prediction, only the future can prove you wrong; in postdiction, you could be wrong right now.”)

³⁷ Dale T. Miller & Skau Gunasegaram, *Temporal Order and the Perceived Mutability of Events: Implication for Blame Assignment*, 59 J. OF PERSONALITY AND SOCIAL PSYCHOLOGY 1111 (1990).

³⁸ *Id.*, at 1111.

(the second player) “would experience more guilt and would be blamed more by Jones than vice versa.”³⁹

The matching-pennies experiment suggests that, in the context of chance, parties who fail to adjust their behavior by guessing future outcomes are perceived as less responsible than parties who fail to comply with past contingencies. To corroborate their findings, Miller and Gunasegaram conducted another study. In their second experiment, Miller and Gunasegaram requested participants to consider the following hypothetical: A professor distributes a list of three study questions to her class and announces that the exam will consist of one of these questions. Because of time constraints, Nancy, a student, prepares for only two questions. It turns out that the question that has been selected for the exam is the one that Nancy did not prepare for. Participants were divided into two groups and told that the teacher selected the question either *before* or *after* Nancy studied for the exam. The participants were then asked “which of the two following two thoughts is Nancy most likely to have: (a) Why did *the professor* select this question? or (b) Why didn’t *I* prepare for this question?” The results show that the participants expected Nancy to be critical of the teacher when she studied *before* the teacher selected the question in the exam. In contrast, the participants predicted that Nancy would feel more accountable where she failed to postdict the questions selected by the teacher.⁴⁰

Thus, while the theory of the illusion of control is concerned with probabilities, the subjective-objective explanation suggests that the difference between prediction and postdiction lies in the nature of the uncertainty. Most importantly, the subjective-objective explanation maintains that individuals perceive differently correct and incorrect guesses of future and past events. As Tversky and Kahneman have explained, “[u]ncertainty about past events is likely to be experienced as ignorance, especially if the truth is known to someone else, whereas uncertainty about the future is more naturally attributed to the disposition of the relevant system.”⁴¹

³⁹ *Id.*, at 1111-12.

⁴⁰ *Id.*, at 1114.

⁴¹ Daniel Kahneman & Amos Tversky, *Variants of Uncertainty*, 11 COGNITION 143 (1982).

III. Prediction, Postdiction and the Law

What are the implications of these behavioral findings for the legal system? Can the legal system exploit the inclination to predict and the reluctance to postdict? This Part explores the relevance of the prediction-postdiction studies in three related legal contexts: Section A shows that the behavioral differences between postdiction and prediction bears on the optimal specificity of legal norms; Section B establishes the importance of these findings for the efficacy of possible law-enforcement strategies; finally, Section C establishes the relevance of the behavioral differences for the design of legal sanctions.

A. The Optimal Specificity of Law: On the Choice between Rules and Standards

Both rules and standards are legal norms that adjudicators use to evaluate actions. Standards and rules can be depicted as two extremes in a one-dimensional space representing the degree of specificity of legal norms. Standards are open-ended norms, allowing the adjudicator to make fact-specific determinations, such as whether a driver used “reasonable care” in a given situation. A rule, conversely, is a more specific and concrete norm and consequently leaves lesser discretion to the decision-maker than standards do.⁴² The distinction between rules and standards is a matter of degree. A legal norm can be more or less rule-like or standard-like. To simplify matters, however, we shall refer only to two pure types of norms: rules on the one hand and standards on the other.

Rules and standards may both generate uncertainty. Standards are legal norms whose interpretation is provided only ex-post by the courts. Standards, therefore, produce *future* uncertainty resulting from indeterminacy with respect to the interpretation given to them ex-post by the courts. Rules, as opposed to standards, are concrete norms which leave no (or little) discretion to decision-makers.⁴³ Yet

⁴² On the distinction between specified and general legal norms, their relative advantages, and the role of the courts in their application, see, for example, Pierre J. Schlag, *Rules and Standards*, 33 UCLA L. REV. 379 (1985).

⁴³ For the importance that legal theory has given to the ex-ante/ex-post characteristics of rules and standards, see, for example, Louis Kaplow, *Rules*

individuals whose behavior is governed by rules are not always familiar with the specific details of a rule; especially where the applicable rule is complex, familiarization with regard to its content is often costly.⁴⁴ Individuals who know that their behavior is governed by rules—but fail to familiarize themselves with the rules—thus face uncertainty concerning already existing regulation or legislation. In contrast to standards, this type of uncertainty requires individuals to *postdict* the content of the law.

Before exploring the implications of this observation, let us first examine the traditional way in which the debate concerning the optimal specificity of law has been described in the legal literature. After presenting the conventional considerations governing the choice between rules and standards, we shall examine whether and in what ways the findings concerning the difference between postdiction and prediction may be relevant to the optimal design of legal norms.⁴⁵

The use of rules and standards, as law and economics scholars have shown, involves different costs and benefits.⁴⁶ The cost

versus Standards: An Economic Analysis, 42 DUKE L.J. 557, 579-60 (1992) (“Arguments about the definitions of rules and standards commonly emphasize the distinction between whether the law is given content *ex ante* or *ex post*.”).

⁴⁴ “Actors seeking to comply with more complex rules may need to expend resources to learn how the rules apply to their contemplated acts ... [and] because acquiring information is costly, some will choose not to learn the rules.” Louis Kaplow, *A Model of the Optimal Complexity of Legal Rules*, 11 J. L. ECON. & ORG. 150, 151 (1995).

⁴⁵ Recent legal scholarship has observed the possible implications of psychological studies on the choice between rules and standards, yet it has not addressed the importance of the behavioral findings concerning uncertainty. See Russell B. Korobkin, *Behavioral Analysis and Legal Form: Rules vs. Standards Revisited*, 79 OR. L. REV. 23 (2000); Yuval Feldman & Alon Harel, *Social Norms and Ambiguity of Legal Norms: An Experimental Analysis of the Rules v. Standard Dilemma*, forthcoming in REVIEW OF LAW AND ECONOMICS. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=989216

⁴⁶ The two most comprehensive law and economics analyses are Isaac Ehrlich & Richard A. Posner, *An Economic Analysis of Legal Rulemaking*, 3 J.LEGAL STUD. 257 (1974) and Louis Kaplow, *supra* note 43. For additional contributions applying economics analysis of rules and standards see: Colin S. Diver, *The Optimal Precision of Administrative Rules*, 93 YALE L.J. 65 (1983); Pierre J. Schlag, *supra* note 42; Gillian K. Hadfield, *Weighing the Value of Vagueness: An Economic Perspective on Precision in the Law*, 82 CAL. L. REV. 541 (1994); Louis

of producing standards is typically lower, but they usually entail higher enforcement and compliance costs than rules. Formulating the standard “to take reasonable care in all matters” is extremely easy and is nearly costless. Yet applying this standard would generate significant costs for both judges, who have to determine whether the defendants have complied with the standard or not (enforcement costs), and for potential defendants, who have to determine what level of care is necessary to escape liability (compliance costs).⁴⁷ In the case of specific norms, the relative size of costs is exactly the opposite. The legislature or the regulator incurs larger production costs in creating a rule than in creating a standard since it has to specify more precisely the scope of the rule and its consequences. On the other hand, rules are typically easier to apply than standards; thus, rules’ compliance and enforcement costs are lower than those of standards.⁴⁸

While these efficiency considerations are straightforward, assessing the actual production, enforcement and compliance costs in practice is often difficult. Nevertheless, law and economics scholars have suggested that policymakers can use the frequency of the regulated activity as a proxy for determining the relative magnitude of these costs.⁴⁹ Rules are preferable when the regulated activity is

Kaplow, *supra* note 44; Cass R. Sunstein, *Problems with Rules*, 83 CAL. L. REV. 953 (1995).

⁴⁷ See e.g., Isaac Ehrlich & Richard A. Posner, *supra* note 46 at 262-69 (discussing the advantages of rules over standards in guiding behavior and in allowing courts to avoid high adjudication costs, while emphasizing that the production costs of standards are typically lower). For a comprehensive discussion, see Louis Kaplow *supra* note 43 at 568-85 (elaborating on the factors that determine the actual costs involved in formulation, enforcement and compliance of legal norms with different levels of precision).

⁴⁸ In some contexts, rules and standards may also differ in other economic aspects, such as the likelihood of settlements or the incentives to purchase legal advice. See Isaac Ehrlich & Richard A. Posner, *supra* note 46 at 270-71. The behavioral findings concerning the differences between future and past uncertainty may also bear on the analysis of these aspects. These topics are beyond the scope of this paper.

⁴⁹ As Kaplow explains, “[d]esigning a rule that accounts for every relevant contingency would be wasteful, as most would never arise. Although it might be more difficult and costly for an individual and an enforcement authority to apply a standard in a particular instance, such an application need be made only if its unique set of circumstance actually arises. Thus when frequency is low, a standard tends to be preferable.” Louis Kaplow, *supra* note 43 at 563.

frequent, while standards do best when behavior varies so greatly that any particular scenario is rare. Designing a rule for a rare scenario is too costly and the use of a standard is therefore preferable given the lower costs of producing standards. When the activity is frequent, however, application of standards entails large compliance and enforcement costs. Thus, when behavior is common, regulation by rules is often more efficient.

As for uncertainty, law and economics scholars have pointed out that under both rules and standards individuals might be uninformed about the content of the norm. Most importantly, law and economic analysis has claimed that in such cases the actual specificity of the norm has no effect on conduct. Thus, in one of the more influential papers on the economic analysis of rules and standards, Louis Kaplow writes:

[U]ninformed individuals' behavior does not depend on whether a rule or a standard prevails, so the benefits and harms of individuals' acts will be the same. Thus in this case, whether a rule or a standard is preferable will depend solely on the differences in the promulgation and enforcement costs.⁵⁰

The findings concerning the differences between prediction and postdiction, however, suggest that the source of uncertainty (rules or standards) does affect behavior. As shown above, the uncertainty generated by standards relates to the future: it is uncertainty resulting from indeterminacy concerning the interpretation given to the standards by the courts *ex-post*. Individuals who face such uncertainty therefore face the need to perform *predictions* concerning the way the standard will be interpreted. Rules, in contrast, may involve only past uncertainty. Individuals who know that the law settles the question, but do not know the content of the applicable legal norm, are involved in *postdictions*. The experimental findings imply therefore that individuals will be less inclined to engage in uncertain rule-governed activities than in uncertain standards-governed activities. The more rule-governed an activity is and the

⁵⁰ *Id.*, at 572.

more complex the rules governing it are, the lesser the inclination to engage in the activity. Transforming a standard-governed activity into a rule-governed activity transforms uncertainty (at least from the perspective of the individuals who are unable or disinclined to learn the rules) from future uncertainty into past uncertainty.⁵¹ This change is likely to affect conduct. To better understand these effects consider the case of the regulation of driving and alcohol consumption.

Drunk driving is currently regulated by rules rather than standards. These rules determine the upper legal limit of alcohol (which is typically 0.08%) in drivers' blood.⁵² Although there are some attempts at producing a device which can calculate blood alcohol content, most individuals do not and cannot determine what their blood alcohol content is.⁵³ To this extent, from a driver's

⁵¹ Changing from a rule-based scheme to a standard-based scheme or vice versa is not a rare event. Speed limits could be specified numerically (a rule) or in vague terms such as "reasonable speed." In 1995, Montana eliminated its numerical-based daytime speed limit on its interstate highways and adopted instead a standard of "reasonable and prudent" daytime driving. For a discussion, see Robert E. King and Cass R. Sunstein, *Doing Without Speed Limits*, 79 B.U. L. REV. 155 (1999). The rule eventually was invalidated on the grounds that it was unconstitutionally vague. See *State v. Stanko*, 974 P.2d 1132 (Mont. 1998). Drunk driving provides an example for the opposite process in which standard-based norms have been replaced by rules-based norms. See *infra* note 52.

⁵² See <http://www.iihs.org/laws/dui.aspx> (presenting laws regarding drunk driving in the several states). Drunk driving in the past was regulated under a general norm prohibiting "driving while intoxicated (DWI)." Because this standard was "difficult to prove ... [o]nce Blood Alcohol Testing (BAC) devices became commercially available in the 1930s, states developed presumptions allowing juries to presume that certain BAC percentages implied intoxication. ... However, proving intoxication beyond a reasonable doubt was still a difficult task... State legislatures, with the encouragement of Congress, responded to this enforcement problem by enacting 'per se' laws. ... Today, nearly every state has enacted a per se law, in addition to retaining the offense of DWI." Jennifer L. Pariser, *In Vino Veritas: The Truth About Blood Alcohol Presumptions in State Drunk Driving Law*, 64 N.Y.U.L. REV. 141, 142-144 (1989). In 2003, the state of Massachusetts was the last state to adopt a rule-like regime to regulate drunk driving. See, Kelsey P. Black, *Undue Protection Versus Undue Punishment: Examining the Drinking and Driving Problem Across the United States*, 40 SUFFOLK U. L. REV. 463, 476 (2007) ("Prior to 2003 in Massachusetts, the .08% BAC level was not a per se law; it was 'evidence but not proof of drunkenness.' In 2003, however, Massachusetts finally adopted a per se BAC law...").

⁵³ See, e.g., Alana Semuels, *Too Drunk to Drive? Devices May Help Decide*, Pittsburgh Post-Gazette (December 31, 2004) (describing attempts to develop

perspective, an alternative standard-like norm of regulating drunk driving—such as a standard that dictates a person ought not to drive when her ability to drive safely is significantly impaired by alcohol— would be as costly to comply with as the rule based on the blood alcohol content.⁵⁴

Although the level of uncertainty and the cost of compliance are essentially similar under both forms of regulation, the behavioral findings suggest that drivers' behavior under a rule or a standard is likely to be different. More specifically, if the purpose of the legal norms governing drunk driving is to induce drivers to err on the side of caution, legal rules of the type used now may be preferable to legal standards of the type suggested above. Drivers who face legal rules based on blood alcohol content are more risk averse than drivers who would face a legal standard prohibiting driving when, for instance, alcohol impairs significantly one's ability to drive. Consequently, the use of a rule based on blood alcohol content is more effective and hence more desirable in deterring unsafe driving than the use of a standard.

The propensity to be more risk-averse concerning uncertainty about rules-based norms (as compared to standards-based norms) challenges the traditional legal preference for specified and precise regulation in the context of constitutional rights. The clearest manifestation of this preference is the doctrine of "void for vagueness."⁵⁵ Under this doctrine "a statute which either forbids or requires the doing of an act in terms so vague that men of common

devices that would provide drivers with information about their blood alcohol and the "inherent flaws" of such devices).

⁵⁴ For a suggestion to replace the rule-like scheme of drunk driving with a general standard - on the basis that the current regimes are "arbitrary, capricious and contingent on the judgments of cops and technicians" since "without the government's Breathalyzer, there is no way to tell for sure if we are breaking the law" see, Llewellyn H. Rockwell Jr., *Legalize Drunk Driving* at: <http://www.lewrockwell.com/rockwell/drunkdiriving.html>. For a legal analysis of the constitutionality of the current drunk driving laws see, Stephan G. Thompson, *The Constitutionality of Chemical Test Presumptions of Intoxication in Motor Vehicle Statutes*, 20 SAN DIEGO L. REV. 301, 318-22 (1983).

⁵⁵ For an overview, see Andrew E. Goldsmith, *The Void for Vagueness Doctrine in the Supreme Court, Revisited* 130 AMERICAN JOURNAL OF CRIMINAL LAW 279 (2003); See also the symposium issue of the *California Law Review* on "Void for Vagueness," May 1994.

intelligence must necessarily guess at its meaning and differ as to its application violates the first essential of due process of law.”⁵⁶

One of the rationales underlying the doctrine is the conviction that vague legal norms operate to inhibit the exercise of freedoms and that “uncertain meanings inevitably lead citizens to 'steer far wider of the unlawful zone' than if the boundaries of the forbidden areas were clearly marked.”⁵⁷ In cases of norms declared to be void for vagueness, courts have often mandated the replacement of the vague standards that have such “chilling effect” with more narrow-tailored rules.⁵⁸ Thus, the legislature can, at times, remedy the defect by enacting more specific rules – rules which do not leave too much discretion to officials or judges.⁵⁹ Most importantly, the void for vagueness doctrine provides incentives for legislatures to prefer rules over standards in contexts in which the proposed legal norm may infringe fundamental rights.

While courts are justifiably concerned about the chilling effects of standards resulting from the uncertainty triggered by vagueness, there is no similar concern regarding the chilling effects of rules. The prediction-postdiction literature, however, indicates that rules—especially complex rules whose content is costly to acquire—may induce even greater inhibition of lawful behavior. To this extent,

⁵⁶ *Connally v. General Construction Co.*, 269 U.S. 385, 391 (1926)

⁵⁷ *Grayned v. City of Rockford*, 408 U.S. 104, 109 (1972). See also Gillian K. Hadfield, *supra* note 46 at 544 (discussing the economic implications of the risk of “overprotective behavior”).

⁵⁸ See, e.g., *Winters v. New York*, 333 U.S. 507, 520 (1948) (arguing that “to say that a state may not punish by such a vague statute carries no implication that it may not punish circulation of objectionable printed matter... by the use of apt words to describe the prohibited publications). See Also, Note: *The Void for Vagueness Doctrine in the Supreme Court*, 109 U. PA. L. Rev. 67, 111 (1960) (maintaining that the vagueness cases “purport to pass upon the legitimacy or illegitimacy of means invalidating a particular regulation with regard to those as to whom it is indefinite and *because* it is indefinite and reserving judgment as to whether the end sought to be achieved is achievable through more definite regulation.”).

⁵⁹ One of the most well known examples for such an attempt is the proposal of Andrea Dworkin and Catharine MacKinnon to regulate pornography. The proposal included a very detailed set of provisions designed to overcome concerns about vagueness. The proposal was later adopted by the legislature of Indianapolis. This proposal, however, was found by the 7th Circuit to violate the First Amendment. See *American Booksellers Association v. Hudnut* 771 F.2d 323 (1985).

where legislatures replace standards found to be “void for vagueness” with a complex set of rules designed to replace vague terms, they may paradoxically generate *greater* chilling effects than the chilling effects of the standards found to be void under existing doctrine.

A recent controversial case of the Supreme Court can illustrate how an attempt to use legal rules may in fact increase rather than decrease the chilling effects of legal norms. In *Hill vs. Colorado*, the Court discussed a provision of Colorado law which “made it unlawful, within 100 feet of the entrance to any health care facility, for any person to ‘knowingly approach’ within 8 feet of another person, without that person’s consent, for the purpose of passing a leaflet or handbill to, displaying a sign to, or engaging in oral protest, education, or counseling with such other person.”⁶⁰ A majority of the Court decided to uphold the provision and rejected the argument, supported by Justice Kennedy, that the provision was too vague.⁶¹ Among the arguments of the majority was the fact that the provision was rule-like. It used precise terms to define the forbidden behavior and to draw precise criteria to determine when and where a protester would be forbidden from exercising free speech rights. Perhaps most revealingly, Justice Stevens, speaking for the majority, maintained that “[a] bright-line prophylactic rule may be the best way to provide protection, and, at the same time, by offering clear guidance and avoiding subjectivity, to protect speech itself.”⁶²

The behavioral findings back up Justice Kennedy’s argument that this reasoning is deficient. A protester may be chilled from exercising his free speech rights not because the provision is too vague but because it is too precise. Since it is difficult for a person to precisely evaluate the distance between herself and an object, a rule requiring a distance of “100 feet of the entrance to any health care” and “8 feet of any person” can be sometimes hard to follow.⁶³ The

⁶⁰ 530 U.S. 703 (2000)

⁶¹ *Id.*, at 621.

⁶² *Id.*, at 729.

⁶³ *Id.*, at 773. In his opinion, Justice Kennedy discusses another related uncertainty that requires postdiction on the part of potential defendants: “Finally, as we all know, the identity or enterprise of the occupants of a building which fronts on a public street is not always known to the public. Health care providers may occupy

uncertainty generated by the rule (past uncertainty) may be more chilling than the uncertainty generated by an equivalent standard (future uncertainty), such as a standard requiring the maintenance of “reasonable distances.” This may require courts to complement the doctrine of “void for vagueness” with a doctrine which guarantees that the rules replacing the vague standards are simple and that information concerning these rules is available. Otherwise, the remedy proposed by courts to the problem of chilling effects of standards may be worse than the disease itself.

In the two contexts of drunk driving and constitutional liberties the behavioral literature provides guidance for policymaking. In the first, it shows that the use of rules rather than standards can serve to increase deterrence. In the second, it establishes that complex rules are likely to generate chilling effects that are greater than those that result from standards. Sometimes, however, the choice between rules and standards may require a more cautious investigation.

Consider, for example, the regulation of potentially polluting activities. From a social perspective, such activities should be encouraged where their benefits outweigh their costs and prevented when their net return is negative. A regulator can deter undesirable polluting-activity either by applying a general standard such as prohibiting (or imposing liability for) “unreasonable” or “unnecessary” pollution. Alternatively, the regulator can develop a set of rules governing pollution and impose criminal or civil liability for violating these rules. The empirical findings suggest that the rule-governed regulation has greater deterrent effect than standards-governed regulation. A rule-governed scheme (particularly a complex rule-governed scheme) would be more effective in discouraging individuals from polluting than a standards-governed scheme, both in cases in which the activity that generates the pollution is socially desirable and in cases in which it is undesirable. In contrast, a standard-like scheme is less likely to impede cost effective activities but also less likely to prevent cases of “inefficient” pollution. The choice between a rules-governed scheme

but a single office in a large building. The Colorado citizen may walk from a disfavored-speech zone to a free zone with little or no ability to discern when one ends and the other begins.” *Id.*, at 773-74.

and a standards-governed scheme has therefore both costs and benefits, and those should be weighted carefully against each other.

To conclude, the legal debate concerning the specificity of legal norms has overlooked the effect of uncertainty on conduct. Under the conventional perception, the behavior of uninformed individuals is assumed to be identical whether the applicable law is in the form of a rule or a standard. The prediction-postdiction studies, however, indicate that this assumption is false. Different levels of specificity, even when producing the same level of uncertainty, can inhibit or encourage behavior. As the preceding analysis has demonstrated, regulators and judges ought to consider these effects in choosing the desirable form of legal norms.

The behavioral findings concerning past and future uncertainty are also important for the ways in which the law (either a rule or a standard) is applied. The next Section discusses the importance of the prediction-postdiction studies for the optimal design of law-enforcement policy.

B. Future and Past Uncertainty and Law Enforcement

Public and private investments in law enforcement can increase the likelihood of crime detection. Methods of law enforcement can be divided into two types. Some methods are designed such that facts *preceding* the commission of the offence determine the chances of apprehension. Others are designed such that facts *succeeding* the commission of the crime determine whether the offender will be detected or not. The behavioral literature on uncertainty suggests that the deterrent effects of the former type of law enforcement methods are greater than the deterrent effects of the latter type. Thus, at least as long as deterrence is the primary concern, in making decisions about the allocation of resources to law enforcement priority should be given to the former type.

Consider, for example, car owners who wish to deter thieves. Imagine that owners may choose between either hiring a private force that will periodically patrol in the neighborhood looking for suspicious drivers or installing a Lojack in a car such that it is possible to locate the thieves once the car is stolen. While both types of investments raise the probability of detection and thus increase deterrence, they are likely to differ in their effects. The presence or

the absence of Lojack is determined *prior* to the commission of the offence. Stealing a car thus requires the thief to postdict whether a Lojack has been installed or not. In contrast, the possibility of an encounter with a patrol is a future contingency that depends on factors that are determined *after* the commission of the crime. The differential attitudes towards postdiction and prediction suggest that, all other things being equal, investing in Lojacks may be more effective in deterring car thefts than investing in increasing the number of patrols. Thieves' willingness to take risks of the latter type (an accidental encounter with a patrol after stealing a car) is higher than the willingness to take risks of the former type (stealing a car with Lojack).

To be sure, without further data it is difficult to evaluate which law enforcement mechanism, Lojack or patrols, is more efficient. First, the relative cost of each mechanism is different. Second, patrols are likely to reduce various types of crimes besides car thefts; Lojacks, by contrast, deter only car-related crimes. Finally, and most importantly, one must explore whether and to what extent criminals are aware when investments in patrols/Lojacks are made. For example, if criminals cannot tell whether car owners install Lojacks—while they are sensitive to the operation of the police—investments in patrols provide greater deterrence.⁶⁴

The prediction-postdiction findings, however, are important not only for choosing between two different law enforcement strategies, such as Lojacks and patrols. The behavioral findings concerning past and future uncertainty can also bear on the way in which a *specific* law-enforcement strategy should be applied, as the example of random monitoring demonstrates.

Our income tax system is based on self reporting and probabilistic auditing. Because the government cannot review all tax files, only a small percentage (about 1%) of the files are actually examined.⁶⁵ Tax evasion is a serious public concern. According to

⁶⁴ For a study investigate the effectiveness of Lojacks, see Ian Ayres & Steven D. Levitt, *Measuring Positive Externalities from Unobservable Victim Precaution: An Empirical Analysis of Lojack*, 113 QUART. J. ECON. 43 (1998).

⁶⁵ The primary results of the 2006 IRS survey show that the audit coverage of individual return was 0.98%. By the year of 2000, this rate was only 0.49%, although this was after a sharp drop from the previous years (1.28% in 1997). See, Internal Revenue Service, Fiscal Year 2006, Enforcement and Service Results, 2-4

the estimate of the Internal Revenue Services (IRS), it fails to collect about 17% of total federal income taxes due, which corresponds to over 345 billion dollars.⁶⁶ This figure exceeds the combined amounts appropriated to the Departments of Education, Homeland Security, Housing and Urban Development, Interior, Justice, Labor, State, Energy, Commerce and the Judiciary.⁶⁷

The behavioral findings concerning uncertainty suggest that the IRS can increase the level of compliance at no additional cost. With the current practice, individuals first file their tax return (whether correct or false). Later, the IRS randomly selects a small number of files for auditing. The names of those who will be audited are determined only after tax returns are filed. Under the current enforcement mechanism, therefore, individuals who consider committing fraud are engaged in *prediction*. The IRS, however, could change the filing-auditing sequence. Under this alternative system, the tax authorities would select in advance the identities of the individuals whose files will be audited. Here, individuals who consider committing fraud would engage in *postdiction*. The question whether they will be audited had been determined *prior* to the commission of the offense, so that committing the offense exposes them to a risk concerning a past event. If individuals are indeed, as research has demonstrated, particularly averse to postdiction, the alternative system has greater deterrence effects than the current system. The perception of potential transgressors that the facts concerning who is going to be audited *has been determined* prior to

(Nov. 20, 2006), available at: http://www.irs.gov/pub/newsroom/11-06_enforcement_stats.pdf.

⁶⁶ IRS enforcement activities, coupled with other late payments, recover about \$55 billion of the tax gap, leaving a net tax gap of \$290 billion. The total federal budget is approximately \$1,958 billion (these numbers refer to year 2001, currently the most recent year with finalized data). See The News Release IR- 2006-28, Internal Revenue Service, IRS Updates Tax Gap Estimates (Feb. 14, 2006), <http://www.irs.gov/newsroom/article/0,,id=154496,00.html> (Pages 96-7).

⁶⁷ According to the United States Government Printing Office Tables, for the year 2001 the budget of the Department of Education was \$39,932 million; Homeland Security - \$16,445 million; Housing and Urban Development - \$32,370 million; Interior- \$9,709 million; Justice - \$19,448 million; Labor - \$44,485 million; State- \$8,328 million; Transportation- \$6,1621 million; Energy- \$17,687 million; Commerce- \$5,174 million; the Judiciary- \$4,483 million. See 97 Historical Tables, Budget of the United States Government, Fiscal Year 2006, available at: <http://www.gpoaccess.gov/usbudget/fy06/pdf/hist.pdf>.

the decision whether to commit fraud generates greater deterrence than under circumstances in which the facts concerning who is going to be audited *will be determined* after the commission of the offence.

Full appraisal of the likelihood of better compliance under the alternative system requires more experimental and empirical testing. Yet, evidence has shown the applicability of related behavioral findings concerning probabilistic outcomes in the tax-compliance context.⁶⁸ For example, research has consistently found that taxpayers who are in the status of “gain” (expect to get a refund) are substantially more risk-averse (avoid cheating) when filing their taxes as compared to individuals who are in the status of “loss” (expect to owe money to the IRS).⁶⁹ Consequently, it has been recommended that the IRS “increase the amounts that are withheld from wages and other sources of income, so that more taxpayers can expect a refund.”⁷⁰ The robust findings concerning prediction and postdiction suggest another venue for increasing the effectiveness of

⁶⁸ As scholars have explained, the large gap between the actual rates of tax compliance and the compliance rates expected under conventional utility maximization models indicates that behavioral factors play an important part in parties’ decision whether to pay taxes. *See e.g.*, James Andreoni et al., *Tax Compliance*, 36 J. ECON. LITERATURE 818, 855 (1998) (explaining that the “most significant discrepancy that has been documented between the standard economic model of compliance and real-world compliance behavior is that the theoretical model greatly overpredicts noncompliance” and arguing that the compliance largely depends on behavioral factors). For a recent overview of the psychological literature on tax compliance, see recently ERICH KIRCHLER, *THE ECONOMIC PSYCHOLOGY OF TAX BEHAVIOR* (2007). *See also* Edward J. McCaffery, *Cognitive Theory and Tax*, 41 UCLA L. REV. 1861 (1994) (discussing the contributions of cognitive theory in understanding tax compliance).

⁶⁹ *See e.g.*, Otto H. Chang et al., *Taxpayer Attitudes Toward Tax Audit Risk*, 8 J. ECON. PSYCHOL. 299, 301-07 (1987) (conducting an experiment with MBA students that were randomly assigned to either a gain [refund] or a loss [payment] conditions and finding that the first were substantially less inclined to cheat); Henry S.J. Robbenn et al., *Decision Frame and Opportunity as Determinants of Tax Cheating: An International Experimental Study*, 11 J.ECON. PSYCHOL. 341 (1990) (presenting both experimental and empirical evidence for greater tax compliance among taxpayers entitled to refund as compared to taxpayers who expect to owe money to the IRS and arguing that behavioral theories can account for these results). *See also*, Chris Guthrie, *Prospect Theory, Risk Preference, and the Law*, *supra* note 6 at 1143-45 (discussing additional studies exploring the application of prospect theory in the context of tax compliance).

⁷⁰ Elizabeth F. Loftus, *To File, Perchance To Cheat*, PSYCHOL. TODAY, Apr. 1985, at 38.

the tax system, one that requires a smaller modification of the current tax-collection practice.⁷¹ Given the magnitude of the tax evasion problem, even a small shift in deterrence could result in a significant increase in amounts collected by the IRS.

The observed behavioral differences with regard to past and future uncertainty may also affect the current debates concerning various controversial law enforcement policies. Law enforcement mechanisms that require criminals to postdict—such as the installation of hidden cameras in public places—are typically more intrusive than those that require criminals to predict; the former type of law enforcement mechanisms often involve monitoring individuals *prior* to the commission of an offense and intruding into their lives. In deciding the constitutionality of intrusive law enforcement mechanisms, courts often inquire whether other means of law enforcement are possible.⁷² For example, where police may increase the number of patrols in vulnerable places, courts tend to invalidate the use of hidden cameras as a method for achieving greater deterrence.⁷³

The behavioral findings, however, suggest that the two alternatives present different types of law enforcement strategies.

⁷¹ Scholars have also expressed doubts about the effectiveness of ideas to use the findings of prospect theory (that is, to increase the number of taxpayers who are entitled to refund) to promote compliance. John S. Carroll, *Compliance with the Law: A Decision-Making Approach to Taxpaying*, 11 LAW & HUM. BEHAV. 319, 327 (1987) (noting that “there are other ways to frame this situation that makes this policy recommendation more risky, such as framing each withholding as a loss, or comparing oneself to other people who may pay less taxes”). The idea of switching the sequence of filing and auditing is not susceptible to such concerns.

⁷² See, for example, *U.S. v. Ashley*, 876 F.2d 1069 (R.I., 1989) (holding that “[p]rior to granting authorization for a wiretap, the issuing court ‘must satisfy itself that the government has used normal techniques but it has encountered difficulties in penetrating a criminal enterprise or in gathering evidence-to the point where ... wiretapping becomes reasonable.’”).

⁷³ See, for example, the recent discussion in *Tanh Thuy Vo v. Garden Grove*. In addressing a rise in violent gang crimes, the city of Garden Grove enacted an ordinance to regulate the operation of cyber cafes. Among other provisions, the city required the installation of closed circuit cameras. In his dissent, Judge Sills argued that such cameras violates costumer privacy and are unnecessary for the purpose of deterring crime, because “[t]here are any number of substantial means by which the city’s interest in protecting against gang violence could be realized without video surveillance. Police patrols could be increased...” *Than Thuy Vo v. Garden Grove*, 115 Cal. App. 4th 425 (2004).

The possible monitoring by video cameras involves postdiction and such law enforcement mechanisms are likely to be more effective than the ones requiring prediction. The greater effectiveness of the former does not dictate that they ought to be preferred over other less intrusive types of law enforcement mechanisms, but it suggests that the reluctance to use them has greater costs than traditionally appreciated.

Because the risk of apprehension is almost always less than 100%, studies concerning the effects of uncertainty, as the preceding analysis establishes, have important implications concerning the design of law enforcement policies. The next section shows that these studies are also relevant to the design of legal sanctions. Although conventionally perceived as predictable, legal sanctions in practice are often uncertain and may depend on past as well as future contingencies. The behavioral findings suggest that the actual type of uncertainty (past or future) created by different sanctions is likely to have diverse effects on the incentives of potential offenders.

C. Legal Uncertainty and the Deterrent Effect of Legal Sanctions

Criminal law theory often emphasizes the importance of certainty and predictability.⁷⁴ Consideration of moral accountability and “fair warning,” it is argued, dictate that the legal system inform potential transgressors of the penalties they would suffer in case of noncompliance.⁷⁵ In reality, however, the severity of the sanction following the perpetration of an offense is rarely known with

⁷⁴ Section 1.02 of the Model Penal Code that is devoted to specifying its purposes states in sub-section 1.02(2)(d) that one of the Code’s objectives is: “to give fair warning of the nature of the sentences that may be imposed on conviction of an offence.” See AMERICAN LAW INSTITUTE, MODEL PENAL CODE AND COMMENTARIES PART I p. 13 (1985). Fair warning requirements with respect to the sentences are entrenched in numerous criminal codes. For a list of jurisdictions explicitly requiring fair warning with respect to the size of the criminal sanctions see the ALI p. 27 note 38.

⁷⁵ For a discussion of these concerns from the perspective of the principle of legality, see *supra* note 74 at 27; See also, JOSHUA DRESSLER, UNDERSTANDING CRIMINAL LAW 40 (3rd ed. 2001) (discussing the principle of legality and justifying it on justice-based considerations).

sureness to the potential perpetrator of a crime. Criminals typically must make conjectures concerning the expected size of a sanction under conditions of uncertainty.⁷⁶

A number of factors make the size of legal sanctions unpredictable. Most importantly, several of these factors depend on the existence of various circumstances *prior* to the time that an offense is committed. Others depend on the materialization of contingencies that take place only *subsequent* to the behavior that constitutes the offense. “Sanctions uncertainty” may thus involve past uncertainty, future uncertainty or a combination of the two. From the perspective of potential transgressors, any attempt to evaluate the expected severity of criminal sanctions can demand predictions as well as postdictions.

Consider initially how future contingencies may affect the size of sanctions inflicted for wrongdoing. Many legal systems treat complete crimes and unsuccessful attempts differently.⁷⁷ The accomplishment or failure of crimes is often a matter of future uncertainty – uncertainty with respect to eventual realization of the goals of the criminal. Even with respect to complete crimes, the perpetration of a crime may lead to more or less serious harms. Graver harms—for example, serious injuries—are often followed by

⁷⁶ See ALI, *supra* note 74 at 19 (maintaining that “[t]he clarity that is attainable is often limited by the complexity of the conflicting elements”). As Justice Holmes once observed “the law is full of instances where a man’s fate depends on his estimating rightly, that is, as the jury subsequently estimates it If his judgment is wrong, not only may he incur a fine or a short imprisonment. He may incur the penalty of death.” *Nash v. U.S.*, 229 U.S. 373, 377 (1913).

⁷⁷ The majority of states punish inchoate crimes at a lower level than the punishment for a completed crime. See, e.g., CAL. PENAL CODE § 664 (1998) (establishing that the maximum term for an attempt is no more than one half of the maximum term authorized for the completed offence); N.Y. PENAL LAW § 110.05 (MCKINNEY 1998) (establishing that punishment for an attempt is typically one classification below that of the completed crime). However, a substantial minority of states have followed Section 5.05(1) of the Model Penal Code, and made the punishment for attempt nearly equal to that of the completed crime. See, SANFORD KADISH & STEPHEN SCHULHOFER, *CRIMINAL LAW AND ITS PROCESSES: CASES AND MATERIALS* 185-86 (1995). Among the state codes that follow the Model Penal Code are 720 ILL. COMP. STAT. 5/8-4 (West 1999), CONN. GEN. STAT. ANN. § 53a-51 (West 1999), DEL. CODE ANN. tit. 11, § 531 (1998), and PA. STAT. ANN. tit. 18, § 905 (West 1999).

harsher sanctions.⁷⁸ The distinction between “bodily injury” and “serious bodily injury” is the basis for differentiating between simple assault and aggravated assault.⁷⁹ These different offenses carry different sentences. Yet, the perpetrator often may not know at the time of the crime whether his assault will result in “bodily injury” or “serious bodily injury.”⁸⁰ Last, the discretionary powers granted to judges in some jurisdictions involve future uncertainty with respect to the size of the sanction. The severity of the actual punishment depends on the future exercise of discretion by the decision-maker.⁸¹

Other elements that affect the size of sanctions are contingent upon the existence of facts *prior* to the time that criminal behavior is carried out. To be sure, because of the general *mens rea* requirement in criminal law—the requirement that the transgressor be morally blameworthy—a defendant must usually know the circumstances under which his act is performed. Even so, the actual application of *mens rea* allows for past uncertainty.⁸² First, as courts have decided in a line of cases, many circumstances which affect the *size* of a

⁷⁸ “[T]he assessment of harm caused by the defendant as a result of a crime charged has understandably been an important concern of the criminal law, both in determining the elements of the offense and in determining the appropriate punishment.” *Payne v. Tennessee*, 501 U.S. 808, 819 (1991). *See generally*, Paul H. Robinson, *A Functional Analysis of the Criminal Law*, 88 NW. U. L. REV. 857 (1994) (reviewing the correlation between victims’ harms and the severity of criminal sanctions).

⁷⁹ *See, e.g.*, Model Penal Code § 211.1(1) (simple assault) and § 211.1 (2) (aggravated assault). For a general overview, see, Travy A. Batemen, Annotation, *Sufficiency of Bodily Injury to Support Charge of Aggravated Assault*, 5 A.L.R.5th 243 (1992) (discussing the boundaries between simple and aggravated assault).

⁸⁰ *See, e.g.*, Robert A. Mikos, “Eggshell” Victims, *Private Precautions, and the Societal Benefits of Shifting Crime*, 105 MICH. L. REV. 307, 326-28 (examining across various jurisdictions the necessary *mens rea* for conviction in aggravated assault and indicating that it usually requires only that a *risk* of serious bodily injury was foreseeable).

⁸¹ One of the official aims of the Sentencing Guidelines was to eliminate or at least reduce the disparity in sentencing resulting from judicial discretion. But recent studies have established that despite this effort great disparities still exist. *See, e.g.*, Kirby D. Behre & A. Jeff Ifrah, *You Be the Judge: The Success of Fifteen Years of Sentencing under the United States Sentencing Guidelines*, 40 AM. CRIM. L. REV. 5, 7 (2003). *See also*, David Mustard, *Racial, Ethnic and Gender Disparities in Sentencing: Evidence from the US Federal Courts*, 44 J.L. & ECON. 285 (2001) (presenting data showing substantial sentencing disparities).

⁸² For the general requirement of *mens rea*, see DRESSLER *supra* note 75 Chap. 10.

sentence are not considered essential elements of the offense and consequently the prosecution need not establish that the perpetrator knew of these circumstances.⁸³ To this extent, a criminal uncertain of the existence of aggravating factors during the commission of the crime may nevertheless be convicted of the aggravated crime. Second, even when such circumstances are essential elements of the offense, criminal law often dictates only proving that the defendant knew of their *possible* existence. The requirement of mens rea thus does not presuppose certainty concerning existing circumstances, but only understanding of the possibility that the relevant circumstances may apply.⁸⁴ As such, criminals may often face the need to postdict the existence of contingencies that would affect the magnitude of possible sanctions.

The context of property offences (such as robbery, theft, or fraud) illustrates how existing factors unknown to the offender at the time of the crime may affect the severity of sanctions. In many jurisdictions, the sentencing of property offences varies incrementally with the dollar amount involved in the offence.⁸⁵ Furthermore, the very classification of the offence may change when the amount changes. For example, the distinction between “felonious theft” and “petty theft” often depends on the value of the object stolen. Where a perpetrator snatches a purse and finds, much to his

⁸³ In an effective critique of the deterioration of the requirement of mens rea, Richard Singer has recently demonstrated the techniques which allow conviction in circumstances under which the perpetrator was unaware of some of the surrounding relevant circumstances. Under the first technique, courts determine that these (unknown) circumstances are not an element of the crime at all but a sentencing factor. Under the second, courts determine that the relevant circumstances create only a “jurisdictional element” of an offence. By employing such classifications, courts in effect allow conviction despite the fact that the perpetrator was not aware of some of the surrounding circumstances such as the nature of smuggled drugs or the dollar amount of stolen property. Richard Singer, *The Model Penal Code and Three, Two (Possibly One) Ways Courts Avoid Mens Rea*, 4 BUFF. CRIM. L. REV 139 (2000).

⁸⁴ See *infra* text accompanying footnotes 90 and 91. See also SANFORD H. KADISH, STEPHEN J. SCHULHOFER & CAROL S. STEIKER, CRIMINAL LAW AND ITS PROCESSES, CASES AND MATERIALS 225 (8TH ED. 2007) (explaining that common law position is that the default culpability standard requires awareness of the possible existence of the relevant circumstances or results).

⁸⁵ See ALI Part II 138-40 (pointing out that “[m]ost jurisdictions classify thefts according to the monetary value of the property stolen”).

surprise, that it contains a \$100,000 rather than small bills which he expected, he may be convicted of felonious theft although he never intended to commit such an offense.⁸⁶ Given that the expected sentence varies with the amount of money stolen, the criminal faces the task of *postdicting* the sanction; while unknown to the criminal, the factors upon which the sanction depends already exist when the offense is committed.

The sentencing of property offenses represents a more general rule concerning the limited scope of the mens rea requirement. An offender can be convicted of a more serious offense even if the circumstances responsible for its greater severity are unknown to the offender. The decision of the Supreme Court in the case of *United States v. Feola* demonstrates this principle.⁸⁷ In convicting the accused of an assault of a federal officer (an aggravated offense with a higher sanction as compared to the assault of non-federal agents) the Court asserted that “in order to effectuate the congressional purpose of according maximum protection to federal officers by making prosecution for assaults upon them cognizable in the federal courts, § 111 cannot be construed as embodying an unexpressed requirement that an assailant be aware that his victim is a federal officer. All the statute requires is an intent to assault, not an intent to assault a federal officer.”⁸⁸ The exclusion of such non-essential elements of the offense from the scope of mens rea means that offenders may often face past uncertainty (here, for example, uncertainty as to whether he is assaulting an officer). In

⁸⁶ DRESSLER, *supra* note 75 at 547 n. 12 (pointing out that the common law distinguished between grand and petit larceny on the basis of the amount taken by the thief). For a discussion of this practice, see Robert A. Mikos, *supra* note 80 at 330-32. See also, ALI Part II 146 (arguing that under the traditional view of common law “the defendant would be held ... [responsible] to take the jewels as he found them and thus to be guilty of felony theft even though he held the non-reckless belief that the jewels were worth only \$100”). The Model Penal Code, however, recommends regarding the amount stolen as a material element of the offense and therefore requires proof that the thief at least considered the possibility that the sum stolen is higher than the threshold for grand or otherwise aggravated theft. See ALI Part II p. 144.

⁸⁷ *United States v. Feola*, 420 US 671, 684 (1975). For review of similar decisions, see Richard Singer *supra* note 83, at 143-74.

⁸⁸ *Id.*, at 684.

anticipating their expected sanction, offenders are required to guess whether or not the aggravating circumstances exist in their case.⁸⁹

But even with respect to essential elements of offenses, where the demand of mens rea applies, offenders may be involved in postdiction. As noted, criminal conviction usually does not dictate that a defendant be *certain* of the relevant facts. In some contexts, conviction merely requires that the perpetrator knows of the possibility that the essential facts constituting the offense indeed exist. For example, the Model Penal Code (MPC) provides that “when the culpability sufficient to establish a material element of an offense is not prescribed by law, such element is established if a person acts purposely, knowingly *or recklessly* with respect thereto.”⁹⁰ The concept of recklessness defined in the MPC is specifically designed to facilitate the conviction of a person under conditions of uncertainty. Section 2.02(2)(c) of the MPC dictates that “[a] person acts recklessly with respect to a material element of an offense when he consciously disregards a substantial and unjustifiable *risk* that the material element exists or will result from

⁸⁹ Commentators have suggested that several decisions of the Supreme Court might indicate a potential shift in the scope of the mens rea requirement. Under the rules of evidence and procedure, “material elements of the offense”—as opposed to “sentencing factors”—must be proven beyond reasonable doubt and be decided by juries rather than by a judge. In recent years, the Court has stiffened the evidential and procedural requirements and extended the scope of what constitutes material elements for these purposes: *Apprendi v. New Jersey*, 530 U.S. 466, 490 (2000) (maintaining that “[o]ther than the fact of a prior conviction, any fact that increases the penalty for a crime beyond the prescribed statutory maximum must be submitted to a jury and proved beyond a reasonable doubt.”); *Blakely v. Washington*, 542 U.S. 296, 303-04 (2004) (extending *Apprendi* and arguing that the “statutory maximum” in *Apprendi* was “the maximum sentence [the judge] may impose *without* any additional findings”); *United States v. Booker*, 543 U.S. 220 (2005) (extending the previous decisions to also cover sentencing based on the Federal Sentencing Guidelines). Scholars have argued that this trend might eventually also affect the definition of “material elements” in the context of mens rea. See, Richard Singer, *supra* note 83 at 195. To this extent, if the Court applies the requirement also with respect to factors that determine the size of the sanction, potential offenders will face less past uncertainty. As our analysis suggests, such a change is likely to decrease deterrence.

⁹⁰ Model Penal Code § 2.02(3). The general framework of the mens rea requirement of the MPC, “has been adopted explicitly in more than half of American jurisdictions. SANFORD H. KADISH, STEPHEN J. SCHULHOFER & CAROL S. STEIKER, *supra* note 84 at 222 (8th ed. 2007).

his conduct.” Thus, a person who is uncertain about his partner’s consent to sexual intercourse, would be convicted of rape if it turns out there was no consent.⁹¹ From the perspective of the perpetrator, the decision whether or not to engage in sexual intercourse involves postdiction concerning the existence of consent. The more criminal law allows convictions on the basis of recklessness, the more individuals are likely to confront past uncertainties.

Against this background, legal analysis has recently paid increasing attention to the effects of sanctions uncertainty on individuals’ willingness to engage in criminal conduct. Legal scholars and policymakers have suggested that sanction uncertainty can be harnessed to augment the deterrent effect of the criminal system. While designing mechanisms to create uncertainty, however, they have focused exclusively on the creation of future uncertainty. Overlooking the greater deterrent effects of past uncertainty, these proposals fail to fully exploit the incentives that uncertainty may provide for discouraging criminal behavior.

In a recent article, for example, Professor Katyal has written in favor of the (much-criticized) “Pinkerton rule”—which renders criminals liable for the crimes of their co-conspirators—since it results in “uncertainty about the sanction.”⁹² As Professor Katyal argues, this uncertainty “will deter some from joining the conspiracy and it will also make the contract for payment tougher to strike.”⁹³ While acknowledging that the rule may be challenged on fairness grounds, Professor Katyal highlights the positive deterrence effects it produces given the uncertainty it creates among members of a potential conspiracy who scheme to perpetrate a crime. The deterrence benefits of the rule, contends Katyal, may well outweigh its possible fairness deficiency.⁹⁴

⁹¹ The commentaries to the Model Penal Code clarify this point, explaining that “[a]s the Code uses the term, recklessness involves conscious risk creation. It resembles acting knowingly in that a state of awareness is involved, but the awareness of risk, is that of probability less than substantial certainty.” See ALI Part I p.236.

⁹² Neal Kumar Katyal, *Conspiracy Theory*, 112 YALE L.J. 1307, 1372-75 (2003) (discussing the effects of the Pinkerton rule on individuals’ incentives to take part in a criminal conspiracy).

⁹³ *Id.*, at 1372-73.

⁹⁴ *Id.*, at 1375. For a similar recent approach concerning the possible advantages of uncertainty in enhancing deterrence, see Dru Stevenson, *Toward a New Theory of*

In another recent article, Professor Tom Baker and his colleagues have examined the effects of uncertainty in experimental settings.⁹⁵ 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. In the experiment, the certainty of the information provided to the participants about the size of the fine and the chances of being caught was varied, while holding constant the expected value of the sanction and the average probability of being caught.⁹⁶ The results showed “that uncertainty with regard to either the size of the sanction or the probability of detection increases deterrence.”⁹⁷ Thus, participants were less likely to take the action when told that the sanction would be in the amount between \$1 to \$5 than when told that it would be in the range of \$2 to \$4, or a certain sanction of \$3.⁹⁸ Based on these findings, Professor Baker and his colleagues have argued that broad sentencing discretion regimes that generate uncertainty about the size of criminal sanctions should be endorsed since they provide greater deterrence as compared to regimes in which criminal sentences are predetermined and predictable.⁹⁹

Notice and Deterrence, 26 CARDOZO L. REV. 1535, 1545-47 (2005) (“Instead of eliminating the deterrent effect of laws, as the classic law and economics writers have assumed, uncertainty functions as a deterrent on its own. ... The ‘information gap’ created by widespread ignorance of the law, which is an inevitable and natural result of laws... is not necessarily an insurmountable obstacle to deterring harmful activities. Rather, an optimal level of uncertainty may generate an appropriate equilibrium of deterrence and personal liberty.”).

⁹⁵ Tom Baker et al., *The Virtues Of Uncertainty in Law: An Experimental Approach*, 189 IOWA L. REV. 443 (2004).

⁹⁶ *Id.*, at 457-61 (discussing the design of the experiment).

⁹⁷ *Id.*, at 464.

⁹⁸ *Id.*, at 461-64.

⁹⁹ Arguably, these results seem to conflict with prospect theory that predicts individuals will be *risk loving* with respect to *losses*. Baker and his colleagues suggest that a possible explanation might be the way in which the participants (and criminals in the real world) frame the payoff scheme that involves a certain gain and a risk for a loss. Baker et al explain that “[i]t 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 this way, the participants appear to have framed the [payoff scheme] as presenting the possibility of a gain, with the resulting risk-averse behavior that prospect theory predicts with regard to gains.” *Id.*, at 466.

Policymakers have explicitly approved sentencing strategies that generate uncertainty for the sake of augmenting deterrence. The increasing federal criminal legislation in recent years has made a wide range of offenses subject to concurrent jurisdiction (federal and state), with the severity of the federal sentence usually exceeding the severity of the sentence imposed by state law.¹⁰⁰ During the period that Rudolph Giuliani was the US Attorney in New York, he “initiated ‘federal day,’ one day chosen at random each week in which all street-level drug dealers apprehended by local authorities would be prosecuted in federal court. Giuliani stated that ‘[t]he idea was to create a Russian-roulette effect.’”¹⁰¹ In his later political campaigns, Giuliani often referred to this “sentencing lottery,” arguing that it kept drug dealers off balance.¹⁰²

The preceding analysis, however, suggests that these practices might not be the most effective strategies to employ uncertainty for enhancing the deterrent effect of criminal sanctions. The Pinkerton rule, broad-discretion sentencing regimes and Giuliani’s lottery system – all similarly generate *future* uncertainty. From the potential perpetrator’s perspective, each of these practices requires to *predict* the outcomes of contingencies that will be resolved subsequent to her decision whether or not to commit the crime. Given the behavioral findings concerning uncertainty, the legal system can achieve grater deterrence where potential perpetrators would be required to *postdict* the results of past events

¹⁰⁰ Sara Sun Beale, *Too Many and Yet Too Few: New Principles to Define the Proper Limits for Federal Criminal Jurisdiction*, 46 HASTINGS L.J. 979, 984-88 (1995) (discussing the increasing overlapping between federal criminal law and state criminal law, and noting that individuals who are indicted in federal courts are usually “subjected to much harsher sentences.” *Id.*, at 997).

¹⁰¹ *Id.*, at 1000.

¹⁰² William Glaberson, *Giuliani’s Powerful Image Under Campaign Scrutiny*, N.Y. TIMES, July 11, 1989, at A1. For a proposal similar to Giuliani’s in the context of corporate law, see recently, Ashwini Jayaratnam, *Prosecuting Stock-Option Backdating: The Ethics of Enforcement Techniques*, 20 GEO. J. LEGAL ETHICS 755, 763-64 (2007) (“Another method of achieving optimal deterrence... is for prosecutors to randomly select a specified number of companies to prosecute. This would be akin to a lottery where the companies chosen for prosecution are essentially picked out of a hat, or chosen on some other random basis... the arbitrariness of a lottery is likely to keep companies on their toes when it comes to issues like option backdating...”).

(such as the existence of aggravating factors) in gauging their expected sanction.

Determining the desirable level of sanction uncertainty requires balancing between competing interests, such as fair-warning principles and efficient deterrence. But any such determination should be sensitive to the type of uncertainty it creates. If the design of criminal sanctions is such that it involves mostly postdiction, it is likely to provide greater deterrence than a similar system that mostly involves prediction. Lawmakers who wish to decrease uncertainty but keeping deterrence constant can thus substitute legal practices that include substantial future uncertainty with practices that include only a limited level of past uncertainty.

IV. Conclusion

Behavioral studies establish that individuals who are required to guess the results of future events act differently than individuals who are required to guess the results of past events. Although from the standpoint of probability theory the source of uncertainty should have no effect, individuals manifest a consistent preference for future guesses over past guesses. Individuals who predict are more optimistic, confident and risk taking than individuals who postdict. The preceding analysis shows that legislators, law-enforcement authorities and judges can often *choose* the nature of legal uncertainties. Most importantly, their decisions regarding the specificity of norms, law-enforcement strategies and the parameters that set sanctions severity determine whether legal contingences would be placed in the future or in the past. The different effects of past and future uncertainty on behavior thus suggest that the legal system can influence incentives not only by providing positive and negative payoffs in the form of formal penalties and subsidies; it may inhibit and encourage behavior also by manipulating the nature of law-related uncertainties. Furthermore, the prevalence of uncertainty across different legal contexts allows policymakers to select from a spectrum of possibilities and combinations. Policymakers may regulate an activity in a way that involves future, past or a certain combination of past and future contingencies. This rich set of alternatives shows the potential wide-range implications of the prediction-postdiction findings in the context of legal regulation.