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Uncertainty Revisited: Legal Prediction and Legal Postdiction

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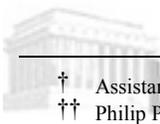
A large body of experimental literature has established that individuals treat guesses concerning the future differently than guesses concerning the past. Even where objective probabilities are identical, individuals are much more willing to predict a future event (and are more confident in the accuracy 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 coin toss than they are willing to bet on the results of a past coin toss in an opaque box.

After presenting the relevant psychological literature, this article argues that the behavioral differences between predictions and postdictions are relevant to legal policy. Several examples are provided. First, we show that these behavioral findings are relevant to the determination of the optimal specificity of legal norms, i.e., to the choice between rules and standards. Then we show how the distinction between prediction and postdiction can be used to enhance the effectiveness of law enforcement. Finally, our paper demonstrates how uncertainty regarding the past or future can influence the deterrent effects of criminal and civil sanctions.

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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 past as well as in the future. For example, when purchasing a used car, the uncertainty of the buyer can relate to the maintenance history of the vehicle (past) or to the date that the manufacturer will terminate the production of this model (future). In the context of law enforcement, a burglar might be uncertain whether a hidden camera has been installed in the house (past) or concerning the likelihood that the owners will return early (future). In torts, a doctor can be uncertain if his patient has just used (past) or will use drugs (future) that prevent the prescription of possible medicine.

Under the conventional rational choice theory, usually employed in legal scholarship, individuals' behavior is assumed to be governed by the relevant probabilities and relevant payoffs. Thus the question whether the uncertain event precedes or succeeds the decision is perceived irrelevant. Rich experimental literature, however, has established that individuals treat predictions very differently than postdictions. Most importantly, this literature shows that - even when objective probabilities and payoffs are manifestly identical - individuals are much more willing to bet on future events (and are much more confident in the accuracy of their predictions) than they are willing to bet on similar past events (and also are less confident in the accuracy of their postdiction).

The effects of uncertainty on behavior have been explored thoroughly by both economists and psychologists and the insights gained in this research have been integrated into legal analysis.¹ This article demonstrates that despite its sophistication, legal research concerning uncertainty failed to account for the fundamental distinction between postdiction and prediction. Furthermore, this article establishes that the

¹ See, e.g., Chris Guthrie, Jeffrey J. Rachlinski & Andrew J. Wistrich, *Inside the Judicial Mind*, 86 CORNELL L. REV. 777 (2001); Chris Guthrie, *Framing Frivolous Litigation: A Psychological Theory*, 67 U. CHI. L. REV. 163 (2000); Russell Korobkin, *Aspirations and Settlement*, 88 CORNELL L. REV. 1 (2002); Russell Korobkin & Chris Guthrie, *Psychology, Economics and Settlement: A New Look at the Role of the Lawyer*, 76 TEX. L. REV. 77 (1997); Alon Harel & Uzi Segal, *Criminal Law and Behavioral Law and Economics: Observations on the Neglected Role of Uncertainty in Deterring Crime*, 1 AM. L. & ECON. REV. 276 (1999).

behavioral differences between future guesses and past guesses are important to legal theory and that policymakers ought to take into account this distinction and its behavioral ramifications.

This article unfolds as follows. Part II.A presents the experimental literature on the prediction-postdiction distinction. Part II.B discusses the psychological rationales scholars have suggested to explain the difference in the individuals' choices when faced with future and past guesses. Part III explores the legal relevance of these findings. Part III.A examines the effects of legal uncertainty – uncertainty with respect to the content of legal norms -- and establishes that the distinction between predictions and postdictions is relevant to the optimal design of legal norms. Part III.B examines the effects of factual uncertainty in the law-enforcement contexts. It demonstrates that criminals face two types of factual uncertainty: future uncertainty and past uncertainty and that the latter forms of uncertainty have greater deterrent effects. Last Part III.C explores the deterrent effects of criminal and civil sanctions and shows that both criminals and tortfeasors often face both past uncertainty (uncertainty concerning facts predetermined at the time in which the crime or tort are being perpetrated) and future uncertainty (uncertainty concerning facts which are determined after the crime or the tort are being perpetrated). The optimal design of sanctions can benefit from an understanding of the differential effects of these two types of uncertainty. To conclude the difference between prediction and postdiction is relevant for all stages of law-making: the design of legal norms, in particular the choice between rules and standards, the stage of enforcement and the stage in which sanctions are inflicted.

Part II: The Behavioral Findings

This Part presents the experimental literature exploring risk perception concerning prediction and postdiction. It establishes the robustness of the findings concerning the differences in individuals' attitudes with respect to past and future guesses. Furthermore, in the latter section of this Part, it is shown that these differences are grounded in broader and deeper behavioral dispositions.

A. Experimental Research

In a study by Rothbart and Snyder, participants divided into two groups were required to bet on the results of a die toss.² In the first group, participants initially rolled the die (to a distance that is out of their sight) and were then asked to guess the outcome. In the second group, participants first made their prediction and the die was then tossed. Participants were shown that the toss is 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.

Conventional rational-choice paradigm would not predict any difference in the behavior of the participants. Since the level of risk and 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 conservatism" and were more risk-averse as compared to participants who first guessed and then tossed.³

In another study by Ladouceur and Mayrand, postdiction and prediction were compared and examined in a roulette game.⁴ 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). Ladouceur and Mayrand allowed participants to decide not only the size but also the *type* of wager. Participants could choose, for example, to bet on the exact number (a likelihood of 1:38), column (likelihood of 1:4), color (1:2), or a combination of several bets with different likelihoods of winning. The results showed that participants in the

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

³ 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).

⁴ Robert Ladouceur & Marie Mayrand, *The Level of Involvement and the Timing of Betting in Roulette*, 121 THE JOURNAL OF PSYCHOLOGY 169 (1987).

prediction condition (bet first) both invested significantly more money and took more risky wagers.

The experiments by Rothbart & Snyder, and Ladouceur & Mayrand, involved only a positive payoff (a reward for a correct guess) and applied a between subjects design.⁵ Later studies replicated these experiments using a within-subjects design and included the possibility of a negative payoff for an incorrect guess.⁶ 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 “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.”⁷

Tossing a die or betting on roulette bets are rather artificial environments. Additional studies have demonstrated that “prediction preference” occurs also in more realistic settings. For example, in an experiment by Heath and Tversky, participants were presented with a choice to select 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).⁸

From a group of more than 180 participants, nearly 70% “preferred to bet on tomorrow’s closing price.”⁹ Similar results were obtained in a study involving guessing the sex of a

⁵ 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 contexts all subjects confront both predictions and postdictions.

⁶ Wibecke Brun & Karl H. Teigen, *Prediction and Postdiction Preferences in Guessing*, 3 JOURNAL OF BEHAVIORAL DECISION MAKING 17 (1990).

⁷ *Id.*, at 21.

⁸ Chip Heath & Amos Tversky, *Preference and Belief: Ambiguity and Competence in Choice under Uncertainty*, 4 JOURNAL OF RISK AND UNCERTAINTY 5 (1991).

⁹ *Id.*, at 8-9.

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 are equal, a substantial majority (79%) preferred to bet on the child's sex before rather than after birth.¹⁰

Individuals' 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 is held (while the actual result will be known only later).¹¹ Friedland et al used a 9-point scale, where the low end (1) indicated a preference for betting *after* the game and the high end (9) 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.¹² Similar results were obtained by Brun and Teigen in a similar experiment, involving betting on a soccer match. Of 93 participants, 82 individuals (89%) preferred to bet *before* the game, 9 individuals (9%) chose to bet *after* the game, and 2 individuals (2%) expressed no preference.¹³

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."¹⁴ 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

¹⁰ Wibecke Brun & Karl H. Teigen, *supra* note 6 at 22-23.

¹¹ 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).

¹² *Id.*, at 928.

¹³ Wibecke Brun & Karl H. Teigen, *supra* note 6 at 22-23

¹⁴ 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).

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.¹⁵ From a strict economic perspective, whether the game is played such that participants decide simultaneously or one 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.¹⁶

Such behavior was also observed in other coordination games. In a recent study, Webber et al examined to what extent the order in which the ultimatum game is carried out affects parties' behavior.¹⁷ In their experiment, Webber et al gave every two participants \$10, and pairs were then divided to three groups, differing only in the sequence in which participants were required to make their choices. In the simultaneous condition, "proposers" and "responders" were requested to hand their offers / demands at the same time. In the other two groups, participants' 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 about 60% to 65% to 80% when responders move after, at the same time, or before proposers.¹⁸

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

¹⁵ 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.

¹⁶ 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).

¹⁷ 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).

¹⁸ *Id.*, at 34.

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 difference in individuals' attitudes concerning past and future bets. The first theory is based on "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 payoffs* than identical postdictions.

1. Illusion of Control

Experimental and empirical research indicates that individuals often assume to possess at least some control over purely probabilistic outcomes.¹⁹ For example, subjects who are actively 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).²⁰ Similarly, it has been shown that when rolling dice in craps,

¹⁹ Ellen J. Langer, *The Illusion of Control*, in JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES (DANIEL KAHNEMAN ET AL. EDS., 1982).

²⁰ Camille B. Wortman, *Some Determinants of Perceived Control*, 31 JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY 282 (1975).

individuals tend to execute a soft, easy throw if they need a low point but choose a hard, fast throw when they desire a high number.²¹

Some findings provide evidence that illusionary control underlies the preference for prediction over postdiction. In their die rolling study, Brun and Teigen requested participants to 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.²² 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.”²³ Participants were then divided into two groups, betting either before or after a toss of a die. The results showed that while the tendency to bet more in the prediction condition (bet before) is general, it especially characterizes participants who manifested high desirability of control.²⁴

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 “guess-first” preference is explained in terms of a subjective feeling of control, one could expect 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.”²⁵

2. Information Availability

²¹James M. Henslin, *Craps and Magic*, 73 AMERICAN JOURNAL OF SOCIOLOGY 316 (1967).

²²Wibecke Brun & Karl H. Teigen, *supra* note 6 at 20.

²³Jerry M. Burger & Harris M. Cooper, *The Desirability of Control*, 3 MOTIVATION AND EMOTION 381 (1979).

²⁴Burger 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 \$20.9 as compared to \$25.3 in the prediction condition; among participants who showed “high desirability of control,” the average total bet was \$22.8 in the postdiction condition and \$37.2 in the prediction condition. *Id.* at 390.

²⁵Chip Heath & Amos Tversky, *supra* note 8 at 8.

Since the past, unlike the future, is knowable in principle, postdiction and prediction involve different types 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, uncertainty with respect to events that have already occurred is subjective; at the time in which postdiction is made the relevant information already exists and some agents may have access to this information. The source of uncertainty has been shown to affect people's choice in contexts of chance. In Ellsberg's famous experiment, individuals were found to prefer betting on the color of a bead drawn from an urn with 50 red and 50 blue beads (objective uncertainty), than betting on the color of a bead drawn from an urn containing 100 blue and red beads with unknown proportions (subjective uncertainty). Although from the perspective of probability theory both bets are identical, individuals sense more dissatisfaction when making incorrect guesses involving subjective uncertainty. Psychologists have suggested such perception makes postdiction unattractive as compared to similar prediction.²⁶

Miller and Gunasegaram have demonstrated the role that blame assignment plays in explaining the difference between future and past bets.²⁷ Miller and Gunasegaram requested undergraduate students to consider the following case. 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 asked "which of the two following two thoughts is Nancy most likely to have: (a) Why did *the professor* select this question? (b) Why didn't *I* prepare for this question?" The results show that the participants expected Nancy to be critical of the teacher only when she studied *before* the teacher selected the question in the exam.²⁸

²⁶ See, e.g. Wibecke Brun & Karl H. Teigen, *supra* note 6 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 8 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.")

²⁷ Dale T. Miller & Skau Gunasegaram, *Temporal Order and the Perceived Mutability of Events: Implication for Blame Assignment*, 59 *Journal of Personality and Social Psychology* 1111 (1990).

²⁸ *Id.*, at 1114.

The explanation underlying the behavioral difference between postdiction and prediction is important not only to satisfy one's scientific curiosity. It is important because it demonstrates that the behavioral differences between postdiction and prediction are not merely corroborated in experiments, but reflect deeply seated human dispositions. These explanations thus provide support for the claim that the behavioral differences analyzed above are robust and that they reflect universal human dispositions. The next section examines the relevance of these findings to the realm of law and law making policy.

III Prediction and Postdiction and the Law

What are the implications of these behavioral findings on the legal system? Can the legal system exploit the inclination to predict and the reluctance to postdict for the sake of pursuing its goals?

This section explores the relevance of the behavioral findings in three contexts: the optimal design of legal norms, the optimal enforcement policy and the optimal design of legal sanctions. In conjunction, the investigation of these three contexts establish that the behavioral differences between postdiction and prediction are relevant to the legislator/lawmaker who designs the legal norms, the police and other law enforcement authorities who are in charge of detecting violators and to judges (or lawmakers) who are in charge of determining the sanctions following the violation of norms. The broad scope of the legal implications reflects the fact that uncertainty penetrates every dimension of the legal system. The making of the law, the effective detection of violators and the efficacious infliction of sanctions generate different types of uncertainty and those can be exploited in order to provide optimal incentives only if the complexity of the behavioral effects of uncertainty is appreciated.

Section A illustrates that the behavioral differences between postdiction and prediction bears on the choice between rules-governed and standards-governed legal norms. Section B shows that the behavioral differences influence the choice of enforcement mechanisms, in particular, the choice between enforcement mechanisms designed such that facts *preceding* the commission of the offence predetermine whether

the offender will be detected or not and mechanisms designed such that fact *succeeding* the commission of the offence determine whether the offender will be detected or not. Last, we establish the relevance of the behavioral differences to the optimal design of criminal and civil sanctions, in particular the choice between sanctions whose severity depends on facts preceding the commission of the offense/tort and sanctions whose severity depends on facts succeeding the commission of the offense/tort.

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

In the law and economics literature, much attention has been paid to the difference between “standards” and “rules.”²⁹ Standards and rules can be depicted as two extremes in a one-dimensional space representing the degree of specificity of legal norms. Both standards and rules are legal norms that adjudicators use to evaluate actions. 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 do standards.³⁰

Both rules and standards generate uncertainty. Standards are vague norms whose interpretation is provided only ex-post by the courts. Standards therefore produce *future* uncertainty resulting from uncertainty with respect to the interpretation given to standards ex-post by the courts. As opposed to standards, rules are concrete norms which leave no (or little) discretion to decision-makers. Yet individuals whose behavior is governed by rules are not always familiar with the rules and, furthermore, familiarizing themselves with the rules is often too costly. Individuals who know that their behavior is governed by rules (but fail to familiarize themselves with the rules) therefore face uncertainty concerning the content of these rules. 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

²⁹ See Louis Kaplow, *Rules versus Standards: An Economic Analysis*, 42 DUKE L.J. 557 (1992); Cass R. Sunstein, *Problems with Rules*, 83 CAL. L. REV. 953 (1995).

³⁰ See Pierre J. Schlag, *Rules and Standards*, 33 UCLA L. REV. 379 (1985)

described in the law and economics literature. After presenting the conventional law and economics considerations governing the choice between rules and standards, we shall examine whether and in what ways the experimental findings concerning the difference between postdiction and prediction may be relevant to the optimal design of legal norms, in particular to the choice between rule-like and standard-like legal norms.

The use of rules and standards involves different costs and benefits.³¹ The cost of producing standards is typically lower, but, according to the conventional view, they entail higher enforcement and compliance costs than rules. Promulgating the standard “to take reasonable care in all matters” is extremely easy and does not generate any cost at all. 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, and for defendants, who have to determine what level of care is necessary to escape liability. In the case of specific norms (rules), the relative size of costs is exactly the opposite. The legislature incurs larger 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; the costs of legal advice are lower and it is easier for citizens to predict their effects and act accordingly.

While these efficiency considerations are straightforward, assessing the actual costs in practice is often difficult. Nevertheless, law and economics scholars have suggested policymakers may use as a proxy the frequency of the regulated activity.³² Rules are preferable when the regulated activity is 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 standards is therefore preferable given the lower costs of producing standards. Rules are more expensive to create than standards and these costs are worthwhile when the regulated activity is frequent. As such, more costs should be invested in prior rule-governed regulation in cases where the regulated activity is frequent³³.

³¹ Kaplow, *supra* note 29.

³² Louis Kaplow, *A Model of the Optimal Complexity of Legal Rules*, 11 J. L. ECON. & ORG. 150 (1995).

³³ *Id.*

Yet the traditional law and economics literature concerning the optimal specificity of legal norms appears incomplete as it fails to account for behavioral considerations.³⁴ Traditional law and economics literature points out that both standards and rules generate uncertainty but it fails to understand that these types of uncertainty may have different behavioral implications. The behavioral differences between postdiction and prediction imply that uncertainty resulting from standards (standards uncertainty) affects behavior differently than uncertainty resulting from rules (rules uncertainty).

Standards uncertainty, as shown above, is a future uncertainty; it is uncertainty resulting from uncertainty concerning the future interpretation given to the standards ex-post. The feature which characterizes standards is that the legal questions governed by standards are resolved only ex-post and the resolution of these questions is not known to the parties whose behavior is governed by the standards. Individuals who face standards uncertainty face therefore the need to perform predictions concerning the way the standard will be interpreted. Rules, in contrast, may involve only past uncertainty. Individuals know that the law settles the questions, but the costs involved in learning the existing legal rules are prohibitive and, consequently, individuals who face rules uncertainty are required to perform 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 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 disinclined to learn the rules) from future uncertainty into past uncertainty. This change is likely to affect individuals' behavior. To better understand these effects consider the following case.

Assume the legislature wishes to deter the emission of pollution. The legislature can deter pollution either by applying a vague standard such as prohibiting (or imposing liability) for “unreasonable” or “unnecessary” pollution. Alternatively, the legislature or the regulator can develop a set of complex rules governing pollution and impose criminal

³⁴ 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* (unpublished manuscript)

or civil liability for violating these rules. The empirical findings suggest that the rule-governed regulation has greater deterrent effects than standards-governed regulation.

The greater deterrence resulting from a rule-governed scheme has both desirable and undesirable ramifications. A rule-governed scheme (particularly a complex rule-governed scheme) would be more effective in deterring 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. The rule-governed scheme may deter individuals from the activity even in cases in which pollution is desirable (cost effective) while the standards-governed scheme may be less effective in deterring individuals from emitting undesirable pollution – pollution which ex-post would be classified as a violation of the relevant standard and which would not have been performed had the activity been regulated by rules. The choice between a rule-governed and standards-governed scheme has therefore both costs and benefits and those should be weighted carefully against each other.

Debates concerning the advantages and disadvantages of rule-governed or standards-governed legal schemes are common in the legal literature. The assumption underlying existing analysis of the specificity of legal norms is that rules reduce uncertainty. Yet the degree to which rules decrease uncertainty depends on their complexity. A complex rule-governed scheme may generate more rather than less uncertainty. Among the implications of our findings is that a complex rule-based scheme may be more inhibitive than a standards-based scheme. Even if some individuals may learn the rules and follow them, others may be reluctant to invest the resources necessary to do so. The choice between a rule-governed and a standard-governed scheme as well the decision how much to invest in the design of legal rules and in disseminating their content ought to be affected by these considerations. This finding has implications not only on the optimal choice between a rule-governed scheme and a standard-governed scheme but also on the decision as to how much to invest in designing the rules and in disseminating their content.



Committing crimes exposes criminals to the risk of being detected and convicted. Public and private investment in precautions can increase the likelihood of detection. Yet some precautions result in uncertainty concerning the future while other result in uncertainty concerning the past. The former type of precautions induce criminals to predict (future) events (e.g., a future encounter with the police) while the latter require them to postdict (past) events (e.g., the existence or non-existence of a camera documenting the crime). If all other conditions are equal, the deterrent effects of the latter type of precautions are greater than the deterrent effects of the former type of precautions. Hence, in making decisions concerning the allocation of resources to law enforcement, priority should be given to the latter type of precautions – precautions which require postdiction on the part of criminals.

To illustrate the difference between these two types of precautions let us investigate the example of tax compliance. Tax enforcement authorities face a choice between two strategies. Under one enforcement mechanism the tax authorities select in advance (before the beginning of the auditing period) the identities of the individuals who are going to be audited. Under a second mechanism the tax authorities select the names at the end of the auditing period.

Under the first enforcement mechanism, individuals who commit fraud are engaged 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. Under the second mechanism, individuals who commit fraud are engaged in prediction, i.e., a lottery concerning the question of whether their names will be selected for an audit *after* the commission of the offense. If individuals are indeed, as research has demonstrated, particularly averse to postdiction, the former mechanism has greater deterrence effects than the latter. The perception of potential transgressors that the facts concerning who is going to be audited *had been determined* before their 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 offense.

It is not difficult to see other policy implications for the difference between prediction and postdiction. Law enforcement mechanisms can be divided into two types. Some law enforcement mechanisms are designed such that facts *preceding* the commission of the offence predetermine whether the offender will be detected or not. Other law enforcement mechanisms are designed such that facts *succeeding* the commission of the offence determine whether the offender will be detected or not. Often the very same offence involves both predictions and postdictions. The behavioral findings suggest that these two types of precautions have differential effects. Let us provide an example illustrating the practical implications of this difference.

Car thieves are exposed to the risk that the car they steal is equipped with the Lojack system. The presence or the absence of Lojack is determined prior to the commission of the offence. Stealing a car can be easily perceived by those who consider whether to perform a theft as an act which requires a postdiction concerning the question whether a Lojack has been installed or not. Stealing a car, however, also involves uncertainty concerning the future, e.g., a prediction concerning a possible future encounter with the police. The differential attitudes towards postdiction and prediction suggest that investing in Lojacks may be more effective in deterring car thefts than investing in increasing the number of police cars searching for stolen cars. The willingness to take risks of the latter type (accidental encounter with the police) is higher than the willingness to take risks of the former type (stealing a car with Lojack).

More generally, in choosing between investing in precautions designed such that facts existing *prior* to the commission of the offence predetermine whether the offender will be detected or not, and precautions designed such that events occurring *after* the commission of the offence determine whether the offender will be detected or not, law enforcement authorities ought to prefer the former type to the latter type. Investments in the former type of precautions are, as a general rule, more effective than investments in the latter type of precautions.

This observation may affect the current debates concerning controversial law enforcement policies. Precautions which require criminals to postdict are typically more intrusive than precautions which require criminals to predict; the former type of precautions often require monitoring individuals prior to the commission of the offense

and intruding into their lives. Thus, for instance, the use of wiretapping and cameras require postdiction on the part of potential criminals. The behavioral findings suggest that these precautions may be particularly effective. The greater effectiveness of these precautions does not dictate that they ought to be preferred over other less intrusive types of precautions, but they do suggest that the reluctance to use them has greater costs than traditionally appreciated.

C. Legal Uncertainty and the Deterrent Effect of Legal Sanctions

Both criminal law and tort law are designed to deter wrongful behavior by inflicting sanctions for wrongdoing. The size of the sanction (either criminal or civil) following the perpetration of a crime or a tort is rarely known with certainty to the potential perpetrators of the crime or the tort. Most typically, criminals or tortfeasors face the need to make conjectures concerning the expected size of the sanction under conditions of uncertainty.

Law and economics scholars have discussed the deterrent effects of uncertainty of sanctions. It was for instance pointed out that uncertainty with respect to the size of sanctions may be conducive to deterrence when criminals (or tortfeasors) are risk averse. In contrast, such uncertainty may weaken deterrence when criminals (or tortfeasors) are risk loving.³⁵ Theorists have speculated as to whether uncertainty with respect to the sanctions increases or decreases deterrence.

Despite their great sophistication, these writings failed to acknowledge the complexity of the issue because it was generally assumed that the deterrent effects of uncertainty with respect to the (criminal or civil) sanction do not depend on the *type* of uncertainty. In other words, theorists treated uncertainty as a single category. Uncertainty concerning the size of sanctions has the same effects irrespective of what the sources of uncertainty are. Its effects depend merely on the risk loving or risk aversion of potential criminals/tortfeasors.

³⁵ Alon Harel, Uzi Segal, Criminal Law and Behavioral Law and Economics: Observations on the Neglected Role of Uncertainty in Deterring Crime 1 *American Law and Economics Review*, 276-312 (1999); Tom Baker, Alon Harel, Tamar Kugler, The Virtues of Uncertainty in Law: An Experimental Approach 89 *Iowa L. Rev.* 443-494 (2004)

The findings of this paper establish that uncertainty with respect to sanctions cannot be treated as a single category. Some uncertain factors which affect the severity of sanctions involve past uncertainty and therefore require postdiction on the part of potential criminals or tortfeasors while others involve future uncertainty and therefore require prediction on the part of potential criminals or tortfeasors. At times the sanction depends both on facts which exist at the time in which the crime or the tort is perpetrated (and therefore the decision to perpetrate the crime or tort involves postdiction) and on facts which take place after the crime or tort are perpetrated (and therefore the decision to perpetrate the crime involves also prediction). It is simplistic to presuppose without further examination that uncertainty with respect to sanctions is a single category that always has the same effects on deterrence. The rest of this section explores more carefully the different types of uncertainty faced by criminals and tortfeasors. It establishes that the severity of both criminal and civil sanctions often depend on facts preceding the commission of the crime/tort and at other times on facts which succeed the commission of the offense.

1. Criminal Sanctions

The size of criminal sanctions often depends on factors unknown to criminals. Some unknown factors affecting the size of sanctions depend on facts which exist at the time the crime is committed while others depend on future facts.

The sentencing guidelines provide several examples of past uncertainty. The guidelines determine that the sentencing of property offences varies incrementally with the dollar amount involved in the offence. The sentence for a robbery depends on the amount of money which was taken in the robbery. Interestingly empirical data collected by the Sentencing Commission makes clear that even before issuing the Guidelines, judges who exercised discretion within broad legislatively determined sentencing limits (say, a range of 0 to 20 years) would impose very different sentences upon offenders engaged in the same basic criminal conduct, depending among other things upon the

amount of money taken (in respect to robbery, theft, or fraud).³⁶ The Sentencing Guidelines have endorsed this judicial practice.

Sanctions for property offences which vary with the amount of money involve past uncertainty. The criminal who considers committing a property law offence often does not know the amount of money which she is likely to steal. If the sanction varies with the size of money stolen, the criminal faces the task of postdicting the sanction since the sanction depends on existing facts – facts which, while unknown to the criminal at the time she commits the crime, are predetermined at the time of the commission of the offense.

Criminal law theorists may challenge this claim on doctrinal grounds and argue that the principles of criminal law preclude the possibility of uncertainty with respect to the past because convicting a person on the basis of facts unknown to him at the time the offence was committed conflicts with the foundations of criminal law and is incompatible with the requirement of mens rea.

This objection is flawed for two reasons. First, many surrounding circumstances which affect the size of the sentence are not considered essential elements of the offense and consequently courts have rejected the claim that it is necessary to establish that the defendant was aware of these circumstances. Second, even when existing circumstances are essential elements of the offense and, consequently, the prosecution must prove that the defendant must be aware of their *possible* existence, an awareness of the possibility of the existence of these circumstances does not entail certainty. The requirement of mens rea in criminal law does not presuppose knowledge or certainty concerning existing circumstances, but only knowledge of the possibility that the relevant circumstances may apply.

One case in which it was established that existing circumstances are not essential elements of the offence (and consequently the prosecution need not prove that the defendant was aware of the existence of these circumstances) is the case of *State v. Combariati*. The defendant in this case was convicted of stealing a controlled substance. The defendant argued that in order to be convicted of such an offence, the prosecution

³⁶ See United States Sentencing Commission, Supplementary Report on the Initial Sentencing Guidelines and Policy Statements 35—39 (1987)

needs to establish that the defendant knew that the stolen property consists of controlled substance. The court rejected this view and argued that: “neither at common law nor in the criminal statutes was there a requirement that the accused know the nature or type of property he had stolen in order to be guilty of stealing it.”³⁷ This applies also to the distinction between felonious theft and petty theft which depends on the value of the object stolen. If X snatches a purse and find, much to his surprise, that it contains a \$100,000 rather than small bills which he expected, he may be convicted of felonious theft.³⁸

Similarly sentencing drug offences often depends on the quantity of the drug produced or sold. These cases also do not require that the defendant be aware of the quantity and quality of the drug. In the court’s words: “The quantity and quality were not elements of the offense and the prosecutor need not prove and the jury need not find that defendant knew the quantity or the quality of the controlled dangerous substances involved.”³⁹

But even when the criminal law requires mens rea with respect to the relevant circumstances, it does not require that the defendant be certain of these circumstances. Conviction is typically based on proving that the defendant knew of the possibility of the existence of the relevant circumstances. To illustrate it think of the distinction between regular assault and aggravated assault. In order to convict a person in aggravated assault under The Model Penal Code (and many states following the relevant provision of the Model Penal Code), it is necessary that the defendant: “purposely, knowingly, or recklessly” causes “serious bodily injury” to another. To satisfy the requirements of this section it is sufficient that the defendant knew that there is a possibility that the assault would lead to “serious bodily injury”. Thus if unbeknownst to the defendant the victim has an “eggshell skull” and suffer as a result permanent brain damage in the assault the defendant would not be convicted of serious bodily injury. But if the offender knew of the possibility that the victim may have an “eggshell skull”, she would be convicted even

³⁷ State v. Combariate, 452 A. 2d 710, (N.J. Super.Ct Law Div. 1982)

³⁸ For a discussion of unforeseeable harms in crime, see Robert A. Mikos. “Eggshell Victims’ Private Precautions, and the Societal Benefits of Shifting Crime 105 Michigan 307, 326-328 (2006).

³⁹ State of New Jersey, v. Torres 563 A. 2nd 1144.

if she was not certain of it. The requirement of mens rea concerning the surrounding circumstances of a crime is not equated with knowledge or certainty.

The concept of recklessness defined in the Model Penal Code is specifically designed to facilitate the conviction of a person under conditions of uncertainty. Section 2.02 (2) (c) of the Model Penal Code 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 his conduct. The risk must be of such a nature and degree that, considering the nature and purpose of the actor's conduct and the circumstances known to him, its disregard involves a gross deviation from the standard of conduct that a law-abiding person would observe in the actor's situation.”

The Model Penal Code also determines 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.” Thus, under the Model Penal Code the category of recklessness is precisely designed to address cases of uncertainty on the part of the perpetrator of the crime and recklessness is in most cases sufficient for conviction. Criminal law facilitates the conviction of a defendant (or enhancement of the sanction) in cases in which the defendant was uncertain of existing facts.

Other factors which affect the size of the sentences fall into the category of future uncertainty. The differential treatment of complete crimes and attempts is one example. The success or failure of crimes is 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. More serious harms, e.g., serious injuries are often followed by harsher sanctions. The distinction between “bodily injury” and “serious bodily injury” is the basis for differentiating between simple assault and aggravated assault.⁴⁰ These different offenses carry with them different sentences. Yet the defendant may not know at the time of the crime that his assault will result in “bodily injury” or “serious bodily injury”. Last, the discretionary powers granted to judges in some jurisdictions involve future uncertainty with respect to

⁴⁰ See Model Penal Code section 211.1 (1962)

the size of the sanction. The size of the sanction depends on the future exercise of discretion on the part of the decision-maker.

2. Tort Law

Similar differentiation between the two types of uncertainty can be made in tort law. The size of compensation or its nature sometimes depend on uncertain facts which exist at the time the tort is perpetrated while, at other times, it depends on future contingencies.

One of the main considerations determining the size of compensation for an injury is the lost earnings of the victim. Complicated equations are designed to help judges and juries to make these determinations. The potential tortfeasor who considers whether to perform a tort faces uncertainty with respect to the earnings – earnings whose size is predetermined at the time of perpetrating the tort. Similarly a tort which endangers property often involves uncertainty concerning the value of that property – value which is predetermined at the time the tort is committed. Both types of uncertainty fall into the category of uncertainty concerning the past and involve therefore postdiction on the part of the tortfeasor.

In contrast other components of the remedies following the perpetration of tort involve uncertainty concerning the future. Most importantly, uncertainty resulting from the granting of discretion to juries falls into this category. Punitive damages are imposed by juries and, as empirical research has established, punitive damages often vary in their size.⁴¹ The potential tortfeasor faces the task of evaluating the expected costs of punitive damages. Similarly, compensating a victim for “pain and suffering” depend on the decision of juries – decision which takes place after the commission of the tort. An attempt on the part of a potential tortfeasor to evaluate the amount she may be required to pay under this heading depends therefore on the future exercise of discretion by juries.

Do these observations have any normative ramifications? Should they guide the decision-maker in making determinations concerning the factors which ought to influence

⁴¹ See Cass R. Sunstein et al, *Punitive Damages: How Juries Decide* (2002)

the size of the sanctions? In what ways could these findings guide the decision-maker who considers the optimal design of criminal sanctions or civil remedies?

It seems that to the extent that the decision-maker wishes to enhance the deterrent effects of sanctions by exploiting aversion to uncertainty, it ought to increase as much as possible the components falling into the category of past uncertainty and decrease the components falling into the category of future uncertainty. The use of uncertainty resulting from punitive damages to deter crime may be less effective than uncertainty resulting from remedies whose size depends on lost earnings or the value of the property damaged.

IV Conclusion

Uncertainty ought not to be understood by agents who are in charge of making the law or enforcing it as a single category without awareness of the behavioral differences resulting from different types of uncertainty. Former attempts to explore the effects of uncertainty and to exploit uncertainty suffered from lack of a nuanced understanding of the behavioral effects of uncertainty.

This paper explores at least one relevant factor which influences the behavioral effects of uncertainty. It also demonstrates that sensitivity to the complexity of the behavioral effects of uncertainty is relevant to legal policy-making. The optimal specificity of legal norms (the choice between rules or standards), the nature of the enforcement mechanisms and, last, the parameters which determine the severity of the sanctions can be designed optimally only once the complexity of the behavioral effects of uncertainty are appreciated by policy-makers. The behavioral effects of uncertainty vary in accordance with the type and source of uncertainty and attempts to exploit these behavioral effects and provide optimal incentives requires complex and multifaceted policies. It follows therefore that when the policy-maker wishes to exploit uncertainty for the sake of providing optimal incentives; she is faced with much greater challenges than is appreciated by economists. To address these challenges successfully one ought to be informed by contemporary behavioral science.