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“Modeling Uncertainty in Tax Law”

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SCHEDULE FOR 2013 NYU TAX POLICY COLLOQUIUM

(All sessions meet on Tuesdays from 4-5:50 pm in Vanderbilt 208, NYU Law School)

1. January 22 – David Kamin, NYU Law School, “Are We There Yet?: On a Path to Closing America's Long-Run Deficit.”
2. January 29 – Edward McCaffery, USC Law School, “Bifurcation Blues: The Perils of Leaving Redistribution Aside.”
3. February 5 – Jake Brooks, Georgetown Law School, “Taxation, Risk, and Portfolio Choice: The Treatment of Returns to Risk Under a Normative Income Tax.”
4. February 12 – Lilian Faulhaber, Boston University School of Law, “Tax Expenditures, Charitable Giving, and the Fiscal Future of the European Union.”
5. February 26 – Peter Diamond (with Emmanuel Saez), MIT Economics Department, “The Case for a Progressive Tax: From Basic Research to Policy Recommendations.”
6. March 5 – Darien Shanske, University of California at Hastings College of Law, “Modernizing the Property Tax.”
7. March 12 – Dhammika Dharmapala, U. of Illinois Law School, “Competitive Neutrality among Debt-Financed Multinational Firms.”
8. March 26 – Leslie Robinson, Tuck Business School, Dartmouth College, “Internal Ownership Structures of Multinational Firms.”
9. April 2 – Alan Viard, American Enterprise Institute, “Progressive Consumption Taxation: The Choice of Tax Design.”
10. April 9 – Brian Galle, Boston College Law School, “A Nudge is a Price.”
11. **April 16** – **Sarah Lawsky, University of California, Irvine School of Law, “Modeling Uncertainty in Tax Law.”**
12. April 23 – Larry Bartels, Department of Political Science, Vanderbilt University, “Inequality as a Political Issue in the 2012 Election.”
13. April 30 – Itai Grinberg, Georgetown Law School, “A Governance Structure to Mediate the Battle Over Taxing Offshore Accounts.”
14. May 7 – Raj Chetty, Harvard Economics Department, “Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark.”



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Modeling Uncertainty in Tax Law

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ARTICLES

MODELING UNCERTAINTY IN TAX LAW

Sarah B. Lawsky*

Each year, the government faces a massive shortfall in tax collections: the annual difference between the amount taxpayers owe the government and the amount the government actually receives is nearly \$400 billion dollars. The questions of when and why taxpayers choose to comply with the tax law are thus pressing ones for scholars and policymakers. Many legal scholars rely on economic models better to understand these issues. However, none of the models that legal scholars use can accommodate the reality that taxpayers face unknown probabilities when they decide whether to comply. A taxpayer does not know, for example, the probability that he will be selected for audit, the probability that the government will identify a particular questionable position on his tax return, or the probability that the IRS or a court will strike the position down.

This Article presents a formal model of tax compliance that, unlike other models of tax compliance used in legal scholarship, takes unknown probabilities into account. The model presented incorporates both the extent of a taxpayer's uncertainty and the taxpayer's attitude toward uncertainty, and thus provides new insights into problems as disparate as how the government should reveal information about its approach to audits, whether the government should use anti-abuse rules to attack tax shelters, and whether tax professionals should be subject to penalties for providing certain kinds of tax advice.

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The most rational man I ever met, whom I shall call Ysidro, determined his own . . . preference[s] When told that he did not satisfy all of the . . . axioms [of game theory], he replied that he thought it more rational to satisfy his preferences and let the axioms satisfy themselves.

—Paul Samuelson¹

INTRODUCTION

Imagine you are offered a choice between, on the one hand, \$100, or, on the other hand, the opportunity to bet on a coin flip, where you will get \$50 if the coin comes up heads and \$150 if it comes up tails. If you are like most people, you prefer the certain \$100, even though the risky choice has the same

1. Paul A. Samuelson, *Probability and the Attempts to Measure Utility*, 1 KEIZAI KENKYU [ECONOMIC REVIEW] 167, 169-70 (1950) (footnote omitted). Samuelson notes in a footnote that “Ysidro’s father and mother had [Bernoulli-Marshall] functions, but he inherited a blend of them which is *not* such a function.” *Id.* at 170 n.5. Ysidro, as it turns out, could have been subject to a Dutch Book—that is, a series of bets, all of which he would accept, that would be guaranteed to lose him money—but Ysidro’s (or Samuelson’s) larger point still stands. See PAUL A. SAMUELSON, *Postscript to Probability and the Attempts to Measure Utility*, in 1 THE COLLECTED SCIENTIFIC PAPERS OF PAUL A. SAMUELSON 124, 124 (Joseph E. Stiglitz ed., 1966) (noting, in a postscript, that Leonard Savage had, upon reading Samuelson’s article, advised Samuelson that Ysidro could “make book against [himself] and end up making . . . money”).

expected value.² Now imagine another choice: the coin flip game, which gives you an even chance at \$50 or \$150, or a different game, which will give you an unknown chance at \$50 and an unknown chance at \$150. Most people pick the coin flip, the game that features a known probability (that is, an even chance of winning), over the second game, which presents an unknown probability.³ The first choice, between \$100 and a coin flip, tests how you feel about risk, that is, a known probability. The second choice, between the coin flip and the other game, tests how you feel about uncertainty, an unknown probability.

A taxpayer trying to decide whether to comply with the tax law faces uncertainty, not risk. He does not know whether he will be audited by the Internal Revenue Service (IRS), and perhaps he does not even know whether his tax position is correct as a matter of law. And he also does not know the *chance* that he will be audited, or the *chance* that his tax position is correct. If the IRS were rolling dice to determine whether to audit the taxpayer, the taxpayer would know the chance that he would be audited (assuming he knew that the IRS's dice were not weighted). If, for example, rolling a pair of sixes would trigger an audit, the taxpayer would know that he had a 1 in 36 chance of being audited. He would not know how the roll of the dice would turn out, but he would know the chance that the roll would go against him. If a roll of the dice determined whether a taxpayer would be audited, and the taxpayer knew that, the taxpayer would be making a decision under risk—an unknown outcome with known probabilities.

Rather, when the taxpayer decides whether to comply, he grapples with a decision more like the decision of how much to bet on the outcome of a football game. Not only does the taxpayer not know who is going to win the football game, but he also does not know with certainty the chance that a given team will win. And when the taxpayer decides whether to comply with the tax law, not only does he not know *whether* he will be audited and his position will be disallowed; he also does not know *the chance* that he will be audited and his position will be disallowed. The taxpayer's decision whether to comply is thus a decision under uncertainty, an unknown outcome with unknown probabilities.

Many people are averse to uncertainty, both in general⁴ and in the tax compliance context. For example, one experiment found that taxpayers are so uncertainty averse that “when low fines were combined with vague information about the probability of audits, the average percentage of reported income was

2. *See infra* Part I.C.

3. *See infra* Part III.B.

4. Colin Camerer & Martin Weber, *Recent Developments in Modeling Preferences: Uncertainty and Ambiguity*, 5 J. RISK & UNCERTAINTY 325, 333-34 & tbl.3 (1992) (summarizing a number of studies); *see also, e.g.*, Ming Hsu et al., *Neural Systems Responding to Degrees of Uncertainty in Human Decision-Making*, 310 SCIENCE 1680, 1680 (2005) (finding neurological evidence of ambiguity aversion).

quite close to that obtained when high fines were employed.”⁵ Low fines and uncertainty, that is, deterred cheating almost as much as high fines alone. Brain imaging studies show that different parts of the human brain activate when considering risk as opposed to uncertainty.⁶ Indeed, even apes⁷ and monkeys⁸ have been shown to distinguish between risk and uncertainty, and to prefer risk to uncertainty.

But while legal scholarship’s existing economic models of tax compliance can take risk and attitudes toward risk into account, they cannot incorporate attitudes toward uncertainty. By “model,” I mean a deductive argument from exactly specified premises that deliberately simplify and omit facts about the world.⁹ To say that the models of tax compliance cannot take uncertainty into account is to say that nothing in the models can be adjusted to represent increased (or decreased) uncertainty about the probability that a fine will be imposed, or to represent taxpayers’ attitudes toward uncertainty. It is not just that the models *do* not take uncertainty into account; rather, the models *cannot* take uncertainty into account.¹⁰

This Article, in contrast, offers a formal model of tax compliance—what I call the uncertainty model—which takes into account both the taxpayer’s degree of uncertainty and the taxpayer’s attitude toward uncertainty. The

5. Nehemia Friedland, *A Note on Tax Evasion as a Function of the Quality of Information About the Magnitude and Credibility of Threatened Fines: Some Preliminary Research*, 12 J. APPLIED SOC. PSYCHOL. 54, 58 (1982).

6. *E.g.*, Hsu et al., *supra* note 4, at 1680; Scott A. Huettel et al., *Neural Signatures of Economic Preferences for Risk and Ambiguity*, 49 NEURON 765, 765 (2006).

7. Alexandra G. Rosati & Brian Hare, *Chimpanzees and Bonobos Distinguish Between Risk and Ambiguity*, 7 BIOLOGY LETTERS 15, 15 (2011).

8. Benjamin Y. Hayden et al., *Ambiguity Aversion in Rhesus Macaques*, FRONTIERS NEUROSCIENCE, Sept. 17, 2010, at 1, 1.

9. *See* Allan Gibbard & Hal R. Varian, *Economic Models*, 75 J. PHIL. 664, 666 (1978); Sarah Lawsky, *How Models Work*, 53 B.C. L. REV. 1657, 1660-63 (2012). How best to define “model” is a difficult question. *See, e.g.*, Uskali Mäki, *Realistic Realism About Unrealistic Models*, in THE OXFORD HANDBOOK OF PHILOSOPHY OF ECONOMICS 68, 75 (Harold Kincaid & Don Ross eds., 2009).

10. Many articles address what they call tax law uncertainty, but those articles address unknown *outcomes*. In contrast, this Article focuses on uncertainty in the sense of unknown *probabilities*. *See, e.g.*, James Alm, *Uncertain Tax Policies, Individual Behavior, and Welfare*, 78 AM. ECON. REV. 237, 237 (1988); Paul J. Beck & Woon-Oh Jung, *Taxpayer Compliance Under Uncertainty*, 8 J. ACCT. & PUB. POL’Y 1, 1 (1989); Mark P. Gergen, *Uncertainty and Tax Enforcement: A Case for Moderate Fault-Based Penalties*, 64 TAX L. REV. 453, 453 (2011); Kyle D. Logue, *Optimal Tax Compliance and Penalties When the Law Is Uncertain*, 27 VA. TAX REV. 241, 241 (2007); Leigh Osofsky, *The Case Against Strategic Tax Law Uncertainty*, 64 TAX L. REV. 489, 489-91 (2011); Suzanne Scotchmer & Joel Slemrod, *Randomness in Tax Enforcement*, 38 J. PUB. ECON. 17, 17 (1989); David A. Weisbach, *An Economic Analysis of Anti-Tax-Avoidance Doctrines*, 4 AM. L. & ECON. REV. 88, 105-08 (2002); *see also* Matthew D. Adler & Chris William Sanchirico, *Inequality and Uncertainty: Theory and Legal Applications*, 155 U. PA. L. REV. 279, 285 (2006) (discussing uncertainty and providing an example of uncertainty as an unknown outcome with known probabilities).

uncertainty model imagines that taxpayers determine whether to comply with tax law based not only on the fine that could be imposed, the probability of that fine, and the taxpayer's feelings about risk (unknown outcomes), but also based on how sure the taxpayer is about the probabilities he assigns to various outcomes, and how the taxpayer feels about unknown probabilities. The model provides new insights into a variety of contentious problems in tax law and policy, including how the government should reveal information about its approach to audits, whether the government should use anti-abuse rules to attack tax shelters, and whether tax professionals should be subject to penalties for providing unsupported tax advice.

Several scholars outside the legal academy have empirically studied taxpayer attitudes toward uncertainty,¹¹ but only a few legal scholars even take into account that the decision whether to comply with the tax law is a decision under uncertainty.¹² In other areas of the law, especially criminal law and tort law, some legal scholars have begun to investigate uncertainty and uncertainty aversion using a combination of theoretical, empirical, and doctrinal approaches.¹³ (The recent financial crisis may have piqued general interest in unknown probabilities, as some believe that the crisis was due in part to mistaking uncertainty for risk, unknown for known probabilities.)¹⁴ Unlike most legal scholarship that addresses uncertainty, however, this Article focuses on formal modeling, rather than empirical studies or a more intuitive (which is not to say any less valuable) analysis.

11. See, e.g., James Alm et al., *Institutional Uncertainty and Taxpayer Compliance*, 82 AM. ECON. REV. 1018 (1992); Jeff T. Casey & John T. Scholz, *Boundary Effects of Vague Risk Information on Taxpayer Decisions*, 50 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 360 (1991); Friedland, *supra* note 5, at 58; Michael W. Spicer & J. Everett Thomas, *Audit Probabilities and the Tax Evasion Decision: An Experimental Approach*, 2 J. ECON. PSYCHOL. 241 (1982). The study reported in Dipankar Ghosh & Terry L. Crain, *Structure of Uncertainty and Decision Making: An Experimental Investigation*, 24 DECISION SCI. 789 (1993), involves a known mean and a known distribution, which in my terminology is risk, not uncertainty. This Article, in other words, addresses the "narrowly defined" version of uncertainty referred to in Ghosh and Crain's article. See *id.* at 799.

12. Two exceptions are Terrence R. Chorvat, *Ambiguity and Income Taxation*, 23 CARDOZO L. REV. 617, 618-19 (2002), and Sarah B. Lawsky, *Probably? Understanding Tax Law's Uncertainty*, 157 U. PA. L. REV. 1017, 1017-18 (2009).

13. See, e.g., Tom Baker et al., *The Virtues of Uncertainty in Law: An Experimental Approach*, 89 IOWA L. REV. 443, 445 (2004); Shawn J. Bayern, *Rational Ignorance, Rational Closed-Mindedness, and Modern Economic Formalism in Contract Law*, 97 CALIF. L. REV. 943, 960-68 (2009); Daniel S. Nagin, *Criminal Deterrence Research at the Outset of the Twenty-First Century*, 23 CRIME & JUST. 1, 10-11 (1998); Uzi Segal & Alex Stein, *Ambiguity Aversion and the Criminal Process*, 81 NOTRE DAME L. REV. 1495, 1495 (2006); Eric L. Talley, *On Uncertainty, Ambiguity, and Contractual Conditions*, 34 DEL. J. CORP. L. 755, 755 (2009).

14. See, e.g., Rafael Ramirez, Op-Ed., *Five Overlooked Global Risks*, REUTERS (Sept. 15, 2009), <http://blogs.reuters.com/great-debate/2009/09/15/five-overlooked-global-risks> ("The . . . perhaps most important risk . . . is confusing categories of ignorance. This most centrally is about confusing risk with uncertainty.").

Only three pieces of legal scholarship have incorporated any of the significant amount of scholarship outside of legal academia on formal modeling of uncertainty. First, Daniel Farber has applied formal modeling of uncertainty to propose a new approach to environmental policymaking.¹⁵ Second, Eric Talley has investigated material adverse event clauses in contracts using an uncertainty modeling framework.¹⁶ The current Article takes a different approach to modeling uncertainty than either Farber or Talley.¹⁷ Finally, Joshua Teitelbaum has modeled uncertainty in tort law using the same approach as this Article: Choquet expected utility with neoadditive capacities.¹⁸

After this Introduction, Part I describes three approaches to modeling tax compliance and how scholars have used these models. Part II proposes a new model for tax compliance—the uncertainty model—that, unlike any other model of tax compliance in legal scholarship, takes uncertainty into account. Part III explores the benefits and practical consequences of the new model: the information it gives us that we can incorporate into our understanding of the law, the questions it raises that might lead to useful empirical work, and problems with translating the model directly into law.

I. THREE MODELS OF TAX COMPLIANCE

This Part considers three models that scholars and policymakers use to understand why taxpayers comply with the tax law and how to increase tax compliance. The first model, the simple cost-benefit model, posits a taxpayer who weighs the cost in dollars of complying (tax owed) against the cost in dollars of not complying (tax owed plus fine owed). This model is not generally used in scholarship, though it might be used by unsophisticated individuals who are deciding whether to take a particular tax position. The second model, the expected value model, is the most common model in tax legal scholarship. It also imagines that each taxpayer compares costs in dollars, but discounts each possible dollar outcome by the probability of that outcome. The third model, the expected utility model, is common in economic scholarship and has been incorporated into some policy documents. It posits a taxpayer who compares the

15. Daniel A. Farber, *Uncertainty*, 99 GEO. L.J. 901, 901 (2011).

16. Talley, *supra* note 13, at 755 (showing how ambiguity aversion can shed light on certain contractual terms).

17. Farber uses the α -maxmin approach, which involves weighting the best possible outcome and the worst possible outcome. *See* Farber, *supra* note 15, at 919, 930. Talley uses maxmin expected utility, which takes into account only the worst possible outcome. *See* Talley, *supra* note 13, at 778. The approach in the current Article involves, as explained further below, weighting the best possible outcome, the worst possible outcome, and the expected value.

18. Joshua C. Teitelbaum, *A Unilateral Accident Model Under Ambiguity*, 36 J. LEGAL STUD. 431, 431 (2007). To my knowledge, although Teitelbaum did not invent Choquet expected utility or Choquet expected utility with neoadditive capacities, Teitelbaum's article is the first in legal scholarship to use this model.

expected utility of various outcomes, not the expected dollar amount; this model, unlike the expected value model, can take into account taxpayers' attitudes towards risk.

One cannot, of course, determine in the abstract how useful a given model is to legal scholars and policymakers. A particular model may be useful for one sort of question but not for another. Nonetheless, better to understand when a given model may be useful, this Part evaluates each model on three criteria: the model's accuracy, the extent to which it directs legal scholarship, and its simplicity.¹⁹

First, a model may be more useful to legal scholars for certain purposes the more accurately it describes the world. For example, a more accurate model might help policymakers calibrate penalty and audit levels. One way to demonstrate the accuracy of a model is to show that an element of the model corresponds to a fact in the world—for example, that people's behavior in reality corresponds to the model's assumptions about behavior. Another way to show that a model is accurate is to show that it correctly predicts outcomes—in our case, predicts the extent to which people comply with the tax law. Second, a model can be useful if it focuses scholars' attention on factors that are susceptible to change, or suggests areas that should be further studied. Such a model is not somehow intrinsically better than a model that focuses on immutable or unreachable factors; it is more useful to legal scholars, however, to the extent that legal scholars are interested in critiquing or amending the law. Finally, a simpler model is, all else equal, better for legal scholars and policymakers, because it is easier to understand and to use.²⁰

These three criteria do not, of course, always point in the same direction. For example, a model that reflects many facts in the world and is therefore very accurate would also be complex, perhaps to the point of being unworkable. And there is no particular weight one can assign to each factor to determine that one model is somehow "better" than another in the abstract; the correct balance among the factors depends on, among other things, how the model is to be used. But these factors are nonetheless useful as a framework for comparing different models.

19. These are preliminary criteria for evaluating a legal model. In contrast to other areas, such as economics, little scholarship explicitly addresses the philosophy of modeling in legal scholarship. For further discussion, see Lawsky, *supra* note 9, at 1668-83.

20. See, e.g., Gibbard & Varian, *supra* note 9, at 672 ("When economic models are used . . . to explain casually observable features of the world, it is important that one be able to grasp the explanation. Simplicity . . . will be a highly desirable feature of such models. Complications to get as close as possible a fit to reality will be undesirable if they make the model less possible to grasp.").

A. *Simple Costs and Benefits*

1. *The model*

Perhaps the simplest way to think about the taxpayer's choice whether to comply is to think of him as comparing dollars to dollars, comparing what the law says the taxpayer will pay if he complies to what the law says he will pay if he does not comply. I call this the simple cost-benefit model. Take, for example, a taxpayer, Henry, who has pretax income (I) of \$100 and is trying to decide whether to pay a \$40 tax (T). If he does not pay the tax and is caught, he will owe the tax plus a \$10 fine (F). In the simple cost-benefit model, Henry compares \$40, the tax he will owe, with the number of dollars the law tells him he will have to pay if he does not comply—in our example, \$50, the tax plus the fine.²¹ Henry would prefer to pay as little to the government as possible, so he will choose to pay his tax. In the simple cost-benefit model, any fine will be enough to get a taxpayer to comply.

Symbolically, Henry will comply whenever he will have more money after paying the tax than after paying the tax together with the fine. That is, he will comply whenever

$$I - T > I - T - F \tag{1}$$

Obviously, this implies that a taxpayer will comply whenever $F > 0$.

2. *Evaluating the model*

The simple cost-benefit model (represented in Equation 1) may be useful in some contexts. Law enforcement, for example, sometimes encourages people to make decisions without discounting penalties by probabilities. An ad that used to play over the speakers in Washington, D.C., Metro stations asked whether eating a candy bar on the subway was worth \$100, the fine for eating on the subway. Of course, the ex ante cost of eating the candy bar was better considered to be \$100 discounted by the (extremely low) probability of the fine being imposed.

Notwithstanding its potential use as a device to encourage compliance through misinformation, the simple cost-benefit model is limited in a number of ways. This model is not terribly accurate: it does not describe how taxpayers actually make decisions because, in general, taxpayers do discount outcomes

21. We can set aside that he pays interest, as the interest serves, at least in theory, simply to make him indifferent to the time of his payment—that is, to remove any advantage that would stem from delaying the tax.

by probabilities, at least to some extent.²² The simple cost-benefit model also does not accurately predict when people will comply with the tax law, because it predicts that everyone will comply whenever penalties are greater than zero, which is clearly false.

The simple cost-benefit model does capture the important idea that taxpayers weigh costs and benefits when determining whether to comply, but aside from that, the simple cost-benefit model focuses one's attention only on whether the fine is nonzero. That is, although the size of the fine is susceptible to change, the only change this model suggests is that penalties should be greater than zero.

Finally, the simple cost-benefit model is, as its name suggests, simple, but perhaps too simple. It is nearly useless for those who wish to improve tax compliance, because it gives so little information about how to structure penalties and shape detection efforts and does not direct researchers' efforts.

B. *Expected Value*

1. *The model*

A more sophisticated model envisions a taxpayer who not only weighs costs and benefits, but also weights each possible outcome by the probability of that outcome. Consider a taxpayer who is weighing a tax position that would allow him to avoid paying a particular tax. If the taxpayer does not take this tax position, he will, under the expected value model, pay the tax (T) which reduces his pretax income (I) so that after tax, he has total income of $I - T$. If he does take the position, he might be audited or he might not be audited; if he is audited, his position might or might not be detected by the authorities; and, if the position is detected, it might or might not be upheld. Call the probability of the bad outcome p (bad from the taxpayer's perspective), where p combines all the relevant probabilities, including the chance that the IRS will audit the taxpayer, the chance that if the IRS audits the taxpayer, it will detect and challenge his position, and the chance that if the IRS detects and challenges his position, a court will ultimately strike down the position.²³

If the IRS detects and successfully challenges his position, the taxpayer must pay not only the correct amount of tax (T) but also a fine (F). If the position is successful—is not struck down—he will pay no tax at all. That is, if he

22. See, e.g., Kurt J. Beron et al., *The Effect of Audits and Socioeconomic Variables on Compliance*, in *WHY PEOPLE PAY TAXES: TAX COMPLIANCE AND ENFORCEMENT* 67, 80 (Joel Slemrod ed., 1992) (finding that increasing the probability of an audit generally increases tax compliance, but that elasticity is less than one).

23. If the probability of the bad outcome is p , the probability of the good outcome will be $(1 - p)$, because either the good outcome or the bad outcome will occur—that is, the probability of the two outcomes must, in this model, add to 1, or 100%. Probabilities do not add to 100% in all models, as discussed further below in Part II.A.

takes the position, he expects to have income equal to $p(I - T - F) + (1 - p)(I)$, because he weights each possible outcome by the probability of that outcome. The taxpayer will therefore comply when

$$I - T > p(I - T - F) + (1 - p)(I) \quad (2)$$

which can also be stated

$$pF > (1 - p)(T) \quad (2a)$$

Put another way, imagine the taxpayer is starting at $I - T$, his pretax income less his tax owed. If he cheats and doesn't get caught, he is better off by T , because he doesn't have to pay the tax. If he cheats and does get caught, he is worse off by F , because he has to pay the fine. The chance of getting caught is p , and the chance of not getting caught is $(1 - p)$, so he weights the respective outcomes by those amounts.

Return to Henry, the taxpayer with pretax income of \$100, tax owed of \$40, and a possible fine of \$10. Say that the probability of the bad outcome for Henry—the chance that Henry's position will be detected and struck down—is 75%. In this example, if Henry complies, he knows for sure that he will have \$60 (\$100, his income, less \$40, the tax he will have to pay). If he does not comply, he has a 75% chance of having to pay the fine in addition to the tax, and a 25% chance of having to pay the government nothing at all. So his expected value of not complying is

$$75\% \times (\$100 - \$40 - \$10) + 25\% \times (\$100) = \$62.50$$

Because the expected value of complying (\$60) is less than the expected value of not complying (\$62.50), in this model, Henry will not comply. (Equivalently, using Equation 2a, we know Henry will not comply because the probability of getting caught multiplied by the bad outcome (paying the fine) is $75\% \times \$10 = \7.50 , which is less than the probability of not getting caught multiplied by the good outcome (keeping the tax), $25\% \times \$40 = \10 .)

2. *Evaluating the model*

Like the simple cost-benefit model (Equation 1), the expected value model (as represented in Equations 2 and 2a) is not particularly accurate. While people do tend to discount outcomes by probabilities,²⁴ the expected value model

24. See *supra* note 22 and accompanying text.

does not actually predict compliance well, as many scholars have noted.²⁵ The probability of detection and rate of penalties are so low that the expected value model predicts that nobody should voluntarily comply with tax law.²⁶ The current audit rate for individuals is approximately 1%,²⁷ and the usual fine for underpayment is 20% of the underpayment.²⁸ In our example, the taxpayer is supposed to pay T but pays nothing, so the penalty (F) is 20% of T , or $0.2(T)$. The audit rate is 1%, and not all audited returns result in penalties,²⁹ so it is an overstatement to say that p is 1% (that is, saying p is 1% leans too strongly in favor of compliance). Even given this generous overstatement, though, the expected value model predicts that nobody will comply. A taxpayer should comply only if

$$I - T > p(I - T - F) + (1 - p)(I)$$

Or, equivalently,

$$pF > (1 - p)(T)$$

Using the values noted above for p and F ,

$$(0.01) \times (0.2T) > (1 - 0.01)(T) \\ 0.002T > 0.99T$$

This is clearly false, so the taxpayer in this model will not comply.

Of course, the relevant probability is not the actual audit rate, but rather the perceived audit rate—what the taxpayer believes the audit rate to be.³⁰ But even if we assume that, as a number of studies suggest, the taxpayer wildly overestimates the probability that the bad tax position will be apprehended and

25. See, e.g., Christopher C. Fennell & Lee Anne Fennell, *Fear and Greed in Tax Policy: A Qualitative Research Agenda*, 13 WASH. U. J.L. & POL'Y 75, 82-84 (2003); Sarah B. Lawsky, *Fairly Random: On Compensating Audited Taxpayers*, 41 CONN. L. REV. 161, 187-88 (2008); Leandra Lederman, *The Interplay Between Norms and Enforcement in Tax Compliance*, 64 OHIO ST. L.J. 1453, 1457-59, 1464 (2003); Eric A. Posner, *Law and Social Norms: The Case of Tax Compliance*, 86 VA. L. REV. 1781, 1783 (2000).

26. See, e.g., Lederman, *supra* note 25, at 1464-65.

27. See, e.g., IRS, Publication 55B, INTERNAL REVENUE SERVICE DATA BOOK 2011, at 26 tbl.9b (2012), available at <http://www.irs.gov/pub/irs-soi/11datbk.pdf> (stating that the overall audit rate for 2011 was 1.11%).

28. See 26 U.S.C. § 6662 (2011).

29. See, e.g., IRS, *supra* note 27, at 42 tbl.17 (providing information about civil penalties from fiscal year 2011).

30. See, e.g., Lawsky, *supra* note 12, at 1041 (explaining that tax compliance probabilities are best given a subjectivist, rather than a frequentist, interpretation).

struck down, the expected value model still predicts that nobody will comply. Assume the taxpayer believes, as studies suggest,³¹ that p is 50%. Under the expected value model, the taxpayer complies only if he believes that the fine would equal more than 100% of the tax owed: that is, that if he cheats and is apprehended, he will have to pay twice the tax he would have owed had he complied. No civil penalty in our system is this harsh (the harshest civil penalty for income tax offenses is for fraud, and that equals only 75% of tax underpaid attributable to fraud³²).

The expected value model fails to predict compliance in part because it omits many factors that affect whether people comply with the tax law, including, for example, compliance costs, attitudes towards tax authorities, and non-monetary costs and benefits of complying with the law. Nonetheless, although the expected value model is not particularly good at predicting tax compliance, it is superior to the simple cost-benefit model in some ways, because the expected value model directs scholars to an additional factor that is susceptible to change: the probability that the position will be struck down. Unlike the simple cost-benefit model, which implies only that the fine should be greater than zero, the expected value model suggests that certain combinations of penalties and probabilities of detection are too low. Scholars and policymakers can thus use the expected value model to propose ways to increase penalties, or increase probabilities of detection, or both.

More specifically, the legal literature on tax compliance tends to rely on the expected value model for three important insights. First, like the simple cost-benefit model, the expected value model counsels that penalties should be structured to take into account that taxpayers weigh costs and benefits when deciding whether to comply with tax law. Second, the expected value model (but not the simple cost-benefit model) suggests that increasing penalties increases compliance. Third, the expected value model suggests that if all else is equal, taxpayers will tend to comply more as the probability that their position will be struck down increases—that is, that taxpayers consider expected penalties rather than nominal penalties, by discounting nominal penalties by the chance that they will escape detection.

Kyle Logue, for example, examines a rational, risk-neutral actor who faces no external sanctions against tax noncompliance. He says that such a person would decide whether to comply based on “the probability that the particular tax question . . . will be discovered and . . . if detected . . . rejected by the [IRS],” and on “the size of the penalty.”³³ Logue presents a number of examples of taxpayers deciding whether to engage in a particular transaction by

31. See, e.g., John T. Scholz & Neil Pinney, *Duty, Fear, and Tax Compliance: The Heuristic Basis of Citizenship Behavior*, 39 AM. J. POL. SCI. 490, 497-98 (1995) (finding a perceived probability of around 48%).

32. See 26 U.S.C. § 6663(a).

33. Logue, *supra* note 10, at 245.

comparing the expected value, in dollars, of not engaging in the transaction with the expected value, in dollars, of engaging in the transaction.³⁴ The important insight, Logue explains, is that “the lower the probability of detection . . . the larger the incentive that taxpayers have to take aggressive tax positions.”³⁵ He uses this insight to propose a strict liability regime for tax penalties. He discusses risk aversion only briefly.³⁶

Similarly, Alex Raskolnikov relies on the expected value model to propose a novel approach to structuring tax penalties. Raskolnikov notes that it is an obvious and “critical” flaw in our tax penalty system that the IRS determines whom to audit in part based on “red flags” on tax returns, because taxpayers, knowing this, choose to evade tax in ways that do not raise red flags.³⁷ Taxpayers are able to decrease the probability that the penalty will be imposed, which in turn decreases their expected penalty, which in turn makes them less likely to comply with tax law.³⁸ Raskolnikov thus suggests a “self-adjusting penalty,” which would increase as taxpayers made their cheating more difficult to detect by hiding an illegitimate deduction within legitimate deductions.³⁹ In particular, if a taxpayer takes an illegitimate deduction, he would lose a portion of his legitimate deduction of the same type. The basis for Raskolnikov’s approach is, as he explains, Gary Becker’s insight that “when rational utility-maximizers decide whether to violate the law, they take into account not the nominal penalties (i.e., the sanctions set forth in the statute), but the expected ones . . . [which equal] the nominal penalty discounted by the probability that the penalty will be imposed.”⁴⁰ Like Logue, Raskolnikov briefly addresses how his proposal would interact with risk aversion, but his main insight does not depend on attitudes toward risk.⁴¹

Finally, the expected value model is quite simple. The expected value model is slightly more complex than the simple cost-benefit model, because the expected value model adds probabilities to the mix, but this does not make the model unworkable. The predominance of the expected value model in legal scholarship suggests that the slight increase in complexity is, for legal scholars, more than outweighed by the expected value model’s other benefits.

34. *Id.* at 265, 267.

35. *Id.* at 265-66.

36. *Id.* at 267, 270.

37. Alex Raskolnikov, *Crime and Punishment in Taxation: Deceit, Deterrence, and the Self-Adjusting Penalty*, 106 COLUM. L. REV. 569, 593-94 (2006).

38. *Id.*

39. *Id.* at 571-73.

40. *Id.* at 576.

41. *Id.* at 635-39.

C. *Expected Utility*

1. *The model*

The expected utility model of tax compliance is common in economic modeling and is also sometimes used by policymakers.⁴² This model posits a taxpayer who compares not the absolute amount of dollars he will receive, but rather the utility of those dollars to him.⁴³ (“Utility” here means, very roughly speaking, something that, when the taxpayer has it, he is better off.)⁴⁴

Whatever the correct definition of utility, the expected utility model imagines that the taxpayer compares the expected utility of complying to the expected utility of not complying, and complies when complying has a higher expected utility than not complying. In the expected utility model, utility is usually a function either of consumption and leisure or sometimes just of consumption, which is represented by income. In the expected utility model’s simplest version, where utility is a function only of income, and a taxpayer’s utility is represented by $U(*)$, the taxpayer complies when

$$U(I - T) > pU(I - T - F) + (1 - p)U(I) \quad (3)$$

42. In one report, for example, the Joint Committee on Taxation identified a variety of factors that could influence whether a taxpayer complied, including the probability of detection, the benefit to the taxpayer of not complying, penalties and other costs imposed if the IRS identified the taxpayer’s position, and the taxpayer’s level of risk aversion. JOINT COMM. ON TAXATION, JCS-3-9, STUDY OF PRESENT-LAW PENALTY AND INTEREST PROVISIONS AS REQUIRED BY SECTION 3801 OF THE INTERNAL REVENUE SERVICE RESTRUCTURING AND REFORM ACT OF 1998 (INCLUDING PROVISIONS RELATING TO CORPORATE TAX SHELTERS) 31 (1999).

43. This approach was introduced in Michael G. Allingham & Agnar Sandmo, *Income Tax Evasion: A Theoretical Analysis*, 1 J. PUB. ECON. 323 (1972); the model presented here is a version of their simplest model. This analysis can be complicated in any number of ways. If the position the taxpayer is considering is clearly against the tax law, the utility function could be expanded to include not only the possible monetary cost of noncompliance, but also the emotional cost, if any, of not complying; a taxpayer might have a taste for fairness that would be offended if he does not comply with the tax law. *See, e.g.*, Lawsky, *supra* note 25, at 189-94. Or complying might impose compliance costs, which would reduce the benefit of complying. Some have taken into account that the fine that the taxpayer may bear depends in part on the *chance* that the position is, as a matter of law, a good position. *See, e.g.*, Lawsky, *supra* note 12, at 1021. These variations and many more have been considered by any number of scholars. The model at the core of these variations remains the same, however: comparing expected utility.

44. There are a variety of possible definitions of utility. Some people, for example, believe that utility is equivalent to preference satisfaction; others hold the view that utility equals happiness. *See* Sarah B. Lawsky, *On the Edge: Declining Marginal Utility and Tax Policy*, 95 MINN. L. REV. 904, 911-12 (2011) (discussing various possible definitions of utility). Happily, this project does not depend on embracing a particular definition of utility.

Again, take as an example Henry, the taxpayer who has pretax income of \$100 and is trying to decide whether to pay a \$40 tax. If Henry does not pay the tax and is caught, he will owe a \$10 fine. The chance that he will be caught is 75%. Under the expected utility model, Henry compares his utility if he pays the tax, $U(100 - 40)$, to his utility if he does not pay the tax, $75\% \times U(100 - 40 - 10) + 25\% \times U(100)$. Thus, Henry will pay the tax if

$$U(60) > 75\% \times U(50) + 25\% \times U(100)$$

To evaluate this inequality, we must pick a way to evaluate Henry's utility function. In the expected utility model, a taxpayer's utility function is often taken to be the natural log of the taxpayer's income, probably because natural log is an easy function to work with and represents a person who has declining marginal utility, a popular assumption.⁴⁵ The expected utility model would thus tell us in this scenario that Henry would pay the tax, because his expected utility of complying is greater than his expected utility of not complying:

$$\begin{aligned} \ln(60) &> 75\% \times \ln(50) + 25\% \times \ln(100) \\ 4.094 &> 4.085 \end{aligned}$$

The expected utility model gives a different prediction than did the expected value model. If Henry compares the expected utility of complying with the expected utility of not complying, he will choose to comply. Recall, however, that when Henry compared the expected *value* of complying and not complying, rather than the expected *utility*, he chose *not* to comply. As noted above, the expected value of complying is \$60, but the expected value of not complying is \$62.50: $75\% \times \$50 + 25\% \times \100 . Considering expected utility, as opposed to expected value, can, in some cases, change the model's predictions.

Why might Henry prefer complying to not complying, even though he expects more income from not complying? In the expected utility model where utility is a function solely of income, there is only one reason that Henry would make such a choice: he is risk averse. He prefers to get \$60 for sure, rather than getting a chance at \$50 and a chance at \$100. He prefers to know the outcome of his choice with certainty, rather than facing risk. As the above example suggests, risk aversion is captured by the taxpayer's utility function. A taxpayer whose utility function has declining marginal utility, for whom the next dollar is worth less than the last dollar, will act as if he is risk averse.⁴⁶ That people have declining marginal utility is intuitively and perhaps morally appealing to

45. For speculation as to why people prefer to assume that people have declining marginal utility, see generally *id.* The natural log represents a taxpayer with declining marginal utility because the second derivative of the natural log is always negative. *Id.* at 915 n.46.

46. *Id.* at 916.

many,⁴⁷ and has some empirical support, so individuals are usually taken to be risk averse in the expected utility model.⁴⁸ (Of course, all this involves many assumptions, including but not limited to the assumptions that individuals' utility can be measured; that individuals have declining marginal utility; that declining marginal utility and risk aversion are equivalent; and that individuals' utility curves are best represented by a natural log curve. I accept all of these here as parts of a model, not because I accept that they are accurate descriptions of the real world.)

Legal scholars are very familiar with the concept of utility; the legal literature on how best to structure a tax system is full of references to declining marginal utility and risk aversion.⁴⁹ Indeed, the shape of an individual's utility function is crucial to, among other things, the question of how progressive a tax system should be.⁵⁰ Nonetheless, many legal scholars use an expected value model when considering compliance, rather than an expected utility model, either implicitly, by comparing dollars with dollars, or explicitly, by stating that the taxpayer in question is risk-neutral.⁵¹

2. *Evaluating the model*

The expected utility model has some advantages over the expected value model. The expected utility model can take into account people's attitudes toward risk, and individuals are not, generally, risk-neutral.⁵² And for a range of probabilities, the expected utility model is better at prediction than is the expected value model.⁵³ However, like the expected value model, the expected

47. *Id.* at 919-23.

48. *Id.* at 923-28.

49. *See, e.g.*, Joseph Bankman & Thomas Griffith, *Social Welfare and the Rate Structure: A New Look at Progressive Taxation*, 75 CALIF. L. REV. 1905, 1947 (1987) (describing the "important . . . assumption[]" that consumption has declining marginal utility); Brian Galle, *Hidden Taxes*, 87 WASH. U. L. REV. 59, 67 (2009) (stating, when discussing "distributive fairness," that "there is a diminishing marginal utility of wealth—a dollar is worth more to those who have fewer of them"); Martin J. McMahon, Jr. & Alice G. Abreu, *Winner-Take-All Markets: Easing the Case for Progressive Taxation*, 4 FLA. TAX REV. 1, 32-39 (1998) (discussing at length the assumption of declining marginal utility as a justification for progressive taxation); Daniel Shaviro, *Beyond the Pro-Consumption Tax Consensus*, 60 STAN. L. REV. 745, 756 (2007) ("Utilitarianism motivates redistribution from better-off to worse-off individuals through the assumption of diminishing marginal utility . . .").

50. *See, e.g.*, Lawsky, *supra* note 44.

51. *E.g.*, Daniel Shaviro, *Disclosure and Civil Penalty Rules in the U.S. Legal Response to Corporate Tax Shelters*, in TAX AND CORPORATE GOVERNANCE 229, 239-40 (Wolfgang Schön ed., 2008) (explicitly assuming risk neutrality when considering how penalties should be structured).

52. *See, e.g.*, Raj Chetty, *A New Method of Estimating Risk Aversion*, 96 AM. ECON. REV. 1821, 1829-31 (2006).

53. David W. Harless & Colin F. Camerer, *The Predictive Utility of Generalized Expected Utility Theories*, 62 ECONOMETRICA 1251, 1276-85 (1994).

utility model does not actually do a good job of predicting when people will comply with tax law. The expected utility model can, of course, explain compliance even if the expected *value* of complying is less than the expected *value* of not complying: people might still comply because, as in the above example, the expected *utility* of complying exceeds the expected *utility* of not complying. But the probability of detection and rate of penalties are so low that, in fact, the expected utility model would predict compliance only if individuals were extremely risk averse, far more so than any research would suggest they actually are.

The expected utility model can accommodate attitudes toward risk, which affect how best to structure tax compliance. For example, Mark Gergen has found that adding an assumption of risk aversion makes fault-based penalties preferable to strict liability penalties,⁵⁴ contrary to what other scholars have found when considering risk-neutral taxpayers.⁵⁵ However, because the expected utility model is so inaccurate, attending to the details of individuals' imagined utility functions does not allow lawmakers to fine-tune penalties or enforcement rates.

Finally, the expected utility model is more complex than the expected value model because, unlike the expected value model, the expected utility model requires lawmakers and scholars to engage with the taxpayer's utility function (or, equivalently, the taxpayer's attitude toward risk). Given the other advantages of the expected utility model over the expected value model and the relatively sparse use of the expected utility model in legal scholarship on tax compliance, legal scholars seem to give significant weight to the expected utility model's comparative (though still limited) complexity.

II. THE UNCERTAINTY MODEL OF TAX COMPLIANCE

This Part presents what I call the uncertainty model of tax compliance.⁵⁶ As described above, the expected utility model takes into account the taxpay-

54. Gergen, *supra* note 10, at 453-54; *see also* Scotchmer & Slemrod, *supra* note 10, at 17-18 (showing that in their model, under certain assumptions, uncertain outcomes can increase compliance).

55. *See, e.g.*, Shaviro, *supra* note 51, at 230-31.

56. The theory behind this model is not unique to this Article. Rather, this model follows Alain Chateaufeuf et al., *Choice Under Uncertainty with the Best and Worst in Mind: Neo-Additive Capacities*, 137 J. ECON. THEORY 538 (2007), and Teitelbaum, *supra* note 18. However, this particular application of Choquet expected utility (CEU) with neoadditive capacities to tax compliance is unique to this Article. The one prior paper that applies CEU with neoadditive capacities to tax law, Jean-Louis Arcand et al., *Who Would Benefit from Simplifying the Tax Code?: Frank Knight and Gustave Choquet Meet the Internal Revenue Service* (Centre d'Études et de Recherches sur le Développement International (CERDI), Working Paper No. 2005-09, 2005), available at <http://www.cerdi.org/uploads/ed/2006/2006.35.pdf>, takes a somewhat different, more complex approach; I indicate below the extent to which its analysis is relevant.

er's perceived probability that his position will be struck down; the amount of the fine; the amount of tax that the taxpayer will pay if he does not take the position; and the taxpayer's attitudes toward risk (as represented by the taxpayer's utility function). The uncertainty model takes not only those four items into account, but also incorporates both the taxpayer's certainty about his position and the taxpayer's attitude toward uncertainty, or, equivalently, his optimism (or pessimism) about whether his position will be struck down. Subpart A explains the motivation behind the uncertainty model, and Subpart B outlines the uncertainty model's details.

A. *Motivating the Uncertainty Model*

Legal scholarship's models of tax compliance do not take into account how to interpret probabilities. The probability that a position will be struck down (p in the above examples) encompasses a number of probabilities—the chance of audit, the chance of detection, and the chance that the position will be struck down—and none of these probabilities is known. None of these probabilities is determined by a roll of the dice. The IRS keeps its methods of selection secret, so taxpayers cannot know their chances of audit. Some taxpayers are selected at random to be audited, but many more are selected because of some combination of characteristics on their tax return or because of a particular area of compliance on which the IRS has chosen to focus. The chance that a position will be detected if the return is audited, and the chance that a particular tax position will be struck down, are also unknown probabilities.⁵⁷

Thus, to say that a transaction has a 40% chance of succeeding on the merits does not mean that “if it were feasible and cost-justified to audit all 100,000 taxpayers who engaged in this transaction, approximately 60,000 of the taxpayers would be found to owe [additional taxes], and the other 40,000, nothing.”⁵⁸ Rather, the quantification of this probability reflects the speaker's degree of belief. To say that a position has a 40% chance of succeeding on the merits is to make a statement about how strongly you believe that particular transaction is a good transaction. That is, the statement “a position has a 40% chance of succeeding” can be taken as equivalent to, “I would pay \$40 to win \$100 if this position succeeds.”⁵⁹

The expected utility model described above⁶⁰ assumes that people assign probabilities to events, and that these probabilities can be represented by a single number. In the expected value and expected utility models of tax compliance, probabilities add to 100%. If there is a 40% chance that a position will be upheld, then there is a 60% chance that it will be struck down. If tax proba-

57. See Lawsky, *supra* note 12, at 1067-68.

58. Logue, *supra* note 10, at 288.

59. See Lawsky, *supra* note 12, at 1028-29.

60. See *supra* Part I.C.

bilities reflected how frequently each event would occur, then it would make sense that the probabilities should sum to 100%, as one or the other event would occur: the position will be upheld or struck down. For example, if there is a 1 in 36 chance that two rolled dice will add to 12, then there must be a 35 in 36 chance that they will not, because there are only two options: the dice will add to 12, or the dice will not add to 12. If we roll the dice many, many times, we will see that some of those rolls add to 12, and some do not. When we consider 100% of the rolls, we will divide the total number into exactly two groups: rolls that added to 12, and rolls that did not.

But, as economist and mathematician David Schmeidler famously noted, this approach does not seem to correspond to how people actually think about probabilities.⁶¹ The expected utility approach does not take into account how a person feels about the amount of information upon which he bases a given probability. Thus probabilities as people actually think of them may fail to follow so-called rules of probabilities.⁶² Probabilities need not add to 100% when they reflect not the frequency of an event's occurrence, but rather the degree of belief a person has about the chance that the event will occur. When a person does not like uncertainty—does not like not knowing probabilities—then the sum of the probability that an individual assigns to two events that are mutually exclusive (only one can happen) and exhaustive (one of the two must happen) can add to less than 100% if the person does not know the probability that each will occur. The missing part represents the person's aversion to uncertainty or, put another way, the amount the person is willing to pay to avoid a situation with unknown probabilities.

The Ellsberg paradox illustrates this point.⁶³ Imagine two urns. Known Urn has 100 balls, 50 black and 50 red. Unknown Urn also has 100 balls, some red and some black, but the number of red and black balls, respectively, is unknown.⁶⁴

First, Picker is told that he must bet on red, but he can choose which urn to draw from. Research shows that most people would choose to draw from Known Urn.⁶⁵ That is, most people would prefer to bet that a red ball will be drawn from Known Urn, rather than to bet that a red ball will be drawn from

61. David Schmeidler, *Subjective Probability and Expected Utility Without Additivity*, 57 *ECONOMETRICA* 571, 572 (1989).

62. Cf. Samuelson, *supra* note 1 (illustrating that individuals' preferences do not always conform to axioms that theoretically define individual preferences).

63. Itzhak Gilboa notes that Schmeidler's critique was cognitive, and not based on behavioral examples such as the Ellsberg paradox, which exhibits certain symmetries that might allow for a "correction" of the problem, in particular resort to Laplace's principle of insufficient reason. Itzhak Gilboa, *Introduction to UNCERTAINTY IN ECONOMIC THEORY* 3, 4-5 (Itzhak Gilboa ed., 2004). Nonetheless, the Ellsberg paradox does provide, in Gilboa's own terms, an "elegant illustration" of the problem at hand. *Id.* at 5.

64. See Daniel Ellsberg, *Risk, Ambiguity, and the Savage Axioms*, 75 *Q.J. ECON.* 643, 650-53 (1961).

65. See *infra* Part III.A.

Unknown Urn. If Picker prefers to draw from Known Urn, he is acting as if the probability of drawing a red ball from Known Urn is greater than the probability of drawing a red ball from Unknown Urn.

Next, Picker is told he must bet on black. But again, he can choose which urn to draw from. And again, if Picker is like most people, he will prefer to draw from Known Urn. So Picker is acting as if the probability of drawing a black ball from Known Urn is greater than the probability of drawing a black ball from Unknown Urn.

Picker would rather pick a red ball from Known Urn than a red ball from Unknown Urn, so he is acting like the probability of getting a red ball from Known Urn is greater than the probability of getting a red ball from Unknown Urn.⁶⁶ He also would rather pick a black ball from Known Urn than a black ball from Unknown Urn. So Picker is also acting like the probability of picking a black ball from Known Urn is greater than the probability of picking a black ball from Unknown Urn.⁶⁷

If both of those are true, then Picker seems to believe that the probability of picking a red ball from Known Urn plus the probability of picking a black ball from Known Urn is greater than the probability of picking a red ball from Unknown Urn plus the probability of picking a black ball from Unknown Urn.⁶⁸

This is strange. If Picker draws a ball from Known Urn, the ball will either be black or it will be red. The two events are mutually exclusive and exhaustive, so the probability of one or the other's happening should equal 100%.⁶⁹ But the chance of drawing either a red ball or a black ball from Unknown Urn should also add to 100%. A ball from the Unknown Urn is also, after all, either red or black, either red or not-red.⁷⁰ So it seems that the probability of picking either a red or black ball from Known Urn should equal the probability of picking either a red or black ball from Unknown Urn.⁷¹ In other words, if the probability of an event happening, plus the probability of an event not happening, really add up to 100%, Picker's preferences violate one of Savage's axioms of probability, the Sure Thing Principle.⁷²

Does this mean that Picker is wrong, that he is not rational? If we explain all this to Picker, will he see the error of his ways and change his mind?

66. That is, Picker is acting like $\text{Pr}(\text{Red from Known}) > \text{Pr}(\text{Red from Unknown})$.

67. $\text{Pr}(\text{Black from Known}) > \text{Pr}(\text{Black from Unknown})$.

68. $\text{Pr}(\text{Red from Known}) + \text{Pr}(\text{Black from Known}) > \text{Pr}(\text{Red from Unknown}) + \text{Pr}(\text{Black from Unknown})$.

69. $\text{Pr}(\text{Red from Known}) + \text{Pr}(\text{Black from Known}) = 100\%$.

70. $\text{Pr}(\text{Red from Unknown}) + \text{Pr}(\text{Black from Unknown}) = 100\%$.

71. $\text{Pr}(\text{Red from Known}) + \text{Pr}(\text{Black from Known}) = \text{Pr}(\text{Red from Unknown}) + \text{Pr}(\text{Black from Unknown})$.

72. See Ellsberg, *supra* note 64, at 651; see also LEONARD J. SAVAGE, THE FOUNDATIONS OF STATISTICS 21-26 (1954) (introducing and explaining the Sure Thing Principle).

Perhaps. Or perhaps Picker will stand firm in his decision, because Picker does not like uncertainty. (As discussed below, many people do stand firm.)⁷³ He does not like having no information about the balls in Unknown Urn. He would prefer to bet less if he does not know the odds. He is, in short, uncertainty averse.⁷⁴

A person is uncertainty averse if, all else equal, he prefers to know the probabilities of the outcomes of choices he makes. Picker is uncertainty averse because he prefers to pick from an urn where he knows the contents, and thus the odds of each possible outcome, even though he does not know the outcome itself. A person could also prefer uncertainty; that person would prefer to pick from an urn where he did not know the contents and thus did not know the odds or the outcome.

Tax compliance often involves unknown probabilities—uncertainty, not risk. Deciding whether to comply with tax law is more like picking from Unknown Urn than from Known Urn, and therefore attitudes toward uncertainty may be relevant to whether people comply with the tax law. None of the current models of tax compliance, however, take attitudes toward uncertainty into account.

B. *The Uncertainty Model*

This Subpart proposes a model of tax compliance that incorporates attitudes toward uncertainty. There are a number of approaches to modeling uncertainty; this Article uses the approach known as Choquet expected utility (CEU) with neoadditive capacities.⁷⁵

The uncertainty model begins with the taxpayer's expected utility, but expected utility does not necessarily determine the taxpayer's overall utility in the uncertainty model. Instead, the taxpayer's expected utility is given weight only to the extent the taxpayer is certain about the probability that his position

73. See discussion *infra* Part III.A.

74. Uncertainty aversion (or, as it is sometimes called, ambiguity aversion) is not the same as risk aversion, and a model that takes into account risk aversion does not necessarily take into account uncertainty aversion. Picker might also be risk averse (we can't tell from the above example, but many people are risk averse). A person is risk averse if, given known odds, he prefers knowing the outcome of an event to not knowing the outcome—that is, if he prefers not to have to deal with probabilities at all. In contrast, a person is uncertainty averse if, loosely speaking, given an unknown outcome, he prefers knowing the odds to not knowing the odds. Risk aversion can easily be included in the expected utility model, and indeed, as described above, that people are risk averse (and thus have concave utility curves) is usually one of the assumptions in the expected utility model. See *supra* note 48 and accompanying text. Uncertainty aversion cannot be included in the expected utility model.

75. Choquet expected utility was introduced in Schmeidler, *supra* note 61. This approach is called “Choquet” expected utility because it relies on a definition of integral proposed by Choquet. *Id.* at 580-81. CEU with neoadditive capacities was introduced in Chateauneuf et al., *supra* note 56, and applied to legal analysis in Teitelbaum, *supra* note 18, which modeled tort law.

will be successful. To the extent the taxpayer is uncertain about the probability that his position will be successful, his utility is determined by his feelings about uncertainty.

The uncertainty model thus arrives at the taxpayer's utility by combining two parts, the "certainty component" and the "uncertainty component." The "certainty component" is just the taxpayer's expected utility. If the taxpayer knows that his belief about the probability is correct, this component alone describes the taxpayer's decisionmaking. The "uncertainty component" is the extra weight the taxpayer gives to a good (or bad) outcome. The certainty component is weighted by the taxpayer's certainty, and the uncertainty component is weighted by the taxpayer's uncertainty. The two components are then added together to arrive at the taxpayer's total CEU.

If the taxpayer has no doubt about the probability that his position will be successful, the uncertainty model is identical to the expected utility model. Similarly, if the taxpayer is, in the face of uncertainty, neither optimistic nor pessimistic—if he overweights neither good outcomes nor bad outcomes when faced with uncertainty—the uncertainty model and the expected utility model are identical. If the taxpayer is not sure that his belief about his probability is correct, however, and the taxpayer (like many people⁷⁶) overweights either good or bad outcomes, the expected utility model and the uncertainty model will not be identical.

This Subpart explains the two components of the uncertainty model, the certainty component and the uncertainty component; how the two components are combined to arrive at the taxpayer's CEU; and how the CEU of taking an uncertain tax position should be compared to the CEU of not taking that position.

1. *The certainty component*

The uncertainty model begins with the taxpayer's expected utility. In the best outcome (for the taxpayer), the taxpayer gets to keep all of his income (I), because he pays no tax. In the worst outcome, the taxpayer has income $I - T - F$; that is, he pays not only the tax, $T > 0$, but also a fine, $F > 0$. If the taxpayer takes a particular tax position and either is not audited or is audited and his position is upheld, he will have income I .

The probability that the position will be struck down is p , which is meant to represent, as in both the expected value and expected utility models described above, the taxpayer's belief,⁷⁷ and each outcome is weighted by the probability that the outcome will occur. So, as described above, where the

76. See *infra* Part III.A.

77. See generally Lawsky, *supra* note 12, at 1023-24 (arguing that probabilities in the expected utility model as applied to tax compliance are best interpreted as degrees of belief).

taxpayer's utility is $U(*)$, the taxpayer's expected utility of taking this position equals

$$pU(I - T - F) + (1 - p)U(I) = \text{Expected Utility} = \text{Certainty Component}$$

This is the taxpayer's expected utility, and also the certainty component of the uncertainty model.

Because p , the probability of the bad outcome, is just the taxpayer's belief about the probability of the outcome, the taxpayer may have reason to doubt the probability. Remember the two urns, Known and Unknown.⁷⁸ Picker had no reason to think that Unknown Urn contained anything except an even mix of black and red balls, so he had no reason to assign anything but an even chance to drawing a red ball and drawing a black ball from that urn. But that did not mean that he felt the same certainty about these even odds as he did about the even odds of drawing a red ball from Known Urn, which he knew contained 50 red balls and 50 black balls.

In the uncertainty model, the taxpayer's extent of doubt is represented by δ , where δ is between 0 and 1, inclusive.⁷⁹ If $\delta = 0$, the taxpayer feels no doubt about the probability he assigns to an event (for example, the taxpayer feels sure that there are 50 red and 50 black balls in the urn). His extent of certainty (his degree of confidence) is represented by the complement of his uncertainty—that is, $(1 - \delta)$. The certainty component, his expected utility, is weighted by the extent of his certainty:

$$(1 - \delta) \times \text{Expected Utility} = \\ (1 - \delta)[pU(I - T - F) + (1 - p)U(I)]$$

If the taxpayer has no doubt about the probability he assigns to an event, the certainty component weighted by the taxpayer's degree of confidence equals the taxpayer's expected utility. If the taxpayer has doubt about this probability, the weighted certainty component is less than the taxpayer's expected utility (because if $\delta > 0$, then $(1 - \delta) < 1$).

2. *The uncertainty component*

The uncertainty model next accounts for the taxpayer's approach to unknown probabilities. In the uncertainty model, a taxpayer may be optimistic or pessimistic. "Optimistic" for these purposes means simply that the taxpayer tends to think that the best result is more likely to happen than its probability suggests; he overweights the good result. This is equivalent to preferring uncer-

78. See *supra* Part II.A.

79. See Chateaufeuf et al., *supra* note 56, at 541, 544.

tainty. If we say the taxpayer is pessimistic, we mean that he tends to think things are more likely to go badly than the probability he has assigned to events suggests; he overweights the bad result, which is equivalent to being uncertainty averse.⁸⁰ The extent of the taxpayer's pessimism equals α , where α is between 0 and 1. If the taxpayer is completely pessimistic—that is, he thinks that all else being equal, the worst will happen—then $\alpha = 1$. The taxpayer's optimism is the complement of his pessimism, that is, his optimism equals $(1 - \alpha)$.⁸¹

The uncertainty component equals the bad outcome, weighted by the extent of the taxpayer's pessimism, plus the good outcome, weighted by the extent of the taxpayer's optimism:

$$\alpha U(I - T - F) + (1 - \alpha)U(I) = \text{Uncertainty Component}$$

The uncertainty component is relevant only to the extent of the taxpayer's uncertainty, so it is weighted by his degree of uncertainty:

$$\delta \times \text{Uncertainty Component} = \\ \delta[\alpha U(I - T - F) + (1 - \alpha)U(I)]$$

3. Combining the components

In the uncertainty model, the CEU of taking the tax position is the sum of the two weighted components:

$$\text{CEU} = (1 - \delta) \times \text{Certainty Component} + \delta \times \text{Uncertainty Component} = \\ (1 - \delta)[pU(I - T - F) + (1 - p)U(I)] + \delta[\alpha U(I - T - F) + (1 - \alpha)U(I)] \quad (4)$$

If the taxpayer feels complete certainty about his position, then the expected value model and the uncertainty model are the same. In the case of complete certainty, $\delta = 0$, the uncertainty component drops out completely, and the weight given to the certainty component equals one:

$$(1 - \delta)(pU(I - T - F) + (1 - p)U(I)) + \delta[\alpha U(I - T - F) + (1 - \alpha)U(I)] = \\ (1 - 0)(pU(I - T - F) + (1 - p)U(I)) + 0[\alpha U(I - T - F) + (1 - \alpha)U(I)] =$$

80. *Id.* at 542 (“[I]t is straightforward to check that of two decision makers with the same beliefs and degrees of ambiguity . . . , the one with [more pessimism] is more ambiguity-averse . . .”).

81. I follow Teitelbaum, *supra* note 18, here in assigning $\alpha = 1$ for complete pessimism; Chateauneuf et al., *supra* note 56, assign $\alpha = 0$ to pessimism. The Teitelbaum approach makes more sense for my purposes, because tax scholarship generally sets p to the probability of the tax position being struck down—that is, the probability of the bad event occurring.

$$pU(I - T - F) + (1 - p)U(I)$$

Because the certainty component equals the taxpayer's expected utility, in the case of complete certainty, the two models are identical.

If the taxpayer has some uncertainty about the probabilities he assigns to each outcome, the two models may be different, depending on how the taxpayer feels about uncertain outcomes. This is made clear by rewriting the sum of the weighted certainty component and the weighted uncertainty component as

$$CEU = [\delta(1 - \alpha) + (1 - \delta)(1 - p)]U(I) + [\delta\alpha + (1 - \delta)p]U(I - T - F) \quad (4a)$$

$U(I)$ is the good outcome and $U(I - T - F)$ is the bad outcome. The uncertainty model thus weights the good outcome and the bad outcome differently than does the expected utility model. The expected utility model weights the good outcome by its probability, $(1 - p)$, and the bad outcome by its probability, p . The uncertainty model, in contrast, adjusts the weight given to the good and bad outcomes, respectively, by taking into account both the taxpayer's degree of uncertainty and the taxpayer's optimism or pessimism.

The good outcome is weighted by $(1 - p)$ only to the extent the taxpayer is certain of probability p . If the taxpayer is uncertain about this probability—is not sure that his belief is correct—the weight given to the good outcome may either increase or decrease, depending on whether the taxpayer is optimistic or pessimistic. If the taxpayer tends to overweight good outcomes when he makes a decision—to weight them more than the probability he has assigned to them would suggest—then the weight assigned to the good outcome will increase under the uncertainty model.⁸² That is, an optimistic taxpayer acts as if

$$\delta(1 - \alpha) + (1 - \delta)(1 - p) > (1 - p)$$

Similarly, a pessimistic taxpayer gives more weight to the bad outcome than the probability suggests he should; he acts as if

$$\delta\alpha + (1 - \delta)p > p$$

The simplified sum makes obvious that the expected utility model (Equation 3) and the uncertainty model (Equations 4 and 4a) are the same if the taxpayer is neither optimistic nor pessimistic. Saying that an optimistic taxpayer overweights the good outcome is saying that

$$\delta(1 - \alpha) + (1 - \delta)(1 - p) > (1 - p)$$

82. See Teitelbaum, *supra* note 18, at 440 & n.20 for a discussion of the effect of overweighting on uncertainty modeling and for an explanation of the following equation.

which simplifies to

$$\alpha < p$$

The taxpayer is therefore optimistic if $\alpha < p$. Through similar reasoning, the taxpayer is pessimistic if $\alpha > p$. If the taxpayer overweights neither position, then $\alpha = p$. Where $\alpha = p$,

$$\begin{aligned} &[\delta(1 - \alpha) + (1 - \delta)(1 - p)]U(I) + [\delta\alpha + (1 - \delta)p]U(I - T - F) = \\ &[\delta(1 - p) + (1 - \delta)(1 - p)]U(I) + [\delta p + (1 - \delta)p]U(I - T - F) = \\ &(1 - p)U(I) + pU(I - T - F) = \text{Expected Utility} \end{aligned}$$

The uncertainty model provides different results than the expected utility model whenever the taxpayer is not certain of the probability he assigns to the outcome, *and* he is either optimistic or pessimistic (that is, he overweights good events or overweights bad events).

4. *Weighing outcomes*

Of course, a taxpayer deciding whether to take a tax position does not determine his utility in just one scenario. To decide whether to take a position, under the uncertainty model, the taxpayer compares the CEU of taking the position with the CEU of not taking the position.

The CEU of not taking the position is straightforward if we assume that the position in question is the only doubtful transaction on the taxpayer's return. If the taxpayer does not take the position, $\delta = 0$ (and $p = 0$), because there is no uncertainty about his tax treatment, and the position will not be struck down. The best-case and worst-case scenarios are identical, as is his expected utility: that the taxpayer has income $I - T$. Therefore, his CEU equals

$$[0(1 - \alpha) + (1 - 0)(1 - 0)]U(I - T) + [0 + 1]U(I - T) = U(I - T)$$

Under the uncertainty model, the taxpayer will take a tax position when the CEU of not taking the position is less than the CEU of taking the position, that is, when

$$U(I - T) < [\delta(1 - \alpha) + (1 - \delta)(1 - p)]U(I) + [\delta\alpha + (1 - \delta)p]U(I - T - F) \quad (5)$$

5. *A tax compliance example*

In the uncertainty model, tax compliance depends not only on the probability that a position will be struck down and the amount of the fine, but also the

amount of uncertainty and the taxpayer's pessimism (or optimism)—that is, his attitude toward uncertainty.

In other words, to get the taxpayer not to take the position, the government should look for ways to reduce the right-hand side of Equation 5, above, so that the CEU of not complying is less than the CEU of complying. As discussed, in the expected utility model, the only ways to reduce the expected utility (as opposed to the CEU) of taking a tax position are to increase the probability that the position will be struck down; increase the fine to which the taxpayer will be subject if the position is struck down; or increase the riskiness of the position (that is, increase the variance). The uncertainty model highlights other reasons that a taxpayer might comply. As in the expected utility model, the utility of taking the position (that is, the right-hand side of the inequality) will, all else equal, decrease as the probability of detection, p , grows; the bigger p gets, the more weight is put on the worst-case scenario, the chance of having to pay both the tax and the fine. And of course the CEU of taking the position also decreases as the fine increases. The CEU of taking the position can also change, however, as the level of uncertainty changes, or as a taxpayer's attitude toward uncertainty becomes more (or less) optimistic (or pessimistic).⁸³ The uncertainty model suggests, therefore, that to increase tax compliance the government could adjust levels of uncertainty.

The more pessimistic the taxpayer is, the more he will avoid taking the position. In the starkest case, complete pessimism, where $\alpha = 1$, the best-case scenario is weighted by only $(1 - \delta)(1 - p)$, and the worst-case scenario is weighted by $\delta + (1 - \delta)p = \delta(1 - p) + p$, which, obviously, exceeds p by $\delta(1 - p)$. Depending on how uncertain the situation is—how large δ is—the overweighting could be quite drastic indeed; as δ approaches 1, this weight also approaches 1. In complete uncertainty (not knowing anything about the colors of the balls in the urn), the extremely pessimistic taxpayer would not take the position at all, no matter how high he believed the probability of success was.

Simply increasing uncertainty will not, however, necessarily result in more tax compliance, because taxpayers are not necessarily pessimistic. Some taxpayers may even prefer uncertainty (though in general, as discussed below, people tend to be uncertainty averse). If a taxpayer is completely optimistic, he will weight the best-case scenario by $\delta + (1 - \delta)(1 - p)$. In the case of complete optimism, $\alpha = 0$, and complete uncertainty, $\delta = 1$, the taxpayer will take the position no matter what; he will give full weight to the good outcome.

Return to the example where Henry has income (I) of \$100 and a possible tax (T) of \$40, facing a potential \$10 fine (F). As before, assume that Henry's utility function is represented by the natural log of income, but now p , Henry's

83. Although it is a possible solution, a policymaker looking for ways to reduce the right-hand side of the equation would probably not attempt to change taxpayers' attitudes toward uncertainty; among other reasons, these attitudes may well be fixed. Taxpayers' attitudes are generally relevant, however, when considering whether taxpayers will comply.

assessment of the probability that his position will be struck down, is 65%, rather than 75%. In the expected utility model, Henry will not comply, because the expected utility of complying and paying the \$40 tax, $\ln(60)$, is less than the expected utility of not complying:

$$\begin{aligned}\ln(60) &< 65\% \times \ln(50) + 35\% \times \ln(100) \\ 4.094 &< 4.155\end{aligned}$$

But Henry may not have enough information to feel certain about the 65% chance he assigns to the bad outcome. Perhaps he does not know audit rates, or does not fully understand the tax law, or there is no guidance on the position he is taking. And assume as well that Henry is pessimistic (or, equivalently, uncertainty averse). The uncertainty model, unlike the expected utility model, can take Henry's doubt or pessimism into account. Quantify Henry's doubt, δ , as 70%. Assume Henry moderately overweights bad outcomes, so that while he believes the probability of being caught is 65%, he overweights the chance of being caught. Quantify his pessimism as 80%. (Because 80% is greater than 65%, he is pessimistic.) With these facts, the CEU of complying (4.094) is greater than the CEU of not complying (4.082):

$$\begin{aligned}\ln(60) &> (1 - \delta)[pU(I - T - F) + (1 - p)U(I)] + \delta[\alpha U(I - T - F) + (1 - \alpha)U(I)] \\ 4.094 &> (0.3)[0.65 \times \ln(50) + 0.35 \times \ln(100)] + (0.7)[0.8 \times \ln(50) + 0.2 \times \ln(100)] \\ 4.094 &> 4.082\end{aligned}$$

In the uncertainty model, therefore, the taxpayer will comply, a different result than under the expected utility model.

III. THE UNCERTAINTY MODEL'S USEFULNESS FOR TAX LAW

This Part investigates possible implications of the uncertainty model for shaping tax law and policy. Subpart A provides an overview of research on individuals' attitudes toward uncertainty. Subpart B discusses the model's implication that in some situations, the government should increase uncertainty to increase compliance. Subpart C considers whether uncertainty and attitudes toward uncertainty justify imposing penalties on tax advisors who recommend aggressive tax positions. Subpart D explains how the uncertainty model can guide researchers toward particular questions regarding taxpayers' attitudes toward uncertainty that could help increase compliance. And, finally, Subpart E addresses the objection that the uncertainty model introduces too much complexity to be of use.

A. Attitudes Toward Uncertainty

Because the uncertainty model depends not only on the degree of uncertainty, but also on taxpayers' attitudes toward uncertainty, the implications of the model for the real world depend on what those attitudes actually are. Research shows that many people are uncertainty averse.⁸⁴ A variety of experiments replicate the Ellsberg paradox,⁸⁵ finding that people were willing to pay up to 70% of expected value in order to avoid uncertainty,⁸⁶ while other studies confirm uncertainty aversion outside of the context of the Ellsberg paradox.⁸⁷ Studies also show that the Ellsberg paradox is not simply an error in judgment that will be corrected when someone explains "how probability works" to those who prefer known probabilities.⁸⁸

However, people appear to be more uncertainty averse when presented with both a certain and an uncertain option, as opposed to only an uncertain option.⁸⁹ That is, when presented with a choice between a known and an unknown probability, individuals will prefer the known probability, but individuals do not discount unknown probabilities as much in the absence of a known probability. The Ellsberg paradox thus stands up to testing, because it asks people to choose between picking from Known Urn, an urn whose contents they know, and Unknown Urn, whose contents they do not know. For example, in one study, subjects asked to price both picking from Known Urn and picking from Unknown Urn were willing to pay much more to pick from Known Urn: \$24.34 for Known Urn, as opposed to \$14.85 for Unknown Urn.⁹⁰ But when another group was asked to price picking from Known Urn, and a third, separate group was asked to price picking from Unknown Urn, the prices converged, and even flipped: the subjects were actually willing to pay slightly more to pick from Unknown Urn than from Known Urn (\$18.42 for Unknown

84. See, e.g., Camerer & Weber, *supra* note 4, at 360; Hsu et al., *supra* note 4, at 1680, 1682; Gideon Keren & Léonie E.M. Gerritsen, *On the Robustness and Possible Accounts of Ambiguity Aversion*, 103 ACTA PSYCHOLOGICA 149, 149 (1999) ("Ambiguity aversion is one of the most robust phenomena documented in the decision making literature . . .").

85. See discussion *supra* Part II.A.

86. Camerer & Weber, *supra* note 4, at 333-34 & tbl.3 (summarizing a number of studies).

87. *Id.* at 340-41; see also, e.g., Hsu et al., *supra* note 4, at 1682 (finding neurological evidence of uncertainty aversion).

88. Camerer & Weber, *supra* note 4, at 337 (citing several studies on this point).

89. Craig R. Fox & Amos Tversky, *Ambiguity Aversion and Comparative Ignorance*, 110 Q.J. ECON. 585, 599 (1995). Fox and Tversky propose a difference framework for understanding their results, but arguably their "comparative ignorance" approach can be handled by the same conceptual framework as ambiguity aversion. See, e.g., Horacio Arlo-Costa & Jeffrey Helzner, *Comparative Ignorance and the Ellsberg Phenomenon*, in PROCEEDINGS OF THE FOURTH INTERNATIONAL SYMPOSIUM ON IMPRECISE PROBABILITIES AND THEIR APPLICATIONS 2-3, 8-9 (2005); Keren & Gerritsen, *supra* note 84, at 169-70.

90. Fox & Tversky, *supra* note 89, at 588-89.

Urn as opposed to \$17.94 for Known Urn).⁹¹ At least one other study has found that uncertainty aversion does not disappear entirely in the absence of an alternative choice with known probability, but that it does diminish.⁹²

Thus, as described further below, any implications of the uncertainty model should take into account both uncertainty aversion, when taxpayers are faced with a certain and uncertain option, and diminished uncertainty aversion when taxpayers are faced only with an uncertain option.

B. *Manipulating Uncertainty*

Because most people are uncertainty averse, the uncertainty model might seem to imply that the government could use uncertainty strategically to increase tax compliance.⁹³ This approach may, however, be ineffective or undesirable in the real world in some situations, for reasons not immediately apparent from the model.

To the extent that people are uncertainty averse, increasing taxpayers' uncertainty should also increase tax compliance, even if neither penalty levels nor actual audit frequency increases. As the example above suggests,⁹⁴ in some situations, a taxpayer's expected utility of not complying could exceed his expected utility of complying, but with sufficient uncertainty (and sufficient uncertainty aversion), the outcome could flip, and the CEU of complying could exceed the CEU of not complying. In other words, with sufficient uncertainty and uncertainty aversion, a taxpayer will comply even if the expected utility model (as opposed to the uncertainty model) suggests that he will not comply.

However, if uncertainty is to help increase compliance, there must be another choice for the taxpayer that permits him to avoid uncertainty, or at least face lower uncertainty. The taxpayer in the example above did not choose to comply with the tax law simply because the tax law was uncertain. Rather, he chose to comply because if he complied (chose not to take the position), he

91. *Id.*

92. In Clare Chua Chow & Rakesh K. Sarin, *Comparative Ignorance and the Ellsberg Paradox*, 22 J. RISK & UNCERTAINTY 129 (2001), the authors reported a study finding that subjects were willing to pay \$33.17 for a certain bet and \$25.05 for an uncertain bet in a comparative condition, and \$30.12 for a certain bet and \$25.59 for an uncertain bet in a noncomparative condition. *Id.* at 133-34. The authors noted that "[t]he key finding that emerges from our experiments is that comparison enhances the difference in prices between clear and vague bets. In absence of a direct comparison . . . this difference is smaller but it does not disappear." *Id.* at 136.

93. This discussion assumes that the goal is to maximize compliance with the tax law. Of course, it might be better, in a larger sense, for individuals not to comply with tax law. The law itself may be flawed; it is not impossible, for example, that a taxpayer could do more to maximize overall welfare by investing his money in something other than the U.S. government. But this Article assumes for the sake of discussion that the government should maximize compliance.

94. *See supra* Part II.B.5.

faced no uncertainty, whereas if he did take the position, he faced uncertainty (in addition to a possible penalty). Thus, the model recommends that the government should manipulate uncertainty by making some sorts of tax positions subject to uncertainty, while leaving others subject to little or no uncertainty. In other words, the model suggests the government should very roughly break tax behavior into two categories: an uncertainty-free but still risky category (corresponding to the left-hand side of the uncertainty model) and an uncertainty category (corresponding to the right-hand side).

The uncertainty model thus supports the government's keeping certain information secret. For example, the IRS decides whom to audit based on, among other methods, something called the "Discriminant Index Function" (DIF), which uses a statistical profile to determine which tax returns are more likely to exclude income.⁹⁵ The IRS keeps the DIF a secret, so that taxpayers do not know the probability that their tax return will be flagged by the DIF and selected for further review.⁹⁶ The uncertainty model suggests that revealing the DIF, or otherwise providing taxpayers with information about the probability that they will be audited, could reduce compliance.

The uncertainty model also suggests, however, that there is a second piece to handling information about the DIF: the government should (as it does) make public that some suspicious combinations of information on a tax return are more likely to trigger an audit than others, and that avoiding these "red flags" reduces or eliminates the chance of being caught by the DIF and leaves a taxpayer open primarily to audits at a known audit rate. By implying that taxpayers who engage in standard, uninteresting behavior (for example, earning only income subject to information reporting, and taking the standard deduction) will not be caught by the DIF, the government creates the uncertainty-free left-hand side of the model. By refusing to release the DIF or provide details about how it works, the government creates the uncertainty in the right-hand side of the model for taxpayers who engage in some range of more questionable transactions.

The uncertainty model provides less support, however, for creating uncertainty not only about the probability of audit, but also, in certain situations, about the substance of the law itself. Recall that δ includes uncertainty not only about the probability that one will be audited, but also about the probability that if one is audited, a court would strike down the tax position in question. Thus the uncertainty model might appear to suggest that if the government wants to drive taxpayers away from some class of transactions, it should make the parts of the tax law relating to those transactions unclear so that the probability of success of those tax positions is uncertain. The uncertainty model, in other words, might seem to suggest that legal uncertainty is not always bad. (By "legal uncertainty," I do not mean only that taxpayers do not know the substantive

95. Lawsky, *supra* note 25, at 165-66.

96. Lawsky, *supra* note 12, at 1068-69.

outcome of taking a particular tax position; rather, I mean that they do not know the substantive outcome *and* they do not know the probabilities of the various possible outcomes.)

It might initially seem, therefore, that the uncertainty model adds new support for standards in the longstanding debate about rules and standards in the tax law.⁹⁷ Consider, for example, the question of whether anti-abuse doctrines should be used to fight tax shelters, transactions that “appear to comply in a literal manner with the [Internal Revenue] Code, but which are designed to reach a tax result that Congress would not have intended.”⁹⁸ The government’s main weapons against tax shelters are standard-like common law doctrines, such as the sham transaction doctrine,⁹⁹ the business purpose doctrine,¹⁰⁰ and the economic substance doctrine,¹⁰¹ that can apply to strike down even transactions that adhere to the letter of the tax law. Additionally, an anti-abuse standard for tax shelters was codified in 2010.¹⁰² The statute permits a court to strike down a transaction that adheres to the rest of the tax law if the transaction does not change the taxpayer’s economic position in a “meaningful way,” or the taxpayer does not have a “substantial purpose” aside from tax effects for entering into the transaction.¹⁰³ It is, needless to say, difficult to tell in advance what transactions would violate this provision, and the IRS has declined to issue an “angel list” that lists particular transactions that would be unaffected by the statute,

97. The literature on this topic is voluminous. *See, e.g.*, Mark P. Gergen, *The Common Knowledge of Tax Abuse*, 54 SMU L. REV. 131 (2001) (arguing in favor of standards); Alan Gunn, *Tax Avoidance*, 76 MICH. L. REV. 733 (1978) (arguing against standards, and in particular that “tax-avoidance purpose” is never a satisfactory reason to strike down a tax position); David A. Weisbach, *Formalism in the Tax Law*, 66 U. CHI. L. REV. 860 (1999) (arguing that the tax law should include some standards in order to permit the law to be less complex). For a more general argument that knowledge of the tax law is not always socially desirable, see David Weisbach, *Is Knowledge of the Tax Law Socially Desirable?* (Univ. of Chi. Law Sch., John M. Olin Law & Econ. Working Paper No. 563 (2d series), 2011), available at <http://www.law.uchicago.edu/files/file/563-daw-knowledge.pdf>.

98. Steven A. Dean & Lawrence M. Solan, *Tax Shelters and the Code: Navigating Between Text and Intent*, 26 VA. TAX REV. 879, 882 (2007).

99. *See, e.g.*, *Frank Lyon Co. v. United States*, 435 U.S. 561, 572-73 (1978) (“[T]he Court has refused to permit the transfer of formal legal title to shift the incidence of taxation attributable to ownership of property where the transferor continues to retain significant control over the property transferred In the light of these general and established principles, the Government takes the position that the . . . transaction should be regarded as a sham. The agreement as a whole . . . was only an elaborate financing scheme . . .”).

100. *See, e.g.*, *Gregory v. Helvering*, 293 U.S. 465, 469-70 (1935) (holding that a corporate reorganization “having no business or corporate purpose” would not affect a company’s tax liability).

101. *See, e.g.*, *Klamath Strategic Inv. Fund ex rel. St. Croix Ventures v. United States*, 568 F.3d 537, 543-44 (5th Cir. 2009) (“The economic substance doctrine allows courts to enforce the legislative purpose of the Code by preventing taxpayers from reaping tax benefits from transactions lacking in economic reality.”).

102. Health Care and Education Reconciliation Act of 2010, Pub. L. No. 111-152, § 1409, 124 Stat. 1029, 1067-68 (codified at 26 U.S.C. § 7701(o) (2011)).

103. 26 U.S.C. § 7701(o)(1).

preferring instead to tell taxpayers simply that “relevant case law under the common-law economic substance doctrine” continues to apply.¹⁰⁴

However, government manipulation of uncertainty is less likely to be effective than it might initially appear. It is true that because the anti-abuse doctrines are standards, not rules, taxpayers will be unsure not only *whether* their position will be captured by an anti-abuse doctrine, but also the *probability* that their position will be captured by such a doctrine. But such standards may create noncomparative uncertainty.¹⁰⁵ That is, a taxpayer deciding whether to engage in a potentially dubious transaction may simply know that he is deciding whether to engage in a transaction and that he does not know the chance that the transaction will be struck down. He is not given a choice between a transaction with a known probability of being struck down and a transaction with an unknown probability of being struck down. Because ambiguity aversion decreases or even disappears in a noncomparative situation, the model suggests that ambiguity aversion may not weigh in favor of using standards as opposed to rules to battle tax shelters.

There are also objections to unknown probabilities in the tax law that are not captured by the uncertainty model. For example, uncertainty aversion could overdeter taxpayers’ participation in transactions that might trigger an audit under the DIF, or be examined under the anti-abuse doctrines, but that would nonetheless be upheld, and might even increase societal welfare overall. Or increasing uncertainty, even in limited areas of the tax law, might undermine taxpayers’ confidence in the tax system and thus reduce compliance. And if the U.S. tax system has more uncertainty than other tax systems, businesses may choose to go to other countries.

Even, or perhaps especially, if one rejects a consequentialist approach, one might still be concerned about increasing uncertainty. One could argue that people have the right to know their chances of audit, or the right not to adhere to anything beyond the actual words of a statute.¹⁰⁶ Moreover, using uncertainty as a compliance tool may have distributional consequences. Middle- or lower-income taxpayers may be more affected by uncertainty than wealthy taxpayers who can hire tax advisors to eliminate uncertainty. That the uncertainty model does not resolve these questions should not be surprising, though, because the uncertainty model, like the expected utility model, provides insight only into the question of how to increase the tax paid, not whether using these approaches to increase the tax paid is socially desirable.

104. I.R.S. Notice 2010-62, 2010-40 I.R.B. 411.

105. See discussion *supra* notes 89-92 and accompanying text.

106. See, e.g., Gunn, *supra* note 97.

C. Penalizing Tax Advisors

Tax advisors are subject to a number of possible penalties, including censure, suspension, and disbarment, for providing tax advice that is insufficiently supported by facts and law.¹⁰⁷ Legal practitioners and scholars tend to characterize these penalties as an attempt to dissuade tax advisors from contributing to tax evasion.¹⁰⁸ The uncertainty model suggests an additional reason either to penalize tax advisors or to increase penalties for a taxpayer who uses a tax advisor and takes a position that is ultimately struck down: tax advisors may decrease taxpayers' uncertainty and thus increase the CEU of taking a particular position for a taxpayer who is uncertainty averse.¹⁰⁹

Consider again the example above where the taxpayer's uncertainty about his own probability estimate combined with his pessimism meant that he chose to comply with the tax law even though the expected utility (as opposed to CEU) of not complying exceeded the expected utility of complying.¹¹⁰ If the taxpayer were more certain about his position, he would choose not to comply. In the above example, the taxpayer's doubt (δ) was quantified at 70%, meaning that the taxpayer was very uncertain about the probability he assigned to whether his position would be struck down. If the taxpayer could reduce that level of doubt to, say, 50%, he would choose not to comply, because his CEU would be greater for not complying (4.102) than for complying (4.094).

A tax advisor can reduce a taxpayer's doubt about a tax position. After all, the advisor is paid for his expertise. On his own, a taxpayer might feel unsure about the chance that a given position will be struck down, but an advisor can provide not only a probability estimate, but also certainty about that estimate. It is not that the advisor's estimate is "correct" in some larger sense, but rather that the taxpayer may have more faith in the advisor's view than in his own. The taxpayer may believe that the advisor has more information, such as greater knowledge of audit rates or audit patterns, a better sense of what courts tend to do when faced with similar transactions, or a better understanding of tax law.

Indeed, depending on the taxpayer's level of pessimism, the taxpayer might be willing to take the position even if the tax advisor says that he believes there is a lower chance of success than the taxpayer originally estimated. In the above scenario, for example, the taxpayer initially thought that there was

107. See, e.g., 31 C.F.R. §§ 10.50-10.51 (2011) (codifying a portion of Treasury Department Circular 230, which imposes a variety of penalties on tax advisors who do not sufficiently support their conclusions, including censure, suspension, and disbarment).

108. See, e.g., Deborah H. Schenk, *The Circular 230 Amendments: Time to Throw Them Out and Start Over*, 110 TAX NOTES 1311, 1312 (2006); Michael Schler, *Effects of Anti-Tax-Shelter Rules on Nonshelter Tax Practice*, 109 TAX NOTES 915, 918-19 (2005).

109. Arcand et al., *supra* note 56, at 23, proposes that uncertainty aversion explains why taxpayers use accounting firms to prepare tax returns, although this portion of their article remains only a suggestion; the simulations remain to be done.

110. See *supra* Part II.B.5.

a 65% chance that the position would be struck down. If a tax advisor tells the taxpayer that there is a 70% chance the position will be struck down, but the tax advisor also eliminates all doubt in the taxpayer's mind about that 70% probability, the taxpayer will change his mind: before he hired the tax advisor, he would choose to comply, but now that he has hired the tax advisor and eliminated all doubt about the chance that his position will be struck down, he will choose not to comply. He will choose not to comply even though the tax advisor told him his position was *less* likely to succeed than the taxpayer originally thought. Thus, perhaps counterintuitively, even a conservative tax advisor could cause an uncertainty-averse taxpayer to comply less than he would without a tax advisor.

This provides another justification for imposing penalties on tax advisors who provide unsupported tax advice: to increase the cost of obtaining tax advice. In order to provide an opinion on which a taxpayer can rely and avoid incurring penalties, tax advisors must put in many hours of work establishing the facts and law. These hours of work translate into higher fees for taxpayers, and thus may make it too expensive for some taxpayers to ask a tax advisor to provide certainty about a tax position.

This insight does not resolve the problem of whether tax advisors should face large penalties. There are many other issues to consider. Preventing taxpayers from seeking tax advice may deter some taxpayers from taking socially desirable positions. Increasing the cost of tax advice may increase deadweight loss. Even more fundamentally, this approach assumes that we want taxpayers to pay as much tax as possible. Again, the uncertainty model cannot resolve these questions.

D. Future Research: Identifying Attitudes Toward Uncertainty

Although degrees of uncertainty and attitudes toward uncertainty could in theory make a marginal difference in taxpayers' behavior, we need more information to know when uncertainty in fact makes a difference, and thus to know how to adjust policies to address uncertainty. What little empirical work exists in this area does provide some insight into unknown probabilities and tax compliance. One study, for example, found that while less ambiguity concerning the audit rate reduced compliance, reducing uncertainty does not have as much of an effect when taxpayers believe that their audit rate is relatively low.¹¹¹ Empirical work has also found that the effect of reducing uncertainty varies depending on whether taxpayers believe that they receive a benefit for their tax payments.¹¹² And it may be that taxpayers who are more likely to engage in dubious transactions do not share the general aversion to uncertainty.

111. Ghosh & Crain, *supra* note 11, at 799-800.

112. James Alm et al., *Institutional Uncertainty and Taxpayer Compliance*, 82 AM. ECON. REV. 1018, 1024-25 (1992).

However, much more empirical investigation remains to be done, especially on taxpayers' degrees of uncertainty (represented in the model by δ) and attitudes toward uncertainty (α , the taxpayer's optimism or pessimism). Researchers could, for example, study variation among types of taxpayers' attitudes towards uncertainty, or variation among attitudes toward uncertainty depending on the type of uncertainty. This Subpart discusses each possibility in turn.

First, researchers might study whether different types of taxpayers have different attitudes toward uncertainty. Just as tax officers for corporations seem to approach tax planning more risk-neutrally than individual taxpayers,¹¹³ corporate tax officers might be more tolerant of uncertainty than individual taxpayers. Researchers might also compare wealthier taxpayers' attitudes toward uncertainty with the attitudes of lower-income taxpayers, or small businesses' attitudes with those of larger businesses. This information could help shape the government's enforcement efforts. For example, the government might feel more confident about reducing uncertainty for corporations if corporations are neutral toward uncertainty, but more cautious about creating clear guidelines in all situations for groups of individual taxpayers who tend to be uncertainty averse. The government could, in other words, tailor its enforcement approach based on groups' particular attitudes toward uncertainty.

Second, while the model imagines a taxpayer who combines all relevant probabilities into one probability (p) about which the taxpayer may feel some doubt (δ), scholars and policymakers may wish to break p down further, by identifying types of uncertainty and particular decisions about which a taxpayer may experience uncertainty.

Take, for example, an individual taxpayer deciding whether to engage in a transaction that will not be subject to information reporting. The taxpayer may assign probabilities to, among other things, the chance that his tax return will be audited; the chance that if his tax return is audited, the IRS will discover his position; the chance that if the IRS discovers his position, it will decide to challenge it; the chance that if the IRS challenges it, the taxpayer will be unsuccessful in persuading the auditor that the position is a good position; the chance that, if the position ends up in court, the court will strike down the position; the chance that a penalty will be imposed, and if so, the chance that the IRS will be satisfied with, say, a 20% underpayment penalty,¹¹⁴ or will ask for a larger penalty, such as a 75% fraud penalty.¹¹⁵

Not only will the probabilities the taxpayer assigns to these various events be different, but the taxpayer's degree of certainty and attitude toward uncertainty could vary systematically. A taxpayer may have different attitudes toward uncertainty depending on whether he faces factual uncertainty (for example, not knowing whether he will be selected for audit) or legal uncertainty

113. See, e.g., Shaviro, *supra* note 51, at 239.

114. See 26 U.S.C. § 6662 (2011).

115. See *id.* § 6663.

(for example, not knowing how a court will treat a particular tax position). Or variations in attitudes might be even more fine-grained: a taxpayer might be pessimistic regarding his chance of audit (that is, he may overweight the probability he assigns to the chance of being audited), but given that he is audited, he might be neither pessimistic nor optimistic about the probability he assigns to the outcome of the audit (because, for example, he may defer completely to his tax advisor's views). With more research, tax compliance efforts could be tailored not only to address different types of taxpayers' attitudes toward uncertainty, but also to take into account how taxpayers' levels of uncertainty and attitudes toward uncertainty vary based on the type of event about which they are uncertain.

E. *The Simplicity Objection*

One might object that the uncertainty model adds too much complexity to be useful. The uncertainty model requires quantifying uncertainty and levels of doubt, tasks which are at best difficult. How can we put a number to how much doubt someone has, or how much he disfavors or favors uncertainty? This is of course a problem; indeed, it is a problem with any model that relies on quantifying almost anything, including probability, risk, utility functions, and so forth. However, that some ideas are difficult to quantify does not mean that we should reject all models, or even revert to the simpler models—we should not, that is, let the best be the enemy of the good, though of course we must keep in mind the limitations of our knowledge. As David Weisbach has written in a slightly different context, “One is forced between the Scylla of simple generalizations that are sometimes wrong and the Charybdis of an approach that is too complex to apply.”¹¹⁶ The uncertainty model is complex, but it is not too complex to apply, and its advantages will sometimes outweigh the disadvantages of its complexity.

While quantifying uncertainty and attitudes toward uncertainty is not easy, there are several ways to approach the project. Experimental work can suggest how much a person is willing to pay to avoid uncertainty—to reach a state where he knows a probability without doubt, or with less doubt (with more information).¹¹⁷ People might be asked to describe how uncertain they feel about something, and then that interpretation could be translated into numbers. By studying relatively small groups of people, with particular attention to types of taxpayers, the IRS could generate information that could be put to wider use in tax compliance.

These methods are of course not precise, but we need not reject the uncertainty model simply because the magnitude of doubt, or an attitude toward

116. David A. Weisbach, *Line Drawing, Doctrine, and Efficiency in the Tax Law*, 84 *CORNELL L. REV.* 1627, 1670-71 (1999).

117. *See, e.g.,* Camerer & Weber, *supra* note 4, at 335-37.

uncertainty, cannot be exactly quantified, if the uncertainty model provides some advantage over other models. Put another way, the expected value and expected utility models each consider doubt to be zero, so the question is really whether it is better to assume that taxpayers have no doubt at all, or to come up with a number or range that represents taxpayers' level of doubt and their attitudes toward uncertainty. Because taking uncertainty into account can, as explained above, make a significant difference in how we think about tax compliance, it may be better, when faced with certain questions, to represent uncertainty, albeit roughly, than to ignore it entirely, especially as experimental work provides additional information about levels of doubt and of uncertainty aversion or preference.

CONCLUSION

This Article has presented a new formal model of tax compliance, the uncertainty model, which, unlike any other formal model used in tax legal scholarship, incorporates the level of taxpayers' uncertainty as well as their attitudes about uncertainty. The uncertainty model captures something real about the world that other models neglect, helps us develop new intuitions about longstanding questions in tax compliance, and suggests new areas of research, and thus is one useful approach to thinking about tax compliance.