TAX COMPLIANCE AND PERCEPTIONS OF THE RISKS OF DETECTION AND CRIMINAL PROSECUTION

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In this paper we use a survey concerning a hypothetical taxpayer to analyze how certain features of the enforcement of the tax laws shape perceptions of the risks of detection and penalties for tax noncompliance. We also examine the effects of these perceptions on intended noncompliance behavior. Our findings provide strong support for various hypotheses concerning the effect of the enforcement process on perceptions. We also find, in contrast to prior results, that the perceived risk of criminal prosecution appears to act as a powerful deterrent to noncompliance. We explain why earlier studies might have failed to detect a deterrent role for the severity of punishment.

I. INTRODUCTION

Tax cheating is as old as tax laws. Despite the long history of resistance to taxation, however, knowledge of the determinants of compliance behavior is quite limited. Only recently have researchers begun to examine such basic issues as the role of norms, perceptions of equity, experiential factors, legal complexity and ambiguity, and inadvertent error in determining compliance.[1] Beyond some commonly observed correlations between demographics and compliance, one of the few consistent findings in the tax compliance literature is that the fear of detection acts as a deterrent to noncompliance (cf. Mason and Calvin, 1978, 1984; Scott and Grasmick, 1981; Witte and Woodbury, 1985; Kinsey and Smith, 1987; and Dubin and Wilde, in press). By contrast, there is little evidence that the severity of penalties deters noncompliance and even some evidence that it *increases* noncompliance (Witte and Woodbury, 1985).

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[1] See Jackson and Milliron (1986), Smith and Kinsey (1987), and Klepper and Nagin (in press b) for reviews of the literature.

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Even the findings concerning the fear of detection raise fundamental questions. For example, if noncompliance is deterred by a greater probability of detection, why isn't noncompliance also deterred by greater penalties? The answer may lie in a better understanding of how taxpayers form perceptions about the likelihood of detection and the severity of penalties. Currently our knowledge about taxpayer perceptions is meager. Those issues that have been considered include the effect on perceptions of attitudes, experience, opportunities for noncompliance, and demographic factors (Kinsey and Smith, 1987; Mason, 1987). Many issues, however, remain largely unaddressed or untested, including the influence of the enforcement process itself on perceptions of the probability of detection and the severity of penalties.

In an earlier paper (Klepper and Nagin, in press a), we developed a model of noncompliance in which perceptions of the probability of detection and the severity of penalties were shaped by certain features of the enforcement process of the tax laws. This model was capable of explaining a wide range of empirical regularities concerning noncompliance at the level of the line item on the tax return, thereby providing indirect support for our characterization of perceptions. In this paper, we directly test this characterization by eliciting probabilities of detection risk and criminal prosecution for specific tax noncompliance scenarios and probe the influence of these perceptions on intended behavior.

While the focus of the study is tax compliance, our findings have implications for the broader deterrence literature. The results strongly support various hypotheses concerning the effects of the tax enforcement process on perceptions. These findings are consistent with an underlying premise of criminal opportunity theory, which holds that perceptions of the risk of apprehension and punishment for a specific type of law breaking have some grounding in the realities of the enforcement process.[2] We also find that the perceived risk of criminal prosecution is a powerful deterrent to noncompliance. This contrasts sharply with the general null findings in the criminal deterrence literature concerning the severity of punishment. In the process of relating our results, we explain why other studies may have failed to find a deterrent role for the severity of punishment.

The paper is organized as follows. First, we present a number of hypotheses concerning the factors that influence perceived risks of detection and criminal prosecution of tax noncompliance and the effects of these perceptions on behavior. Second, we describe the design and implementation of our scenario format. Third, we test the hypotheses concerning the perceived risks of detection and

[2] For reviews of this literature, see Cornish and Clarke (1986) and Cook (1986).

criminal prosecution. Fourth, we probe the effects of these perceptions on intended behavior. Finally, we offer concluding remarks.

II. RISK PERCEPTIONS

A. *Probability of Detection*

Our hypotheses concerning perceptions of the probability of detection of tax noncompliance stem from some key features of the Internal Revenue Service's (IRS) tax enforcement process. It is well known that IRS selects returns for audit based on its estimates of noncompliance for each filed return. The estimates are derived from predictive equations for noncompliance developed in the Taxpayer Compliance Measurement Program (TCMP). Once a return has been identified for audit, it is reviewed manually to determine whether it should in fact be audited and, if so, on which line items the audit should concentrate.

Focusing on the second stage of the audit selection process, the choice of a particular line item for audit depends on the potential tax that could be recovered and the cost of recovering the tax (i.e., the cost of the audit). We assume that taxpayers perceive that the greater the amount of noncompliance on a line item, the greater will be IRS's estimate of noncompliance on the item and hence the greater the probability that IRS will audit the line item, *ceteris paribus*. Therefore, our first prediction, labeled Hypothesis 1, is: The perceived probability of detection of noncompliance on a line item will be an increasing function of the total noncompliance on the line item. (See Table 1 for a summary of this and all other hypotheses.)

A more novel prediction stems from our characterization of the factors that influence the cost of an audit. Although audits may sometimes yield incontrovertible evidence of a specific amount of noncompliance, in many instances the evidence is more circumstantial. This is especially true of income items not subject to information reporting, such as self-employment income. Auditors must often resort to indirect methods, such as comparing reported costs to reported receipts, analyses of bank records, and comparing changes in net worth plus consumption to reported income, to establish noncompliance on such line items.

When the evidence is circumstantial, the credibility of an auditor's assessment is likely to be greater when the manifestations of the noncompliance are more clear-cut. Taxpayers are likely to perceive that these manifestations will be more obvious the greater the amount of noncompliance as a percentage of the true amount on the line item. For example, a net worth or financial analysis[3] is less likely to uncover convincing evidence of unre-

[3] These are analyses of the taxpayer's financial records, including bank accounts and listings of assets and liabilities.

ported income the smaller the unreported income as a percentage of the true income. Thus, the cost of accumulating the evidence to establish a given assessment on a line item is likely to be inversely related to the percentage noncompliance on the line item. Assuming that the probability of an audit is inversely related to the cost of the audit, this suggests Hypothesis 2: The perceived probability of detection of noncompliance on a line item will be an increasing function of the percentage noncompliance on the line item.

For a given total and percentage noncompliance, the cost of establishing the noncompliance is likely to vary across line items. This cost will be lowest on line items such as wages and salaries where the true amount of the item is reported to the IRS by a third party. It will be next lowest on subtraction-to-income line items, such as itemized deductions, where the taxpayer is required to produce evidence supporting his report. The cost is likely to be greatest for income line items not subject to third-party reporting, such as self-employment income, where the burden is entirely on the IRS to establish the noncompliance. This suggests Hypothesis 3: For a given total and percentage noncompliance, the perceived probability of detection will be greater for subtraction-to-income items than for income items not subject to third-party reporting.[4]

The fourth hypothesis concerning the probability of detection emerges from the two-stage nature of the audit process. In order for a line item to be audited, the return must first be selected for audit. Because this selection depends on the overall estimated noncompliance on the return, the probability that noncompliance on any given line item will be detected will increase with the amount of noncompliance on the other line items. The influence of noncompliance elsewhere on the return on the probability of detection of noncompliance on a specific line item is expected to be most pronounced for line items that are "inferior evasion opportunities." These are line items for which, *ceteris paribus*, the probability of selection in the second stage is greater than for other, "superior evasion opportunity" line items.[5] Inferior evasion opportunity line items, precisely because they are inferior, will generally contribute less to the overall noncompliance on the return and thus will play a less important role in determining whether the return is selected for audit in the first stage. Consequently, the probability of audit for noncompliance on an inferior evasion opportunity will depend importantly on the amount and percentage noncompliance on the other superior evasion opportunities. In contrast, because noncompliance on superior evasion opportunity line items will generally dominate the overall noncom-

[4] It is likely to be even greater for items subject to information reporting, but we do not test this in this study.

[5] For example, Hypothesis 3 implies that subtraction-to-income line items will generally be inferior evasion opportunities compared to income line items not subject to third-party reporting.

Table 1. Hypotheses Concerning Perceptions of Detection Risk and Criminal Prosecution and Intended Behavior

Hypothesis 1:	The perceived probability of detection of noncompliance on a line item will be an increasing function of the total noncompliance on the line item.
Hypothesis 2:	The perceived probability of detection of noncompliance on a line item will be an increasing function of the percentage noncompliance on the line item.
Hypothesis 3:	For a given total and percentage noncompliance, the perceived probability of detection will be greater for subtraction-to-income items than for income items not subject to third-party reporting.
Hypothesis 4:	The perceived probability of detection, especially for inferior evasion opportunity line items, will be an increasing function of the total and percentage noncompliance on the other line items.
Hypothesis 5:	The perceived probability of criminal prosecution for noncompliance on a line item will be an increasing function of the percentage noncompliance on the line item.
Hypothesis 6:	The perceived probability of criminal prosecution for a given percentage noncompliance on a line item will be lower when the legal requirements pertaining to the line item are more complex and/or ambiguous.
Hypothesis 7:	The greater the perceived probability of detection of a given noncompliance gamble, the lower the likelihood the taxpayer will be willing to take the gamble.
Hypothesis 8:	The greater the perceived probability of criminal prosecution of a given noncompliance gamble, the lower the likelihood the taxpayer will be willing to take the gamble.
Hypothesis 8′:	If the perceived probability of criminal prosecution for a given noncompliance gamble is non-zero, the likelihood that a taxpayer will be willing to take the gamble is zero unless the perceived probability of detection is zero.

pliance on the return, the chance they will be audited will not depend as much on noncompliance on the other line items. This suggests Hypothesis 4: The perceived probability of detection, especially for inferior evasion opportunity line items, will be an increasing function of the total and percentage noncompliance on the other line items.

B. Probability of Criminal Prosecution

The penalty for detected noncompliance is most often a fine. In more extreme cases, the taxpayer can also be criminally prosecuted. It is well known that the magnitude of the fine and the

likelihood of criminal prosecution depend on the seriousness of the offense. Seriousness, as judged by the IRS and the courts, depends on the taxpayer's ability to excuse the noncompliance as accidental or non-fraudulent (e.g., based on what the taxpayer believed to be a reasonable interpretation of the law). It will generally be easier to excuse the noncompliance on a line item the smaller the amount of the noncompliance as a percentage of the true amount on the line item. When this percentage noncompliance is small, excuses such as "I forgot" or "I overlooked a transaction" are more believable. However, when a large percentage of the true liability is not reported, such appeals will generally be less convincing. This suggests Hypothesis 5: The perceived probability of criminal prosecution given detection (hereafter the qualifier "given detection" is dropped) for noncompliance on a line item will be an increasing function of the percentage noncompliance on the line item. Note that in contrast to Hypothesis 1, it is expected that only the percentage noncompliance and not the total noncompliance will have an effect on the probability of criminal prosecution.

Like the probability of detection, the perceived probability of criminal prosecution for a given percentage noncompliance is expected to vary across line items. It will be easier for a taxpayer to rationalize noncompliance on line items where the law is complex and/or ambiguous, such as partnership income, than where the law is simple, such as interest paid to financial institutions. This suggests Hypothesis 6: The perceived probability of criminal prosecution for a given percentage noncompliance on a line item will be lower the more complex and/or ambiguous the legal requirements pertaining to the line item.

C. *The Influence of Risk Perceptions on Behavior*

We pose two elementary hypotheses about the effects of risk perceptions on behavior. The first, Hypothesis 7, is: The greater the perceived probability of detection of a given noncompliance gamble, the lower the likelihood that the taxpayer will be willing to take the gamble. The second, Hypothesis 8, is: The greater the perceived probability of criminal prosecution of a given noncompliance gamble, the lower the likelihood that the taxpayer will be willing to take the gamble.

In Klepper and Nagin (in press a), we conjectured that *any* prospect of criminal prosecution would deter many taxpayers from taking a noncompliance gamble. This suggests an alternative to Hypothesis 8, labeled Hypothesis 8′: If the perceived probability of criminal prosecution for a given noncompliance gamble is nonzero, the likelihood that a taxpayer will be willing to take the gamble is zero unless the perceived probability of detection is zero. Note that this hypothesis implies that when both the perceived probability of detection and the perceived probability of criminal

prosecution exceed zero, increases in the perceived probability of criminal prosecution will have no effect on the likelihood of taking a noncompliance gamble. Thus, in contrast to Hypothesis 8, Hypothesis 8′ implies that an increase in the perceived probability of criminal prosecution will not change the likelihood that a taxpayer will engage in a noncompliance gamble.

III. THE SCENARIOS

In this section we describe the various scenarios we asked respondents to consider concerning a hypothetical taxpayer.

A. *The Basic Features of the Scenarios*

Each respondent answered questions concerning two scenarios. All scenarios began as follows:

> In answering the questions in this scenario, assume the taxpayer is a plumber who works for a construction firm. The firm paid the plumber $35,000 in wages, and reported these wages to the IRS on a W-2 form. The plumber earned an additional $XXX by moonlighting as an independent contractor. The typical plumbing job costs $50 or less, and customers generally pay by check. The plumber and his wife have no other sources of income. They and their two children live in a home on which there is a $50,000 mortgage. During the year in question, the plumber paid $5,000 in mortgage interest to his bank, an additional $1,500 in property, state, and local taxes, and contributed $YYY in cash to his church and local civic organizations.

In each scenario, specific amounts of self-employment income and charitable deductions were supplied. They are not specified above because these amounts were varied across scenarios, as we describe below.

Next, respondents were told that the plumber correctly reported his mortgage interest payments; his state, local, and property taxes; his exemptions; and his earnings from the construction company. For the first scenario, respondents were told to assume the plumber had overstated his charitable deductions by a certain amount. They were next presented with three gambles in which the plumber under-reported his self-employment income by 25 percent, 50 percent, and 90 percent, respectively, with each gamble expressed in terms of the total amount of unreported income rather than in percentage terms. For each gamble, the respondents were asked to estimate: (1) the chance the IRS would catch at least half of the unreported income; (2) the chance the plumber would be criminally prosecuted if at least 50% of the unreported income were detected; and (3) the likelihood they would take the risk of the gamble if in the plumber's position. (See Table 2 for

Table 2. Questions posed to Respondents for the Case of Self-Employment Income Equal to $15,000[a]

Question	Noncompliance as a Percentage of the True Amount[b]
Please estimate the likelihood of the following events by giving a percentage ranging from 0 to 100:	
1. a) Suppose the plumber reports $1,500 of his $15,000 in self-employment income and thus understates his income by $13,500. What are the chances that the IRS will catch half or more of the plumber's **$13,500 understatement** of self-employment income? _____%	90%
b) Suppose the plumber reports $7,500 of his $15,000 in self-employment income and thus understates his income by $7,500. What are the chances that the IRS will catch half or more of the plumber's **$7,500 understatement** of self-employment income? _____%	50%
c) Suppose the plumber reports $11,250 of his $15,000 in self-employment income and thus understates his income by $3,750. What are the chances that the IRS will catch half or more of the plumber's **$3,750 understatement** of self-employment income? _____%	25%
2. a) Suppose the plumber reports $1,500 of his $15,000 in self-employment income and thus understates his income by $13,500. If the IRS were to catch more than 50% of the plumber's **$13,500 understatement** of self-employment income, what are the chances that the plumber will face criminal prosecution? _____%	90%
b) Suppose the plumber reports $7,500 of his $15,000 in self-employment income and thus understates his income by $7,500. If the IRS were to catch more than 50% of the plumber's **$7,500 understatement** of self-employment income, what are the chances that the plumber will face criminal prosecution? _____%	50%
c) Suppose the plumber reports $11,250 of his $15,000 in self-employment income and thus understates his income by $3,750. If the IRS were to catch more than 50% of the plumber's **$3,750 understatement** of self-employment income, what are the chances that the plumber will face criminal prosecution? _____%	25%
3. a) If you were in the plumber's position, how likely is it that you would take the risk of **reporting only $1,500** of your $15,000 in self-employment income? _____%	90%
b) If you were in the plumber's position, how likely is it that you would take the risk of **reporting only $7,500** of your $15,000 in self-employment income? _____%	50%
c) If you were in the plumber's position, how likely is it that you would take the risk of **reporting only $11,250** of your $15,000 in self-employment income? _____%	25%

[a] Both the true amount and the amount of the overstatement of charitable deductions were previously provided to the respondents.

[b] Respondents were not given this percentage.

examples of the self-employment gambles presented to each respondent in the first scenario.)

For the second scenario, respondents were told to assume that the plumber had under-reported his self-employment income by a certain amount. Then they were presented with three gambles in which the plumber overstated his charitable deductions by the three percentages of 25 percent, 50 percent, and 90 percent, respectively, where again all the gambles were expressed in terms of the total overstatement of charitable deductions rather than in percentage terms. They were next asked questions for the three charitable deductions gambles that were analogous to the questions asked for the self-employment income gambles in the first scenario.

Finally, all respondents were asked their age, gender, whether they had been audited in the previous five years, whether they had itemized deductions, and whether they had self-employment income in the past five years. If they filed a joint return, they were asked whether they, their spouse, or both had primary responsibility for filling out the return.

B. Variations in the Scenarios

Three aspects of the scenarios were varied across individuals. The true self-employment income was specified as either \$5,000 or \$15,000, the true charitable deductions were specified as either \$1,000 or \$5,000, and the noncompliance for the "other" line item was specified as either 10 percent or 50 percent of the true amount, which again was specified in terms of the total noncompliance rather than in percentage terms. For the self-employment income gambles, the other line item was charitable deductions, while for the charitable deductions gambles, the other line item was self-employment income. To illustrate the specification of noncompliance on the other line item, when considering the self-employment gambles respondents were told to assume that the plumber overstated his charitable deductions by a certain amount, which was either 10 percent or 50 percent of his true charitable deductions. This defined eight possible scenarios for self-employment income according to: the true amount of self-employment income (\$5,000 or \$15,000) $\times$ the true amount of charitable deductions (\$1,000 or \$5,000) $\times$ the reported amount of charitable deductions (10% or 50% more than the true amount). Similarly, there were eight possible scenarios for charitable deductions according to: the true amount of charitable deductions (\$1,000 or \$5,000) $\times$ the true amount of self-employment income (\$5,000 or \$15,000) $\times$ the reported amount of self-employment income (10% or 50% less than the true amount). Each respondent was presented with only one of the eight possible scenarios for each line item.

C. *Administration of the Survey*

The survey was administered to 163 students enrolled in an evening master's of public management program. Nearly all the respondents were working or had worked as middle-level managers (spanning both the profit and not-for-profit sectors), which was generally a requirement for admission to the program. Their average age was thirty-five. Thus, these individuals had had considerable experience, generally a decade or more, with filing tax returns.

The survey was given at the beginning of class. Respondents were told that the purpose of the survey was to examine perceptions of tax cheating risks and consequences. Anonymity was assured. The response rate was nearly 100 percent. Our impression was that the respondents gave serious consideration to their responses.

IV. TESTING THE HYPOTHESES

In this section the hypotheses concerning perceptions of the probabilities of detection and criminal prosecution are tested.

A. *Perceptions of the Probability of Detection*

The first four hypotheses in Table 1 pertain to perceptions about the probability of detection. They imply that perceptions of the probability of detection on a line item should be shaped by: (1) the total noncompliance on the line item; (2) the percentage noncompliance on the line item; (3) the total and percentage noncompliance on other line items; (4) the cost of detecting noncompliance on the line item. To test the importance of these factors, the following equation was estimated for both self-employment income and charitable deductions:

$$Y = \beta_0 + \beta_1 LY + \beta_2 HY + \beta_3 HLP + \beta_4 LHP + \beta_5 HHP + \beta_6 AGE + \beta_7 SEX + \beta_8 JOINT + \beta_9 SELF + \beta_{10} SPOUSE + \beta_{11} AUDIT + \beta_{12} SEI + \beta_{13} ITEM + \omega$$

where the β_i, $i = 0, 1, \ldots, 13$, are coefficients, and ω is a disturbance.

The variables of the equation are defined as follows. The variable Y is the perceived probability of detection for a specific noncompliance gamble. The variables LY and HY represent the total amount of noncompliance of the gamble. If the true amount on the line item equals the lower of its two possible values ($5,000 for self-employment income; $1,000 for charitable deductions), then LY equals the total noncompliance of the gamble and HY equals zero, whereas if the true amount on the line item equals the higher of its two possible values ($15,000 for self-employment income; $5,000 for charitable deductions), then HY equals the total noncompliance of the gamble and LY equals zero. For example, consider the following self-employment income gamble. Suppose

the true amount of self-employment income equals $15,000 and the percentage noncompliance of the gamble equals 50 percent, so that the total noncompliance is $7,500. For this self-employment income gamble, *HY* would equal $7,500 and *LY* would equal zero.

The variables *HLP*, *LHP*, and *HHP* represent the noncompliance on the "other" line item. There are four possible cases for the noncompliance on the other line item according to whether the total true amount on this item equals its low or high value and whether the percentage noncompliance on this item equals its low (10%) or high (50%) value. The first letter of each of the variables denotes whether the true amount of the other line item equals its low (*L*) or high (*H*) value, and the second two letters of each of the variables indicate whether the percentage noncompliance on the other line item equals its low percentage (*LP*) or high percentage (*HP*) value. Each variable is a dummy variable that equals one when the true amount and the percentage noncompliance on the other line item conform to the defined variable and zero otherwise. For example, consider a particular self-employment income gamble. Suppose that for this gamble the true amount of charitable deductions was specified as $5,000 (the higher of its two possible values) and the reported amount of charitable deductions was specified as $7,500, so that the percentage noncompliance on charitable deductions was 50 percent (the higher of its two possible values). For this self-employment income gamble, *HHP* would equal one, and *LHP* and *HLP* would equal zero. Note that only variables representing three of the four possible cases concerning noncompliance on the other line item were included in the equation. We had to drop the fourth variable to identify the equation. Thus, the coefficients of the three included variables measure the effect on the probability of detection of noncompliance on the other line item *relative* to the omitted case (that is, *LLP*).

The remaining variables of the equation represent characteristics of the respondent. The variable *AGE* is the age of the respondent. The other variables are 1–0 dummy variables. The variable *SEX* equals one for females. The variable *JOINT* equals one if the respondent files a joint return. The variable *SELF* equals one if the respondent files a joint return and takes primary responsibility for the return. The variable *SPOUSE* equals one if the respondent files a joint return and if the spouse of the respondent takes primary responsibility for the return.[6] The variable *AUDIT* equals one if the respondent was audited in the previous five years. The variable *SEI* equals one if the respondent or the spouse of the respondent had self-employment income in the last five years. Finally, the variable *ITEM* equals one if the respondent itemizes deductions.

[6] The category of both individuals taking major responsibility for the return was omitted for identification.

The influence of total and percentage noncompliance on the line item is captured by the LY and HY variables. Hypotheses 1 and 2 predict that the perceived probability of detection will be an increasing function of both the total and percentage noncompliance on the line item. To determine the implications of this for the coefficients of the equation, consider first the self-employment income equation. Suppose that the perceived probability of detection of unreported self-employment income is a function of only the total amount of unreported self-employment income. Then an increase in total unreported self-employment income of \$1 would have the same effect on the perceived probability of detection regardless of whether the true amount of self-employment income equaled \$5,000 or \$15,000. This would require a \$1 change in LY and a \$1 change in HY to have the same effect on the probability of detection, which requires that β_1 equal β_2. Alternatively, suppose the perceived probability of detection is a function of only the percentage noncompliance on the line item. Then an increase in unreported self-employment income of \$1 would have three times as large an effect on the perceived probability of detection when the true self-employment income was \$5,000 versus \$15,000, since the \$1 increase would represent three times as large a change in the percentage noncompliance. This would require a \$1 change in LY to have three times as large an effect on the probability of detection as a \$1 change in HY, which requires that β_1 equal $3\beta_2$. Since, however, the perceived probability of detection is hypothesized to be a function of both the total and percentage noncompliance on the line item, this implies that β_1 must be greater than β_2 but less than $3\beta_2$, or $0 < \beta_2 < \beta_1 < 3\beta_2$. For charitable deductions the high true amount equals five times the low true amount implying that β_1 and β_2 must be related by $0 < \beta_2 < \beta_1 < 5\beta_2$.

Hypothesis 3 predicts that for a given total and percentage noncompliance, the perceived probability of detection will be greater on line items for which it is more costly to establish the noncompliance. We expect that it would be more costly to detect noncompliance for self-employment income than for charitable deductions. Consequently, if the total and percentage noncompliance on self-employment income and charitable deductions are equal, the perceived probability of detection should be greater for charitable deductions. The true amounts on the two line items are equal (to \$5,000) when true self-employment income is equal to its lower value and true charitable deductions are equal to their higher value. If, in addition, the total noncompliance on self-employment income is equal to the total noncompliance on charitable deductions, then LY for self-employment income (the total noncompliance on self-employment when self-employment income equals \$5,000) will equal HY for charitable deductions (the total noncompliance on charitable deductions when charitable deductions equal \$5,000), and the percentage noncompliance on self-em-

ployment income will equal the percentage noncompliance on charitable deductions. Accordingly, when *LY* for self-employment income equals *HY* for charitable deductions, the perceived probability of detection should be higher for charitable deductions than for self-employment income. A sufficient condition for this is $\beta_{0c} \geq \beta_{0s}$ and $\beta_{2c} > \beta_{1s}$, where the *c* and *s* subscripts denote the respective coefficients for charitable deductions and self-employment income.

Hypothesis 4 predicts that the perceived probability of detection should be an increasing function of both the total and percentage noncompliance on the other line item, especially for inferior evasion opportunities. For the self-employment income equation, the respective amounts of the total and percentage noncompliance on charitable deductions (the other line item) equal $2,500 and 50 percent when *HHP* equals one, $500 and 50 percent when *LHP* equals one, $500 and 10 percent when *HLP* equals one, and $100 and 10 percent in the omitted case. Therefore, the probability of detection of self-employment income noncompliance should, *ceteris paribus*, be greatest when *HHP* equals one, next greatest when *LHP* equals one, next greatest when *HLP* equals one, and smallest for the omitted case. This requires $\beta_5 > \beta_4 > \beta_3 > 0$. For the charitable deductions equation, the respective amounts of the total and percentage noncompliance on self-employment income equal $7,500 and 50 percent when *HHP* equals one, $2,500 and 50 percent when *LHP* equals one, $1,500 and 10 percent when *HLP* equals one, and $500 and 10 percent for the omitted case. Therefore, once again the probability of detection of charitable deductions noncompliance should be greatest when *HHP* equals one, next greatest when *LHP* equals one, next greatest when *HLP* equals one, and smallest when *LLP* equals one, which again requires $\beta_5 > \beta_4 > \beta_3 > 0$. Since charitable deductions are expected to be an inferior evasion opportunity to self-employment income, however, Hypothesis 4 suggests that this prediction is more likely to be satisfied for the charitable deductions equation than the self-employment income equation.

The various coefficient predictions concerning the probability of detection are summarized in the left column of Table 3. The first entry summarizes the predictions for each equation concerning β_1 and β_2, the second entry summarizes the predictions for each equation concerning β_3, β_4, and β_5, and the third entry summarizes the predictions about the relative values of β_0, β_1, and β_2 for the two equations.

While not the focus of our inquiry, a number of personal characteristics are included in the specification. There is some evidence in the perceptual deterrence literature that experience may reduce sanction risk perceptions (cf. Paternoster *et al.*, 1983). This suggests that detection risk perceptions will be lower for those who itemize deductions, have had self-employment income, and

Table 3. Coefficient Predictions Concerning the Probabilities of Detection and Criminal Prosecution for Both the Self-Employment Income and Charitable Deductions Equations

	Probability of Detection Equations	Probability of Criminal Prosecution Equations
1.	The total and percentage noncompliance on the line item matter: Self-employment income equation: $0 < \beta_2 < \beta_1 < 3\beta_2$ Charitable deductions equation: $0 < \beta_2 < \beta_1 < 5\beta_2$	Only the percentage noncompliance on the line item matters: Self-employment income equation: $\beta_1 = 3\beta_2$ Charitable deductions equation: $\beta_1 = 5\beta_2$
2.	Noncompliance on other line item matters: Both equations: $0 < \beta_3 < \beta_4 < \beta_5$	Noncompliance on other line items does not matter: Both equations: $0 = \beta_3 = \beta_4 = \beta_5$
3.	The probability of detection of a given total and percentage noncompliance is greater for charitable deductions than for self-employment income: $\beta_{2c} > \beta_{1s}$ and $\beta_{0c} \geq \beta_{0s}$	The probability of criminal prosecution for a given percentage noncompliance is equal for charitable deductions and self-employment income: $\beta_{1c} = 5\beta_{1s}$ and $\beta_{2c} = 3\beta_{2s}$

take major responsibility for the return. Also included in the specification are gender and prior audit experience. It has been consistently found that women are more likely to comply with the tax laws, which Kinsey (1984) suggests may occur because women typically have fewer favorable opportunities for noncompliance. Alternatively, women may perceive higher probabilities of detection than men for noncompliant acts, in which case detection risk perceptions will be higher for women. Regarding prior audit experience, taxpayers who have been previously audited might perceive a higher risk of detection if a prior audit had successfully identified their noncompliance. Alternatively, detection risk perceptions might be lowered if the audit did not uncover significant amounts of noncompliance.[7] Consequently, we cannot predict *a priori* the effect of prior audit experience on the perceived probability of detection.

The equation was estimated for each of the two line items by pooling the reported probability of detection across all 163 respondents for the three gambles to which they responded. This yielded 489 observations to estimate each equation. Since the reported

[7] The latter prediction is consistent with Spicer and Lundstedt (1976), who found that individuals who had been audited reported a greater inclination to evade in the future.

Table 4. Probability of Detection of Noncompliance

Variable	Coefficient[a]		
	Income	Charitable (1)	Charitable (2)
Intercept (β_0)	.0964	.209**	.385**
	(1.56)	(2.53)	(4.42)
LY (β_1)	.0388**	.101*	.272**
	(4.76)	(1.84)	(3.60)
HY (β_2)	.0179**	.127**	.0804**
	(6.63)	(11.7)	(6.71)
HLP (β_3)	.119**	.0329	.0309
	(3.67)	(.84)	(.80)
LHP (β_4)	.0232	−.00583	−.0114
	(.67)	(−.14)	(−.29)
HHP (β_5)	.011	.0809*	.0717*
	(.34)	(2.07)	(1.85)
DH	—	—	.281**
			(4.24)
AGE	−.00392**	−.00360	−.00385*
	(−2.41)	(−1.61)	(−1.74)
SEX	.0860**	.00590	−.000
	(3.57)	(.21)	(−.00)
JOINT	−.00151	.114**	.110**
	(−.04)	(2.50)	(2.40)
SELF	.0786*	−.0940*	−.0842*
	(2.22)	(−1.94)	(−1.70)
SPOUSE	.11**	−.0694	−.0684
	(2.62)	(−1.32)	(−1.30)
AUDIT	.0623*	−.0065	−.00374
	(2.09)	(−.16)	(−.10)
SEI	−.00155	.0606*	.0525
	(−.06)	(1.75)	(1.51)
ITEM	−.0563*	−.0926**	−.0903**
	(−1.96)	(−2.36)	(−2.30)
N	489	489	489

[a] *t* - statistics in parentheses

* Significant at the .05 level (one-tailed test)

** Significant at the .01 level (one-tailed test)

probabilities must lie between 0 and 1 and there were a number of 0 and 1 responses, the equation was estimated as a Tobit equation with the dependent variable bounded by 0 and 1. Maximum-likelihood estimates of the coefficients and *t*-statistics are reported in Table 4 for the two line items.[8]

[8] While the variables representing the characteristics of the respondents that were included in the equation control for some of the individual characteristics that may affect the perceived probability of detection, there may be other pertinent individual characteristics that we did not measure. This sug-

Focusing first on the results for self-employment income, the coefficient estimates generally conform with the predictions summarized in Table 3. Using a caret to denote an estimate, both $\hat{\beta}_1$ and $\hat{\beta}_2$ are positive and significant at the .01 level, as predicted. Moreover, $\hat{\beta}_1 > \hat{\beta}_2$ and $3\hat{\beta}_2 > \hat{\beta}_1$, as predicted, with both $\hat{\beta}_1 - \hat{\beta}_2$ and $3\hat{\beta}_2 - \hat{\beta}_1$ significantly different from zero at the .05 level. Thus, perceptions of the probability of detection for self-employment income appear, as predicted, to be an increasing function of both the total and percentage unreported self-employment income.

Consider next the estimates of the coefficients pertaining to noncompliance on the other line item. The estimates $\hat{\beta}_3$, $\hat{\beta}_4$, and $\hat{\beta}_5$ are all positive, as predicted. However, only $\hat{\beta}_3$ is significantly different from zero at the .05 level, and the estimates do not conform with the predicted order, with $\hat{\beta}_3 > \hat{\beta}_4 > \hat{\beta}_5$. Thus, there appears to be only mild support for the hypothesis concerning the importance of noncompliance on the other line item. Since self-employment income was expected to be perceived as a superior evasion opportunity, however, it was anticipated that the variables representing noncompliance on charitable deductions would not have a pronounced effect on the perceived probability of detection of self-employment income noncompliance.

Turn next to the results for the charitable deductions equation. Results for two specifications are reported in Table 4. Consider first the results shown in the third column of the table. In contrast to the results for self-employment income, the coefficient estimates for β_1 and β_2 do not conform with the predictions.[9] While $\hat{\beta}_1$ and $\hat{\beta}_2$ are both positive and significantly greater than zero at the .05 level, $\hat{\beta}_2 > \hat{\beta}_1$, which is inconsistent with the prediction that $5\beta_2 > \beta_1 > \beta_2$. Indeed, the ordering of $\hat{\beta}_1$ and $\hat{\beta}_2$ suggests that respondents perceived that a $1 increase in noncompliance would have a greater effect on the probability of detection when the true amount on the line item was $5,000 rather than $1,000 even though it represents a smaller increase in the percentage noncompliance. The estimates do, however, provide some support for the hypothesis concerning the importance of the variables representing noncompliance on the other line item. While only two of the three estimates, $\hat{\beta}_3$ and $\hat{\beta}_5$, are positive, $\hat{\beta}_5$ is much greater than

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gests that this equation (and the subsequent equations we estimate) should have been estimated as a random effects model. Unfortunately, we could not obtain a computer package that could estimate a random effects model for a Tobit equation. Nevertheless, our estimates are consistent although not efficient (Maddala, 1983).

[9] For all respondents, the income scenario was administered before the charitable deductions scenario. Thus, it is possible that the difference in findings between the charitable deductions and self-employment income specifications concerning the influence of noncompliance on the other line item could be the result of an order effect. Order effects could also have affected the test of Hypothesis 3.

both $\hat{\beta}_3$ and $\hat{\beta}_4$ and is significantly greater than both at the .05 level.[10]

One possible explanation for the ordering of $\hat{\beta}_1$ and $\hat{\beta}_2$ is that $5,000 represents an extremely large charitable deduction for a taxpayer with no more than $50,000 in total income. Respondents may have thought that such an amount was so high that it was likely to draw considerable attention from the IRS and thus result in a high probability of detection for even a small amount of noncompliance. On the other hand, the two possible true amounts for self-employment income of $5,000 and $15,000 are not particularly distinctive relative to the other aspects of the hypothetical taxpayer's return, so this same reasoning was not expected to apply to self-employment income.

To test this hypothesis, the equation was re-estimated for both line items adding a 1–0 dummy variable, denoted as *DH* in Table 4, which assumes a value of one when the true amount on the line item is the higher of its two values. Thus, for charitable deductions *DH* equals one when the true charitable deductions equal $5,000 and zero otherwise. Similarly, for self-employment income *DH* equals one when true self-employment income equals $15,000 and zero otherwise. If our hypothesis is correct, the probability of detection of a given total and percentage noncompliance should be higher than expected based only on the total and percentage noncompliance when the true amount on the line item equals its higher value, particularly for charitable deductions. This requires the coefficient of *DH* to be positive, particularly for charitable deductions. In fact, as Table 4 indicates, the estimate of the coefficient of *DH* is positive and significant at the .01 level for charitable deductions. The corresponding estimate for self-employment income is not reported because, as anticipated, the inclusion of the *DH* variable had virtually no impact on any of the other coefficient estimates, and its coefficient estimate was close to zero and insignificant at conventional levels. Perhaps most importantly, when the *DH* variable is included in the charitable deductions equation, $\hat{\beta}_1$ is considerably greater than $\hat{\beta}_2$ and less than $5\hat{\beta}_2$ as predicted

[10] Perhaps it is not surprising that only in the case of the high true amount-high percentage does self-employment income noncompliance have a pronounced impact on the perceived probability of detection of charitable deductions noncompliance. Respondents were given the information about noncompliance on the other line item as they were presented with a variety of facts about the income and expenses of the plumber. For the three cases in which either the true amount or the percentage noncompliance on self-employment income equaled the smaller of its two possible values, the total noncompliance on self-employment income was either $500, $1,500, or $2,500 versus $7,500 in the high true amount-high percentage noncompliance case. It may well be that even $2,500 in unreported self-employment income was not enough to get the attention of most of the respondents, whereas unreported self-employment income of $7,500 was so much larger that it was perceived to have had an impact on the probability of detection of charitable deductions noncompliance.

(see Table 3), and $\hat{\beta}_1 - \hat{\beta}_2$ and $5\hat{\beta}_2 - \hat{\beta}_1$ are both significantly greater than zero at the .10 level. Thus, when the *DH* variable is included, the coefficient estimates of $\hat{\beta}_1$ and $\hat{\beta}_2$ for both line items conform with the predictions.

Our last prediction is that $\beta_{0c} \geq \beta_{0s}$ and $\beta_{2c} > \beta_{1s}$. Using the estimates of β_{0c} and β_{2c} with *DH* included, both of these predictions are satisfied. Both $\beta_{2c} - \beta_{1s}$ and $\beta_{0c} - \beta_{0s}$ are significantly greater than zero at the .01 level. This implies that for a given total and percentage noncompliance, the perceived probability of detection is higher for charitable deductions than for self-employment income. This is consistent with our characterization of charitable deductions as an inferior evasion opportunity relative to self-employment income.

The remaining coefficient estimates pertain to the personal characteristics. A comparison of these coefficient estimates for the self-employment income and charitable deductions equations reveals considerable differences in their signs and statistical significance. The only consistency in the estimates is for age and itemization of deductions, with older respondents and those who itemize perceiving lower probabilities of detection.

B. Perceptions of the Risk of Criminal Prosecution

Hypotheses 5 and 6 in Table 1 pertain to perceptions about the probability of criminal prosecution. To test these hypotheses, we estimated the same two equations as for the probability of detection. Hypothesis 5 predicts that only the percentage noncompliance on a line item and not the total noncompliance on the line item or on other line items should affect the perceived probability of criminal prosecution. For the self-employment income equation, a $1 rise in total noncompliance represents three times as large a percentage increase when the true amount of self-employment income equals $5,000 versus $15,000. If only the percentage noncompliance on a line item affects the perceived probability of criminal prosecution, this requires β_1 to equal three times β_2, with both coefficients greater than zero. For charitable deductions since the high true amount equals five times the low true amount, then β_1 should equal five times β_2 for the charitable deductions equation. In addition, if the total and percentage noncompliance on the other line item are not pertinent, this requires $\beta_3 = \beta_4 = \beta_5 = 0$ for both line items. These predictions contrast with those for the probability of detection, where it was predicted that $\beta_1 < 3\beta_2$ for self-employment income, $\beta_1 < 5\beta_2$ for charitable deductions, and $\beta_5 > \beta_4 > \beta_3 > 0$ for both line items.

Hypothesis 6 predicts that for a given percentage noncompliance, the probability of criminal prosecution will be greater on line items for which it is more difficult to excuse the noncompliance. The two types of noncompliance used on our survey are both quite

blatant—in one case the taxpayer does not report some of his income while in the other he overstates his deductions. Neither appears easy to excuse. Consequently, Hypothesis 6 suggests that for the same percentage noncompliance, the probability of criminal prosecution should be similar for the two items. Suppose the true amount of both line items equals its lower value, so that the true self-employment income equals $5,000 and the true charitable deductions equal $1,000. Further, suppose the percentage noncompliance on the two line items is equal. Then the total noncompliance would be five times greater for self-employment income than for charitable deductions, and the value of LY would be five times greater for self-employment income than for charitable deductions. But if only the percentage noncompliance affected the perceived probability of criminal prosecution, the perceived probability of criminal prosecution would have to be the same in both cases, which requires $\beta_{1c} = 5\beta_{1s}$. Using similar reasoning, since the high value of self-employment income equals three times the high value of charitable deductions, Hypothesis 6 predicts $\beta_{2c} = 3\beta_{2s}$. The various coefficient predictions concerning the probability of criminal prosecution are contrasted with the comparable predictions concerning the probability of detection in the right column of Table 3.

The coefficient estimates and t-statistics are reported in Table 5 for the two line items. The equation for charitable deductions was estimated both with and without the DH variable (the DH variable again had virtually no effect on the coefficient estimates for the self-employment income equation). Examining first the self-employment coefficient estimates, $\hat{\beta}_1$ and $\hat{\beta}_2$ are both positive and significantly greater than zero at the .01 level and $\hat{\beta}_1 = 3.4\hat{\beta}_2$, with $\hat{\beta}_1 - 3\hat{\beta}_2$ not significantly different from zero. Thus, the distinctive prediction that $3\beta_2 = \beta_1$ (rather than $3\beta_2 > \beta_1$) for the perceived probability of criminal prosecution is supported for self-employment income. Also supported is the (distinctive) prediction that $\beta_3 = \beta_4 = \beta_5 = 0$, as neither $\hat{\beta}_3$, $\hat{\beta}_4$, nor $\hat{\beta}_5$ is significantly different from zero. Thus, as predicted, only the percentage underreporting of self-employment income affects the perceived probability of criminal prosecution.

The estimates of the coefficients for charitable deductions are again sensitive to the inclusion of the DH variable. The estimate of the DH coefficient is positive and significantly greater than zero at the .05 level, suggesting that for a given percentage noncompliance the perceived probability of criminal prosecution is greater when the true charitable deduction is $5,000 rather than $1,000. Again, $5,000 is such a large charitable deduction for a taxpayer with no more than $50,000 in total income that respondents may have felt that the IRS would deal especially harshly with any amount of noncompliance.

Since the DH variable makes a significant contribution to ex-

Table 5. The Probability of Criminal Prosecution

	Coefficient		
Variable	Income	Charitable (1)	Charitable (2)
Intercept (β_0)	.411**	.308**	.399**
	(3.48)	(3.41)	(3.95)
LY (β_1)	.0397**	.0805	.169*
	(2.73)	(1.38)	(2.28)
HY (β_2)	.0117**	.0607**	.0360**
	(2.58)	(5.31)	(2.54)
HLP (β_3)	.074	−.0161	−.0175
	(1.25)	(−.36)	(−.39)
LHP (β_4)	.0336	−.0652	−.0687
	(.58)	(−1.40)	(−1.47)
HHP (β_5)	.00891	.0659	.0608
	(.16)	(.50)	(.37)
DH	—	—	1.47**
			(−2.19)
AGE	−.00825**	−.00512*	−.00519*
	(−2.40)	(−2.01)	(−2.01)
SEX	−.0519	−.0108	−.0142
	(−1.16)	(−.30)	(−.40)
JOINT	−.0200	.0243	.0238
	(−.32)	(.56)	(.54)
SELF	.0107	−.0613	−.0573
	(.18)	(−1.31)	(−1.23)
SPOUSE	.171**	.0687	.0681
	(2.55)	(1.23)	(1.22)
AUDIT	.0456	−.0679	−.0676
	(.90)	(−1.52)	(−1.48)
SEI	−.0794	−.00646	−.0112
	(−1.53)	(−.15)	(−.26)
ITEM	−.0902	−.0885*	−.0876*
	(−1.63)	(−2.05)	(−2.01)
N	489	489	489

[a] *t* - statistics in parentheses
* Significant at the .05 level (one-tailed test)
** Significant at the .01 level (one-tailed test)

plaining the variation in the perceived probability of criminal prosecution, we concentrate on the coefficient estimates of the equation including the *DH* variable. As predicted, $\hat{\beta}_1$ and $\hat{\beta}_2$ are both positive and significantly greater than zero at the .05 level and $\hat{\beta}_1 = 4.7\hat{\beta}_2$ with $\hat{\beta}_1 - 5\hat{\beta}_2$ not significantly different from zero. Thus, once again the predictions about β_1 and β_2 are supported. Also as predicted, and in contrast to the estimates for the probability of detection, $\hat{\beta}_3$, $\hat{\beta}_4$, and $\hat{\beta}_5$ are all not significantly different from

zero. Thus, as for self-employment income, only the percentage overstatement of charitable deductions affects the perceived probability of criminal prosecution. Lastly, $\hat{\beta}_{1c} = 4.3\hat{\beta}_{1s}$, with $\hat{\beta}_{1c} - 5\hat{\beta}_{1s}$ not significantly different from zero, and $\hat{\beta}_{2c} = 3.1\hat{\beta}_{2s}$, with $\hat{\beta}_{2c} - 3\hat{\beta}_{2s}$ not significantly different from zero. Thus, as predicted, the estimates are consistent with the hypothesis that detected noncompliance will be equally difficult to excuse for the two line items.

A comparison of the coefficient estimates for personal characteristics across the self-employment income and charitable deductions equations reveals general instability in the signs and significance of the estimates. As with the probability of detection, the only consistency is for the age and itemization variables, both of which are negative and significantly less than zero at (or near) the .05 level for both line items.

C. *Synthesis*

All of our predictions concerning perceptions of detection risk and criminal prosecution were supported for self-employment income. They were also supported for charitable deductions once the *DH* variable was added to the specification. Our findings suggest that perceptions of detection risk on a line item are influenced by the amount and percentage noncompliance on the line item, the noncompliance on other line items (especially for line items that are inferior evasion opportunities), and the cost to the IRS of detecting noncompliance on the line item. Our findings on perceptions of criminal prosecution suggest that the perceived probability of criminal prosecution is shaped principally by the percentage noncompliance on the line item.

V. WILLINGNESS TO ENGAGE IN THE NONCOMPLIANCE GAMBLE

We now consider the effect of perceptions of the probability of detection and criminal prosecution on respondents' willingness to accept noncompliance gambles.

A. *The Basic Model*

Hypotheses 7 and 8 predict that the willingness of respondents to take on a specific noncompliance gamble will be inversely related to the perceived probabilities of detection and criminal prosecution. These hypotheses can be derived from a formal model that yields other testable hypotheses as well. Suppose respondents will take a specific noncompliance gamble as long as the expected utility of the gamble is greater than the (expected) utility from truthful reporting. The expected utility of the gamble will depend on the perceived probability of detection, the perceived probability of criminal prosecution, the size of the gamble, and the respondent's

attitude toward risk. If this is modeled formally and respondents are assumed to be risk averse, it is possible to derive the following rule, where p_d denotes the perceived probability of detection, p_c denotes the perceived probability of criminal prosecution, and f denotes the percentage noncompliance: Accept the gamble if and only if $p_d \leq \bar{p}$, where $\bar{p}$, the maximum acceptable detection risk, is a decreasing function of p_c and f.[11] Thus the larger p_c and f, the smaller $\bar{p}$ and hence the lower the perceived probability of detection for which the gamble is attractive.

To implement the rule of accepting the gamble if $p_d \leq \bar{p}$, respondents must assess p_d. The true value of p_d depends on many factors, such as the IRS's auditing strategy and the ability of a plumber to hide his noncompliance. It is doubtful whether any of our respondents had sufficient information concerning these factors to pinpoint p_d. Instead, we assume they entertained different possible values for p_d. We interpret their reported probabilities of detection, which we denote as $\bar{p}_d$, as the median or modal value of the possible values they thought p_d could be. When asked to report the likelihood that if in the plumber's position they would take the noncompliance gamble, we assume they answered by reporting the likelihood that the true value of p_d was less than or equal to $\bar{p}$ based upon their perceptions about the probability of detection. This would explain why the majority of the responses to this question were between zero and one rather than equal to zero or one.[12] Respondents would report zero only if $\bar{p}$ were so low that they believed there was no chance p_d was less than or equal to $\bar{p}$, while they would report one only if $\bar{p}$ was so high that they were sure p_d was below $\bar{p}$.

The likelihood that a respondent would believe that p_d is less than or equal to $\bar{p}$ clearly depends on the magnitude of $\bar{p}$ and the respondent's perceptions of p_d. It follows directly that the lower $\bar{p}$, the lower the likelihood that p_d is less than or equal to $\bar{p}$. Since

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[11] For income line items, let y^* denote the true amount on the line item, $(1 - f)$ denote the fraction of y^* reported, δ denote the penalty per dollar of unreported taxes if detected (δ can be allowed to vary with f, the percentage noncompliance), t denote the (constant) tax rate, c denote the cost per dollar of noncompliance associated with criminal prosecution and the subsequent punishment, and $U(\bullet)$ denote the respondent's utility function, where the first derivative of U is positive and the second derivative is negative (i.e., the respondent is risk averse). Then it can be shown that the expected utility of the gamble will exceed the expected utility of truthful reporting whenever $p_d \leq \bar{p}$, where

$$\bar{p} = \frac{U(y^*(1-t(1-f))) - U(y^*(1-t))}{U(y^*(1-t(1-f))) - (1-p_c)U(y^*(1-t-\delta tf)) - p_c U(y^*(1-t-\delta tf-cf))}$$

It can be shown that $\partial\bar{p}/\partial p_c < 0$ and $\partial\bar{p}/\partial f < 0$, and hence that $\bar{p}$ is a decreasing function of p_c and f. A similar derivation applies for deduction items.

[12] Sixty percent of the responses for self-employment income and 52% of the responses for charitable deductions were between zero and one.

$\bar{p}$ is a decreasing function of p_c and f, this implies that the greater p_c and f, the lower the likelihood of taking the gamble. Similarly, it would be expected that the larger $\bar{p}_d$, the smaller the likelihood the respondent would attach to p_d being less than or equal to $\bar{p}$. Therefore, the larger $\bar{p}_d$, the lower the likelihood of taking the gamble. Thus, the theory predicts that the likelihood of taking the noncompliance gamble will be a decreasing function of $\bar{p}_d$, p_c, and f. The first two predictions are just standard deterrence predictions—the larger the perceived probabilities of detection and criminal prosecution, the smaller the likelihood of a noncompliant act. The prediction concerning f, the percentage noncompliance, follows from the assumption of risk aversion. Intuitively, when f increases, the size of the gamble rises, causing the gamble to become less attractive to a risk-averse individual. The same prediction concerning f follows if δ, the penalty per dollar of detected noncompliance, is assumed to be an increasing function of f. Then an increase in f would cause the penalty rate to rise, which would also make the gamble less attractive.

To test the predictions of the model, the following equation was estimated for each of the two line items:

$$L = \beta_0 + \beta_1 LP + \beta_2 HP + \beta_3 \bar{p}_d + \beta_4 p_c + \gamma' \mathbf{PC} + \epsilon$$

where β_0, β_1, β_2, β_3, and β_4 are coefficients, γ is a vector of coefficients, and ϵ is a disturbance. The variables of the equation are defined as follows. The variable L is the reported likelihood of taking the gamble. The variables LP and HP represent the fractional size of the noncompliance gamble. For both line items, the fractional gamble (i.e., the total amount of noncompliance expressed as a fraction of the true amount on the line item) equals either .25, .50, or .90. If the true amount on the line item equals its lower value, then LY equals the fractional gamble and HY equals zero, whereas if the true amount on the line item equals its higher value, then HY equals the fractional gamble and LY equals zero. The variables $\bar{p}_d$ and p_c are the reported probabilities of detection and criminal prosecution, respectively. The vector of variables **PC** is the same vector of respondent characteristics included in the prior equations.

The theory predicts that the larger the fractional gamble and the greater the reported probabilities of detection and criminal prosecution, the less attractive the gamble. This requires that β_1, β_2, β_3, and β_4 all be negative. To be consistent with the theory, the fractional size of the gamble is entered as two separate variables according to the true amount on the line item. The total size of a given fractional gamble will vary according to the true amount on the line item. The theory predicts that both the total amount and the fractional size of the gamble may affect the likelihood of taking the gamble. The effect of the size of the gamble, however, de-

pends on the nature of the respondent's aversion to risk, which is not predicted by the theory. Consequently, the theory makes no predictions about the relative magnitudes of β_1 and β_2. Because the theory makes no predictions about the influence of personal characteristics, we refrain from making predictions about their coefficients.

For each line item, the model was again estimated as a Tobit equation using the pooled responses from the 163 respondents to the three noncompliance gambles they were asked to consider. The estimates of the coefficients and *t*-statistics for the two line items are presented in Table 6. For both line items, $\hat{\beta}_1$, $\hat{\beta}_2$, and $\hat{\beta}_3$ are negative and significantly different from zero at the .01 level, as predicted. However, for both line items $\hat{\beta}_4$ is not significantly different from zero at conventional levels. This suggests that respondents considered the monetary features of the gambles, including the probability of detection and the fractional gamble, but were not concerned about the prospects of criminal prosecution. Thus, the results support Hypothesis 7 but are inconsistent with Hypothesis 8.[13]

The estimates of the coefficients of the personal characteristics for the two line items are more similar than for either the perceived probability of detection or the perceived probability of criminal prosecution. For both line items the likelihood of taking a noncompliance gamble declines with age and the filing of a joint return and is higher for individuals who have been audited, itemize deductions, and had self-employment income. The findings regarding age and prior audit experience are consistent with previous findings.[14] To our knowledge, the other factors have not been previously investigated.

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[13] There is considerable evidence that individuals who believe that tax noncompliance is morally wrong are less likely to noncomply (cf. Grasmick and Scott, 1982; Thurman *et al.*, 1984). If individuals with greater moral commitment to compliance also perceive that the risk of detection of noncompliance is higher, our estimate of the deterrent impact of the perceived probability of detection may be inflated or even spurious. Thus, the extent to which our results support Hypothesis 7 may be overstated. To test for this possibility, we included in the scenarios a question designed to probe the rationale for the responses to the questions concerning the individual's willingness to engage in the noncompliance gambles. One available response was designed to identify those who felt that noncompliance was morally wrong. The specifications reported here were expanded to include dummy variables distinguishing respondents based on their response to this question. We found that the "moral" respondents did not have systematically higher risk perceptions than others. Further, while the results indicated that the "morals" were much less likely to indicate that they would engage in the noncompliance gambles, the magnitude and significance of the detection risk and criminal prosecution coefficient estimates were unaltered in the extended specification. This same observation applies to the results reported in the next section.

[14] Unlike prior studies, however, we find no evidence that women are more prone to comply. As the design of the experiment controls for opportunity, the finding that gender has no significant impact on either risk perceptions or behavioral intentions is consistent with the previously cited specula-

Table 6. The Evasion Gamble: Model I

Variable	Coefficient[a]	
	Income	Charitable Deductions
Intercept (β_0)	.583**	.775**
	(3.92)	(5.93)
LP (β_1)	−.265**	−.325**
	(−3.25)	(−4.19)
HP (β_2)	−.451**	−.586**
	(−4.65)	(−5.43)
$\bar{p}_d$ (β_3)	−.781**	−.306**
	(−5.93)	(−2.97)
p_c (β_4)	.0369	−.00592
	(.52)	(−.06)
AGE	−.0102**	−.0195**
	(−2.58)	(−5.31)
SEX	.0144	−.0163
	(.28)	(−.35)
JOINT	−.200**	−.258**
	(−2.83)	(−3.10)
SELF	.218**	.263**
	(3.22)	(3.17)
SPOUSE	.125	.0619
	(1.55)	(.64)
AUDIT	.126*	.143**
	(2.14)	(2.67)
SEI	.259**	.188**
	(4.82)	(3.64)
ITEM	.223**	.276**
	(3.77)	(4.17)
N	489	489

[a] *t* - statistics in parentheses
* Significant at the .05 level (one-tailed test)
** Significant at the .01 level (one-tailed test)

B. An Alternative Model

While the estimates of the effect of p_c on L are inconsistent with Hypothesis 8, they are not inconsistent with Hypothesis 8′. In deriving Hypothesis 8, it was implicitly assumed that the costs associated with criminal prosecution and potential incarceration were moderate. But suppose these costs are enormous. Then respondents would be unwilling to take a noncompliance gamble unless they believed the probability of criminal prosecution equals

tion of Kinsey (1984) that earlier findings on gender may be a reflection of differential opportunity for noncompliance.

zero or the probability of detection equals zero. This suggests that L will not be a continuous function of p_c but rather a function of whether $p_c = 0$ or $p_c > 0$.

To test this idea, the following equation was estimated for each of the two line items:

$$L = \beta_0 + \beta_1 LP + \beta_2 HP + \beta_3 \bar{p}_d + \beta_4 C + \beta_5 C \times LP + \beta_6 C \times HP + \boldsymbol{\alpha}'\mathbf{PC} + \omega$$

where the β_i, $i = 0, 1, \ldots, 6$, are coefficients, $\boldsymbol{\alpha}$ is a vector of coefficients, ω is a disturbance, and C is a 0–1 dummy that assumes the value of one when $p_c > 0$. Consider first the case in which $p_c = 0$. Then $C = 0$ and the model reduces to

$$L = \beta_0 + \beta_1 LP + \beta_2 HP + \beta_3 \bar{p}_d + \boldsymbol{\alpha}'\mathbf{PC} + \omega$$

which is the same as the prior model without the variable p_c. Since p_c equals zero, it is expected that, as before, β_1, β_2, and β_3 will each be negative, and L will represent the likelihood that $p_d \leq \bar{p}$, given $p_c = 0$. Alternatively, suppose $p_c > 0$. Then $C = 1$, and the model can be expressed as

$$L = \beta_0 + \beta_4 + (\beta_1 + \beta_5)LP + (\beta_2 + \beta_6)HP + \beta_3 \bar{p}_d + \boldsymbol{\alpha}'\mathbf{PC} + \omega$$

If $p_c > 0$, the theory predicts that the respondent will take the gamble only if $p_d = 0$. Therefore, in this case we interpret L as the likelihood the respondent attaches to the true probability of detection equaling zero.[15] But if $p_d = 0$, the size of the gamble will be irrelevant even for a risk-averse individual because there is no risk.[16] This implies that $\beta_1 + \beta_5 = \beta_2 + \beta_6 = 0$, which requires that $\beta_5 > 0$ and $\beta_6 > 0$. It would be expected that the larger $\bar{p}_d$, the lower the likelihood the respondent attaches to the true value of p_d equaling zero. Hence, as for the case of $C = 0$, β_3 would be expected to be negative.[17] Last, consider β_4. If p_c goes from zero to

[15] Note that this and all other predictions of our model rest on the assumption that individuals do not make moral judgments about tax noncompliance. For those individuals who would never noncomply because they feel tax noncompliance is morally wrong, L would equal zero even if they felt there was some chance that the true probability of detection equaled zero.

[16] Alternatively, if it is perceived that p_d is greater than zero (and $p_c > 0$), the size of the gamble will also be irrelevant, as the gamble would never be taken under any circumstances.

[17] For $C = 1$, if respondents were sure that the probability of detection was greater than zero, they would never take the gamble. Then variations across respondents in the probability of detection would have no effect on the likelihood of taking the gamble. We assumed, however, that respondents do not know the probability of detection. Moreover, we assumed that the larger the value they reported for $\bar{p}_d$ the smaller the likelihood they attached to the true probability of detection equaling zero. Consequently, because $\bar{p}_d$ is a proxy for the likelihood the respondent attaches to the true probability of detection equaling zero, it is expected to affect the likelihood of taking the gamble.

positive, the predicted change in L will be $\beta_4 + \beta_5 LP$ when the true amount on the line item is the lower of the two amounts, and $\beta_4 + \beta_6 HP$ when the true amount on the line item is the higher of the two amounts. The theory predicts that in either case the change in L must be negative, which requires that $\beta_4 \leq -\beta_5 LP$ and $\beta_4 \leq -\beta_6 HP$. Since both β_5 and β_6 are predicted to be positive, this requires β_4 to be negative.

To summarize, the theory that $p_c > 0$ is an absolute deterrent

Table 7. The Evasion Gamble: Model II

	Coefficient[a]	
Variable	Income	Charitable Deductions
Intercept (β_0)	.957**	1.04**
	(5.92)	(7.10)
LP (β_1)	−.467**	−.560**
	(−2.47)	(−3.52)
HP (β_2)	−.808**	−1.87**
	(−4.44)	(−4.94)
$\bar{p}_d$ (β_3)	−.722**	−.258**
	(−5.62)	(−2.72)
C (β_4)	−.388**	−.305**
	(−3.82)	(−3.22)
$C \times LP$ (β_5)	.282	.281
	(1.38)	(1.55)
$C \times HP$ (β_6)	.477*	1.38**
	(2.19)	(3.68)
AGE	−.0116**	−.0199**
	(−2.99)	(−5.27)
SEX	−.00748	−.0161
	(−.15)	(−.35)
JOINT	−.255**	−.241**
	(−3.30)	(−2.89)
SELF	.218**	.247**
	(3.36)	(2.92)
SPOUSE	.155*	.0605
	(1.93)	(.63)
AUDIT	.122*	.119*
	(2.15)	(2.21)
SEI	.241**	.181**
	(4.63)	(3.41)
ITEM	.232**	.264**
	(3.84)	(3.87)
N	489	489

[a] *t* - statistics in parentheses

* Significant at the .05 level (one-tailed test)

** Significant at the .01 level (one-tailed test)

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given $p_d > 0$ implies two distinctive predictions. The first is that for $p_c > 0$, the size of the gamble will not influence behavioral intentions. This requires $\beta_5 > 0$, $\beta_6 > 0$, and $\beta_1 + \beta_5 = \beta_2 + \beta_6 = 0$. The second concerns the magnitude of the deterrent effect of p_c as measured by β_4. Not only is β_4 predicted to be negative, but it is also expected to be less than or equal to $-\beta_5 LP$ and $-\beta_6 HP$.

The estimates of the coefficients and t-statistics are reported in Table 7 for the two line items. For both line items $\hat{\beta}_1$, $\hat{\beta}_2$, and $\hat{\beta}_3$, the coefficient estimates for LP, HP, and $\bar{p}_d$, respectively, are negative and significant at the .01 level, as in the prior model. Turning to the first distinctive prediction of the alternative model, for both line items $\hat{\beta}_5$ and $\hat{\beta}_6$ are positive and significantly greater than zero at the .10 level, as predicted. This means that the fractional size of the gamble has a lower effect on the likelihood of taking the gamble when the perceived probability of criminal prosecution is greater than zero. But contrary to expectations, $\hat{\beta}_1 + \hat{\beta}_5$ and $\hat{\beta}_2 + \hat{\beta}_6$ are negative for both line items and significantly different from zero at the .05 level in three of four instances. Thus, while the fractional gamble has a smaller effect on the likelihood of taking the gamble when the perceived probability of criminal prosecution is greater than zero, the effect of the fractional size of the gamble is still significant. For both line items, however, $\hat{\beta}_1 + \hat{\beta}_5$ is only about half the value of $\hat{\beta}_1$, and $\hat{\beta}_2 + \hat{\beta}_6$ is only about one-third the value of $\hat{\beta}_2$. Thus, when $p_c > 0$, the influence of the fractional gamble is substantially reduced but not entirely eliminated.

Consider next the second distinctive prediction of the alternative model. For both line items, $\hat{\beta}_4$ is negative, as predicted, and significantly less than zero at the .01 level. Thus, in contrast to the variable p_c, the dichotomous variable representing whether $p_c = 0$ has a significant impact on respondents' willingness to take the noncompliance gamble. The theory also predicts that $\beta_4 < -\beta_5 LP$ and $\beta_4 < -\beta_6 HP$. This was tested by setting LP and HP equal to their average values of .55 (this is the average of the three fractional gambles of .25, .50, and .90). For self-employment income $\hat{\beta}_4 < -.55\hat{\beta}_5$ and $\hat{\beta}_4 < -.55\hat{\beta}_6$, while for charitable deductions $\hat{\beta}_4 < -.55\hat{\beta}_5$ but $\hat{\beta}_4 > -.55\hat{\beta}_6$. This suggests that for three of the four cases corresponding to self-employment income equal to $5,000 and $15,000 and charitable deductions equal to $1,000, the likelihood of taking the noncompliance gamble is lower when the perceived probability of criminal prosecution is greater than zero, as predicted. Even in the remaining case where true charitable deductions equal $5,000, the results are really not inconsistent with our prediction. In this instance, the true amount is already so high relative to the taxpayer's total income that even among respondents who reported a zero probability of criminal prosecution, their average likelihood of taking the three fractional gambles was only

.04.[18] This leaves virtually no room for the fear of criminal prosecution to act as a deterrent.

In the three instances in which the prediction concerning the magnitude of β_4 is supported, $\hat{\beta}_4 + .55\hat{\beta}_5$ and $\hat{\beta}_4 + .55\hat{\beta}_6$ are not significantly different from zero at conventional levels (the t-statistics range from $-.9$ to -1.5). But the point estimates indicate that the threat of criminal prosecution (i.e., $C = 1$) reduces the likelihood of taking the gamble by .14 to .20. Given that the average likelihood of taking the gamble in the three cases is about .20, this suggests a very sizable impact.

Thus, the estimates provide strong support for Hypothesis 8′, especially relative to Hypothesis 8. In effect, a simple test of the deterrent effect of criminal prosecution suggests that fear of criminal prosecution is irrelevant, whereas a threshold formulation of the deterrent effect of criminal prosecution suggests it is a very powerful deterrent. The estimates also suggest that when respondents do not fear criminal prosecution, the monetary aspects of gambles play a prominent role in their decisions on noncompliance.

Our interpretation of the results assumes causality flows from perceptions to behavior and not in the reverse direction. It is possible, however, that experienced noncompliers have a lower perception of the probability of detection and possibly criminal prosecution by dint of their experience, causing the past (and possibly intended future) incidence of noncompliance to be negatively correlated with the perceived probability of detection even though no direct causality exists (cf. Paternoster *et al.*, 1983). We doubt, however, that this possibility has much bearing on our results. Only 20 percent of our respondents had had any self-employment income in the previous five years, and none were plumbers, so in general they did not bring much experience to the self-employment income gambles they were asked to consider. Moreover, we included experience-related variables in all the perceptions equations and in general they did not have consistent effects on perceptions of the probability of detection or criminal prosecution. Further, our results control for experience in the compliance gamble equations by including the same experience-related variables in these equations.

VI. CONCLUSION

The findings suggest that taxpayers are sensitive to the effects of their noncompliance behavior on the risks of detection and criminal prosecution and that these risks have important effects on their willingness to engage in noncompliance. Not only do taxpayers appear to make calculated decisions, weighing the benefits and costs of noncompliance, but their calculations appear to con-

[18] In contrast, when true charitable deductions equal $1,000, the average value of this likelihood was .35.

form closely to the institutional realities of the enforcement process. Like the findings of other studies on the "rational" criminal, our results portray an image of an informed, rational taxpayer who structures his noncompliance gambles to keep the risks of detection and criminal prosecution down to acceptable levels. This conclusion has a number of important implications.

Our results concerning the influence of the taxpayer's noncompliance choices on risk perceptions underscore an argument advanced by Graetz *et al.* (1986) and Dubin and Wilde (in press) that detection risk is not exogenous but a function of the level of noncompliance. Our findings concerning the risk of criminal prosecution extend this argument, indicating that the perceived probability of criminal prosecution is also a function of the taxpayer's noncompliance behavior.

The endogenous nature of risk perceptions suggests that survey research focusing on the deterrent impact of such perceptions would benefit from a careful delineation of the type and extent of noncompliance to respondents. Without such a delineation, respondents will be forced to impose their own assumptions about the nature of the noncompliance. Variations across respondents on the assumptions they impute may confound the interpretation of results concerning the influence of risk perceptions on behavior or, conversely, behavior on risk perceptions.

A second generalization of the argument put forth by Graetz *et al.* follows from what we call the "substitution effect" (Klepper and Nagin, in press a). The substitution effect predicts that individuals with superior evasion opportunities will be less aggressive in exploiting noncompliance on inferior opportunities than individuals without superior opportunities. This prediction is a manifestation of cross–line item linkages in detection risk. Especially for inferior evasion opportunities, the results suggest that the perceived risk of detection is a function not only of the extent of noncompliance on that (inferior) opportunity but also of noncompliance elsewhere on the return. It is this linkage that gives rise to the substitution effect.

The substitution effect has a number of implications for policy and research design. Policy innovations designed to reduce a particular type of noncompliance may be undermined if taxpayers transfer some of their noncompliance on the targeted opportunity to other, now superior evasion opportunities. This implies that an evaluation of the impact of such enforcement innovations will be incomplete and possibly misleading if it estimates only the direct compliance gains on the targeted opportunities. A full evaluation must also consider the possibility of increased noncompliance on non-targeted opportunities.

Perhaps the most important finding of this inquiry pertains to the deterrent effect of criminal prosecution. Few studies in the extensive deterrence literature have found evidence of a deterrent

effect of perceived severity of formal sanctions. Indeed, the long series of negative findings concerning perceived severity led Jensen *et al.* (1978) to conclude that the perceived severity of formal sanctions had *no* consequential deterrent effect. The findings reported here may illuminate why previous studies have failed to find evidence of a deterrent role for perceived severity. To our knowledge all such studies have calibrated perceived severity using indices analogous to our continuous measure of the perceived risk of criminal prosecution.[19] Like most prior studies, our analysis revealed no evidence that a continuous measure of perceived severity acts as a deterrent to law breaking. By contrast, substantial evidence was found that a non-zero perception of prosecution risk had a powerful deterrent impact.

If the cost of criminal prosecution is perceived to be so high for our middle class respondents that a perception of any non-zero chance of criminal prosecution is an absolute deterrent, the difference in results across alternative measures of perceived severity is understandable. If a non-zero chance of criminal prosecution is an absolute deterrent, marginal increases in the perceived risk of criminal prosecution above the zero threshold should be inconsequential to behavior. Thus, the general failure of prior studies to find evidence of a deterrent effect for severity may be attributable to the specification of the severity measure and not to the absence of a severity effect on deterrence. This interpretation is consistent with the argument of Grasmick and Bryjak (1980). They contend that the general null findings concerning the deterrent effect of severity of punishment are attributable to a failure to control for differences among individuals in the personal consequences of being punished with a specific formal sanction. Our argument is a special case of the Grasmick and Bryjak argument in which personal costs are enormous for all individuals.

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[19] See Grasmick and Bryjak (1980) for a review of these studies and their severity measures.

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