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March, 2017

WORKING PAPER #2017-01

WORKING PAPER SERIES
DEPARTMENT OF ECONOMICS
HASLAM COLLEGE OF BUSINESS
http://econ.bus.utk.edu

Endogenous Tax Audits and Taxpayer Assistance Services: Theory and Experiments[1]

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Endogenous Tax Audits and Taxpayer Assistance Services: Theory and Experiments

Abstract: In recent years there has been a sharp rise in the information available to individual income taxpayers, such as through tax preparation software provided by third parties and support available by tax agencies, although the effects of this information on tax reporting is not well understood. Within a setting characterized by an endogenous audit process and taxpayer uncertainty, this study uses theory and laboratory experiments to investigate the effects of taxpayer assistance services that better inform taxpayers about their tax liability and the audit process. The endogenous audit rule we study is simple, yet relative to existing work is more likely to characterize the actual incentives facing taxpayers. Among our findings, and in contrast to the case of purely random audits, in theory the effect of information services on tax underreporting is ambiguous, and we find support empirically for increased tax underreporting even in a setting where theory predicts the opposite. When services provide better information on both liability and the audit process, audit information is more salient to participants, negating the strong effects observed when only liability information is provided.

JEL Classifications: C91; D8; H24; H26; H83

Keywords: individual income tax; taxpayer assistance services; endogenous audits; tax reporting and enforcement; experimental methods

1. Introduction

In a voluntary reporting tax system, such as the US individual income tax, taxpayers may try to reduce their burden by engaging in tax underreporting. While tax withholding and third party reporting can reduce the effects of this evasion "gamble", the fact remains that a substantial fraction of income sources and claimed deductions are neither subject to withholding nor to third party reporting. Common examples include tip and self-employment income, capital gains and rental income, and charitable contributions. Many workers not subject to withholding do not file tax returns and are sometimes labeled as "ghosts" (Erard and Ho, 2001). The overall effect of tax underreporting by tax filers and non-filers has led to a persistent tax "gap" by which an estimated $300 billion goes uncollected ($235 billion in individual income tax and $57 billion in the self-employment tax) as of the tax year 2006 (Bloomquist et al., 2013).

Limited by resource constraints, it has long been recognized that many tax agencies use endogenous rules that base audit chances on taxpayer characteristics and tax reporting behavior. Such rules can be crudely characterized as ones that, for a given peer group of taxpayers (i.e. an audit class), lead to audit chances that are increasing with the level of noncompliance (Phillips, 2012). Indeed, as audits are costly, there is an efficiency argument for rules that do well in targeting those taxpayers with the highest expected taxes evaded. In turn, when facing an endogenous audit rule, individuals contemplating how much tax to evade may take into account available information signals on how the audit process is perceived to work. This study uses economic theory and laboratory experiments with human subjects to provide insight on possible interactions between an endogenous audit process and information signals provided by taxpayer

services, including information on tax liability and the audit process.[2, 3]

The particular audit rule we develop and examine determines the audit probability, separately for each taxpayer, as a strictly increasing function of one's expected level of tax evasion.[4] Although this rule represents a simplification of actual audit processes, it captures the key incentive present in most endogenous processes in the field and, in expectation, leads to audits that target the worst offenders. Much of the prior experimental work related to individual tax compliance has instead relied on the use of purely random audits. As exceptions, a handful of studies have studied endogenous audit mechanisms that establish an agent's audit probability based on the observed, relative behavior within a regulated group (Alm and McKee, 2004; Cason, Friesen and Gangadharan, 2016; Gilpatric, Vossler and McKee, 2011) or based on compliance history (Alm, Cronshaw, and McKee, 1993; Cason and Gangadharan, 2006; Clark, Friesen and Muller, 2004). Models based on peer evaluations create interactions between taxpayers – e.g. a competition effect to avoid being selected for audit or an incentive to coordinate reports to lower the equilibrium audit probability – and are most relevant when the regulated group is small. In actuality, a taxpayer is unlikely to know the size and membership of their audit class, and further – given the large number of taxpayers with similar observable characteristics – it is improbable that any individual taxpayer believes he can actually influence the audit chances of *others* through her reporting behavior. Models based on compliance history, while they may capture an important tax consideration, introduce a complicated dynamic game

[2] Alm, Bloomquist and McKee (2015) provide a discussion, along with supportive evidence, of the external validity of laboratory experiments on individual income tax compliance.
[3] Our discussion of the literature focuses on related work examining endogenous audit rules or the effects of information services on income tax compliance. Of course, the literature on tax compliance (evasion) is vast, and we point the interested reader to Alm (2012), and references therein, for a discussion of the broader literature.
[4] Alternatively, some have modelled the audit process as imposing a threshold, where reporting taxes above the threshold results in a zero audit chance. Although this may explain some audit rules in practice, field evidence is largely inconsistent with theoretical predictions from such threshold models (Andreoni, Erard and Feinstein, 1998).

between the taxpayer and the regulator. Importantly, aside from using history to apply differential audit efforts to previously compliant and noncompliant taxpayers, audits are randomly determined.

In recent years there has been a sharp rise in available information related to individual income tax reporting. This includes taxpayer assistance services provided by tax agencies, such as telephone help lines and internet information documents, as well as information provided by third-parties, including tax preparation software (e.g. TurboTax and TaxAct), professional tax preparers, and publications with insight on tax agency operations. These sources inform taxpayers about the tax code and provide guidance on how to determine tax liability. Further, the use of some tax preparation software is likely to provide signals on how the audit process works through, for example, suggestions of audit flags and information about what like-taxpayers report in charitable contributions.[5] This is to say that, although survey evidence suggests that many taxpayers are ill-informed of IRS audit rules (Louis Harris and Associates, Inc., 1988), the use of tax software is likely to engender beliefs that audit chances are increasing with noncompliance.

In this study, we look at the effect that taxpayer information sources have on tax reporting when there is an underlying endogenous audit rule, with a focus on services that provide better information from which to estimate one's tax liability (hereafter, this is referred to as a "liability information service") as well as information related to the audit procedure ("audit information service", hereafter). The effects of liability information services have been studied previously in the lab (Alm et al., 2010; Vossler and McKee, 2017), albeit under random audits, with the basic findings that providing more precise information on tax liability leads to less tax

[5] Ayers, Jackson and Hite (1989) survey third-party tax preparers and find they tend to have pro-taxpayer interpretations of tax regulations. While this may be generally true for third-party information providers, as we are also interested in the effects of (presumably unbiased) information provided by tax agencies, in our design we focus on the provision of unbiased information.

underreporting and increases filing rates both theoretically and experimentally. With the endogenous audit rule, and in contrast to the case of purely random audits, providing more accurate information about one's tax liability in theory no longer has an unambiguous effect on tax underreporting. In particular, liability information can alter expected liability which in turn impacts beliefs regarding the audit probability associated with any level of underreporting. For example, when a service alerts the taxpayer that her liability is lower than expected, this increases the expected audit probability tied to a given level of underreporting and thus increases the marginal incentive to comply. Furthermore, the effect of improved information on reporting is ambiguous even if it does not change expected liability but reduces the uncertainty regarding it. When uncertainty is reduced this decreases the expected penalty the taxpayer faces for any given level of underreporting of taxable income, which in turn reduces the value of avoiding an audit. A lower expected penalty conditional on being audited reduces the benefit of lowering the probability of audit by reporting more taxable income, and may lead to reduced compliance.

Whereas more accurate information regarding a taxpayer's liability has a complex and generally ambiguous affect, more accurate information regarding the probability of audit conditional on reported taxable income has a very straightforward impact on predicted behavior. If the information reveals the audit probability to be higher than expected this increases predicted compliance, and if it reveals the audit probability to be lower than expected this reduces predicted compliance. Reduced uncertainty that does not change the expected audit probability has no impact on predicted behavior.

A variation on the audit mechanism that we consider is the possibility of partial audits, which reflects a situation where particular tax form line items (e.g., itemized deductions) may be subject to differential scrutiny. We incorporate this feature to study whether taxpayers respond as

theory predicts (e.g. differential evasion across line items with a greater level exhibited on the line less likely to be audited). Alternatively, taxpayers can employ simple heuristics when determining compliance which are insensitive or sub-optimally responsive to these type of differences in the enforcement context. We find that if the probability of being audited doubles for any level of reported taxable income, but only one line will be audited and either is equally likely, then predicted behavior is unaffected. However, if information services reveal which of the two line items is more likely to be audited, this is predicted to lead to increased compliance in the line with a higher probability of audit, and reduced compliance on the other line, as is intuitive. It is possible that the overall effect may be to either increase or decrease reported taxable income.

Finally, we find that a liability information service guarantee that insulates the taxpayer from any penalties accruing from an audit, conditional on the taxpayer meeting reporting requirements (e.g., reported at least expected liability), may increase reported taxable income. This is predicted to happen only if the report that would minimize the taxpayer's expected costs (absent the guarantee) is lower than the recommended report from the service but the difference is sufficiently small. In such a case the taxpayer benefits from reporting more taxable income because, although she incurs a higher tax payment, this is offset by the reduction in possible penalties. If obtaining the guarantee does not require too large an increase in reported taxable income, then this trade-off will be beneficial.

The experimental results serve to both confirm and challenge the theoretical model. The most striking finding is that resolving uncertainty over tax liability has either a null or a negative impact on tax underreporting. This contrasts with prior work, which suggests strong and positive effects (Alm et al., 2010; Vossler and McKee, 2017). In fact, one prominent theme of this study

is that we have revealed settings theoretically and/or empirically where information services can have undesirable consequences on tax reporting. In the full audit settings, when services provide better information on both liability and the audit process, audit information appears to be more salient to participants, negating the strong effects observed when only liability information is provided. The effects of the audit services are largely in line with theory, in the sense that revealing a higher (lower) audit chance increases reported taxes, and – in the partial audit case – revealing which line item is likely to be audited decreases reporting associated with the untargeted line item. Additional details of our results are described later.

2. Theoretical Framework

The basic theoretical framework for tax evasion was derived by Allingham and Sandmo (1972), and follows from the Becker model of crime. This approach views tax evasion as a gamble. In this section, we build upon the theoretical literatures that assume the probability of audit is a decreasing function of reported income (see Andreoni, Erard, and Feinstein, 1998), and considers taxpayer uncertainty (Beck and Jung, 1989). The focus of this study is on tax reporting in settings where evasion is most likely to occur, that is, on reporting tied to sources of income and deductions that are subject to little or no third-party reporting requirements. In such settings, taxpayers will naturally have uncertainty over their true liability, given bookkeeping and other recording errors. Uncertainty can also arise given that reporting requirements for some sources, such as the value of donated goods, are tied to estimation methods. Further, uncertainty over liability may arise due to the complexities of the tax code.

Although taxpayers believe their choices of reported income and deductions impact the probability they will be audited, they may nevertheless remain uncertain regarding the audit

probability for any given report. This framework will allow us to make predictions about how information services that reduce taxpayer uncertainty about true tax liability or the likelihood of being audited will affect behavior both for individuals and in the aggregate.

Consider a taxpayer whose income x is drawn from distribution $F(x)$ with positive density $f(x)$ on the interval $[a, b]$. Similarly, let the taxpayer's deductions, denoted δ, be drawn from distribution $H(\delta)$ with positive density $h(\delta)$ on the interval $[j, k]$. The taxpayer will choose a level of reported income R and deductions D in order to minimize his expected compliance cost, which is the sum of his tax payments and expected penalties. Denote the tax rate as t and let β be the rate the taxpayer must pay on any liability revealed by an audit. This rate includes payment of additional taxes due plus some additional fine, thus $\beta > t$. The probability the taxpayer is audited is a function of his reported income and deductions, $p(R, D)$, with $\frac{\partial p(R,D)}{\partial R} \leq 0$ and $\frac{\partial p(R,D)}{\partial D} \geq 0$ (the inequalities are strict unless the probability reaches 0 or 1). Furthermore, we assume that the audit probability function is equally responsive at the margin in decreased reported income or increased deductions, $\frac{\partial p(R,D)}{\partial R} = -\frac{\partial p(R,D)}{\partial D}$. The decision problem for a risk-neutral taxpayer can be represented in this general framework as

[1] $$\min_{R,D} t(R - D) + p(R, D)\beta \left[\int_R^b (x - R) f(x) dx + \int_j^D (D - \delta) h(\delta) d\delta\right].$$

The first term in the objective function is the tax on reported income and the second term is the expected additional payments resulting from the possibility of an audit. The first order conditions identifying cost-minimizing reporting and deductions are respectively

[2] $$t + \frac{\partial p(R,D)}{\partial R}\beta \left[\int_R^b (x - R) f(x) dx + \int_j^D (D - \delta) h(\delta) d\delta\right] - \beta p(R, D) \int_R^b f(x) dx = 0, \text{ and}$$

[3] $$t - \frac{\partial p(R,D)}{\partial D}\beta \left[\int_R^b (x - R) f(x) dx + \int_j^D (D - \delta) h(\delta) d\delta\right] - \beta p(R, D) \int_j^D h(\delta) d\delta = 0.$$

The general framework above shows the tradeoffs that the taxpayer faces in this context.

Reporting more income (deducting less) increases the tax payment, but reduces the expected penalty through two channels: a reduced probability of being audited and reduced expected penalty conditional on being audited. Optimal choices equate the increased tax payment and reduced expected penalty at the margin. Note that a *ceteris paribus* increase in the audit probability or increased responsiveness to a marginal change in reported income/deductions at all (R, D) pairs will increase reported income and decrease reported deductions. Also, for a given audit probability function, an increase in expected income while holding the variance constant will lead to an increase in reported income, and similarly for deductions. However, the effect of an increase in the variance of income or deductions while holding their expected values constant is ambiguous in general.

In order to generate specific predictions regarding the effects of information services on behavior in our experimental framework we will impose additional structure on the model. We assume uncertainty regarding income and deductions is represented by uniform distributions, in particular that $x \sim U[a, b]$ and $\delta \sim U[j, k]$. We also assume that the probability of audit is a linear function of the taxpayer's reported taxable income: $p(R, D) = \gamma(y - R + D) + c$. In this expression c is a constant and y is a reference point to which the taxpayer's reported taxable income is compared.[6] The parameter $\gamma > 0$ represents the rate at which the audit probability changes in accordance with reported taxable income. Note that this structure implies that a taxpayer's audit probability is equally sensitive to reported income and deductions, i.e. $\frac{\partial p(R,D)}{\partial R} = -\frac{\partial p(R,D)}{\partial D} = \gamma$.

With this added structure the taxpayer's decision problem can be represented as

[6] A natural choice for y is to set this equal to expected true taxable income, i.e. $E[x] - E[\delta]$. As discussed later, in the experiment for convenience we set $y = b - j$.

[4] $\min_{R,D} t(R-D) + (\gamma(y-R+D)+c)\beta\left[\frac{(b-R)^2}{2(b-a)} + \frac{(D-j)^2}{2(k-j)}\right]$.

The first order conditions identifying cost-minimizing reporting and deductions are respectively

[5] $t - \beta\gamma\left[\frac{(b-R)^2}{2(b-a)} + \frac{(D-j)^2}{2(k-j)}\right] - c\beta\left(\frac{b-R}{b-a}\right) - \frac{\gamma\beta(y-R+D)(b-R)}{(b-a)} = 0$, and

[6] $t - \beta\gamma\left[\frac{(b-R)^2}{2(b-a)} + \frac{(D-j)^2}{2(k-j)}\right] - c\beta\left(\frac{D-j}{k-j}\right) - \frac{\gamma\beta(y-R+D)(D-j)}{(k-j)} = 0$.

This model generates predictions regarding how a taxpayer's behavior will respond to changes in the enforcement environment, including changes in the information available to the taxpayer. An increase in the intercept, c, or slope, γ, of the audit function will increase the optimal reported income and reduce the optimal deduction. Holding constant the expected value of these audit parameters, better information regarding them (i.e. a reduction in uncertainty about either parameter value) has no effect. Therefore, both parameters in this model can be treated as expected values. For example, the taxpayer's optimal choices are identical if he is certain the intercept is 10% or if he believes it is equally likely to be 5% or 15%, thus having an expected value of 10%. Nevertheless, it may of course be the case that the behavior of taxpayers does not conform to this prediction.

Uncertainty regarding income and deductions is represented in the model by the distributions $x \sim U[a,b]$ and $\delta \sim U[j,k]$. Note that the expected value of these parameters is $E[x] = \frac{a+b}{2}$ and $E[\delta] = \frac{j+k}{2}$. It will be helpful to think of changes in the expected value of these distributions while holding the variance constant, and of changes in the variance while holding the expected value constant. First, note that a change in either distribution will affect the optimal choice of both *R* and *D*. The choices are interdependent because both impact the audit probability. It is also useful to note that if the variances of the distributions are identical, $(b-a) = (k-j)$, then optimal behavior is symmetric in that the under-reporting of income

(relative to the expected value) is equal to over-reporting of deductions: $E[x] - R^* = D^* - E[\delta]$.

Holding constant the tax authority's reference level, *y*, and the variance of income and deductions constant, an increase in the expected value of either distribution will of course increase the optimal report in that dimension. For example, if $E[x]$ increases then R^* increases. The taxpayer's optimal deductions will also increase because as he increases R this reduces the audit probability. Similarly, if $E[\delta]$ increases then D^* increases and her optimal report R increases because of the audit probability increase resulting from the higher deduction claim.

Holding constant the expected value of both distributions, the effect of a reduction in the variance (uncertainty) of either distribution is, in general, ambiguous. Depending on the optimum in the absence of additional information, a reduction in uncertainty might increase or decreases the taxpayer's expected penalty if his choices were to remain unchanged. This changes the marginal benefit of reporting more income or fewer deductions arising from the effect on the audit probability. The change in the distribution also changes the marginal effect of the choice on expected penalty. The optimal response to better information (less uncertainty) depends on the relative strength of these effects. This differs from the random audit case, where reduced uncertainty shifts the optimal reported liability towards its expected value, thus reducing underreporting when underreporting is initially optimal (see Vossler and McKee, 2017). This is not necessarily the case in our endogenous audit model. Because uncertainty resolution may reduce the expected penalty, and thus decrease the value of avoiding an audit, it may increase underreporting.

To this point we have modeled an audit as applying to both line items, income and deductions. We also want to explore a setting where an audit may apply to only one of the line-items, and a taxpayer is uncertain about which line will be audited if one in fact occurs. Let α be

the probability that income is audited (conditional on an audit occurring), with $1-\alpha$ then the probability that deductions are audited. It will also be convenient for the discussion that follows to add a parameter s that multiplies the audit probability function. Incorporating these yields the following optimization problem:

[4'] $\min_{R,D} t(R-D) + s(\gamma(y-R+D)+c)\beta\left[\alpha\frac{(b-R)^2}{2(b-a)} + (1-\alpha)\frac{(D-j)^2}{2(k-j)}\right]$.

The first order conditions identifying cost-minimizing reporting and deductions are respectively

[5'] $t - \beta s\gamma\left[\alpha\frac{(b-R)^2}{2(b-a)} + (1-\alpha)\frac{(D-j)^2}{2(k-j)}\right] - sc\beta\alpha\left(\frac{b-R}{b-a}\right) - \frac{s\gamma\beta\alpha(y-R+D)(b-R)}{(b-a)} = 0$, and

[6'] $t - \beta s\gamma\left[\alpha\frac{(b-R)^2}{2(b-a)} + (1-\alpha)\frac{(D-j)^2}{2(k-j)}\right] - sc\beta(1-\alpha)\left(\frac{D-j}{k-j}\right) - \frac{s\gamma\beta(1-\alpha)(y-R+D)(D-j)}{(k-j)} = 0$.

Consider the case when $s=2$ and $\alpha=\frac{1}{2}$, corresponding to the notion that the auditor can audit twice as many taxpayers with the same resources if only one of the two lines is audited. Note that these terms then cancel and equations [4'], [5'], and [6'] in that case reduce to equations [4], [5], and [6]. That is, if the audit probability doubles for any given choices, *R* and *D*, but only one line-item is audited rather than both and the taxpayer believes either is equally likely to be audited, then the optimal reported income and deductions are identical. But suppose instead the taxpayer may acquire some informative signal regarding which line is more likely to be audited. How does behavior compare when $s=2$ and $\alpha \gtrless \frac{1}{2}$ to that when $s=2$ and $\alpha=\frac{1}{2}$? To answer this question it is helpful to begin by assuming the variance of the income and deduction distributions is identical, $(b-a) = (k-j)$, and recall that in the case when $s=2$ and $\alpha=\frac{1}{2}$ optimal behavior is symmetric in that the under-reporting of income (relative to the expected value) is equal to over-reporting of deductions: $E[x]-R^* = D^* - E[\delta]$. This symmetry implies that the expected penalty if either line is audited is identical: $\frac{(b-R)^2}{2(b-a)} = \frac{(D-j)^2}{2(k-j)}$.

Let $\hat{R}, \hat{D}$ be the optimum when $s = 2$ and $\alpha = \frac{1}{2}$. Then for $\alpha > \frac{1}{2}$ it must be the case that the left-hand-side expression in equation [5'] is negative at $\hat{R}, \hat{D}$, and similarly the left-hand-side expression in equation [6'] is also negative at $\hat{R}, \hat{D}$. That implies that the optimum with $\alpha > \frac{1}{2}$ is to report $R > \hat{R}$ and $D > \hat{D}$. That is, when it is more likely income will be audited, it is optimal to under-report income by less and over-report deductions by more than under otherwise equal conditions when either line is equally likely to be audited. Similarly, if $< \frac{1}{2}$, then the optimum is to report $R < \hat{R}$ and $D < \hat{D}$, that is, to under-report income by more and over-report deductions by less. If the variance of income exceeds the variance of deductions, then the same results hold for $\alpha > \frac{1}{2}$, because at $\hat{R}, \hat{D}$ the expected penalty is higher if income is audited than if deductions are audited, so if income becomes more likely to be audited the incentive to report more income and more deductions are both strengthened. However, if the variance of deductions exceeds the variance of income the results do not hold unambiguously.

The final question we address with the theoretical model is the effect of a service guarantee that insulates the taxpayer, conditional on his reporting a certain level of income and/or deductions, from paying anything other than the additional taxes owed (i.e. no penalty is assessed) if he is audited. Clearly if a service guarantee is provided it is not optimal to report more income or fewer deductions than required to receive the guarantee. Therefore, if cost-minimizing behavior otherwise entailed reporting more income or fewer deductions than required to receive the guarantee, the presence of the guarantee would change optimal behavior. We wish to address whether and under what condition the presence of a service guarantee would make a taxpayer optimally report the levels of income and deductions required to receive the guarantee under circumstances that would lead him, absent the guarantee, to report less income

and more deductions than these levels. Denote the income and deduction reports that solve the optimization problem characterized by equations [4] and [5] to be R^*, D^*, and the levels that receive the guarantee R^G, D^G, with $R^* < R^G$, $D^* > D^G$. Then reporting R^G, D^G results in a lower expected cost for the taxpayer if the following condition holds:

$$[7] \quad t(R^* - R^G - D^* + D^G) + (\gamma(y - R^* + D^*) + c)\beta\left[\frac{(b-R^*)^2}{2(b-a)} + \frac{(D^*-j)^2}{2(k-j)}\right] - (\gamma(y - R^G + D^G) + c)t\left[\frac{(b-R^G)^2}{2(b-a)} + \frac{(D^G-j)^2}{2(k-j)}\right] > 0.$$

The first term in this condition is negative and is the additional tax payment incurred when reporting R^G, D^G rather than R^*, D^*. The second term is the expected additional payments resulting from possible audit (including taxes due and penalties) given reports R^*, D^*, which is positive, and the last term is the expected taxes that may be found due if an audit occurs given that the guarantee does apply. Thus the difference in the last two terms represents expected *penalties* resulting from possible audit, but not additional taxes that may be found due. Note that when the guarantee is in effect the taxpayer is nevertheless liable for taxes due that may be found by audit. It is optimal to report more income and fewer deductions in order to obtain the guarantee if the added tax payment is less than the savings from the elimination of expected penalties net of expect tax liability that may still be found by audit. This condition will hold when the gap between the reporting levels required to obtain the guarantee and the levels that would otherwise be optimal is sufficiently small.

3. Experimental Design

3.1 Experiment Details

Parameters used for the experiments are reported in Table 1. All amounts are denominated in lab dollars. Lab dollars are converted to US dollars at the end of the session at

the rate of 900 lab dollars to one US dollar. A summary of treatment variables, and what is varied within and across sessions, is presented in Table 2. The Reviewer Appendix includes representative written instructions, and computer screenshots. We first describe common features of all experiment sessions, and then discuss specific treatments. An experimental session consists of 24 paid decision rounds arranged into four series of six rounds each. All decisions are made using a computer. At the beginning of each series the participants complete a task based on Gill and Prowse (2012), which replicates the exertion of effort outside the laboratory.[7] Participants are placed into three income groups according to relative performance.

In each decision round, participants self-report their tax liability by choosing income and deduction amounts to report, then face the possibility of audit and penalties for underreporting taxes. On the left side of the tax reporting screen appears initial information about the subject's actual income and allowable deduction amounts, and information on the audit process. In the middle of the screen, when available, appears information from liability and audit services.

The tax form appears on the right side of the screen. Final tax liability is the difference between earned income and deductions claimed (i.e., taxable income), multiplied by a tax rate of 50%. Participants are free to alter their entries on the tax form up until they file or until the tax form times out. As they adjust their entries they can update their tax form by clicking on a "Do the Math" button. By clicking this button, the reported taxable income and tax payment is displayed below the tax form. For simplicity as well as experimental control, it is not possible to receive – legitimately or through evasion – a tax refund.

Tax liability and endogenous audit probabilities are uncertain to the taxpayer. In terms of liability, the tax reporting screen displays a range of possible income and deduction amounts,

[7] Participants confront a large number of slider bars and, within sixty seconds, are asked to move as many slider bars as possible to their middle position.

respectively, and each amount within each range has an equal chance of being the actual amounts (consistent with the uniform distributions employed in the theoretical model above). Participants are required to report income and deduction amounts that are contained within the ranges of probable actual income and allowed deduction amounts. The primary purpose of this restriction is to place persons in all income groups on equal footing in terms of the range of possible tax underreporting that is allowed. Otherwise, since tax liability increases with income, those with higher incomes would naturally be able to underreport significantly more. Also, this avoids having to vary the audit function across income groups to account for the differing ranges of possible tax payment amounts. One way to think of the restrictions is that they represent what is known – based on matching documentation – by the tax agency. For example, for a participant with a range of possible income amounts between 2000 and 3000, the tax agency could be considered to know about 2000 in income, such that unmatched income is in the 0 to 1000 range.

There is an endogenous audit process that is conducted independently for each participant. Specifically, as described in Section 2, we implement a linear audit probability function. The function is anchored on the maximum probable taxable income, such that if one reports this highest amount they face an expected audit chance equal to the intercept of the function, denoted by c, in the full audit case.[8] This corresponds to the theoretical model developed above when the reference point is $y = b - j$. In the full audit case, for every one-dollar decrease in taxable income, the audit probability increases by an amount equal to the slope of the function, denoted by γ, in the full audit case. This linear relationship extends across the range of possible tax payment amounts, and values for c and γ are chosen so as to avoid

[8] The maximum probable tax payment is defined as tax rate multiplied by the difference of the maximum probable income (i.e. upper bound of income range) and the minimum probable deduction (i.e. lower bound of deduction range).

probabilities of 0 and 1.

To describe the audit function, participants are presented with a table (on screen) that maps different tax payment amounts with corresponding audit probabilities.[9] The intercept of the audit function is a random variable, and the audit probability table provides the range of possible audit probabilities associated with different tax payment amounts. Subjects are also provided with the rate of change – the tax payment increase associated with a 1 percentage point decrease in the audit probability. This information is given to make clear that the audit function is linear and continuous.

Information provided by assistance services appear on the tax reporting screen, prior to the audit process. The focus in the study is on the effects of information services rather than the determinants of information service uptake. Therefore, the notion of information services is present in all treatments, although the actual information provided by the services varies exogenously across treatments. To better induce the notion of information services, regardless of whether they provide any information, subjects always see initial information about their income and deductions, and the audit process (as described above). This information is displayed on the left side of the screen. When available, the information provided by service(s) is included as additional information, rather than – for instance – a replacement of the initial information set. When first viewing the tax reporting screen, subjects see the initial information set automatically. In the middle part of the screen where service information (may) later appear, subjects see a message, e.g., "tax information service is being requested…please wait". After eight seconds, information from the service (if any) replaces the waiting message(s).

After the tax form is filed an audit determination screen appears. A graphic on the screen

[9] To increase the transparency of the audit function, we elected to frame audit chances as a function of the *tax payment*, rather than as a function of *taxable income*.

consists of three balls in a box, the balls alternate colors (white and blue), and when the balls stop changing color the participant is audited (blue) or not (white). If the player is selected for an audit, any unpaid taxes (based on the actual income and allowable deduction amounts) are discovered and collected along with the penalty. As described above, the actual audit probability is determined by the submitted tax payment.

After the audit determination, participants are provided with a summary screen that reveals their actual income and deduction amounts, what they reported on the tax form, and a detailed breakdown of earnings from the round.[10] Earnings are determined as the difference between actual income, taxes paid, and any audit costs (unpaid taxes and audit penalty).

3.2 Experiment Treatments

Our design exogenously varies two factors within-subject and three factors between-subject. Within a session, each subject encounters each of four tax liability information service conditions and two audit intensity levels (i.e. two audit function slopes). The order tax liability information conditions are encountered varies randomly across participants in the same session, with the condition switching at the start of each new series. The four liability service conditions are: no information; more precise information about both income and deductions; more precise information about income only; and, more precise information about deductions only. When applicable, the liability service reduces by two-thirds the range of probable income and/or deduction amounts. This is done in a deliberate way. In particular, the service reveals whether the actual amount appears within the bottom, middle, or top one-third of the initial distribution,

[10] In actuality it is not generally the case that uncertainty over liability is resolved after the tax reporting cycle has ended, especially in the absence of an audit. The focus in the study is on a static tax compliance game and so this feedback is provided in order for earnings calculations to be transparent.

with the actual amount having an equal chance of being any amount within the tighter range.[11]

Participants within the same session are randomly placed in either the low or high audit intensity regime for the first two series, and then all participants switch to the alternative audit intensity setting for the remaining two series. The two audit intensity levels are determined by varying the audit function slope, γ, to equal 0.0001 (low) or 0.00015 (high). The expected value of the audit intercept parameter, c, is fixed at 0.10. The distribution of c is uniform on the interval [0.05 to 0.15].

There are three factors varied between subjects, each with two levels, giving rise to eight between-subject treatments. Specifically, we vary: whether or not a liability service guarantee is available; whether or not an audit information service is available; and whether, upon audit, one ("partial audit") or both ("full audit") line items are audited. The service guarantee, when active, provides amnesty from audit penalties. The guarantee is naturally tied to tax liability services: it is only in effect when the liability service reveals better information about income and/or deductions. To invoke the guarantee, the participant must report at least as much tax liability as that associated with the midpoint of the tighter income (deduction) interval provided by the service. For instance, if the service reveals that the actual deduction lies within the [0, 333] range, the guarantee is invoked if the participant reports 167 or less. In the event of an audit, although no penalties are levied, the taxpayer is responsible for any unpaid taxes discovered.

When the audit information service is active, it resolves the uncertainty regarding the audit chance associated with a particular tax payment. Without this service, given that the intercept of the audit function is randomly determined, participants see a 10 percentage-point range of possible audit chances for a given tax payment. With the service, the audit intercept is

[11] If we instead just tightened the distribution without ever changing expected value, this would be predictable by participants and the service would cease to have value.

revealed, and participants see the exact audit probability associated with different tax payment amounts. In the partial audit setting, described in more detail below, the service further reveals with 80% accuracy whether the audit targets reported income or reported deductions.

In the full audit setting, for which we set $s = 1$, upon audit both reported income and reported deduction amounts are checked for unpaid taxes. If unpaid taxes are discovered, participants must pay all unpaid taxes along with a penalty (in the absence of a service guarantee). Under the low audit intensity setting, the audit probability is between 5% and 15% when one reports the maximum possible taxable income and between 25% and 35% when one reports the minimum possible taxable income. For the high audit intensity regime, audit chances also begin at 5% to 15% but rise more sharply, leading to a range of 35% to 45% when one reports the minimum possible taxable income amount.

In the partial audit setting, by setting $s = 2$ the audit chances are exactly doubled relative to the full audit case. Under partial audits, either the reported deduction or the reported income is selected for audit, each with an equal chance. Only the selected item is checked for unpaid taxes and associated penalties.

3.3 Testable Hypotheses

Our experimental design allows for tests of several hypotheses. We state below as formal hypotheses the theoretical predictions that correspond with the specific parameters used in the experiment.[12]

> **Hypothesis 1**. Tax liability services, holding expected liability constant, increases reported taxable income.

[12] To generate predicted values, we solve the minimization problem defined by equation [4'] using Excel's Solver add-in.

Hypothesis 2. The introduction of a service guarantee increases reported tax liability.

Hypothesis 3. Increasing the slope of the audit function increases reported taxable income.

Hypothesis 4. Increasing the intercept of the audit function increases reported taxable income.

Hypothesis 5. Doubling the audit probabilities while simultaneously switching to partial audits (in this two line-item setting) has no effect on tax reporting.

Hypothesis 6. In the partial audit case, a service that with a high degree of accuracy predicts which line item is targeted for audit will drive individuals to report a higher liability for the targeted item and less liability for the item not targeted.

We made a concerted effort to define parameters that lead to unambiguous comparative static results. Moreover, the predicted magnitudes stemming from parameter changes are meaningful in the sense of being able to detect differences empirically. Note that in the absence of any liability or audit information services, theory predicts that individuals will report less than their expected taxable income. Thus, on average, the prediction is that taxpayers will evade, which reflects the stylized fact from field studies. For example, when facing the low audit slope, the cost-minimizing report is 523 lab dollars lower than the expected taxable income. Tax liability services – holding expected liability constant – are predicted to significantly increase reported tax liability (Hypothesis 1).[13] For instance, when facing the low audit slope, providing better information on both income and deductions increases optimal reporting by 220. Predictions are still of underreporting, and as such the introduction of a service guarantee increases reported tax liability (Hypothesis 2). In slightly over half of possible cases it is optimal for participants to report expected taxable income in order to invoke the guarantee.

As unambiguously demonstrated from the theory, increasing (decreasing) the audit

[13] As noted earlier in the theory section, the effect of tax liability services on reported tax liability are ambiguous in general, but our model yields a predicted reporting level for any parameters. We have structured the experiment such that reducing the variance of tax liability—as results from the liability services—increases reported liability.

function slope or intercept increases (decreases) reported taxable income (Hypotheses 3 and 4). In the absence of information services, increasing the audit slope increases optimal reporting by 238. When an audit service reveals the intercept of the audit function, this leads to a wide range of cost-minimizing reports; for instance, with the low audit slope, full audit case, and no liability services, reporting ranges from 667 (c=0.05) to 393 (c=0.15) lab dollars below expected taxable income. Also unambiguous in theory, doubling the audit probabilities while simultaneously switching to partial audits (in this two line-item setting) has no effect on tax reporting (Hypothesis 5). Last, in the partial audit case, a service that accurately predicts which line item is targeted for audit will drive individuals to report a higher liability for the targeted item and less liability for the item not targeted (Hypothesis 6). When the service reveals that income (deductions) will not be the target of any audit, in most cases it becomes optimal to report at or near the highest possible deduction (lowest possible income) amount; for the line item that is targeted, in most cases it becomes optimal to report near the expected true amount.

3.4 Participants and Procedures

The experiments were conducted with undergraduate students at two large public universities. Experiments at both locations used identical software, written instructions, and protocols. Recruiting was accomplished using the Online Recruiting System for Experimental Economics (ORSEE) developed by Greiner (2015). The participant databases were built using recruitment posters and flyers, in-class announcements, and course email lists. The experiment was computerized, programmed and conducted with the experiment software z-Tree (Fischbacher, 2007).

An experimental session proceeded in the following fashion. Each participant sits at a

computer, and is not allowed to communicate with other participants. An experiment moderator welcomes everyone for their participation, explains that earnings are based on decisions in the experiment, decisions are anonymous, and that experimenter deception is not permitted. Then, the software is initialized and on-screen instructions first guide participants through a set of risk elicitation tasks modeled after Holt and Laury (2002). The experiment moderator answers any questions prior to when decisions are made.

The instructions for the tax experiment are then conveyed by a set of printed instructions that are read allowed to ensure both common knowledge and that the participants at each site received exactly the same instructions. The first practice round (unpaid) takes place as the moderator read through the instructions. This allowed participants to see where various pieces of information were located on the screen and to help facilitate understanding of the decision task. Prior to the second practice round, the moderator helped participants work through example scenarios to help make sure that participants understood: how decisions determine the reported tax payment; how the tax payment determines the audit chance; the outcome of the audit process; and how earnings are calculated. Participants continued on to a second unpaid practice round, and then were given a final opportunity to ask questions prior to the paid rounds.

The participants are informed that all decisions are private; the experimenter is unable to observe the decisions, and the experimenter does not move about the room once the session starts to emphasize the fact that the experimenter is not observing the participants' compliance decisions. This reduces, to the extent possible, peer and experimenter effects. All actions that participants take are made on their computer.

The experiment proceeds for 24 paid decision rounds, although the actual number of

rounds is not pre-announced nor is the length of a series.[14] After the final decision round, participants learn of their earnings from the risk elicitation exercise. Participants are then directed to complete both a demographic and taxpayer attitude debriefing questionnaire. After the questionnaire is completed, participants are called up to the front of the room individually and paid their earnings in cash.

The last column of Table 2 presents the subject numbers for each of the between-subjects treatments. For each of these treatments, there are four to six sessions, and 84 to 96 total participants. Overall, there are 715 participants. The number of subjects per session varied widely due to differential show-up rates and variation in when sessions were scheduled. As the only participant interactions are through the income group determination task, the number of participants in a session should have little if any effect on decisions or outcomes. Average earnings were approximately $32, and sessions lasted between 90 and 130 minutes.

4. Econometric Analysis

Descriptive statistics for our data are reported in Table 3. The econometric analysis focuses on the two decision variables in the experiment – reported income and reported deduction – as well as their difference, taxable income. Taxable income is important as the endogenous audit probability is a function of taxable income, which creates an association between the two decision variables. We note that the acquisition of services in this study is not a choice variable. Instead, the design exogenously determines the presence or absence of the various services, thus avoiding potential endogeneity issues related to the uptake decision.

[14] We carried out several pilot sessions to finalize the instructions, software, exchange rates and number of decision periods. As the only difference in the last pilot session was the experiment length (20 periods overall, and five per series), we include this data in the analysis.

In the econometric models, to capture the effects of tax liability information assistance we include the indicators *Income and Deduction Info*, *Income Info Only* and *Deduction Info Only*. The omitted category is no liability information. As the partial resolution of uncertainty can impact expected values, we include the continuous variables *Expected Income Change* and *Expected Deduction Change*, which measure the deviations from expected value based on the initial distributions and those provided by the information services. With the latter control variables, the liability service indicators are capturing the effects of reducing uncertainty. To measure the effects of the liability service guarantee, we include the indicator *Guarantee Available*. With this indicator we are capturing the intent to treat effect; whether one reports appropriate amounts to actually invoke the guarantee is potentially endogenous. The effects of receiving the audit service, which resolves uncertainty about the intercept of the audit function, is captured though inclusion of the continuous covariates *Audit Intercept Increase* and *Audit Intercept Decrease*, which simply measure differences from the expected value of the initial distribution and what is revealed by the service. The indicator *Audit Service* equals one for the audit service treatment. Given the audit change variables, its coefficient can be interpreted as the change in reported liability for a setting where the audit service simply reveals that the expected value of the initial distribution is the actual value. The interactions *Audit Service* × *Liability Service* and *Audit Service* × *Guarantee Available* capture possible service interaction effects. Finally, we include indicators to capture differences due to the audit slope parameter and income group assignment.

To analyze the three tax reporting outcomes, we estimate ordinary least squares regressions using the experiment panel data. There are a modest number of corner-solution outcomes and so we consider estimation using Tobits as a robustness check. To control for

possible heteroskedasticity and within-subject serial correlation, we compute robust standard errors with clustering at the participant level. Further, robust *t* and *F* statistics are used when evaluating hypotheses.[15] Estimation results are presented in Tables 4 – 6.

Table 4 and Table 5 present regressions using data from the full audit and partial audit treatments, respectively. The audit information services vary in a meaningful way across the two settings, and moreover there are notable and stark differences in the effect of treatment variables. Focusing first on the full audit treatment results for reported taxable income (i.e. Model 1), we see that there is an unanticipated and perverse effect of liability information services: reducing uncertainty about one's tax liability actually *decreases* reported taxes. Although the effect of liability services is theoretically ambiguous, with the chosen parameters there is an expected large and *positive* effect of the liability service on reporting. As discussed in the theory section, unlike in the case of random audits where the effect of reducing uncertainty is unambiguously positive, reducing the variance (i.e. decreasing the range of probable actual amounts) serves to decrease the expected penalty conditional upon audit as extreme bad outcomes are ruled out.[16] This, in turn reduces the effectiveness of the endogenous audit. Although, as mentioned, this countervailing effect is dominated theoretically with our parameters, the opposite appears to be true behaviorally. Another surprise is that the magnitude of the effect does not depend on whether uncertainty reduction occurs for income, deductions, or both.

As predicted by theory, when the liability service reveals a higher expected tax liability (higher income or lower deductions), reported taxable income increases. The magnitude of the

[15] For those less familiar with cluster-robust standard errors, note that this is a consistent estimator for the standard errors in the presence of an individual-level random effect.
[16] To be clear, as demonstrated in Vossler and McKee (2017), reducing the variances leads one to report closer to the truth. Thus, in a setting where – in the absence of uncertainty resolution – one optimally underreports taxes, reducing uncertainty leads to an increase in reported taxes.

effect suggests a reporting increase of approximately 50 cents for every one-dollar increase in expected liability. While intuition may suggest that this effect should be 1-to-1, recall that an increase in expected liability means that – holding reported liability constant – one now faces a lower audit probability which of course decreases the incentive to report. This perhaps "weak" response is rather intuitive. Consider what may happen when a taxpayer who donates very little to charity learns that others in his income group donate much more. If she believes that those in her income group face the same audit scrutiny, she would be inclined to report more in donations with little fear of raising an audit flag.

The effect of making available a liability service guarantee is positive and significant, as expected. Importantly, this cancels out the negative effect of the liability service, and even leads to a net increase in reporting. The effects of having the audit information service is asymmetric in the following sense: when the intercept is drawn to be above expected value this has a positive but small effect, but when drawn to be below expected value this motivates a relatively large decrease in reporting. There are interesting effects of having both liability and audit information assistance. In particular, when both service types occur, there is no *overall* impact of liability service information and no impact of having an available guarantee. To see this, note that the interaction *Audit Service* × *Liability Service* is positive and significant. The estimated effect (86.41) is nearly equal in magnitude yet opposite in sign to the effect of having the liability service only (-70.83 to -75.19). The interaction *Audit Service* × *Guarantee Available* is negative and significant. This effect (-116.85) is likewise similar in magnitude yet oppositely signed relative to the guarantee effect when only a liability service is in play (100.00). One possible explanation for both interaction effects is that it may simply be the case that participants largely focus on the information provided by the audit information service when both are activated.

The effect of increasing the audit intensity (slope) is an increase in reporting, as expected. This finding is consistent with parallel results from random audit experiments when audit probabilities are increased. The effects of income group membership largely reflect the fact that those with higher incomes owe more in taxes. What is informative, however, are the particular *levels* of the effects. The middle and high income groups face higher taxable incomes of 500 and 1000 respectively. Thus, as both of the coefficients are statistically different from these respective amounts, and are lower, this suggests an important income effect: those with higher incomes report less relative to expectations. Another way to state this effect is that those with higher incomes underreport their taxes more relative to the (expected) truth. That those with higher incomes evade more is consistent with field evidence (Andreoni, Erard and Feinstein, 1998). This type of income effect has further been a consistent finding in the analysis of data from related experimental work, even with experimental designs where the prediction is for those with higher incomes to actually evade less (Vossler and McKee, 2017). As a possible explanation, assuming that risk aversion is a behavioral driver in the context of this tax evasion "gamble", it is possible that subjects' utility functions follow decreasing absolute risk aversion in that an increase in wealth leads to an increase in tolerated risk.

Examination of Model 2 (reported income) and Model 3 (reported deduction) reveals similar directional effects of treatment variables in terms of reported tax *liability*. That is, reporting more income has the same effect on liability as does an equal decrease in deductions. There are however a few interesting patterns not discernable from the analysis of taxable income. First, the observed effects of reducing tax liability uncertainty, and having a guarantee available, appear to have been driven almost entirely by changes in reported income. This could be due to increased salience of the tax reporting decision, as it appears first on the tax form. (A related

observation is that the goodness-of-fit is dramatically higher for the income reporting model.) Second, when the tax liability information alters expectations regarding income or deductions, this impacts both income and deduction reporting. Reporting on the line item that has not changed in expected value is less dramatic.

Now we turn discussion to the analysis of partial audit treatments, interpreting the regression results reported in Table 5.[17] With the exception of the effects of the audit information service – as it also provides better information about which line item will be audited – theory predicts equivalence across the partial and full audit settings as we implemented them. There are a few qualitative similarities in results: increasing the audit intensity (slope) increases reported liability; changes in expected liability triggered by better liability information motivates reporting changes in the anticipated direction; middle and high income group members report less relative to their liability. There are further some noticeable differences. The effects of reducing uncertainty over liability have a null effect on reported taxable income, although remain significant and negative for reported income. There is no impact of further providing a service guarantee. Most prominent is that when the audit service reveals with a high degree of accuracy (80%) which item will be checked upon audit, this nudges taxpayers to report more liability for this item, but also to report less for the other item. This effect is asymmetric: the decrease in reporting is roughly 2.5 times greater on the unlikely targeted amount relative to the increase in reporting on the targeted amount. Thus, overall the audit service decreases reported taxable income. Theory instead predicts an offsetting effect. The audit service simultaneously resolves uncertainty on the intercept of the audit function. This has a weak influence on the two reporting items, but the overall effect is null. This could reflect the fact that information on which item

[17] In these regressions, we exclude the service interaction effects, which are jointly insignificant in all three models.

would be the subject of audit is more salient.

4.1 Additional analysis

Table 6 presents augmented versions of the two previous taxable income reporting models. Included along with the treatment-related covariates are variables capturing individual characteristics, a linear time trend, two controls for order effects given that audit intensity and the presence/absence of a liability service vary within-subject, and an indicator for experiment lab location. We find that treatment variables that were statistically significant in the prior models remain so here, with the same signs and similar magnitudes.

Risk aversion increases reporting, as expected, but only in the full audit setting. This could be driven by the fact that the range of possible audit penalties, given uncertainty over liability, is reduced when at most one reported amount is checked for accuracy. Consistent with previous tax compliance experiments, females report more in taxes. On average, participants at lab location 2 reported more in taxable income. The controls for order effects are jointly insignificant. Last, as the game is repeated participants reduce reported taxable income.

Although the frequency of "corner solution" outcomes is modest, we alternatively estimated the regressions using a two-limit Tobit. The range of possible reported income and deduction amounts is constrained, and 21.7% of income reports and 14.4% of deduction reports correspond with either the minimum or maximum of the decision space. Interestingly, just 4.1% of taxable income observations correspond with either the maximum or minimum possible amounts. The estimated marginal effects (evaluated at the sample means of the data), are virtually indistinguishable from the OLS coefficients. We include these regressions in the Reviewer Appendix.

5. Discussion

A key finding of our study is that, in an endogenous audit environment that may better approximate tax compliance settings in the field, when taxpayers have better information regarding their actual tax liability this does not necessarily decrease evasion. This is true in theory, where the effect of better information is ambiguous. Importantly, for our parameter values theory predicts evasion should decrease but we instead find that it either increases or remains unchanged (depending on treatment settings). The findings could be driven in part by the salience of extreme outcomes as, for a given level of evasion, improved information significantly reduces maximum possible penalties in our experimental framework. This may reduce subjects' "fear" of an audit, leading to increased evasion.

We find that when information services reveal to a participant that her tax liability is higher (lower) than expected she reports more (less), but the increase is not 1-to-1 with the increased expected liability. This finding has implications for classification of taxpayers into peer groups (i.e. audit classes). In particular, this suggests that if a taxpayer has higher expected liability than is typical for her group, and therefore she can engage in greater evasion without triggering a high likelihood of audit because her report will not appear unusually low, she will take advantage of this by increasing evasion. Moreover, *the regulator's knowledge* of a taxpayer's likely true liability is important for deterring evasion. The less effectively the regulator is at grouping taxpayers with similar liability to form peer groups the more this creates opportunities for evasion.

Our main finding in the partial audit setting is that individuals respond to the salience of some aspect of their report being audited with high probability. When the audit information

service provides a signal of which line is likely to be audited participants do report more on the targeted entry but respond primarily by evading more in the dimension unlikely to be audited. This suggests that if information services are increasingly able to identify tax line items that rarely receive audit scrutiny, perhaps because the auditor finds it difficult or costly to do so, this information will lead taxpayers to exploit this "enforcement gap", and focus evasion on the rarely-audited line.

One innovation in this study is the development and experimental examination of an endogenous audit rule. Existing theory work in this area has studied endogenous audit rules where audit chances are based on peer evaluations. While such mechanisms may explain well the enforcement realities (or possibilities) for small groups, they are unlikely to capture the individual income tax compliance setting, where the number of regulated agents is very large. Our audit rule captures a basic setting where a taxpayer's chance of audit increases with her expected evasion, and as such the mechanism targets the worst offenders, but importantly is independent of the tax reporting of others. The simplicity of the mechanism provides an opportunity to explore the effects of interventions well beyond what is studied here.

Given that most prior experimental work in this area has focused on (exogenous) random audits it is important to identify and assess tradeoffs. Many tax agencies that employ endogenous audits, including the IRS, do not freely advertise their audit procedures, especially not with much detail. If one looks at the IRS web page devoted to explaining the audit process (Internal Revenue Service, 2006), even well-educated persons are unlikely to learn anything definitive. Perhaps as a result, most taxpayers are highly uncertain about actual audit probabilities or how changes in their reporting behavior alter the chances they get audited or penalized. Given this uncertainty, it will be natural for some to think that audits are completely random, and others –

for instance those using sophisticated tax software or those reading about procedures in books written by former tax agency employees – are likely to view the process as endogenous. With both taxpayer "types" in the field, in our opinion using either type of underlying audit process in the lab is likely to be insightful. One theoretical advantage of the linear endogenous audit function we use is that it avoids the corner solution outcomes (i.e. full compliance or maximal evasion) that frequently arise with the random audit model under the assumption of risk neutrality. This, in turn, allows for a richer variation in predicted outcomes, which is often desirable when identifying treatment effects.

Last, as a first step in analyzing the effects of taxpayer assistance services in a setting with endogenous audit rules, we focused on a setting where taxpayers had unbiased priors, and services unambiguously provided more accurate information. Our theory and experimental design can be extended in a straightforward way to explore cases where either priors and/or the information set provided by liability or audit information services are biased. For instance, empirical evidence suggests that professional tax preparers are prone to favor the taxpayer (in terms of decreasing reported liability) when interpreting tax regulations. And, even if taxpayers are aware of biases associated with tax preparers or third-party software, this nevertheless may have important behavioral effects – taxpayers may elect to proceed under a veil of ignorance or otherwise rationalize underreporting in such settings.

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Table 1. Experiment Parameters

Parameter / construct	**Value(s)**
Income	Low Income Group: 1000 to 2000 Middle Income Group: 1500 to 2500 High Income Group: 2000 to 3000
Itemized Deduction	0 to 1000
Audit Probability Function	Endogenous, with probability equal to: $s[\gamma(Max\ Taxable\ Inc. - Reported\ Taxable\ Inc.) + c]$
Audit Slope, γ	0.0001 or 0.00015
Audit Intercept, c	0.05 to 0.15
Full Audit	$s = 1$
Partial Audit	$s = 2$
Penalty Rate, β	200%
Tax Rate, t	50%

Note: all indicated ranges correspond with uniformly distributed random variables

Table 2. Treatments

Treatment	Tax Liability Service	Audit Intensity	Audit Information Service	Liability Service Guarantee	Audit Type	Participants
1	Varies within session		No	No	Full	84
2	Varies within session		Yes	No	Full	88
3	Varies within session		No	Yes	Full	88
4	Varies within session		Yes	Yes	Full	96
5	Varies within session		No	No	Partial	93
6	Varies within session		Yes	No	Partial	96
7	Varies within session		No	Yes	Partial	84
8	Varies within session		Yes	Yes	Partial	86
					Total:	715

Table 3. Data Description

Variable Name	Description	Mean	S.D.
Dependent variables			
Reported Taxable Income	'Reported Income' minus 'Reported Deduction'	1444.108	554.332
Reported Income	Income reported on tax form	1982.476	498.089
Reported Deduction	Deduction reported on tax form	538.368	287.268
Experimental Treatment variables			
Income and Deduction Info	=1 if liability info service partially resolves uncertainty on both income and deduction	0.250	0.433
Income Information Only	=1 if liability info service partially resolves uncertainty on income only	0.250	0.433
Deduction Information Only	=1 if liability info service partially resolves uncertainty on deduction only	0.250	0.433
Expected Income Change	Change in expected income, revealed by tax info service	2.061	192.666
Expected Deduction Change	Change in expected deduction, revealed by tax info service	-1.256	192.077
Guarantee Available	=1 if liability info service guarantee is available	0.372	0.483
Audit Service	=1 if Audit Service treatment	0.510	0.500
Audit Intercept Increase	Reported increase in audit function intercept relative to expected value, 0 to 5%; =0 if 'Audit Intercept Decrease' >0 or if 'Audit Service' = 0	0.646	1.323
Audit Intercept Decrease	Reported decrease in audit function intercept relative to expected value, 0 to 5%; =0 if 'Audit Intercept Increase' >0 or if 'Audit Service' = 0	0.629	1.299
Audit Targets Income	=1 if audit info service reports an 80% chance that income is targeted for audit; =0 if 'Audit Service' =0 or 'Partial Audit'=0	0.125	0.330
Audit Targets Deduction	=1 if audit info service reports an 80% chance that deduction is targeted for audit; =0 if 'Audit Service' =0 or 'Partial Audit'=0	0.131	0.337
High Income Group	=1 for high income group; $1500 to $2500	0.319	0.466
Middle Income Group	=1 for middle income group; $2000 to $3000	0.331	0.471
High Audit Slope	=1 if high audit slope, γ=0.00015	0.500	0.500
Partial Audit	=1 if Partial Audit treatment	0.504	0.500

Additional control variables			
Risk Averse	=1 if participant selected the safe option at least six times in the risk elicitation task	0.520	0.500
Female	=1 if participant is female	0.422	0.494
Employed	=1 if participant employed full or part-time	0.602	0.489
Lab2	=1 if participated at lab location #2.	0.297	0.457
Liability Order	=1 if tax liability service in effect at start of session	0.728	0.445
Audit Order	=1 if high audit slope in effect at start of session	0.504	0.500
Round	Round in experiment, 1 to 24	12.513	6.890

Table 4. Tax Reporting Models: Full Audit Treatments

	Model 1: Reported Taxable Income	Model 2: Reported Income	Model 3: Reported Deduction
Liability Service Effects			
Income and Deduction Info	−75.19** (33.06)	−50.60** (20.26)	24.59 (20.53)
Income Information Only	−71.11** (31.40)	−38.50** (19.51)	32.61 (20.27)
Deduction Information Only	−70.84** (31.13)	−63.99** (19.80)	6.85 (20.10)
Expected Income Change	0.54** (0.03)	0.69** (0.02)	0.15** (0.02)
Expected Deduction Change	−0.51** (0.03)	0.13** (0.02)	0.63** (0.02)
Liability Service Guarantee			
Guarantee Available	100.00** (43.00)	66.51** (24.79)	−33.49 (25.97)
Audit Service Effects			
Audit Service	−11.89 (39.08)	−13.06 (27.31)	−1.18 (25.73)
Audit Intercept Increase	12.45** (4.59)	4.72 (3.39)	−7.71** (3.11)
Audit Intercept Decrease	−20.84** (4.67)	−8.38** (3.45)	12.46** (2.90)
Service Interaction Effects			
Audit Service × Liability Service	86.41** (41.64)	61.92** (27.62)	−24.49 (27.26)
Audit Service × Guarantee Available	−116.85* (60.76)	−81.61** (36.46)	35.24 (35.26)
Other Experiment Treatments			
High Audit Slope	60.73** (13.69)	33.61** (9.54)	−27.11** (8.50)
High Income Group	920.14** (29.72)	970.79** (19.68)	50.65** (17.56)
Middle Income Group	444.73** (26.59)	469.72** (17.06)	25.00 (15.36)
Constant	969.69** (33.11)	1501.48** (21.83)	531.78** (20.88)
Number of Observations	8427	8427	8427
F	131.93**	272.27**	108.51**
R^2	0.503	0.690	0.202

*Notes: * and ** denote estimates that are statistically different from zero at the 10% and 5% significance levels, respectively. Standard errors (in parentheses) are clustered at the participant-level.*

Table 5. Tax Reporting Models: Partial Audit Treatments

	Model 4: Reported Taxable Income	Model 5: Reported Income	Model 6: Reported Deduction
Liability Service Effects			
Income and Deduction Info	−17.49 (17.31)	−28.05** (12.14)	−10.56 (11.47)
Income Information Only	−22.21 (17.54)	−35.31** (12.42)	−13.10 (12.54)
Deduction Information Only	−5.97 (18.43)	−22.78* (12.85)	−16.81 (12.11)
Expected Income Change	0.63** (0.02)	0.74** (0.02)	0.12** (0.01)
Expected Deduction Change	−0.51** (0.02)	0.15** (0.02)	0.66** (0.02)
Liability Service Guarantee			
Guarantee Available	−4.03 (25.63)	8.75 (15.98)	12.78 (15.50)
Audit Service Effects			
Audit Targets Income	−54.09* (27.89)	35.24** (17.74)	89.34** (20.50)
Audit Targets Deduction	−51.72* (28.20)	−94.71** (21.47)	−42.99** (16.62)
Audit Intercept Increase	−4.52 (3.50)	−5.45* (2.83)	−0.93 (2.74)
Audit Intercept Decrease	−6.52 (4.00)	−1.36 (3.17)	5.16* (3.14)
Other Experiment Treatments			
High Audit Slope	49.76** (10.94)	21.94** (8.15)	−27.82** (7.49)
High Income Group	890.69** (26.12)	930.33** (16.26)	39.64** (16.23)
Middle Income Group	397.89** (22.39)	443.49** (14.89)	45.60** (14.46)
Constant	1066.30** (24.90)	1576.82** (17.33)	510.52** (16.73)
Number of Observations	8559	8559	8559
F	154.92**	365.60**	134.43**
R^2	0.557	0.700	0.243

*Notes: * and ** denote estimates that are statistically different from zero at the 10% and 5% significance levels, respectively. Standard errors (in parentheses) are clustered at the participant-level.*

Table 6. Reported Taxable Income: Expanded Models

	Model 7: Full Audit	Model 8: Partial Audit
Liability Service Effects		
Income and Deduction Info	−77.10** (32.74)	−22.90 (17.00)
Income Information Only	−72.27** (30.82)	−25.73 (17.06)
Deduction Information Only	−71.57** (30.72)	−11.22 (17.99)
Expected Income Change	0.55** (0.03)	0.62** (0.02)
Expected Deduction Change	−0.51** (0.03)	−0.52** (0.02)
Liability Service Guarantee		
Guarantee Available	111.69** (42.74)	8.01 (25.23)
Audit Service Effects		
Audit Service	−5.44 (37.98)	
Audit Targets Income		−51.95* (28.20)
Audit Targets Deduction		−47.30* (28.46)
Audit Intercept Increase	12.67** (4.55)	−5.50 (3.61)
Audit Intercept Decrease	−21.40** (4.68)	−7.06* (3.94)
Service Interaction Effects		
Audit Service × Liability Service	77.04* (41.41)	
Audit Service × Guarantee Available	−109.12* (60.11)	
Other Experiment Treatments		
High Audit Slope	60.24** (13.39)	48.71** (10.73)
High Income Group	928.07** (29.14)	910.30** (25.77)
Middle Income Group	443.80** (25.90)	403.74** (21.85)
Additional Control Variables		
Risk Averse	78.96** (30.15)	25.59 (24.95)
Female	57.93* (31.32)	105.88** (25.81)
Employed	−25.71 (30.47)	−28.04 (24.52)
Lab 2	81.60** (32.25)	84.13** (26.65)
Liability Order	−33.25 (33.24)	−41.98 (28.22)
Audit Order	−46.64 (29.91)	−31.96 (26.32)
Round	−4.13** (0.99)	−3.52** (0.81)
Constant	991.82** (50.64)	1078.71** (41.83)
Number of Observations	8427	8559
F	99.74**	114.16**
R^2	0.519	0.577

*Notes: * and ** denote estimates that are statistically different from zero at the 10% and 5% significance levels, respectively. Standard errors (in parentheses) are clustered at the participant-level.*

Reviewer Appendix for "Endogenous Tax Audits and Taxpayer Assistance Services: Theory and Experiments"

This appendix presents representative materials describing the experimental setting, and supplemental analysis. The representative materials are for Treatment 8, which reflects the most complicated setting (partial audits, both audit and liability information services).

Figure A.1 Subject screen for risk elicitation task

SCENARIO	LOTTERY	CERTAIN AMOUNT	YOUR CHOICE
	Choice A	Choice B	
1	10% chance of $4 and 90% chance of $0	$2 for sure	Choice A ○ ○ Choice B
2	20% chance of $4 and 80% chance of $0	$2 for sure	Choice A ○ ○ Choice B
3	30% chance of $4 and 70% chance of $0	$2 for sure	Choice A ○ ○ Choice B
4	40% chance of $4 and 60% chance of $0	$2 for sure	Choice A ○ ○ Choice B
5	50% chance of $4 and 50% chance of $0	$2 for sure	Choice A ○ ○ Choice B
6	60% chance of $4 and 40% chance of $0	$2 for sure	Choice A ○ ○ Choice B
7	70% chance of $4 and 30% chance of $0	$2 for sure	Choice A ○ ○ Choice B
8	80% chance of $4 and 20% chance of $0	$2 for sure	Choice A ○ ○ Choice B
9	90% chance of $4 and 10% chance of $0	$2 for sure	Choice A ○ ○ Choice B
10	100% chance of $4 and 0% chance of $0	$2 for sure	Choice A ○ ○ Choice B

On the left are 10 scenarios which allow you to choose between receiving $2.00 or playing a lottery.

Please choose either A or B for each scenario.

At the end of the experiment the computer will randomly select ONE of these 10 scenarios.

If you selected the lottery, choice A, for the randomly selected scenario, the computer will determine the outcome based on the chances associated with the selected scenario.

Otherwise you will receive $2.00.

Submit

Figure A.2 Subject screen for income group determination task

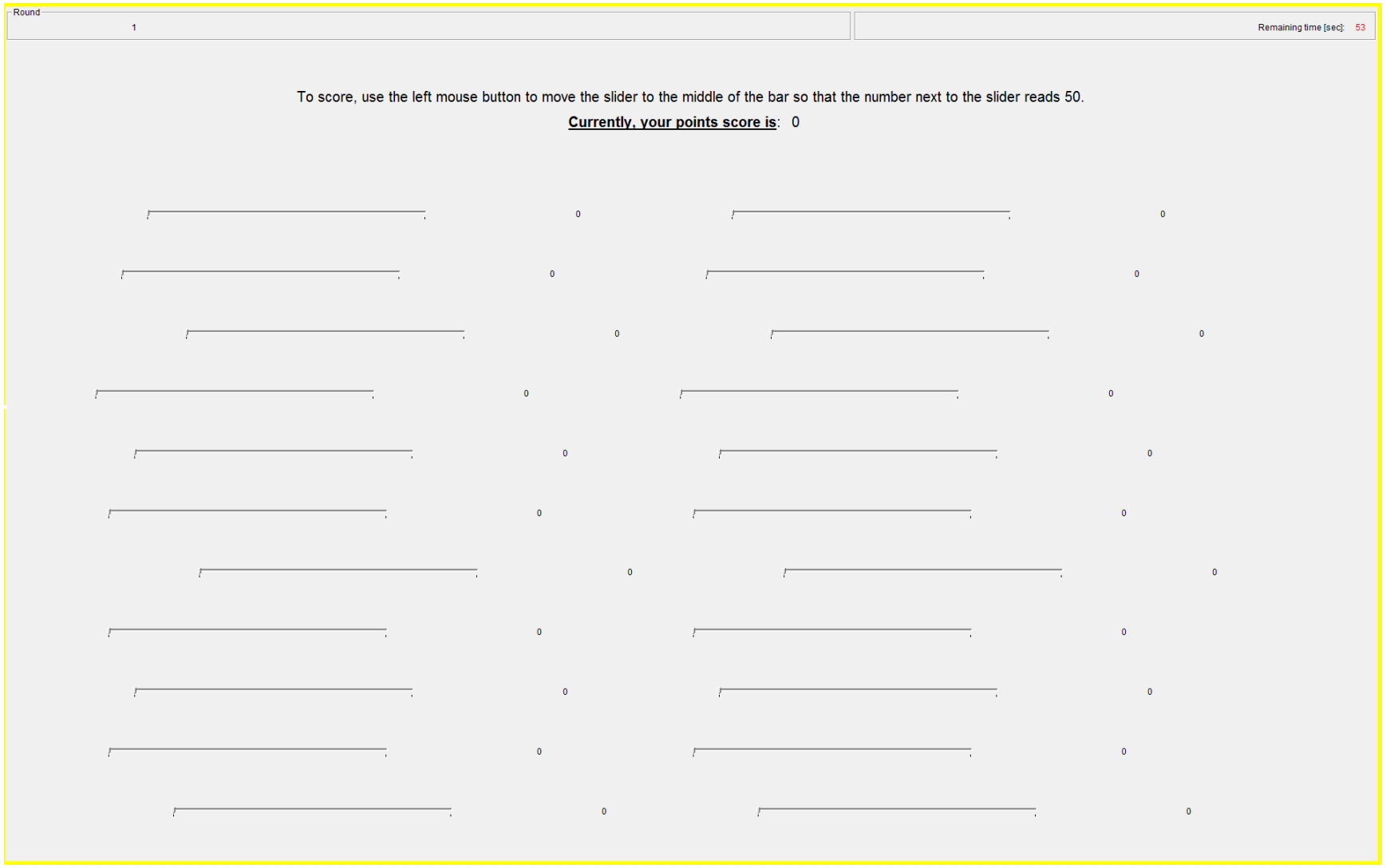


Figure A.3 Subject tax reporting screen, Treatment 8 (waiting for services)

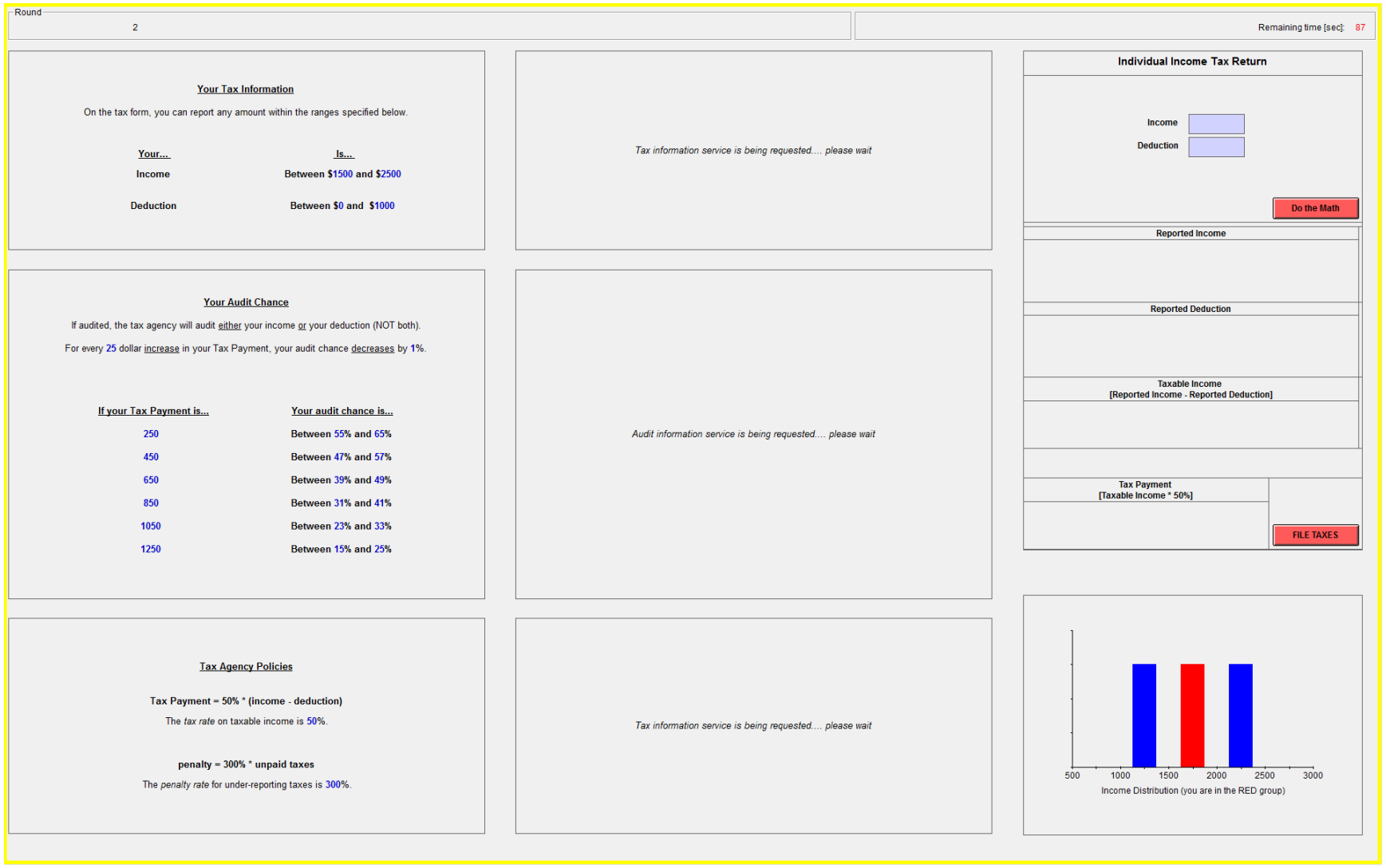


Figure A.4 Subject tax reporting screen, Treatment 8 (services displayed)

Figure A.5 Audit determination screen (animated)

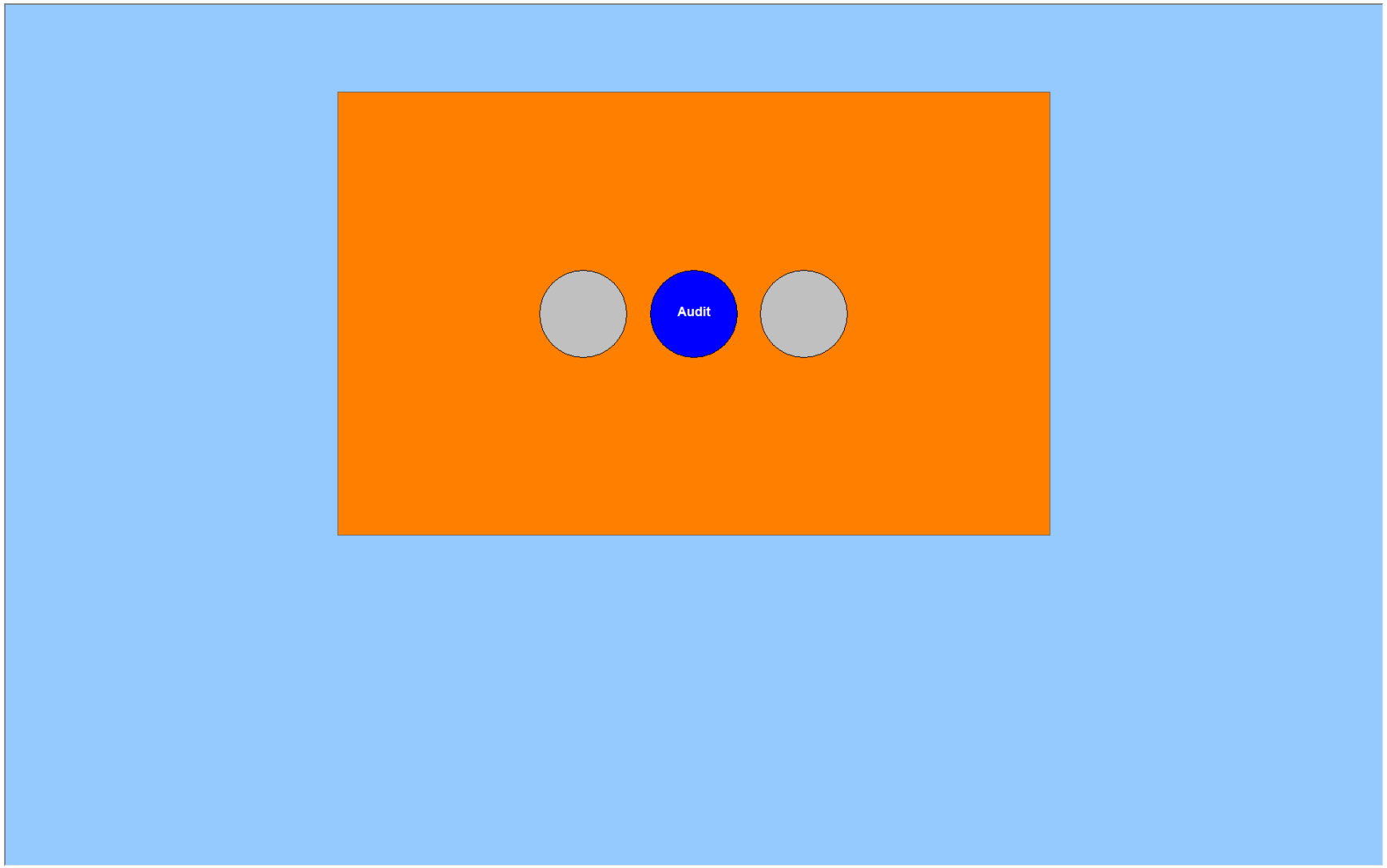
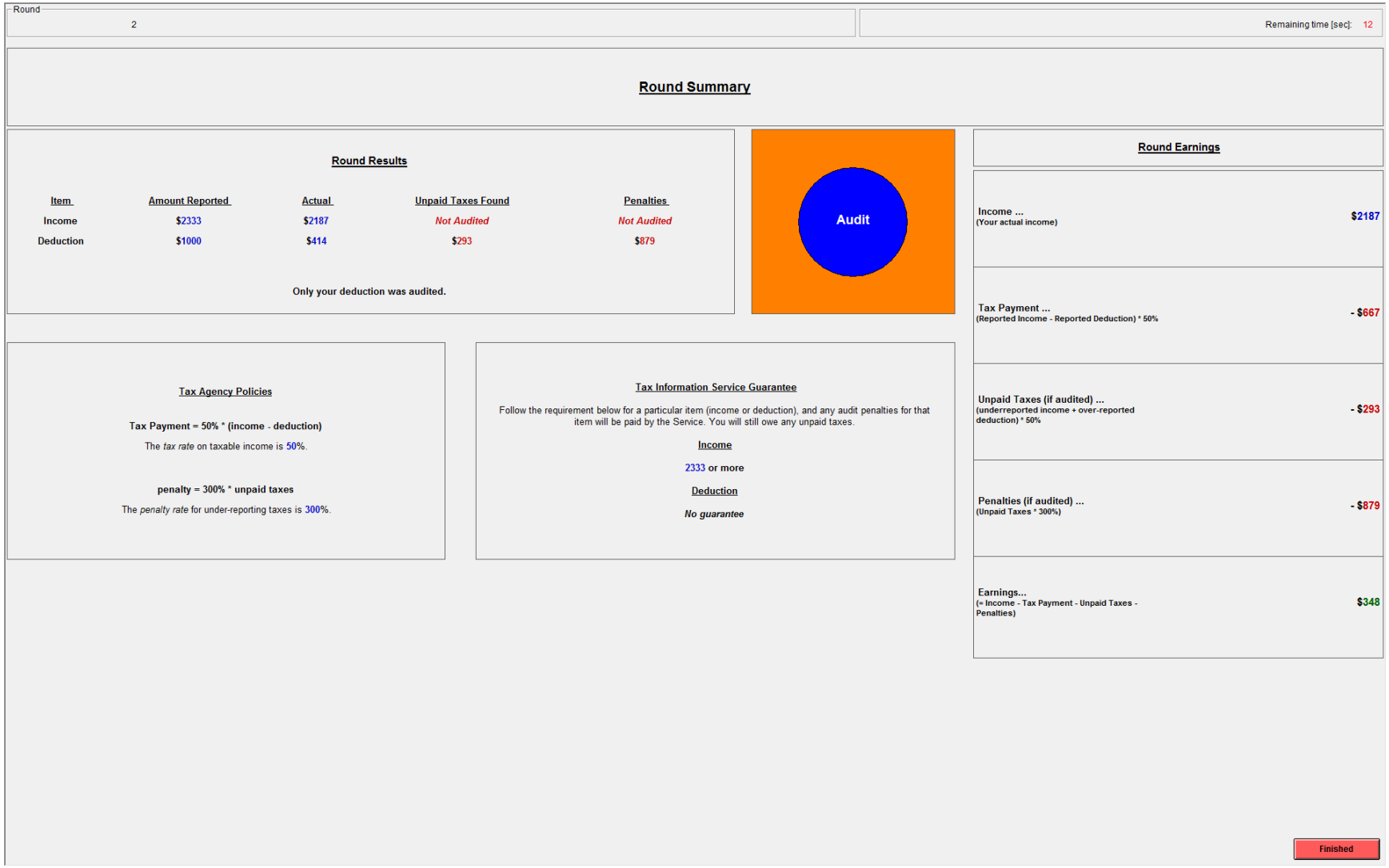


Figure A.6 Subject screen for end of round summary, Treatment 8



Experiment Instructions (Treatment 8)

You are about to participate in an experiment in economic decision making. Please follow the instructions carefully, as the amount of money you earn in the experiment will depend on your decisions. At the end of today's session, you will be paid your earnings privately and in cash. Please do not communicate with other participants during the experiment unless instructed. Importantly, please refrain from verbally reacting to events that occur during the experiment.

Today's experiment will involve several decision "rounds". You will not know the number of rounds until the end of the experiment. The rounds are arranged into multiple series. After all decision rounds are finished, we will ask you to complete a questionnaire.

Aside from decisions in "training" rounds, each decision impacts your earnings, which means that it is very important to consider each decision carefully prior to making it. Each decision round is separate from the other rounds, in the sense that the decisions you make in one round will not affect the outcome or earnings of any other round. All money amounts are denominated in lab dollars, and will be exchanged at a rate of 900 lab dollars to US$1 at the end of the experiment.

As we read the instructions, we will work through one training round to help our understanding of the procedures. Here is the set up. In each round, you fill out and file a tax form. Then, there is a process for selecting whether your tax form is audited. Last, a summary of your earnings for the decision round, including the outcome of the audit process, is provided.

Tax Reporting

On the tax form, located on the right side of the screen, you will report income and deduction amounts.

Reporting your income

You will not know your income for sure. Instead, on the left side of your screen, you will be shown a range of possible income amounts. Any number in this range has an equal chance of being your actual income. On the tax form, you can report any amount within the income range.

The more you report in income, the *higher* your tax payment will be.

Reporting your deduction

You will not know the amount you are allowed to claim in deductions. Instead, on the left side of your screen, you will be shown a range of possible deduction amounts. Any number in this range has an equal chance of being your actual deduction. On the tax form, you can report any amount within the deduction range.

The more you report in deductions, the *lower* your tax payment will be.

Your tax payment

Your tax payment is determined by multiplying your taxable income by a tax rate of 50%:

Tax Payment = 50% × (your reported income – your reported deduction)

On the tax form, after you choose income and deduction amounts to report, click on the "Do the Math" button. When you do this, you will see relevant tax calculations appear below the tax form, including the Tax Payment. *At this time, for practice, please enter income and deduction amounts on the tax form and click the "Do the Math" button.*

Audit Procedures

There is a chance that the tax agency will audit your tax form.

The chance you are audited depends on the tax payment you report on the tax form. The audit chance *decreases* as you *increase* your tax payment.

On the left part of the tax reporting screen you will see a table that shows your audit chance based on different reported tax payment amounts. You will also be shown the rate of change: the increase in tax payment associated with a 1% decrease in the audit chance. You will notice that there is a 10% range of possible audit chances for each tax payment amount. Each audit chance within this range will be equally likely.

If you are selected for audit, EITHER your reported income OR your reported deduction will be checked for unpaid taxes (NOT both). You will not know in advance which amount will be checked. There is an equal chance that either amount will be checked, if you are audited.

If you are not audited, however, no unpaid taxes will be found.

Any taxes you **overpaid** will not be refunded to you. In this sense, the audit process can never increase your earnings.

Unpaid taxes

If audited, you will have unpaid taxes if you reported too little in income or too much in deductions. Unpaid taxes are calculated as the difference between your actual and reported amounts multiplied by the tax rate. If you underreported your taxes, only the unpaid taxes on the item selected by the audit (income or deductions) will be found. Any unpaid taxes found must be paid back.

Penalty

If you have unpaid taxes, a penalty of 300% will be assessed. What this means is that, if you are audited, for every lab dollar in unpaid taxes you will have to pay back the 1 dollar you owed and in addition pay 3 lab dollars in penalties.

Tax Information Service

On the middle of your screen, towards the top, you may be provided tax information from a third-party; i.e. this information is not provided by, nor is it known to, the tax agency. In particular, you may be provided better (i.e. more precise) information about your actual income and/or deduction. Please know that the third-party information is accurate. For example, if the service provides you with a range of possible income (deduction) amounts, your actual amount is contained within the interval. Any amount within the interval has an equal chance of being your actual income (deduction).

If provided with better information about your income or deductions, you do not have to report an amount within the specified range(s).

Tax Information Service Guarantee

On the middle of your screen, towards the bottom, you may see that a third party has offered you a guarantee.

When available, if you follow the requirement for a particular reporting item (income or deduction), any audit penalties that result for that reporting item will be paid by the Service.

You will still be responsible for any unpaid taxes.

Audit Information Service

On the middle of your screen you will see audit information provided by a third-party service.

The service has provided you with better information about which item (income or deductions) will be checked for unpaid taxes, in the event you are selected for audit.

Also, the service has provided you with better information about your chance of audit for different reported tax payment amounts.

Please know that the third-party information is accurate.

Filing the tax form

When you are ready to record the particular income and deduction amounts you wish to report, you must first click the "Do the Math" button. Once you see the choices recorded, click the "FILE TAXES" button.

There is a timer on the tax reporting screen. If you do not file the tax form before time runs out, this will be treated the same as if you submitted a form that reported 0 in income and 0 in deductions. In addition, your tax form will automatically be audited. In other words, it is NOT in your best interest to let the tax reporting screen time out!

After you file the tax form, you will see an audit screen. While you are on this screen the tax agency is determining whether to audit your tax form, using the audit chance associated with your particular tax payment. *At this time, for practice, please click the "FILE TAXES" button.*

Round Summary

After the tax reporting decision, three things can happen: (1) you are not audited; (2) you are audited but did not underreport your taxes for the item selected for audit; or (3) you are audited and you did underreport your taxes for the item selected for audit. Your earnings are, of course, the same for the first two scenarios. The computer will calculate earnings for you, but it is important that you understand how your earnings are determined. The relevant earnings calculations are given below.

Your earnings (you are not audited OR you are audited but did not underreport taxes)

In both cases, there is no adjustment to your earnings based on the audit process. Your earnings for the round are equal to your actual income minus your tax payment.

	Income	Your actual income (not your reported income)
–	Tax Payment	(Reported Income – Reported Deduction) × 50%
=	Earnings	

Your earnings (You are audited and you underreported your taxes for the selected item)

In this case, all unpaid taxes are found for the item selected for audit, and a penalty is assessed.

	Income	Your actual income (not your reported income)
–	Tax Payment	(Reported Income – Reported Deduction) × 50%
–	Unpaid Taxes	Difference between what you owed and what you paid
–	Penalties*	(Unpaid Taxes) × 300%
=	Earnings	

*When available, if you follow the requirement for a particular item (income or deduction), any audit penalties for that item will be paid by the Service.

At this time, please click the "Finished" button on the Round Summary screen.

Examples

Before we continue, let us work through some examples to make sure we all understand some basic concepts. You will need to refer to the "Your Audit Chance" information on the computer screen for the first two examples. Please ignore information provided by information services at this time.

Example 1. Suppose you report 2000 in income and 1000 in deductions.

What is your tax payment?	500	1000	1500	2000
What is your audit chance?	15% to 25%	35% to 45%	43% to 53%	55% to 65%

Example 2. Suppose you report 2000 in income and 800 in deductions.

What is your tax payment?	400	600	1200	2000
What is your audit chance?	35% to 45%	45% to 55%	51% to 61%	55% to 65%

Example 3. Suppose your reported income is audited. You reported 2200 in income and your actual income is 2300.

What unpaid taxes would be found?	0	50	100	200
What penalties would you pay?	0	50	150	300

Example 4. Suppose that your reported deduction is audited. You reported 250 in deductions and your actual allowed deduction is 400.

What unpaid taxes would be found?	0	75	150	300
What penalties would you pay?	0	150	300	450

Second training round

We will now continue on to a second training round. As with the first, your decisions in the second training round will not affect your earnings. After the training round you will have a final opportunity to ask questions. *At this time, please fill out and file the tax form for the second training round.*

Beginning the experiment

Going forward, before we begin each series of paid rounds, you will first be asked to complete an earnings task. Your score for the task, relative to others in the room, will determine whether you are in the high, medium or low income group for the series of rounds. Roughly one-third of the players will be placed in each group. From time to time a new series will begin and you will be asked to complete a new earnings task.

At the beginning of a new series some of the tax settings will change. When a new series begins please pay close attention to any information that has changed prior to making any decision.

Before we proceed to the paid decision rounds, are there any questions?

Table A.1 Tax Reporting Models: Full Audit Treatments (Two-Limit Tobit)

	Model 1: Reported Taxable Income	Model 2: Reported Income	Model 3: Reported Deduction
Liability Service Effects			
Income and Deduction Info	−76.97** (34.30)	−51.83** (20.79)	24.43 (21.26)
Income Information Only	−73.99** (32.46)	−43.05** (19.85)	36.10* (20.93)
Deduction Information Only	−74.10** (32.36)	−69.73** (20.08)	6.48 (20.85)
Expected Income Change	0.54** (0.03)	0.619** (0.02)	0.14** (0.02)
Expected Deduction Change	−0.50** (0.03)	0.12** (0.02)	0.57** (0.02)
Liability Service Guarantee			
Guarantee Available	106.03** (43.94)	68.39** (25.47)	−36.54 (26.84)
Audit Service Effects			
Audit Service	−15.05 (40.17)	−15.12 (28.24)	−1.34 (25.98)
Audit Intercept Increase	12.26** (4.76)	4.28 (3.48)	−6.95** (3.07)
Audit Intercept Decrease	−21.21** (4.79)	−8.67** (3.57)	12.92** (2.93)
Service Interaction Effects			
Audit Service × Liability Service	93.58** (43.26)	70.42** (28.50)	−29.12 (8.65)
Audit Service × Guarantee Available	−122.81** (62.44)	−85.57** (38.05)	38.26 (36.26)
Other Experiment Treatments			
High Audit Slope	64.35** (14.13)	36.76** (9.72)	−29.12** (8.65)
High Income Group	920.04** (30.79)	969.97** (20.61)	46.90** (17.90)
Middle Income Group	443.71** (27.50)	466.30** (17.92)	22.79 (15.69)
Constant	961.75** (35.02)	1501.54** (28.03)	550.05** (24.61)
Number of Observations	8427	8427	8427
F	58.16**	86.59**	103.26**
Log-likelihood	−59993.57	−49722.22	−52270.66

*Notes: Table entries are marginal effects, treating limit observations as corner solutions. * and ** denote estimates that are statistically different from zero at the 10% and 5% significance levels, respectively. Standard errors (in parentheses) are clustered at the participant-level.*

Table A.2 Tax Reporting Models: Partial Audit Treatments (Two-Limit Tobit)

	Model 4: Reported Taxable Income	Model 5: Reported Income	Model 6: Reported Deduction
Liability Service Effects			
Income and Deduction Info	−17.15 (17.55)	−29.38** (12.50)	−13.50 (13.08)
Income Information Only	−21.98 (17.77)	−35.34** (12.91)	−12.81 (14.09)
Deduction Information Only	−5.89 (18.66)	−25.85* (13.21)	−19.06 (13.91)
Expected Income Change	0.62** (0.02)	0.66** (0.02)	0.13** (0.02)
Expected Deduction Change	−0.51** (0.02)	0.14** (0.02)	0.69** (0.02)
Liability Service Guarantee			
Guarantee Available	−3.40 (25.68)	10.15 (16.66)	12.65 (17.95)
Audit Service Effects			
Audit Targets Income	−52.95* (27.92)	31.73* (18.01)	113.07** (24.72)
Audit Targets Deduction	−50.95* (28.31)	−106.18** (22.66)	−44.36** (18.61)
Audit Intercept Increase	−4.52 (3.52)	−5.61* (2.93)	−1.48 (3.14)
Audit Intercept Decrease	−6.54 (4.00)	−1.51 (3.30)	5.44 (3.62)
Other Experiment Treatments			
High Audit Slope	49.83** (11.08)	22.58** (8.38)	−30.24** (8.46)
High Income Group	891.21** (26.26)	928.04** (16.58)	44.45** (18.76)
Middle Income Group	398.05** (22.44)	442.53** (15.20)	49.27** (16.48)
Constant	1065.13** (25.38)	1595.48** (21.76)	516.88** (19.14)
Number of Observations	8559	8559	8559
F	97.04**	151.07**	127.35**
Log-likelihood	−61453.77	−51052.08	−53775.82

*Notes: Table entries are marginal effects, treating limit observations as corner solutions. * and ** denote estimates that are statistically different from zero at the 10% and 5% significance levels, respectively. Standard errors (in parentheses) are clustered at the participant-level.*