Tax Withholding and Tax Compliance:
Evidence from a Framed Field Experiment[1]

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ABSTRACT

Although tax withholding is a central component of the US income tax system, there is a paucity of research that explores the relationship between tax withholding and subsequent tax reporting. Using a framed field experiment with working adults and deliberate framing, this study looks directly at this nexus. Briefly, we find interesting asymmetries related to tax position, in particular that tax under-reporting is increasing in the level of (possibly) expected as well as unanticipated tax under-withholding, but is invariant to the level of tax over-withholding. Further, we find that better information on tax liability provided by an information "service" only reduces tax under-reporting by those in an under-withholding position. Taxpayer experiences (from outside the lab) and characteristics are strongly tied to experiment behavior.

1. Introduction

The U.S. Internal Revenue Service (IRS) estimates that there is a considerable amount of underreporting of personal income tax in the US tax system. The gross underreporting "tax gap" was estimated to be $235 billion in tax year 2006 (Bloomquist, Emblom, Johns, and Langetieg, 2013). Yet, the level of compliance is actually quite high given the level of enforcement effort. Individuals have heterogeneous preferences and it is likely they respond differently to audit risk. Beyond this simple fact, there is the complex set of interactions between the taxpayer and the government and among taxpayers themselves. The strength, and indeed the direction, of these effects are also likely to vary across individuals reflecting heterogeneous attitudes toward fiscal exchange and toward the behavior of other taxpayers.

Previous work has investigated the effects of taxpayer types (or segments) and how these can affect willingness to comply with tax rules (Kirchler and Wahl, 2010; Vossler, McKee, Bruner and Jones, 2012; etc). Several other effects have been observed and verified through careful empirical analysis. Taxpayer assistance services favorably affect compliance, higher levels of non-matched income lead to lower levels of compliance, pre-populating tax returns increases overall compliance, and, as expected, enforcement effort is positively correlated with tax reporting.[2]

Our focus in this study is on the effects of tax withholding and how this interacts with the individual taxpayer's innate attitude toward taxation and government and with the provision of taxpayer information services. Attitudes are expected to be influenced by the fiscal exchange (the benefits the taxpayer perceives arising from taxes paid) and social norms (the tax reporting behavior of others). This set of interactions is of interest since tax withholding is an important

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[2] See Alm, Cherry, Jones and McKee (2010, 2012), Vossler and McKee (2013), and McKee, Siladke and Vossler (2012) for examples.

part of the tax system and a taxpayer's attitude toward paying the full share of taxes is likely to be affected by the net tax position (additional taxes owed versus tax refund due) she finds herself in at the time taxes are to be filed. In the US individuals are subject to tax withholding or to tax payments throughout the year (e.g., quarterly filing of taxes). Thus, when the traditional filing time (e.g., April 15) occurs the taxpayer may be in a position of owing additional tax or of receiving a refund and it is the effect of this status that we investigate. Beyond the obvious factor of liquidity constraints, there is a large body of literature on the psychology of decision making that leads to our conjecture that the net position at filing time will strongly affect the taxpayer's willingness to fully disclose tax liabilities.[3] Whether the taxpayer is eligible for a tax refund or owes additional taxes at filing time generates a reference point effect. As Kahneman and Tversky (1979) demonstrated, whether the individual faces a change of status in gain space or in loss space greatly affects the individual's attitude toward risk. If a representative taxpayer is looking at a certain loss (owes tax) at filing time, she will be more willing to under-report tax liability than if she is looking at a certain gain (refund). Various factors may complicate this simple result as we noted above. Social norms as well as the perception of the fiscal exchange affect tax reporting behavior. Further, the tax agency may foster a more favorable perception by taxpayers if it is helpful in providing assistance and/or information.

Given the widespread incidence of tax withholding, its overall share of tax revenues from the personal income tax, there is a surprisingly small empirical literature on the effects of withholding on compliance. Clotfelter (1983), in one of the more comprehensive studies using field tax return data (from the Taxpayer Compliance and Measurement Program, or TCMP)

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[3] In the field, the taxpayer may face a liquidity constraint at the time of filing. As Shapiro and Slemrod (1995) show, households may poorly anticipate their resulting tax liabilities when the tax system under-withholds. The case examined was a one-shot policy intervention under President George H. W. Bush. If such under-withholding were systemic, it is possible that households would adjust consumption to save the anticipated taxes owed – much like the Ricardian equivalence arguments regarding public sector debt (Barro, 1977).

found that there is a positive correlation between withholding and tax reporting. Those who under-withhold are more likely to under report. This result is confirmed by Chang and Schultz (1990) who also use TCMP data. The causal chain is less clear, of course, but these results are suggestive. One possibility is that taxpayers intending to underreport choose to under-withhold but another possibility is that taxpayers discovering they have under-withheld adopt a more aggressive position at the tax reporting stage.

Some theoretical investigations, extending the basic framework of Allingham and Sandmo (1972) of the propensity to underreport taxes in the presence of withholding have been undertaken. Yaniv (1988) considers both employer and employee reactions. He notes that employers may evade by not fully remitting the amount they withhold from the workers' pay and employees may evade if the withholding is less than their full tax liability. The usual results hold. Propensity to underreport is lower as the audit probability and penalties increase. But this suggests that an effective enforcement mechanism is to reduce the taxpayer's incentive to under-withhold. When the reference point effects are incorporated, a policy of over-withholding becomes even more effective.

Jones (2010) asks a slightly different question: why so much over-withholding? With more than 75 percent of taxpayers receiving refunds an obvious question is why taxpayers don't reduce their withholding to be able to spend or invest the money? Several reasons have been proffered: time inconsistency, the desire for forced savings, and a precaution against unexpected taxes due. Jones adds inertia to this list and reports results that taxpayers are slow to respond to changes in their own tax status (e.g., the birth of a child) or changes in tax policy (e.g., the introduction of the Earned Income Tax Credit) and the result is over-withholding.

The experimental laboratory provides an important complement to the (sparse) extant field data research. In contrast to the field, the experimenter is able to control the setting and to observe both the true tax liabilities and the tax reporting behavior. In this way the experimenter can also control for the linkage, or simultaneity, of the evasion and withholding decisions in order to focus on the impact of unintended or unexpected under-withholding. If the level of under-withholding is unexpected, it cannot be argued that under-withholding is caused by a planned or conscious decision to evade. Martinez-Vazquez, et al (1992) use a laboratory experiment to investigate the withholding effect. The experiment was designed to test three possible effects: the reaction effect – a type of decision framing bias (see Kahneman and Tversky, 1979); the liquidity effect arising when the individual must pay additional taxes at the time of filing; and the fiscal illusion effect. The experimental results do not support the reflection (reaction) effect of prospect theory. The liquidity effect arises when the taxpayer unintentionally under-withheld at filing time and does not have the liquid assets to pay the taxes owed at filing. The experimental data cannot reject the null hypothesis that for unexpectedly under-withheld taxpayers, liquidity and tax compliance are not related. Fiscal illusion arises when taxpayers underestimate their true tax burdens because of the complexity and indirectness of tax institutions (see Buchanan and Wagner, 1977). The data fail to support the hypothesis that withholding may encourage tax compliance via fiscal illusion. An important methodological issue for these experiments is that the experiment elicits decisions in a hypothetical setting. The authors justify their use of a hypothetical setting (reference is made to Grether and Plott, 1979 and to Lichtenstein and Slovic, 1973) but these references are to very much dated works. Without any financial incentives, empirical and theoretical evidence suggests that true preference revelation is unlikely in settings related to public good provision (Carson and Groves, 2007). A

related concern is that, since Martinez-Vazquez et al. fail to reject all three null hypotheses set forth to explain their results, it possible that their analysis has low statistical power.

Schepanski and Shearer (1995) also conduct an experiment in which they seek to investigate the reference point effect. Using a hypothetical setting they assigned participants to one of four situations: Expected Refund, Unexpected Refund, Expected (tax) Payment, and Unexpected (tax) Payment. According to the reference point hypothesis participants in the Unexpected Payment setting will be most likely to under-report taxes and this is what the researchers observed.

Our experimental setting introduces a tax withholding stage at the beginning of the tax year and a filing stage at the end of the tax year. In an induced value setting participants earn income, elect a withholding level, and file a tax return.[4] We allow the participants to choose whether they will be in an (expected) refund or tax payment situation at the time of filing, but this decision is made under uncertainty about tax liability. Further, we introduce shocks in the sense that the information set changes across withholding and reporting stages (due to uncertainty reduction) and for some this changes expected tax liability. We introduce a withholding cost to reflect the deferred spending or foregone interest associated with pre-payment of taxes. We also introduce a penalty for under-withholding. These are asymmetric – the withholding cost is less than the under-withholding penalty. This allows us to investigate competing motives for withholding decisions and the interaction between the withholding and tax reporting decisions. The experimental setting also introduces (as treatments) social norm information and taxpayer assistance. For these experiments, which is best described as a framed field experiment, the participant pool consists almost entirely of adults in the workforce rather

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[4] In contrast to Schepanski and Shearer (1995) and Martinez-Vazques et al (1992) our experiments use real financial rewards to provide the participants with incentives to incur the cognitive costs of decision making.

than the more typical student population. Further, the experiment uses deliberate tax system framing.[5]

We will briefly summarize our findings here with more detail in the appropriate section below. Our data show behavior that is consistent with the general results reported in the literature: truthful tax reporting decreases as enforcement effort falls and as the overall level of tax reporting by others falls (a social norm effect). We also find that women are less prone to underreporting and that underreporting declines with age. These consistent results confirm the robustness of our design and experiment interface.

Our focus here is on the interaction between tax withholding and the subsequent tax reporting behavior. We find that under-withholding increases the extent to which individuals underreport tax liability. This is consistent with behavior associated with response to reference points; after having taxes withheld, the individual responds to the requirement to pay further taxes by underreporting tax liability to avoid having to pay more.

When taxpayers face uncertain tax liabilities the availability of taxpayer information services has proved to increase truthful reporting (Alm, Cherry, Jones, and McKee, 2010; Vossler and McKee, 2013) in the absence of a tax withholding requirement. We find an interesting asymmetry for those who acquire information: individuals who have under-withheld respond positively by decreasing their level of underreporting, whereas there is no effect for those who have over-withheld. However, unfortunate for tax compliance is those in either an over- or under-withholding position have a lower demand for information relative to those in an exact withholding position. Finally, we find some regularity in the propensity to obtain

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[5] Following the nomenclature of Harrison and List (2004), our experiment is best described as a "framed field experiment" given that it utilizes a targeted subject pool and introduces field context. The demographic data of the subject pool are discussed in more detail later but 71% are employed full time, 23% are employed part time, and 6% report being unemployed or retired.

information by demographic characteristics. Women are less likely to obtain information as are younger individuals but the effect for women is partly offset by their propensity to withhold more in taxes. Information services are costly to the tax agency and the efficiency of these services can potentially be improved by targeting those who would benefit from the information, as we later discuss.

2. Theoretical Discussion

The basic economic theory model of tax compliance (Allingham and Sandmo, 1972; Yitzhaki, 1974) characterizes a situation where a taxpayer faces a tax reporting "gamble" where she assesses the tradeoffs between the risks of penalty with the benefits of a lower tax payment. Here, we first briefly describe the theory model of Vossler and McKee (2013), and its implications for information services, which we used to inform the experimental design. Then, we extend this framework to consider the effects of social interactions, in particular social norms related to compliance and fairness at it related to the fiscal exchange. Finally, we provide some intuitive discussion of how tax withholding is expected to affect tax compliance. We leave more formal modelling of the withholding-reporting nexus to future work.

The withholding decision is made prior to the filing decision, but it is conditional on the taxpayer's planned behavior at the filing stage (by backward induction) and so we will begin by examining the reporting decision. At the reporting stage a risk-neutral taxpayer chooses what to report on one or more "line items" on the tax form.[6] We assume that the taxpayer considers directly the tax liability associated with her line item reports which allows us to generally characterize the optimal decision regardless of whether the line item is associated with a credit,

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[6] To be clear, we use the term "line item" to denote any tax form entry that the taxpayer has discretion over what to report. For simplicity, we rule out simple mathematical errors that, to a large extent, are automatically discovered by the tax authority and not subject to penalty.

deduction, reported income, or otherwise. The audit probability is p, audits are completely random and independent of whether other persons are audited or the reported tax liability. Audits on tax returns perfectly reveal unpaid taxes separately for each line item on the tax form. In addition to being liable for unpaid taxes upon audit, there is a constant per-unit penalty $\beta > 0$ assessed on unpaid taxes.[7]

The actual tax liability on one or more line items is uncertain, and there may be an information service available to partially or fully resolve the uncertainty. Let x_l^0 denote the actual tax liability associated with line item l.[8] From the perspective of the taxpayer, tax liability is a random variable x_l with distribution function $F(x_l)$, which is assumed to have positive density $f(x_l)$ on the interval $[a_l, b_l]$. It is assumed that x_l^0 lies within the interval, i.e. the true tax liability is considered probable. Further, assume that there are institutional or other constraints on the range of amounts the taxpayer is allowed to enter, such that reports lie in the interval $\left[\underline{a}_l, \bar{b}_l\right]$, with $\underline{a}_l \leq a_l \leq b_l \leq \bar{b}_l$.

For each line item on the tax form the taxpayer chooses a tax liability to report, denoted R_l. The optimal reporting problem is then one of choosing a vector of tax liabilities $\boldsymbol{R} = \{R_1, \dots, R_L\}$ in order to minimize expected costs:

[1] $\min_{\boldsymbol{R}} \sum_l \left\{ R_l + p \left\{ (\beta + 1) \int_{R_l}^{b_l} (x_l - R_l) f(x_l) dx_l \right\} \right\}.$

The optimal reporting choice for a particular line item, R_l^*, is implicitly defined by

[2] $1 = p(\beta + 1) \int_{R_l^*}^{b_l} f(x_l) dx_l \qquad \forall l.$

The interpretation is that the taxpayer minimizes cost by equating the marginal cost of taxes

reported with the expected marginal cost of the audit. The first-order necessary conditions can

instead be written as

[2'] $F(R_l^*) = 1 - \frac{1}{p(\beta+1)}$ $\forall l.$

An interior solution exists for R_l^* on the interval $[a_l, b_l]$ if $\frac{1}{p(\beta+1)} < 1$. Otherwise, there is a

corner solution $R_l^* = \underline{a}_l$, i.e. the taxpayer engages in maximum tax evasion.[9] It is possible in

general for the optimal reported liability to be under, over or equal to the true liability. For

instance, even if $E[x_l] = x_l^0$ (i.e. beliefs are unbiased) there is the potential value to over-report in

expectation as it decreases the probability (and expected cost) of being found to have

underreported.

When liability is certain, it is not possible to have over-reporting as optimal, as paying

too much tax provides no benefit regardless of whether an audit occurs. Instead, under certainty,

the solution is to fully comply when $\frac{1}{p(\beta+1)} < 1$, and to engage in maximum evasion when

$\frac{1}{p(\beta+1)} > 1$. Thus, uncertainty in the former case – if anything – leads the taxpayer *away* from the

truth.[10] In the latter case, uncertainty has no effect as the taxpayer will be at the corner solution

of maximum evasion regardless.

2.1 The effect of information services on tax reporting

At the time of filing, the individual may face uncertainty regarding tax liability due to tax

complexity, poor record keeping, or both. An information service provided by the tax agency

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[9] If the line item is associated with a liability, for example, then this means reporting zero liability. However, if the line item is associated with a deduction or a credit, then this implies taking the maximum deduction or credit possible in which case x_l^* is as large and negative as possible.
[10] This result is similar to that obtained by Beck and Jung (1989).

can address this uncertainty and perhaps improve tax reporting accuracy. Vossler and McKee (2013) examine what they label a *helpful information service*. Letting $G(x_l)$ denote the distribution of tax liability after receiving the information service, a helpful service is one with $G(x_l) \leq F(x_l)$ for $x_l \leq x_l^0$ and $G(x_l) \geq F(x_l)$ for $x_l \geq x_l^0$, with strict inequality between distribution functions holding at least for some x_l. Although more general, this characterizes a service, such as the one we explore in the experiment, that is unbiased, i.e. $E[x_l|G] = x_l^0$; and reduces the uncertainty over x_l through, for example, reducing the variance [i.e. $Var(x_l|G) < Var(x_l|F)$]. As Vossler and McKee (2013) show, a helpful information motivates more truthful reporting when there is an interior solution to [1], or there is instead a corner solution of full evasion in the absence of the service.[11]

2.2 The Effect of Social Norms and Fairness of Fiscal Exchange (Public Goods)

Another strand of literature has focused on the role that social norms play in the tax compliance decision (Alm *et al.,* 1999; Torgler; 2002). This literature suggests that, in addition to the explicit expected costs imposed by the tax authority for non-compliance, there are additional, implicit costs from deviating from a norm level of compliance.[12] Norms differs from fairness considerations in tax morale – the latter captures the taxpayer's perception of the tax burden, while the former addresses how others perceive the taxpayer's level of compliance. Hence, a taxpayer with high (low) morale employed in an industry with a norm of evasion (compliance) may be conflicted.[13] Let For simplicity, assume taxpayers incur a sanction, $\lambda > 0$, for deviating from the norm, αt_l,

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[11] To be clear, given that information services have a random outcome, this result is true "on average" rather than specifically for each taxpayer in each instance.
[12] The source of such a norm is beyond the scope of this paper. See Elster (1989) for a detailed discussion on the topic.
[13] Obviously, when the social norm is aligned with a taxpayer's morale, the incentives will reinforce each other.

[3] $s(R_l) = \lambda(\alpha\bar{t}_l - R_l)^2$

where $0 \leq \alpha \leq 1$.[14] These implicit costs can be the result of social sanctions, such as ostracism, resulting in a lost stream of future benefits from exchange with members of one's group, or emotional dismay, as a result of guilt or shame (Erard and Feinstein, 1994). The quadratic specification of these costs in equation assumes a deviation above or below the norm is penalized symmetrically.[15] In this situation, we can write the optimal reporting choice as

[4] $R_l^* = \alpha\bar{t}_l + \frac{1}{2\lambda}\{p(1+\beta)(1 - F(R_l^*)) - 1\}$ $\forall l$.

Now the taxpayer equates reported taxes with that of the expected norm level of compliance, adjusted now for the discounted effect of the uncertain enforcement regime.

Next, we account for the public goods and services that are provided through collected taxes (Alm *et al.,* 1999). Such benefits (costs) create an incentive for increased compliance (evasion). Likewise, considerations such as for fairness (Fehr and Schmidt, 1999) are important. Assume each taxpayer holds a subjective perception, $\pi(R_l)$, regarding the resulting impact their reported taxes will have on their own well-being, a tax morale. In general, these subjective perceptions can either be a benefit, or yet another cost, and may either be increasing or decreasing in reported taxes (i.e. $\pi_1 > 0$ or $\pi_1 < 0$ where π_1 is the first derivative of tax morale). For tractability, let tax morale take the form of a modified public good,

[5] $\pi(R_l) = \gamma \sum_{i=1}^{N} R_{li} - \delta(R_{li} - \bar{R}_l)^2$

where $i = 1, ..., N$ is an index of taxpayers and $\bar{R}_l$ is the average contribution to the public good. The parameter γ denotes the marginal per capita return from the provision of public goods and

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[14] Hence, the norm is regarding the level of compliance not the level of taxes reported. Hence, if taxes differ by income, the norm implies reported taxes will differ by income.

[15] Alternatively, deviations above or below the norm could be penalized asymmetrically. For example, the social cost function could simply penalize deviations below the norm (Alm *et al.,* 1999), inducing higher compliance. However, one can imagine the norm working in the opposite direction. Hence, we employ a general specification of social norms that allows for a broad range of possibilities.

services, which may be perceived to be positive or negative (i.e. a public bad).[16] Typically, $\gamma >$ 1 is necessary to induce voluntary provision of the public good (i.e. voluntary compliance). The presence of fairness considerations, however, complicates the decision considerably.[17] The quadratic term in the above equation implies those who pay more (less) than average, and perceive that to be unfair, $\delta > 0$, incur a psychological cost and are inclined to increase evasion (compliance) to compensate.[18]

Abstracting away from social norms related to compliance (i.e., let $\lambda = 0$), and assuming $\gamma > 0$ and $\delta > 0$, we can write the optimal reporting decision as

[6] $\qquad R_l^* = \bar{R}_l + \frac{1}{2\delta}\{\gamma - 1 + p(1 + \beta)(1 - F(R_l^*))\}$ $\qquad\qquad \forall l.$

Hence, the taxpayer will equate reported taxes with that of the average taxpayer, adjusted now for the discounted effect of both the public goods provision and the uncertain enforcement regime. The basic implication is that tax reporting is increasing in the average (or, with a fixed number of taxpayers, the total) taxes reported.

2.3 The Effects of Tax Withholding[19]

Tax withholding is a central component of the US personal income tax system. Requiring taxpayers to have taxes withheld at the source alters the reporting decision compared with the no withholding case. In making the withholding choice, the taxpayer must weigh the *ex ante* costs of paying taxes in advance of the tax reporting period against the costs associated with

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[16] For example, a criminal may perceive their tax dollars support law enforcement, which in turn, reduces the criminal's income. In this case, the objective is to minimize costs, which results in reduced compliance.

[17] Bordignon (1993) offers a slightly different approach to modeling such preferences. He assumes the fairness consideration enters the taxpayer's objective function as a constraint. This eliminates the possibility to tradeoff motives.

[18] The quadratic specification differs from that of Fehr and Schmidt (1999). It is assumed for simplicity when deriving the optimal tax compliance.

[19] The speculated interactions between tax withholding and tax reporting are inherently behavioral. In this section, we provide some economic intuition to help guide the empirical analysis, and leave formal theoretical modeling for future work.

having to pay additional taxes (and perhaps interest and penalties) at the time of filing. The costs of withholding include the foregone consumption or investment opportunities during the year. The costs of being required to pay additional taxes at the time of tax filing can consist of the administratively imposed costs (interest and penalties) by the tax agency for under-withholding, liquidity costs, and the type of reference effect demonstrated by Kahneman and Tversky (1979). Facing uncertainty regarding true tax liability at the time of the withholding decision, the taxpayer must balance the certain costs of withholding against the expected costs of the under-withholding penalty as well as the reference effect costs posited in K&T. In effect, the withholding choice allows the taxpayer to either avoid or incur these expected costs. There is a cost of avoidance that is increasing in the magnitude of the avoidance. However, absent uncertainty over tax liabilities, taxpayers can choose whether to be in a tax refund or tax payment situation. Uncertainty at the withholding stage introduces the potential for unexpected tax payment situations to arise with the concurrent reference point effect. The uncertainty associated with being in a tax payment versus a tax refund situation is the mechanism that results in the taxpayer facing the reference point effect and it is this effect that links the withholding and filing stages of the tax year. The decision models of K&T predict that the likelihood of underreporting at the time of filing will be driven by whether the taxpayer has under versus over-withheld. In the case of over-withholding the taxpayer on the positive side of the reference point effect and will be less willing to incur the risks associated with tax underreporting, holding enforcement effort fixed. The opposite will hold for the taxpayer in the under-withholding state. Here the taxpayer can also avoid the under-withholding penalty by underreporting taxes.[20]

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[20] Since taxpayers will exhibit heterogeneous preferences, we expect that relative weights of the incentives to over or under-withhold will vary across our participants but that regularities will be identifiable when past audit results and taxpayer characteristics are controlled.

Information services are not directly relevant to the withholding choice since at the beginning of the tax year (when the withholding decision is made) there is no means for the tax authority to provide relevant information. However, the availability of information services at the time of tax filing can have an indirect effect on the withholding choice via the effect on tax reporting. For a given withholding level the taxpayer can face three situations at filing time: withholding exceeds current legal tax liability and a refund is due; withholding falls short of legal tax liability and additional taxes plus an under-withholding penalty must be paid; withholding is exactly equal to legal tax liability. This last case is uninteresting, but nevertheless provides a baseline from which to compare behavior in the other cases.

Since taxes reported is a choice for the taxpayer (based on reported income and deductions claimed), the taxpayer can react to the tax situation she faces at the time of filing by adjusting income and deduction in relation to the tax withholding level. Since the information service allows the taxpayer to know her tax liability perfectly, it seems likely that the taxpayer in the under-withholding state would be more likely to purchase the information. This can lead to avoiding both the audit penalty and the under-withholding penalty.

On the other hand, a taxpayer in the refund position (taxes over-withheld) is getting a refund based on the reported income and deductions. The information may lead the taxpayer to report higher taxes and thus may be viewed as a bad. Thus we predict that those who have over-withheld will be less likely to purchase the information. If participants randomly fall in the tax payment or tax refund states, we would expect to see no aggregate effects from providing the information service.

3. Experimental Design

3.1 Overview

Relative to related tax compliance research, the decision setting here has been expanded to include the tax withholding decision coupled with the provision of a taxpayer information service.[21] The latter serves to reduce taxpayer uncertainty regarding tax liability at the time of filing. At the time of the tax withholding decision the taxpayer faces considerable uncertainty regarding income and deductions since this is the beginning of the tax year.[22] Finally, the experiment setting introduces social norms through information regarding the aggregate tax reporting behavior of the other participants and, as a treatment, the presence of a fiscal exchange in the form of a shared public good financed through tax collections.

As the theoretical framework presented in the previous section suggests, tax reporting behavior is potentially influenced by social norms and by the extent to which taxpayers perceive the "fiscal exchange" to be fair. To capture the effect of social norms and fiscal exchange, we introduce feedback on the tax reporting behavior of others and we incorporate a public expenditure which benefits all participants equally. The latter is implemented as a "transfer payment" by which a fraction of the total taxes collected is returned to the participants; a public good.[23] Prior to the beginning of the period the participants choose an amount of taxes to have withheld (akin to completing a W-4). This amount is credited against taxes owed at the filing time. Since taxes are withheld from the beginning of the period, the true cost of a dollar withheld may be greater than one (e.g., forgone interest) or less than one (the reference effect of

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[21] Interestingly, North Carolina recently introduced a modified withholding structure (a new NC4) that emphasizes penalties for under-withholding and accentuates uncertainty at the time of the withholding decision.
[22] To emphasize the uncertainty we do not allow for revisions to the withholding decision during the tax year. In the naturally occurring setting the individual may, of course, revise her W-4 to reflect changes in tax status arising from marriage, home purchase, or an added dependent. But there are transactions costs associated with such changes.
[23] In the instructions this is characterized as "roads, etc provided by government." The specific marginal per capita return is not revealed in the experiment.

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receiving a refund). At the time of the withholding decision the participant faces uncertainty regarding true income and the level of allowed deductions that may be claimed.

3.2 Experiment Setting Details[24]

The following describes common characteristics of a decision round in the experiment. Participants earn income by performing a task, determine how much in taxes to have withheld, self-report their tax liability, and then face the possibility of audit and penalties for underreporting taxes. In the earnings task, participants are presented with a picture of either a jar of pennies, gumballs or jelly beans, and are asked to guess the number of elements in the jar. One-third of the participants with the closest estimate are placed in the high income group, the second third are placed in the middle income group and the next third in the lowest income group. The income group assignment is in effect for a "series" of rounds, which we later describe.

At the beginning of a decision round the participants select the amount of taxes they wish to have withheld, from a discrete choice set of amounts, through a simplified W-4 form. Specifically, there are five withholding levels to choose from (tied to the number of "allowances" claimed). The withholding amounts span expected tax liability amounts as well as allow the participant to unambiguously over-withhold (by claiming zero allowances) or under-withhold (by claiming four allowances). Participants are provided with information on their income, standard and itemized deduction amounts. In particular, they are provided a range of possible income amounts, two possible standard deduction amounts, and a range of possible itemized deduction amounts. The true income, standard and itemized deduction amounts lie

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[24] This section describes the experimental setting and design in detail. Sample subject computer screens and printed instructions are included in an Appendix.

within the amounts provided. Overall, the information allows one to determine expected tax liability, albeit with considerable uncertainty. There is an added "withholding cost" equal to 10% of the amount withheld. This is intended to reflect factors such as discounting and opportunity cost. Completion of the form is time limited. Failure to complete the form in the time allowed results in the maximum level of tax withholding.[25]

After the withholding choice, and after a small delay, the participants are provided with their tax form. The tax form has the taxpayer report income and claim either a standard deduction (there are two possible amounts) or an itemized deduction (an amount of their choosing). Relative to the withholding stage, and to reflect that taxpayers are better informed after the tax year has ended, there is a partial resolution of tax liability uncertainty. At the time the tax form is to be completed some of this uncertainty will have been naturally resolved with the passage of time. In the field an individual will have received some information via her employer, bank statements, and so on that will partially resolve the income and deduction uncertainty faced when the level of tax withholding was selected. In the experiment, the range that contains their actual income and allowable itemized deduction is reduced by 25%, and further the true standard deduction amount is revealed. Final tax liability is the difference between earned income and deductions claimed, 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 amount of reported taxes (i.e., taxable income multiplied by the tax rate) is calculated along with the corresponding tax payment or refund. The amount of withholding is automatically credited on the form. Thus, a tax payment is revealed if

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[25]   That is, it is as if the participant was claiming zero exemptions on the W-4 form – the default value for anyone not submitting a W-4 to their employer.

the player has reported tax liability in excess of their withholding; otherwise, the relevant tax refund amount (i.e., amount withheld minus reported taxes) is displayed. In the event that a tax payment is due, an under-withholding penalty is also reported, equal to 20% of the reported tax payment.

Following the tax reporting stage, there is an audit process that is completely random and is conducted independently for each participant. A graphic appears on the decision screen consisting of three balls in a box and the balls alternate colors (white and blue) and when the balls stop changing color the participant is audited (blue) or not (white).[26] If the player is selected for an audit, unpaid taxes (based on the actual income and allowable deduction amounts) are discovered and collected along with the penalty, which is equal to 300% of unpaid taxes. These audits occur with a known probability and are perfectly revealing.

Participants are informed that if they report more income than earned and/or claim less in deductions than allowed, they will not be refunded the taxes overpaid. That is, the audit process can never increase a participant's earnings. Allowing the form to time out without filing results in the automatic audit of the return and, since all entries are imputed to be zero, no deduction is claimed. Thus the participant faces the maximum tax liability and the penalty is based on this. We explicitly inform the participants that it is never in their interest to allow the form to time out. Some participants do allow the form to time out but this rarely occurs beyond the earliest rounds.

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

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[26] The audit process used in these experiments is completely random. While much of the IRS audit selection is based on endogenous rules, a purely random process avoids some of the complications that would arise from the use of relative reports. The use of the random process allows us to focus on the issues to be investigated in this series of experiments. Alm and McKee (2004) have examined the behavioral responses under endogenous processes and find the taxpayers attempt to coordinate reporting levels but that they have difficulty doing so.

detailed breakdown of earnings from the round. Earnings are largely determined as the difference

between actual income and taxes paid. The extra withholding cost (10% of withholding), any

under-withholding penalty (20% of tax payment), and audit costs (unpaid taxes and audit

penalty) are also subtracted from earnings as applicable.

3.3 Experiment Treatments and Sessions

We use a 2x2 between-subjects design where the main treatment variables are the

presence/absence of a perfect information service and the presence/absence of information on tax

compliance and a partial redistribution of reported taxes (i.e., a public good). Implemented as a

treatment variable, taxpayer information assistance may be offered prior to tax filing, in the tax

reporting stage (treatments T3 and T4). To reflect the transaction costs associated with obtaining

information there is a monetized cost for the information service, equal to 50 lab dollars. If the

information service is requested (participants simply click on an "Information" button) it is

always supplied and always correct.[27] In particular, the ranges of possible income and itemized

deduction amounts are reduced to the actual amounts upon receipt of the information service.

When the information on tax compliance and a public good is provided (T2 and T4), only

the taxes voluntarily reported are used to finance the good.[28] Implicitly we are treating the

penalties and unpaid taxes collected via the audit as the cost of the audit process. This

assumption is made to emphasize the social norm aspect of the public good provided from the

tax receipts. Penalties are not a part of a social norm of voluntary tax compliance in this setting.

The public good multiplier is set quite low to reinforce that this is a tax reporting exercise not a

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[27] Incomplete and/or incorrect services have been investigated elsewhere (see Alm *et al.,* 2010; and Vossler and McKee, 2013).

[28] In previous research we systematically turned on/off the tax compliance and public good elements in the design (see Vossler *et al*., 2012). As we found no interaction effects, in the current research we opted to simply turn on/off both features simultaneously.

public good provision game.[29] Specifically, 50% of taxes voluntarily paid are equally allocated to all group members.

A second element of the social norm is the extent to which the knowledge of others' tax reporting behavior affects our own. We provide end-of-round information on the actual taxes reported relative to the required taxes broken down by income class. The individual can compare her taxes reported relative to the average of her income group, as well as to reporting behavior of other income groups.

Implemented as a within-subject treatment variable is the audit rate. The three audit rates used are 10%, 30% and 50%. Based on the theoretical framework presented earlier, in the absence of an information service and social norm/public good features, the audit rates are predicted to induce full evasion, partial evasion, and full compliance, respectively. Information services, if requested, perfectly reveal information and as such should lead to full evasion in the 10% audit regime and full compliance otherwise. Parameters used for the experiments are reported in Table 1. All amounts are denominated in lab dollars.[30] The four treatments are presented in Table 2.

An experimental session consists of 18 paid rounds arranged into three blocks of six rounds each. At the beginning of each block the taxpayers (participants) earn income by completing a simple task. These earnings are in effect for the remainder of the block. For the duration of a series the audit probability is constant. All participants experience the three audit probabilities. To help control for order effects as well as increase the number of independent observations, there are two distinct taxpayer groups within each session. In the social

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[29] Previous work (Alm, Jackson, and McKee, 1992, 1993) placed greater emphasis on the fiscal exchange aspect of tax reporting behavior and report that the public good increases compliance in small group settings but the mechanics of the provision (the institutional setting) matter a great deal.

[30] Lab dollars are converted to US dollars at the end of the session at the rate of 300 lab dollars to one US dollar.

norm/public good treatments, compliance information and the transfer payment are group-specific. In all sessions, the sequence of audit rates differs across groups.

There are 18 sessions in the experimental design, the distinguishing features of which are presented in Table 3. Given the interdependencies created by implementing the compliance/public good features, there are six sessions each of the two treatments with these features. For the remaining two treatments there are three sessions each. With three audit rates, there are six unique audit sequences. Each audit sequence is implemented once for the two treatments without the group interaction (i.e., no compliance and public good features), and replicated at each location for the remaining two treatments.

3.4 Participant Pools and Procedures

The experiments were conducted largely with employed adults from the Knoxville, TN and Boone, NC area. The experimental labs are located at the University of Tennessee and Appalachian State University.[31] The labs both include two-dozen networked computers, a server, and software designed for this series of experiments. Recruiting at both sites was accomplished using the Online Recruiting System for Experimental Economics (ORSEE) developed by Greiner (2004). The participant databases were built using posters and email announcements to various community groups in each location. Registered persons were invited to specific sessions via email, and were permitted to participate in only one tax experiment session. Only participants recruited specifically for a session are allowed to participate, and no participant has prior experience in this specific experimental setting. Somewhat unique to this investigation is the use of a non-standard subject pool. Participants for this study were recruited from the general

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[31] Although the pools are intended to be comprised entirely of employed adults who are not full-time students, there is some inevitable leakage of students who are working part time into the subject pool given that the recruiting off campus is biased toward proximity to campuses to ensure greater participation in the experiments.

population living or working in the area near the two universities where the experiments were conducted. The resulting pool is much older than is typical, largely employed full-time (73%) and experienced in the completion of a W-4 and a tax return. Since the experimental setting is highly context specific (tax language is used throughout the instructions and the computer interface) this experience is likely transferred to the lab setting. Overall, there are 359 participants. The number of participants in each session as well as the lab location are presented in Table 3.

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 located in a cubicle, 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), as amended by Bruner (2012). The experiment moderator answers any questions prior to decision making.

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 (instructions are included in the Appendix). The first practice round is conducted with the stage clocks (Withholding and Filing) turned off and with the experimenter directing the participants on the use of the interface. The second practice round (which also does not affect earnings) is conducted with the clocks running as in the paid rounds. Clarification questions are addressed at the end of the second training round. 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 that could affect the decisions of the participants and implements a double blind design in so far as in possible with the person running the experiments being the person who designed them. All actions that participants take are made on their computer station.

The experiment proceeds for 18 paid decision rounds, although the actual number of rounds is not pre-announced nor is the length of a series. After the final decision round, participants learn of their earnings from both the risk elicitation exercise and the tax experiment. Participants are then directed to complete both a demographic and taxpayer attitude debriefing questionnaire. The demographic questionnaire elicits information on personal characteristics as well as tax filing experiences. The taxpayer attitude questionnaire is adapted from Kirchler and Wahl (2010). After the briefing is completed, participants are called up to the front of the room individually and paid their earnings in cash. Average earnings were approximately $80 for the session which lasted about two hours on average.

4. Results

Descriptive statistics for the experiment data used in the subsequent analysis are reported in Table 4. Overall, the participants represent a fairly diverse group. The average age is 38 and ranges from 18 to 68. In terms of employment experience, 73% classify themselves as employed full-time and 23% as part-time employed. Types of employment cover a wide breadth with the largest percentage (40%) being in the education area. Other heavily represented (identified)

sectors include the food services sector (10%) and retail trade (7%). Average (personal) income was approximately $31,000 in the year 2012 with a large standard deviation indicating considerable variation across the participants. The overwhelming majority (89%) filed taxes last year and a very small number (15%) reported being listed as a dependent on another taxpayer's form. Thus, a large fraction of the pool had personal experience with tax filing. There is also a fair amount of variation in tax under-reporting opportunities as illustrated by the number of participants who self-reported having non-wage income (50%) and itemizing deductions (32%). The two largest filing status types are "single" (57%) and "married filing jointly" (26%). Of those identifying which form they used to file their 2012 return, approximately half of the pool reports using the standard 1040 form. Consistent with the population at large a vast majority of our participants claimed a tax refund last year (75%). About one third of the pool used a professional tax preparer last year. A very small fraction of our pool utilized IRS taxpayer services last year (10%). While enhancing the external validity of our results, the diversity of this pool further allows for us to identify associations between experiment outcomes and taxpayer characteristics and experiences.

To analyze three outcomes of interest – tax withholding, demand for information services, and tax reporting – we estimate linear regressions. To investigate tax reporting we use the constructed outcome variable *Tax Underreported*, defined as the difference between one's actual and (expected) tax liability. This thus combines information from the individual income reporting and deduction decisions. Expected liability is based on the information set at the time of filing. As controls common across models we include the following. The variables *Compliance* and *Fairness* relate to variables identified in the theory section to capture the effects of our social norm and public good design elements, when these features are in effect. The

dummy variables *Penalized* and *Not Penalized* are one-period lags of indicators for non-penalizing audits (i.e., individual was selected for audit but not penalized) and penalizing audits, respectively, to allow for behavioral responses to the audit process. *Earned income*, a dummy for whether the high standard deduction is allowed (*High Standard*), and the level of itemized deduction (*Itemized*) allow for differences in choices based on expected liability. *Audit Rate*, the probability of being randomly selected for audit, is included to control for enforcement effort.

Estimation of the models is through ordinary least squares using the experiment panel data. 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.[32] Estimation results are presented in Tables 5 – 7. Two models are estimated for each outcome variable, with the difference being inclusion/exclusion of variables defined in Table 4 that relate to participant characteristics and tax experience. We note that there are only subtle differences in the common coefficients when demographics are included, and for expositional purpose will discuss the effect of demographics after highlighting the main treatment effects.

4.1 Tax reporting

Two models related to tax underreporting are presented in Table 5. The amount of taxes under-withheld, over-withheld, and unanticipated changes in expected liability across stages (i.e., dummy variables for liability increase or decrease) capture nuances of one's tax position at the reporting stage. Further, the indicator variables *Info × Under-withheld* and *Info × Over-withheld* capture the effect of receiving information, allowing for differential effects based on whether one

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[32] 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. It is not possible to include participant fixed effects given issues of perfect collinearity with treatment variables.

finds themselves in an under- or over-withholding position, respectively. We find important asymmetries related to tax position for all three sets of variables.

The coefficients on *Tax Under-withheld* suggest a strong and statistically significant relationship between (expected) tax position and underreporting. In particular, the equation suggests that participants under-report taxes by about 50 cents for every dollar under-withheld. In contrast there is no discernable effect between the amount of tax over-withheld and tax reporting. Turning to unanticipated shocks tied to the resolution of uncertainty across the withholding and reporting stages, there is also an important asymmetry. In particular, those who experience an unanticipated increase in liability underreport about 40 lab dollars more on average (note that average underreporting is 120 dollars) relative to those with no liability "shock". Those experiencing a negative liability shock do not change their reporting behavior on average. Turning to information services, we find that only those who have under-withheld actually underreport less. Those in the information service treatments who do not request information underreport the same on average as those for which the information service is not an option. This is a similar finding to Vossler and McKee (2013), and suggests that information uptake is not simply a sorting device for those wishing to report (un)truthfully.

Increases in tax compliance and tax redistribution (as measured by *Compliance* and *Fairness*, respectively) reduce tax underreporting as suggested by theory. Although statistically significant and large in magnitude, the coefficient on the dummy variable *Social Interactions* – which equals one for the social interaction treatments, simply suggests that there would be large under-reporting in a setting where taxes paid and compliance is zero.

Those audited last round and found to have underreported are more likely to underreport in the current round, perhaps reflecting a type of "double-up to catch-up" strategy. Those who

instead where not found to have underreported decrease underreporting, and in this sense the audit process may have enhanced beliefs regarding what the realized audit probability may be or instead reinforced the strength of a strategy of compliance. Similar to findings from related work (e.g. Vossler and McKee, 2013), we find that underreporting decreases with enforcement effort and expected liability. [33]

4.2 Tax withholding and demand for information services

Table 6 presents linear probability models of information acquisition, using the sample of participants from T3 and T4 for which this service was available. About 40% of participants avail themselves of the information service when it is offered. Recall that there is a fee for this service and thus we have revealed willingness to pay for the information. Looking first at the effects of tax position, we find that both positive and negative deviations from (expected) exact withholding decrease the demand for information. This effect is reasonably small, with the probability of uptake declining by two to three percent for every one-hundred dollar deviation from exact withholding. A negative liability shock (weakly) significantly increases information uptake. Those who receive the info, and the information reveals that taxes have been under-withheld, decrease tax underreporting. There is no effect for taxpayers who experienced a positive shock.

The largest identified drivers for information demand appear to be linked to enforcement. In particular, those audited and penalized in the previous period are about ten percentage points

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[33] We also analyzed the reporting outcomes separately for each audit rate (results available upon request). In brief, the signs and statistical significance of coefficients tend to be consistent across the three models, and with the omnibus model presented in Table 5. The effects of compliance, fairness and expected liability are generally decreasing with the audit rate, which is expected as the high enforcement effort in essence crowds out social preferences relates to fairness and social norms. The effect of the information services is greatest when the audit rate is 50% - this is also expected given that the value of information is increasing in the level of enforcement.

less likely to obtain information whereas those not penalized are almost twenty percentage points more likely to purchase information. For every ten percentage point increase in the audit probability, the probability of uptake increases by about three percentage points. This last result is intuitive as the value of information increases as the marginal cost of evasion increases. The demand for information is increasing in earned income, which is consistent with information being a normal "good".

Withholding is a choice (albeit under considerable uncertainty) and we have seen a positive relation between tax underreporting and tax under-withholding. Thus, it is useful to examine the tax withholding behavior, the results of which we present in Table 7. We find that withholding is increasing in earned income, the audit probability, tax compliance (weakly) and tax fairness. There appears to be no statistically significant relationship between the participant's audit histories nor with the availability of an information service. Viewed in their entirety, these relationships suggest that withholding is partially driven by expected compliance but there are nevertheless drivers of the underreporting decision that are not considered in the withholding stage.

4.3 Individual characteristics and taxpayer experience

Model 2 in Table 5 adds to the basic model several variables related to taxpayer characteristics and experience. The coefficient on the variable *Risk Averse*, which is an indicator for risk-averse individuals based on data from the risk elicitation exercise that preceded the tax compliance experiment, is negative and weakly significant suggesting that risk aversion is tied to less underreporting. Women tend to underreport less, which seems to be a universal empirical finding in the tax compliance literature, and the level of underreporting declines with age. Those

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who report being joint-filers exhibit lower underreporting and this is consistent with the fact both parties are liable if tax cheating is detected. Those who report higher levels of non-matched income engage in more underreporting. Those who itemized deductions in their 2012 tax return significantly underreport. Those who have to pay additional taxes on their last return underreported more in the experiment. These results suggest that our participant pool brings some "homegrown" tax filing experience to the lab and buttresses our argument that we have a framed field experiment. Inclusion of the demographic variables does not noticeably alter the effects of experiment settings, however, suggesting that random assignment into treatment maintains identification in the presence of participants' innate characteristics. The overall goodness of fit improves slightly when demographics are included.

Turning to the information acquisition and withholding models, there are fewer links between these outcomes and participant characteristics and taxpayer experiences. On average, are much less likely to purchase information (a 20 percent difference), and those with a college degree are more likely to acquire information (a 14 percent difference). Risk aversion, being female, and being older increases withholding. Those Participants with higher personal income (*Total Income*) have lower withholding levels, although the effect is only weakly significant.

4.4 Simultaneity of outcome variables

It is certainly plausible that those intending to evade simply under-withhold more. On a similar note, those not interested in being compliant may be the same persons who do not purchase the information service when available. For the estimated relationships regarding tax under-reporting and information acquisition presented previously to be interpretable as causal, one must make the assumption that possible self-selection effects are adequately controlled for

by included observables. As some suggestive qualitative evidence, as highlighted above, the estimated effects of treatment variables – including those tied to withholding and information acquisition – are largely unaffected by inclusion of participant characteristics and tax experiences. One might instead expect that unobserved preferences for tax evasion would be captured by these additional controls and serve to correct at least some of the possible estimation bias. Also, the coefficient on *Info × Not Received* is insignificant in the underreporting model. If those with an unobserved taste for compliance are more likely to acquire information, we would instead expect that those opting out of the service to underreport more than those not given the information service choice.

As a more formal approach, we estimate GMM-IV regressions that parallel Model 1 in Table 5 (tax underreported) and Model 3 in Table 6 (information acquisition) except that we instrument for the covariates *Tax Under-withheld* and *Tax Over-withhold*. As instruments for the withholding variables we use *Liability Decrease* and *Liability Increase*. Although these were included previously as covariates, the values of these variables are based on random draws determined by the experiment software and thus are orthogonal to both the suspected endogenous variables as well as the treatment-related variables.[34] Further, to improve identification as well as allow for a specification test, we include as additional instruments in the tax underreporting model the indicator *College Degree* – which is significant in explaining the variation in information service uptake by not underreporting – and interactions between this variable and the two liability variables. In the information acquisition model we include as additional instruments *Risk Averse*, *Age*, *Payment2012*, and *Itemized Deductions*.

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[34] Of course, when we exclude these two variables from the models this leaves the remaining coefficients virtually unaffected.

In the alternative underreporting model, we find that the signs and statistical significance of the withholding coefficients are unaffected. However, the coefficient on *Tax Under-withheld* increases considerably to 1.98 (std. err. = 0.65). Statistical tests suggest that these two regressors are endogenous ($\chi^2(2) = 15.83$; p <0.01), and an over-identification test fails to reject the specification ($\chi^2(3) = 2.94$; p = 0.40). In the alternative information acquisition model, there is no statistical evidence of endogeneity ($\chi^2(2) = 1.56$; p = 0.46).

5. Discussion

Although tax withholding is a central component in the US income tax system there has been surprisingly little research conducted as to its effects on tax reporting by individuals. This study addresses the question of the effect of withholding behavior on tax reporting and examines the interaction between taxpayer information services and tax withholding. Individuals make their withholding choice under considerable uncertainty since the decision is made at the beginning of the tax year. As the year progresses some of the uncertainty is resolved and the taxpayer has a more accurate estimate of tax liabilities. Taxpayer information services may affect the reporting decision but such information cannot be offered at the time of the withholding decision since the tax agency is also uninformed regarding deduction and income status of the taxpayer. This makes for an interesting interplay between the response to information services and the taxpayer's net tax state at filing.

Our results related to tax liability underreporting support the notion that tax position – whether one finds themselves in an expected tax refund or payment scenario – is a significant behavioral driver. This is true for both planned withholding as well as for shocks that alter tax liability expectations after withholding but prior to filing. Both planned and unexpected under-

withholding leads to significant and large increases in tax underreporting whereas planned or unexpected over-withholding has no discernable effect. These results are somewhat consistent with a Kahneman and Tversky (1979) reference point effect, which implies an asymmetric response to loss space versus gain space. In the tax under-withholding state, the taxpayer is required to pay additional taxes and penalties if the true level of liability is reported and this represents a loss from a reference point of having already paid taxes through withholding. Thus, a greater propensity to take the risk associated with the audit. In the tax over-withheld state the taxpayer is strictly in gain space since a refund is due and so would be less willing to be exposed to the risk of an audit.

Since the under- or over-withholding state is due at least in part to uncertain tax liabilities at the time the withholding decision is made, information services provided by the tax agency may alter the tax reporting decision. It is a choice whether to obtain the information and there is a cost of doing so. There is also a level of cognitive dissonance that may arise from having the information. If the taxpayer is in the tax payment state (withholding is less than taxes owed) and obtains information this makes the information less valuable. Consistent with this notion, we find that those who obtain information in an under-withholding state significantly decrease tax underreporting although the effect for those in an over-withholding state is null.

When the information service is offered in the experiment it completely resolves tax uncertainty, for a fee. As highlighted by the theoretical model of Vossler and McKee (2013), unbiased information services that partially or fully resolve uncertainty lead to more truthful tax reporting behavior. If the service provided by the tax agency can be roughly characterized this way, targeting of the service to those less likely to report truthfully would, *a priori*, be more efficient than an information service that was not so targeted. This and previous work suggests

that the following are associated with less truthful reporting: higher tax liability, greater opportunity for underreporting (as through non-matched income and higher level of itemized deductions), male taxpayers, and those who underestimate audit probabilities (and penalties). Of course, this study highlights further that both expected and unexpected tax under-withholding are strongly related to underreporting and further that those who receive information in the under-withholding state more dramatically change their behavior and in a desirable fashion. In addition we find that underreporting decreases in response to increased fairness of the fiscal exchange and the reported compliance levels of the peer group. Although it may be difficult to target based on these latter two constructs, information programs that highlight "tax dollars at work" and that promote a social norm of compliance are likely to be effective.

Given the nature of our participant pool we have considerable diversity of tax filing experience, levels of income, sources of income, and age. The extensive debriefing questionnaire provides us with several potential explanatory variables related to tax underreporting. This provides suggestive evidence that information services might be more productive for males, younger persons, and those with significant opportunities to underreport (e.g., those with unmatched income, deduction itemizers).

Further analysis of our data and more extensive use of interaction effects in our models may yield additional insights but this is a topic for further research. Additional work is also needed to address the question of why individuals under-withhold. Since there is an explicit penalty for doing so and since there is the potential loss effect from having to pay additional taxes, the persistence of under-withholding merits further analysis of our data. But this is a topic for future work.

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Table 1: Experiment Parameters

Parameter / variable	Value(s)
Income (expected value, EV)	Low: 1250 Medium: 1750 High: 2250 Uncertainty range: +/- 500 in withholding stage
Standard Deduction	250 or 500
Itemized Deduction (EV)	Low: 250 High: 500 Uncertainty range: +/- 250 in withholding stage
Audit Probability	10%, 30%, or 50%
Penalty Rate	300% on unpaid taxes
Tax Rate	50% on taxable income
Under-withholding Penalty	20% of amount owed at tax filing
Withholding Cost	10% of amount withheld
Tax Filing Time	120 seconds
Withholding Time	35 seconds
Information Service	If available, cost is 50 lab dollars to acquire

Table 2: Treatment Conditions

Treatment	Tax Withholding	Uncertain Income & Deductions	Taxpayer Assistance	Public Good & "Social Norm"	Sessions
T1	Yes	Yes	No	No	3
T2	Yes	Yes	No	Yes	6
T3	Yes	Yes	Yes	No	3
T4	Yes	Yes	Yes	Yes	6

Table 3: Experiment Schedule

Session	Treatment	Location	Group 1 Audit Sequence	Group 2 Audit Sequence	Participants
1	1 (Info=No; PG=No)	UT	10-30-50	30-50-10	23
2	1 (Info=No; PG=No)	UT	50-10-30	50-30-10	23
3	1 (Info=No; PG=No)	ASU	10-50-30	30-10-50	19
4[*]	2 (Info=No; PG=Yes)	UT	10-30-50	10-50-30	21
5	2 (Info=No; PG=Yes)	UT	30-10-50	30-50-10	20
6	2 (Info=No; PG=Yes)	UT	50-10-30	50-30-10	21
7	2 (Info=No; PG=Yes)	ASU	10-30-50	10-50-30	19
8	2 (Info=No; PG=Yes)	ASU	30-10-50	30-50-10	19
9	2 (Info=No; PG=Yes)	ASU	50-10-30	50-30-10	19
10	3 (Info=Yes; PG=No)	UT	10-50-30	30-10-50	22
11	3 (Info=Yes; PG=No)	ASU	10-30-50	30-50-10	17
12	3 (Info=Yes; PG=No)	ASU	50-10-30	50-30-10	17
13	4 (Info=Yes; PG=Yes)	UT	10-30-50	10-50-30	24
14	4 (Info=Yes; PG=Yes)	UT	30-10-50	30-50-10	22
15	4 (Info=Yes; PG=Yes)	UT	50-10-30	50-30-10	17
16	4 (Info=Yes; PG=Yes)	ASU	10-30-50	10-50-30	19
17	4 (Info=Yes; PG=Yes)	ASU	30-10-50	30-50-10	18
18	4 (Info=Yes; PG=Yes)	ASU	50-10-30	50-30-10	19

Notes: Order of implementation was random and does not reflect the session number. [*]Due to time constraints, only 15 of 18 periods were completed.

Table 4. Variable Description

Variable Name	Description	Mean	Std. Dev.
Tax Underreported	(Expected) taxes underreported (both line items)	126.076	261.057
Tax Under-withheld	'Expected Liability' minus 'Tax Withheld', if >0	101.932	169.612
Tax Over-withheld	'Tax Withheld' minus 'Expected Liability', if >0	214.450	230.414
Liability Increase	=1 if expected tax liability increases across stages	0.514	0.500
Liability Decrease	=1 if expected tax liability decreases across stages	0.324	0.468
Info × Under-withheld	=1 if received info in under-withholding situation	0.076	0.266
Info × Over-withheld	=1 if received info in over-withholding situation	0.131	0.338
Info × Not Received	=1 if perfect information service available, but not purchased	0.285	0.451
Compliance	(Lag) mean taxes paid minus mean taxes owed for income group; =0 if 'Social Interactions'=0	-72.873	157.781
Fairness	(Lag) mean taxes paid (common group-level); =0 if 'Social Interactions'=0	377.816	286.279
Penalized	=1 if audited and penalized in previous round	0.195	0.396
Not Penalized	=1 if audited and not penalized in previous round	0.105	0.306
Earned Income	(Expected) earned income when filing	1776.901	432.290
High Standard	=1 if 500 Standard deduction allowed	0.504	0.500
Itemized	(Expected) allowable itemized deduction	365.013	142.455
Audit Rate	audit probability; .1, .3 or .5	0.299	0.164
Social Interactions	=1 if info on compliance displayed & taxes partially reallocated	0.660	0.474
Round	Round in session, 1 to 18	9.426	5.159
Risk Averse	=1 if selected sure bet in 70%, 80% or 90% lottery	0.386	0.487
Employed Full-time	=1 if participant employed full time	0.724	0.447
Female	=1 if participant is female	0.575	0.494
Age	Participant's age, in years	38.181	13.193
College Degree	=1 if participant has college degree	0.406	0.491
Total Income	Participant's 2012 (individual) income, in $1000s	30.607	24.656
Unmatched Income	Percentage of total income that is unmatched	8.760	19.506
Asked for Advice	=1 if participant used tax advice from a non-tax	0.221	0.415

	professional		
Used Prep Service	=1 if participant used a professional tax preparation service to file 2012 return	0.301	0.459
Used Prep Software	=1 if participant used tax software (e.g. TuboTax) when preparing his/her 2012 return	0.453	0.498
Payment 2012	=1 if participant paid taxes upon filing for 2012	0.126	0.332
Filed Jointly	=1 if married filing jointly on 2012 return	0.265	0.442
Itemized Deductions	measure of evasion opportunity; =1 taxpayer itemized for 2012 tax return	0.243	0.429
Percent Tax Paid	Percentage of (expected) taxes paid	82.852	38.473
Tax Withheld	Amount withheld in withholding stage	805.477	397.575
Information Service	=1 if information service available	0.492	0.500
High Itemized	=1 if participant faces high itemized deduction range in withholding stage	0.495	0.500
Expected Liability	(Expected) income minus (expected) deductions, multiplied by the tax rate of 50%	692.318	225.07

Table 5. Tax Underreporting Models: Estimation Results

Dependent Variable: Overall tax underreporting, in lab dollars (*Tax Underreported*)		
	Model 1	**Model 2**
Tax Under-withheld	0.55** (0.05)	0.52** (0.05)
Tax Over-withheld	−0.01 (0.03)	0.02 (0.03)
Liability Increase	39.70** (9.14)	42.27** (9.04)
Liability Decrease	10.36 (8.32)	9.16 (8.13)
Info × Under-withheld	−60.17** (26.26)	−71.09** (27.23)
Info × Over-withheld	2.95 (18.70)	−20.67 (17.57)
Info × Not Received	16.74 (19.50)	14.25 (19.01)
Compliance	−0.14** (0.03)	−0.12** (0.03)
Fairness	−0.36** (0.06)	−0.36** (0.06)
Penalized	18.62** (8.02)	16.89** (7.99)
Not Penalized	−68.06** (10.31)	−64.06** (9.88)
Earned Income	0.07** (0.01)	0.07** (0.01)
High Standard	−26.54** (6.49)	−27.32** (6.47)
Itemized	−0.08** (0.02)	−0.07** (0.02)
Audit Rate	−139.17** (25.79)	−145.59** (26.30)
Social Interactions	187.51** (40.30)	179.25** (38.80)
Round		0.62 (0.74)
Risk Averse		−30.06** (15.05)
Employed Full-time		28.21 (20.46)
Female		−44.98** (16.98)
Age		−2.01** (0.88)
College Degree		12.34 (20.15)
Total Income		−0.16 (0.51)
Unmatched Income		0.73** (0.35)
Asked for Advice		−22.86 (20.71)
Used Prep Service		−28.65 (23.79)
Used Prep Software		−3.80 (22.19)
Payment 2012		40.74** (21.39)
Filed Jointly		−34.45** (20.02)
Itemized Deductions		35.35* (19.59)
Constant	6.93 (29.64)	102.74** (46.23)
Number of Observations	6378	6180
R^2	0.253	0.293

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

Table 6. Information acquisition model (Treatments 3 and 4 only)

Dependent Variable: =1 if information purchased; =0 otherwise ("Information Received")		
	Model 3	**Model 4**
Tax Under-withheld (100s)	−0.0345** (0.0127)	−0.0435** (0.0121)
Tax Over-withheld (100s)	−0.0220** (0.0106)	−0.0214** (0.0108)
Liability Increase	−0.0099 (0.0275)	−0.0070 (0.0264)
Liability Decrease	0.0422* (0.0247)	0.0208 (0.0246)
Compliance (100s)	−0.0109 (0.0089)	−0.0125 (0.0087)
Fairness (100s)	−0.0165 (0.0181)	−0.0041 (0.0189)
Penalized	−0.0921** (0.0291)	−0.0811** (0.0273)
Not Penalized	0.1710** (0.0322)	0.1507** (0.0338)
Earned Income (100s)	0.0073** (0.0038)	0.0059* (0.0033)
High Standard	−0.0319* (0.0193)	−0.0428 (0.0191)
Itemized (100s)	−0.0069 (0.0063)	−0.0071 (0.0061)
Audit Rate	0.2711** (0.0607)	0.2643** (0.0631)
Social Interactions	0.0754 (0.1185)	−0.0088 (0.1171)
Round		0.0030 (0.0020)
Risk Averse		0.0156 (0.0606)
Employed Full-time		−0.0325 (0.0764)
Female		−0.2062** (0.0608)
Age		−0.0031 (0.0030)
College Degree		0.1374** (0.0672)
Total Income		−0.0002 (0.0020)
Unmatched Income		0.0019 (0.0014)
Asked for Advice		0.0061 (0.0743)
Used Prep Service		0.0547 (0.0834)
Used Prep Software		0.0341 (0.0697)
Payment 2012		−0.0506 (0.0803)
Filed Jointly		−0.0643 (0.0810)
Itemized Deductions		−0.0200 (0.0647)
Constant	0.3212 (0.0921)	0.5140 (0.1351)
Number of Observations	3144	3000
R^2	0.050	0.112

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

Table 7. Tax Withholding Models: Estimation Results

Dependent Variable: Tax withheld, in lab dollars		
	Model 5	**Model 6**
Information Service	−28.36 (25.21)	−17.71 (24.47)
Compliance	0.06* (0.04)	0.02 (0.03)
Fairness	0.29** (0.09)	0.25** (0.09)
Penalized	1.22 (12.20)	2.55 (12.23)
Not Penalized	17.19 (16.16)	21.03 (15.17)
Earned Income	0.45** (0.02)	0.45** (0.02)
High Itemized	6.41 (8.43)	4.03 (8.21)
Audit Rate	147.47** (31.83)	144.22** (32.30)
Social Interactions	−116.25* (60.92)	−71.52 (57.74)
Round		−1.37 (1.01)
Risk Averse		69.23** (24.45)
Employed Full-time		−7.76 (30.68)
Female		97.75** (25.52)
Age		5.95** (1.37)
College Degree		−29.48 (28.97)
Total Income		−1.03* (0.61)
Unmatched Income		−0.81 (0.65)
Asked for Advice		−10.69 (31.80)
Used Prep Service		−22.77 (35.59)
Used Prep Software		−34.75 (30.04)
Payment 2012		3.26 (30.34)
Filed Jointly		−48.87 (31.77)
Itemized Deductions		−5.52 (27.90)
Constant	−66.62 (44.35)	−292.48** (66.63)
Number of Observations	6399	6201
R^2	0.256	0.311

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

Appendix

This section presents the materials describing the experimental setting. Several of the computer images that form the experiment interface are presented as well as the printed instructions provided to the participants.

Figure A.1 Subject screen for risk elicitation task

SCENARIO	LOTTERY	SHOW-UP FEE	YOUR CHOICE	
	Choice A	Choice B		
1	10% chance of $10 and 90% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	
2	20% chance of $10 and 80% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	On the left are 10 scenarios which allow you to exchange your show-up fee of $5.00 for a lottery.
3	30% chance of $10 and 70% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	
4	40% chance of $10 and 60% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	**Please choose either A or B for each scenario.**
5	50% chance of $10 and 50% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	At the end of the experiment the computer will randomly select ONE of these 10 scenarios.
6	60% chance of $10 and 40% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	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.
7	70% chance of $10 and 30% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	
8	80% chance of $10 and 20% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	Otherwise you will receive your show-up fee.
9	90% chance of $10 and 10% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	
10	100% chance of $10 and 0% chance of $0	$5 show-up fee	Choice A ○ ○ Choice B	Submit

Figure A.2 Subject screen for tax withholding

Figure A.3 Subject tax filing screen

Round
Training2

Income Distribution (you are in the RED group)

Current Situation

Your...	Is...
Income	Between $1750 and $2500
Deduction (Standard)	$500
Deduction (Itemized)	Between $125 and $500
Witholding	$1500

Income   2000

○ Standard Deduction $250
○ Standard Deduction $500
◉ Itemized Deduction

Itemized Deduction   200
Please enter a 0 if choosing a standard deduction.

Do the Math

Reported Income
2000

Reported Deduction
200

Reported Taxes
900

Withholding
1500

Tax Payment
0

Tax Refund
600

Under-Withholding Penalty
0

FILE TAXES

Tax Policy

tax = rate * (income - deductions)

The tax rate is 50%

Enforcement Policy

penalty = rate * unpaid taxes

The penalty rate for under-reporting taxes is 300%.

Audit Chance

(The likelihood of an audit)

If you file taxes   10%

If time runs out before filing   100%

Withholding Policy

The cost of withholding is 10%.

The penalty rate for under-withholding is 20%.

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Figure A.4 Audit determination screen (animated)

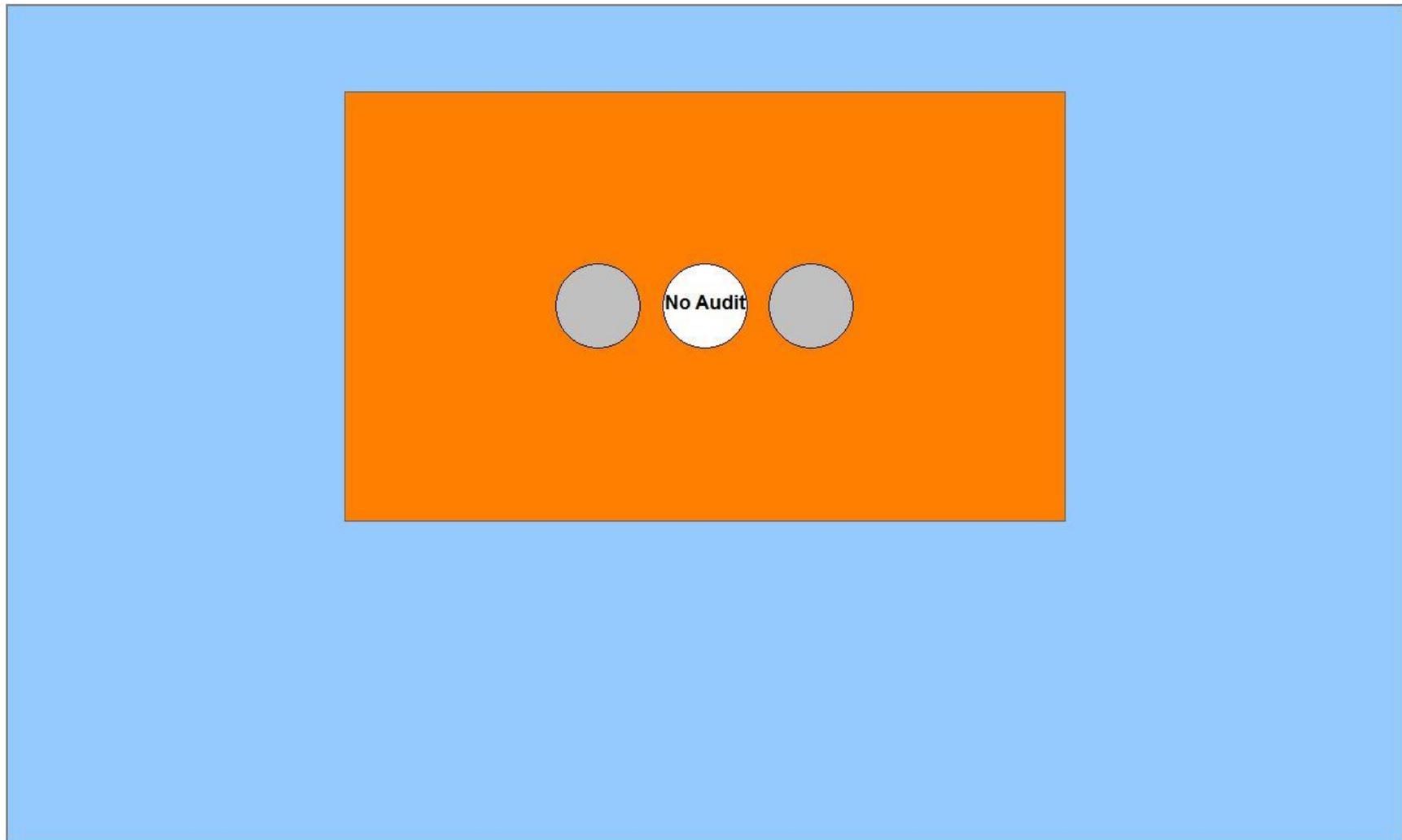**Figure A.5 Subject screen for end of round summary (no social norm features)**

Round
Training2   Remaining time [sec]:   8

Round Summary

Your...	Is...	Filed...
Income	$2014	$2000
Deduction (Itemized)	$415	$200
Withholding		$1500

No Audit

Round Results

Your Actual Income ... $2014

Cost of Withholding
(the tax you withheld + 10%) ...   - $1650

Unpaid Taxes Found ...
(= (unreported income + excess deductions)
* 50%)   - $0

Penalties from audit ...
(300% of Unpaid Taxes Found)   - $0

Tax Policy

tax = rate * (income - deductions)

The tax rate is 50%

Audit Chance

(The likelihood of an audit)

If you file taxes   10%

If time runs out before filing   100%

Tax Refund ...
(= Withholding - 50% of Income less
Deductions)   + $600

Enforcement Policy

penalty = rate * unpaid taxes

The penalty rate for under-reporting taxes is 300%.

Withholding Policy

The cost of withholding is 10%.

The penalty rate for under-withholding is 20%.

Earnings
(= Income - Withholding Cost - Unpaid Taxes
- Audit Penalty + Refund) ... $964

Finished

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Example Instructions – Treatment 4

Introduction
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.

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 300 lab dollars to US$1 at the end of the experiment.

There are four parts to each decision round: the Tax withholding stage, the Tax reporting stage, the Audit determination, and the Round summary. We will now describe each part.

Tax withholding stage
The beginning of each round reflects the beginning of a tax year. At this point you choose how much in taxes to have withheld. This is a pre-payment of taxes. To reflect the fact that pre-paying taxes means you cannot use the money to buy other things during the year, there is an added cost of withholding equal to 10% of your withholding. For example if you choose to withhold 100 dollars you will pay 10 dollars.

The total amount you withheld will be returned to you as a tax credit when you file your tax return. Only the added cost of 10% will directly affect your earnings.

On this decision screen, to help you decide your tax withholding, you will be provided some information about your income and deductions, both of which determine the amount of taxes you are likely to owe for the round (tax year). In particular, the amount of taxes you owe is determined as the difference between your income and deductions multiplied by a tax rate of 50%.

Since it is the beginning of the year, you will not know your income exactly but will know the range of possible income amounts. Any number in this range has an equal chance of being your actual income. You will also not know the exact amount you are allowed to claim in either standard or itemized deductions but will know the range of possible amounts. Any number in the itemized deduction range displayed has an equal chance of being your actual deduction.

If you withhold more than you report in taxes, you will receive a refund when you file. If you withhold less than your reported taxes, this means you will pay additional taxes when you file.

Tax Reporting Stage

When the tax year has finished, you enter the tax reporting stage. Since the tax year has ended you will have a better idea of your income and your allowable deductions, and the ranges you saw in the withholding stage will now be smaller. Your task is to report an income and a deduction amount.

Your taxes are determined by subtracting what you report in deductions from what you report in income, and multiplying this difference by the tax rate of 50%. On your screen, this amount is included among the tax form calculations as "Reported Taxes".

Reporting your income

You will not know your income for sure. You will instead be shown a range of possible income amounts. Any number in this range has an equal chance of being your actual income. You are free to report amounts within, below or above your income range. The more you report in income, the higher your reported taxes will be.

Reporting your deduction

You have the option to claim a standard deduction OR an itemized deduction (but not both). The more you report in deductions, the lower your reported taxes will be.

There are two standard deduction amounts to choose from. You can choose either amount. You will know your actual standard deduction amount prior to filing. If you choose to claim a standard deduction, please enter 0 for your itemized deduction.

You will not know the amount you are allowed to claim in itemized deductions. You will instead be shown a range of possible itemized deduction amounts. Any number in this range has an equal chance of being your actual itemized deduction. You are free to report amounts within, below or above your itemized deduction range.

Information Service

You have the option of paying a fee to obtain better information. When you click on the "Information" button you will be asked if you want to pay for the information. If you choose "Yes" you will be shown your actual income and allowable itemized deduction.

Your tax bill

After you choose income and deduction amounts to report, you click on the "Do the Math" button to calculate your tax payment or tax refund based on these amounts.

As mentioned previously, the amount of tax you withheld will be credited when you file the tax form. This amount is indicated as "Withholding". The difference between your reported taxes and your tax withheld determines what you pay, or receive, upon filing your tax form.

If your reported taxes are higher than your taxes withheld, you owe additional taxes upon filing. In particular, your "Tax Payment" is calculated by subtracting your "Withholding" from your "Reported Taxes".

The tax authority imposes an interest and under-payment penalty for under-withholding. A penalty equal to 20% of your tax payment is assessed in the event you owe additional taxes upon filing (i.e., whenever your tax payment is greater than 0).

If your reported taxes are instead are less than your taxes withheld, you receive a tax refund. Your "Tax Refund" is calculated by subtracting your "Reported Taxes" from your "Withholding".

You are free to alter your income and deduction amounts prior to filing. To file the tax return, first enter the income and deduction amounts you want to submit and click the "Do the Math" button. Then, 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 as if you reported 0 in income and 0 in deductions. 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!

Audits

There is a chance you will randomly be selected for audit. You will know this chance prior to making your tax withholding and tax reporting decisions. The chance does <u>not</u> increase or decrease depending on your current or past reporting choices or on the decision made by others in the group. This is a random selection process.

After you file the tax form, you will see an audit screen. While you are on this screen the computer is randomly determining whether to select you for audit. This selection is done separately for each participant and each round.

If you are selected for audit, your reported income and deductions will be checked against your actual income and deductions. If you underreported your taxes, all unpaid taxes will be discovered. If you are <u>not</u> audited, however, no unpaid taxes will be discovered.

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. Any unpaid taxes discovered in the audit 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.

Know that any taxes you <u>overpaid</u> will not be refunded to you. In this sense, the audit process can never increase your earnings.

<u>Round summary</u>

After the audit determination, you will see a summary screen that provides a detailed breakdown of your earnings.

Transfer Payment

Know that a fraction of the taxes collected from you and other members of your group will be paid to you in the form of a Transfer Payment. Each group member receives the same (equal) share. You may think of this as the service provided by government such as roads, police, and the courts.

Your round earnings depend on many factors, including the audit process. After you submit a tax form, three things can happen: (1) you are <u>not</u> audited; (2) you are audited but did <u>not</u> underreport your taxes; or (3) you are audited and you did underreport your taxes.

Your earnings (if 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 plus transfer payment, less your withholding cost, information cost of information (if applicable), your tax bill and any under-withholding penalty.

	Income	Your actual income
−	Cost of Withholding	Tax you withheld + 10%
−	Cost of Information	(if you requested Information)
−	Tax Payment	(when applicable)
−	Under-Withholding Penalty	20% of your Tax Payment (0 if Tax Refund)
+	Tax Refund	(when applicable)
+	Transfer Payment	Your share of the transfer paid from taxes reported
=	Earnings	

Your earnings (if you are audited and underreported your taxes)

Since the audit will reveal all unpaid taxes, you are responsible for the unpaid taxes and further must pay a penalty. These adjustments are reflected below.

	Income	Your actual income
	Income	Your actual income
−	Cost of Withholding	Tax you withheld + 10%
−	Cost of Information	(if you requested Information)
−	Tax Payment	(when applicable)
−	Under-Withholding Penalty	20% of your Tax Payment (0 if Tax Refund)
−	Unpaid Taxes	Difference of what you owed and what you paid
−	Penalties from audit	300% of Unpaid Taxes
+	Tax Refund	(when applicable)
+	Transfer Payment	Your share of the transfer paid from taxes reported
=	Earnings	

Tax compliance

In addition to a detailed breakdown of your earnings, the round summary screen includes a graph illustrating tax compliance. The graph shows, separately for each income group, the average taxes reported and the average taxes actually owed.

The Series

After the second training round, you will first be asked to complete a task to earn your income. Your performance in the earning task will determine whether you are in the high, medium or low income group. Roughly one-third of the players will be placed in each group. From time to time a new series of rounds will begin and you will be asked to complete a new earnings task prior to this.

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

Beginning the experiment

We have now finished the instructions. We will continue on to a second raining round. As with the first, your decisions in the training round will not affect your earnings. After the training round you will have a final opportunity to ask questions.