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Tax Evasion Revised: Surprising Experimental Evidence on the Role of Principal Witness Regulations and Differences in Gender Attitudes

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Abstract

This paper experimentally investigates indirect tax evasion that requires the cooperation of an intermediary. We explore the effectiveness of the introduction of a principal witness regulation as a means to facilitate tax compliance. Reactions show a significant drop in tax compliance that, surprisingly, is vastly different across gender with the effect being mainly driven by women. As a result, women decrease their tax compliance significantly reaching an even lower level than men who in turn do not react to the institutional change.

Keywords: Indirect tax evasion, gender difference, contextual sensitivity, reciprocity, principal witness regulation

JEL classification numbers: D03; D73; D81; H26

Highlights

- A novel design to study the role of a principal witness regulation (PWR) in tax compliance.
- Overall, the effect of PWR on reducing tax evasion is found to be limited.
- Surprising gender heterogeneity with females driving tax evasion over-proportionally.

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1. Introduction

Illicit behavior, such as tax evasion, induces negative externalities on both the economic and societal level. Understanding its drivers and implementing suitable institutional measures to curb its severity has been at the center of past decade's theoretical, empirical and experimental research. Beyond theoretical exercises such as the seminal work of Allingham and Sandmo (1972), research that analyzes tax evasion experimentally has been growing, although with a particular focus on income tax evasion only (for a recent discussion see Alm, 2012). Other forms of tax evasion, like indirect tax evasion or the evasion of taxes that are in some way collected through the direct intermediation of a tax officer, e.g. some kind of custom duties, have almost completely been neglected by the experimental literature. In many countries, the introduction of the principal witness regulation (PWR) represents an integral institutional feature aiming at suppressing criminal behavior. In this paper, we are interested in examining the role of PWR in tax evasion behavior.

To the best of our knowledge this is the first experiment studying the influence of an institutional change in the form of a PWR on tax compliance when taxes are indirect. Tax compliance, although almost exclusively referring to direct taxes, has been studied extensively in the literature, however, indirect tax evasion has been almost completely neglected. We contribute to this literature by shedding light on how indirect tax evasion is affected by the specifics of the strategic interaction, a dimension not present in a setting with direct taxes. We use a controlled laboratory experiment modeling a tax reporting scenario with indirect taxes that require the interaction between two parties, the tax payer (TP) and the tax officer (TO). First, TPs repeatedly report taxes over the course of 10 rounds after which we introduce the principal witness regulation (PWR). The experiment then continues for another 10 rounds under this modified regime.

The goal of this study is twofold: First, we seek to analyze tax compliance behavior when taxes are indirect. Second, we investigate the effects of an insti-

tutional change via the introduction of a PWR on tax compliance and collusive behavior. We find that the introduction of a PWR induces an initial drop in tax compliance coupled with a reversal in trends before and after the institutional change occurs. While compliance is at a decline in the absence of a PWR we see a steady increase of tax declarations in the periods following the institutional change. Surprisingly the drop on the aggregate level is mainly driven by female participants. In fact, males' tax evasion propensity is not affected by the new regime, while females' tax compliance significantly decreases, to a level even below that of males.

We find a significant decrease of compliance as a reaction to the introduction of a PWR, hence providing evidence that the institutional frame affects tax compliance. Gender differences have been repeatedly demonstrated in various domains such as risk preferences, social preferences, lying behavior (Childs, 2012), and honesty (Muehlheusser et al., 2015). For example, Hasseldine and Hite (2003) study framing effects in tax compliance and find a significant frame by gender interaction indicating a stronger reaction to changes in framing for women. We surprisingly observe that woman strongly react to the institutional change while men's behavior seems mostly unaffected indicating vastly different behavior across gender. Our results add to the growing body of evidence on gender differences within the frame of choice under risk and strategic uncertainty, and provide further evidence to the idea that women are generally more sensitive to the contextual frame. An idea put forward in Croson and Gneezy (2009) where it is argued that gender differences can often be explained by a higher sensitivity of women to the contextual frame.

2. Experimental Design

We use a simple tax reporting game with indirect taxes collected through an intermediary, the tax officer (TO), and hence tax payers (TP) require the cooperation of a third party to evade taxes. The experiment consists of a total of 20 rounds. In each of the rounds 1 to 10 subjects play the tax reporting game,

we henceforth refer to this first phase as "Ph1". After 10 rounds subjects are informed through a detailed description on the screen about the introduction of a PWR. That is, we use a within variation of an institutional setting to study the effect of a PWR on tax compliance. Rounds 11 to 20 were played in this modified environment, i.e. in each of the rounds 11 to 20 subjects played the tax reporting game with PWR, we henceforth refer to this second phase as "Ph2". Subjects were informed in the instructions that the existing institution may be subject to change but no information regarding the nature of the change was provided. Subjects were randomly assigned either the role of a TP or that of a TO. Each TO was randomly assigned 3 TPs and that assignment remained fixed throughout the experiment. For Ph1, the course of events is as follows: TPs receive an income of 80 ECU that has to be declared to the tax authorities represented by the (assigned) TO. Declared income is subject to a tax rate of 50%. An incorrect declaration of less than the full income requires the cooperation of the TO and can be accompanied by a bribe between 1 and 30 ECU that is offered to the TO. The TO receives the tax declarations together with potential bribes of the three TPs assigned to her. She then decides to individually accept or reject each of the incorrect reports together with potential bribes. The rejection of a bribe implies the rejection of the untruthful tax report, forcing the TP to truthfully declare taxes. Correct declarations are automatically accepted. With an exogenous probability of 20%, a TP's declaration is audited and incorrect reports are detected resulting in a fine for the TP that equals 125% of the evaded tax amount (maximal 50 ECU). See Figure 1 for a detailed game tree.

For Ph2, the course corresponds to that of Ph1, with the exception of the existence of a PWR option. We model the PWR by adding an additional stage following detection of an incorrect tax report through an audit. The PWR offers the TP the opportunity to denounce his TO and correct the report, i.e. to truthfully declare taxes, without incurring an additional monetary punishment. A denounced TO on the other hand incurs a fine that equals the bribe received from the respective TP plus an additional 10 ECU. The TOs income per round

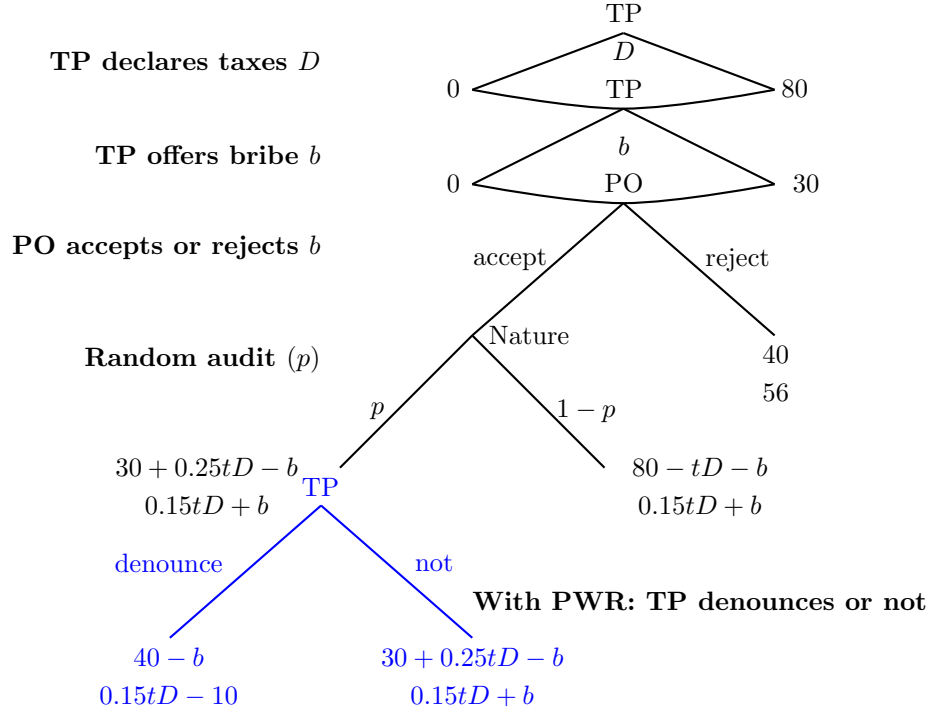


Figure 1: Game tree depicting interaction between TO and single TP within a single round. Blue stage is only available in PWR. D denotes taxes declared, b bribes offered, p the probability of an audit, t the tax rate. For the sake of a simpler exposition the PO's fixed wage of 50 is not depicted.

consists of three components: a fixed wage of 50 ECU, a commission of 15 % of the taxes collected from the three TPs assigned to her, and the bribes she accepted. In Ph2, a TO might also incur a fine that is deducted from her income in that particular round.

In order to make tax evasion more salient in the laboratory setting, we introduce a third party that incurs a monetary damage as a result of tax evasion. That is, tax evasion in the experiment translates into an actual social welfare loss outside the lab (see Eckel and Grossman, 1996; Lambsdorff and Frank, 2010). The final payoff of each subject was determined as the sum of all earnings over the 20 rounds converted to Euro at a rate of $100 \text{ ECU} = \text{€}0.7$. All participants were paid their final payoff plus an additional show-up fee of $\text{€}3$ in cash at the end of the experiment. The experiment was conducted with a total of 128 undergraduate students at the Computable and Experimental Laboratory at the University of Trento. Sessions averaged 60 minutes and consisted 20 rounds followed by an incentivized risk-elicitation task (Holt and Laury, 2002) and a questionnaire. Average earning was $\text{€}12$.

3. Predictions and Hypothesis

Consider the interactions within a single round between a single TP and a TO, both assumed to be risk-neutral expected payoff-maximizers. In this one-shot scenario a TP optimally declares zero taxes independently of the presence of a PWR. In contrast, experimental evidence suggests that in one-shot scenarios subjects tax compliance is well above zero, but oftentimes declines over time when decisions are made repeatedly, thus approaching the one-shot equilibrium prediction. Further, in order to forgo punishment, a TP should always denounce the TO in Ph2. The TO, anticipating this behavior, optimally raises her acceptance threshold for bribes from 6 ECU in Ph1 to 10 ECU in Ph2. Intuitively, the introduction of a PWR offers the TP a "safe way out" effectively reducing the risk faced when evading taxes, while on the other hand exposing the TO to a risk of being denounced and fined. Due to risk-aversion we thus expect tax

compliance to be lower when PWR is implemented.

The literature suggests that there is ample gender heterogeneity with respect to both risk taking in general and particularly engaging in risky unethical behavior within contexts of or similar to tax evasion. Existing research indicates that males have a tendency to be less risk-averse and engage in illicit behavior more often than women (cf. Croson and Gneezy, 2009; Torgler and Valev, 2010; Banuri and Eckel, 2012). We thus expect male participants to evade more taxes, than their female counterparts do.

4. Results and Discussion

We first compare tax compliance behavior before and after the introduction of a PWR. Fig 2 shows a significant decrease of mean tax declarations as a reaction to the institutional change from 20.18 ECU in Ph1 to 14.89 ECU in Ph2 coupled with a reversal in trends.¹ On average, tax compliance was 5.3 ECU lower in Ph1 as compared to Ph2 ($p < 0.001$).² The introduction of a PWR offers the TP a safe way out effectively reducing the risk when evading taxes, and furthermore shifts responsibility to the TO potentially also reducing the TP's psychological costs of evading taxes, which then results in lower compliance in Ph2. We now analyze the evolution of tax compliance behavior over time. In Ph1, prior to the institutional change, the slope shown in Fig. 2 is negative, thus indicating an acceleration of tax evasion over time. However, after the PWR has been introduced in Ph2, we observe that now the slope is positive, with the reversal in slopes being highly significant ($p = 0.0021$).³ Our results suggest

¹It is worth noting that simply looking at average behavior disguises the participant's actual behavior in the experiment. Analyzing the development of behavior across rounds yields that behavior is not stationary but rather approaches a steady-state over time. We thus report both, averages and trends in order to strengthen the robustness of our results.

²Unless noted otherwise, we use Wilcoxon signed-ranks tests for all mean comparisons within subject using individual averages for Ph1 and Ph2.

³We examine differences in trend using OLS estimations with a standard error correction that accounts for repeated game effects. Indicated p-values are obtained using post-hoc

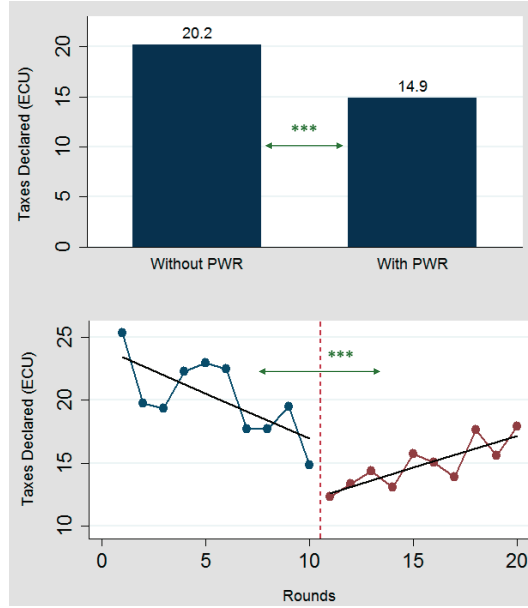


Figure 2: The top figure displays the average tax declared in Ph1 and Ph2 pooled on the individual level. The bottom figure shows the evolution of tax declarations over time.

that the effect of the institutional change is twofold: First, we observe a negative short term effect resulting from a drop in mean compliance directly after the PWR is introduced. Second, the decline in compliance over time observed in Ph1 is halted, and even reversed, in the periods following the institutional change (see Fig. 2). We interpret the reversal in trends for compliance as an indicator for a potential positive long-term effect from introducing a PWR.⁴

Let us now consider the amount of bribes paid. As expected we observe a behavioral break following the introduction of the PWR resulting in an upwards shift of bribes paid in Ph2. The average amount of bribes paid before and after introducing a PWR were 12.98 ECU and 14.63 ECU ($p = 0.0283$), respectively.

estimation tests.

⁴In a control treatment, an additional 36 subjects have played Ph1 for 20 consecutive rounds without introducing a PWR. The findings suggest a gradual decline in tax compliance behavior, thus strengthening our findings related to the impact of a PWR on tax compliance. Results are made available in appendix A.

Evidently, taxpayers acknowledge the higher risk that public officials have to bear after the introduction of the PWR and, at least partially, compensate them with higher bribes. As argued in Section 3, a rational TO optimally rejects all bribes below 6 ECU in Ph1, and respectively below 10 ECU in Ph2. We use the minimal bribe accepted per round by a TO as an indicator for this acceptance threshold. As expected, we find that the threshold for acceptance increases from 14.53 in Ph1 to 16.27 in Ph2, although not significant ($p = 0.164$)⁵. Again there is evidence of a dynamic difference, in Ph1 the threshold stays constant (with an insignificant downward trend), whereas it increases significantly in Ph2 ($p = 0.027$). Again, we observe that behavior is not stationary across periods but dynamically converges to a lower (higher) level in Ph1 (Ph2), suggesting that convergence takes place.

It is not among the specific aims of this paper to investigate the frequency of TOs denouncing corrupted POs, nevertheless it may be interesting to report that on average TOs denounced in 28.62 % of the possible cases. There were no differences between gender.

Notably, our experiment yields surprising results with respect to how differently male and female participants respond to the introduction of a PWR. The main results on gender differences are summarized in Figure 3 illustrating the mean declared taxes in Ph1 and Ph2 broken down by gender, and the development of mean declared taxes by gender over rounds. Previous studies (see e.g., Kastlunger et al., 2010; Torgler and Valev, 2010) found women to be less inclined to be corrupt or evade taxes. For Ph1 (Ph2), our results indicate an average tax compliance of 21.2 ECU and 19.2 ECU (13.1 ECU and 16.5 ECU), for females and males respectively. Pooled over 20 rounds, we observe a mean tax compliance of 17.2 ECU (17.9 ECU) for females (males). In accordance with the literature in Ph1 women are slightly more compliant than

⁵In fact, when accounting for learning in behavior and thus only looking at the last 5 rounds of both Ph1 and Ph2, we see a weakly significant increase in averages in the threshold of accepted bribes from 13.3 ECU to 16.9 ECU ($p = 0.063$)

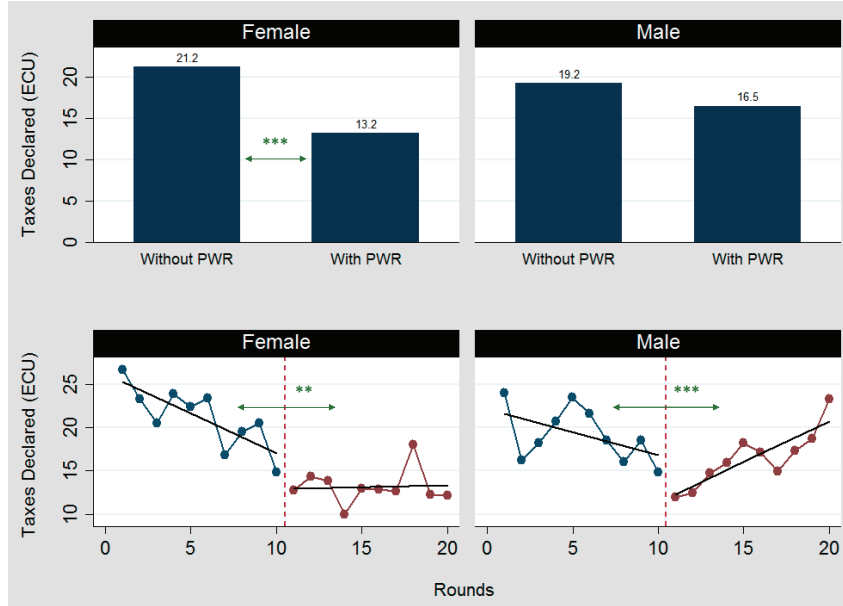


Figure 3: Average Tax Declared by Gender and Shock pooled on the individual level over rounds, and Evolution of Tax Declarations over rounds by gender.

men, but become slightly less compliant compared to their male counterparts when a PWR is introduced. Across gender, differences in general tax compliance are not significant, thus indicating that tendencies towards tax evasion are the same for females and males. Most surprisingly, however, we find a strong heterogeneity in reactions to the introduction of a PWR across gender. There is a highly significant drop in average tax compliance for females by 8 ECU on average ($p < 0.01$), whereas changes in average behavior for males are small (2.7 ECU) and insignificant ($p = 0.34$). In addition, we observe a highly significant change in slopes for women ($p < 0.01$) and men ($p < 0.01$) respectively. Here, the change in slopes suggests that females and males react differently to the introduction of a PWR: females resort to a stationary high tax evasion behavior, while males gradually converge towards higher tax compliance.

In sum, our findings suggest that women show a greater sensitivity in their reactions following the introduction of a PWR, which is both surprising and not completely in line with the existing economic literature.

In what follows, we should discuss factors that could drive our surprising results. The experimental design adopted in our study included two main factors that potentially play a role in explaining female participants reactions to the implemented institutional change. The first ingredient is risk (to be fined) and the second one is the institutional setting adopted to mimic the decisional frame. For one, a general difference in risk attitudes across gender could potentially explain the significant drop in female tax compliance after the introduction of a PWR, since by the design the PWR sharply reduces the risk of deviant behavior. However, our results survive and remain highly significant when controlling for individual risk aversion attitudes. For another, Lighthall et al. (2009) study how stress affects decision making under risk and find that overall men take more risk than females, but interestingly stress increases risk-taking for men, whereas women become more risk-averse. In Preston et al. (2007), using a different stress manipulation, it is shown that stress induces male participants to perform worse, while female participants perform better under stress in the Iowa Gambling Task, a task shown to measure efficiency in decision making under uncertainty. Assuming that stress affects females and males differently, we can interpret our results as an "inverted stress effect". In Ph1 TOs were aware that the decision to evade exposes them to the risk of being punished, a burden they had to bear alone. In Ph2, the PWR provides a possibility to avoid a severe sentence after tax evasion is detected, thus providing a "save way out" that potentially creates an environment that is perceived as less stressful. One would therefore expect women to engage in higher risk-taking in the less stressful environment after the introduction of a PWR, whereas risk-taking of men would be expected to decrease. The exposure to risk is generally higher in Ph1 than in Ph2, and hence risk-aversion would lead to a decrease in compliance from Ph1 to Ph2. As a consequence, a reduction in stress would amplify this tendency for women, while it might counteract a potential effect of stress for men. This might explain we do not observe an increase in compliance for males. However, our reasoning remains speculative as there is, to the best of our knowledge, no existing research on the interrelations between stress, risk aversion, and gender

differences. A potential venue for future research.

A second reason could be that the sudden institutional change affects women more strongly than men, which is in line with (Croson and Gneezy, 2009) who argued that females are more sensitive to the contextual frame. The introduction of a PWR renders the TO formally responsible, hence creating a situation where the responsibility (and risk) is shared among TP and TO. This new distribution of responsibility might enhance the wiggle-room for misbehavior on the side of the females. This second interpretation can be considered as further evidence that gender effects might oftentimes stem from a higher sensitivity of women to the institutional environment.

5. Conclusion

Our examination represents the first attempt to shed light on the effectiveness of the principal witness regulation utilizing a controlled laboratory setting. We extend the general tax evasion framework by adding a dimension of strategic interaction that allows us to capture a broader spectrum of tax evasion contexts. Our findings suggest that the introduction of such a policy measure has a negative short-term effect of decreased compliance, but at the same time induces a reversal in the dynamic adjustment over time that hints upon a potential positive long-term effect of a principal witness regulation on tax compliance. In contrast to the literature, we do not find women to be generally more compliant than men, however, there is considerable gender heterogeneity in terms of responsiveness to the introduced institutional change: women over-proportionally react to the introduction of a PWR by reducing tax compliance, while the results suggest that men react with a gradual increase of tax compliance. Our results yield important policy implications. While the introduction of a principal witness regulation not only yields limited effectiveness in mitigating tax evasion, its effectiveness is also highly gender specific and should thus be regarded in policy decision-making.

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Appendix A. Supplementary material

Average tax compliance in an additional control treatment (N=36).

