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Worker or Shirker – Who Evades More Taxes? A Real Effort Experiment¹

by Christoph Bühren² and Thorben C. Kundt³

Abstract

With the help of a real effort experiment, we analyze if tax evasion depends on the amount of effort invested to generate income. In three treatments, subjects were either endowed with income or had to work moderately or hard to earn it. In line with prospect theory, subjects evaded more taxes when they worked hard for their income. We find little evidence for the prediction that tax evasion in the endowed treatment is higher than in the moderate work treatment.

1. Introduction

Do people feel entitled to evade more taxes because they have worked hard for their income, or are they more afraid of losing their hard-earned money when they get caught cheating? What about people who earned income without any effort - are they likely to gamble with this money in tax declarations? According to standard economic theory, the income source should have no effect on subsequent decisions (Thaler, 1980). However, behavioral economics provides arguments that tax evasion can increase after previous effort (*sunk cost effect*, Arkes and Blumer, 1985) or by the complete absence of effort (*house money effect*, Thaler and Johnson, 1990).

In our real effort experiment, we analyze how tax evasion is affected when the same income is earned without any effort, or with a moderate or high level of effort. We find that subjects who have invested high levels of time and effort evade significantly more taxes than people who work moderately. On the other side, people who are endowed with income also evade more taxes than moderate workers, but this difference is not significant. Our results completely differ from those of Kirchler et al. (2009), who find that low effort increases tax evasion compared to high effort and endowed income. Yet Kirchler et al. (2009) use a hypothetical survey, which is typical for psychological studies

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on tax evasion. On the other hand, economic real effort experiments usually do not focus on taxpayers' decisions (e.g. Abeler et al., 2011). The only studies that combine real effort tasks with the analysis of tax evasion are Anderhub et al. (2001) and Boylan (2010). However, Anderhub et al. (2001) do not vary income source (i.e. income can only be earned) and Boylan (2010) does not vary effort (i.e. they vary earned vs. endowed income). To our knowledge, we are the first to combine these variations in a real effort experiment on tax evasion.

Our paper is organized as follows: The next section gives an overview of previous experimental studies on the link between tax evasion and effort. Section three explains theoretical considerations of tax evasion derived from prospect theory. In the fourth section, we describe our experimental settings and derive our hypothesis. Section five depicts our results followed by a concluding section.

2. Literature Review

Results from experiments on the relationship between effort and tax evasion are mixed. The few existing studies have applied different methods to assign income to participants: real effort tasks (Anderhub et al., 2001; Boylan and Sprinkle, 2001; Boylan, 2010), entitlements (Durham et al., 2012), or hypothetical settings (Muehlbacher and Kirchler, 2008; Kirchler et al., 2009) (see Table 1 for an overview).

The first category is probably the most interesting as real effort experiments have received increasing attention in a variety of economic contexts (e.g. Abeler et al., 2011; Ball et al., 2001; Fahr and Irlenbusch, 2000; Hofmann and Spitzer, 1985). They are likely to add more realism to the experimental settings (Carlsson et al., 2012). Yet only Boylan and Sprinkle (2001) and Boylan (2010) vary income sources (endowed versus earned) in a real effort experiment on tax evasion. In the earned conditions of both experiments, participants had to work on a 3-digit by 3-digit multiplication task for one hour and half an hour respectively. The authors chose the multiplication task because all participants were supposed to be trained in it since their school days. Subjects were informed that they would receive an income of 20,000 experimental francs (\$20) if they met certain criteria in the multiplication task. Otherwise, they would only get an income of 2,000 experimental francs. However, the criteria were designed in a way that all of the subjects met them (Boylan and Sprinkle, 2001), i.e. incomes were not really performance-based and did not vary between subjects. Boylan and Sprinkle (2001) find that relative

cheating in the reporting phase does not differ by income source. In contrast, Boylan (2010) reports a positive relationship between effort and compliance, at least in the first round of the experiment. Furthermore, Boylan and Sprinkle (2001) report a significant interaction effect of income source and changes in the tax rate, and Boylan (2010) finds an interaction of income source and prior tax audit.

Table 1: Related Experimental Literature

| Study | Income source | Receiving mechanism | Effects on tax evasion |
|---------------------------------|--|-----------------------|---|
| Anderhub et al. (2001) | Earned | Real effort task | Higher income level increases tax evasion |
| Boylan and Sprinkle (2001) | Earned vs. endowed | Real effort task | No direct effect of income source |
| Boylan (2010) | Earned vs. endowed | Real effort task | Effort decreases tax evasion in round 1 |
| Durham et al. (2012) | Earned vs. endowed | Double-auction market | No direct effect of income source |
| Muehlbacher and Kirchler (2008) | Earned (low effort) vs. earned (high effort) | Hypothetical setting | Low effort increases tax evasion compared to high effort |
| Kirchler et al. (2009) | Earned (low effort) vs. earned (high effort) vs. endowed | Hypothetical setting | Low effort increases tax evasion compared to high effort and endowed income |

In Durham et al. (2012), half of the subjects “earned” income in a computerized double-auction market whereas the other half was endowed with it. Although their experimental setting cannot be described as a real effort task, participants of the market mechanism could feel entitled to the income (cf. Hoffman et al., 1994). Yet tax evasion did not differ by the two treatments and Durham et al. (2012) do not find any significant correlation between income source and other experimental variables.

Muehlbacher and Kirchler (2008) and Kirchler et al. (2009) use a hypothetical setting in which participants had to imagine being an architect and earning an income that was linked to a certain extent of effort. In contrast to the studies discussed above, the authors do not merely compare earned vs. endowed income, they also vary the *level of*

(*hypothetical*) effort invested (high vs. low). In Kirchler et al. (2009), the number of subjects that cheated was significantly higher in the low effort condition than in the high and no effort conditions.

3. Theory

3.1. Tax Evasion Under Prospect Theory

A growing number of studies have applied a prospect theory framework (Kahneman and Tversky, 1979) to analyze tax compliance decisions from a behavioral perspective.⁴ Alm et al. (1992) argue that the assumptions of prospect theory are better suited to explain the observed high levels of tax compliance than the neoclassical model introduced by Allingham and Sandmo (1972).

In general, the taxpayer's compliance decision can be modeled as follows.⁵ A representative taxpayer with an exogenous taxable income Y declares a certain amount Y_D , which is not necessarily equal to her true income (i.e., $Y_D \leq Y$). The declared income is subject to a flat tax $t \in [0;1]$. With a probability of $p \in [0;1]$ the tax authority audits the taxpayer. If the taxpayer gets caught cheating, she has to pay a fine $ft(Y - Y_D)$ on the taxes under-declared, with $f > 0$. In this case, the resulting income is $Y_C = (1-t)Y - ft(Y - Y_D)$. If the taxpayer is not caught cheating, she receives an income $Y_{NC} = Y - tY_D$.

Following Dhimi and Al-Nowaihi (2007) and Bernasconi et al. (2013), we denote the decision to pay taxes under prospect theory with:

$$V(Y) = \pi(p)V(Y_C - R) + (1 - \pi(p))V(Y_{NC} - R)$$

A specific feature of prospect theory is that individuals apply subjective weights to the probabilities which are represented by a non-linear *weighing function* $\pi(p)$. Furthermore, individuals value outcomes relative to a neutral *reference point* R . The subjective *value function* $V(\cdot)$ is concave in the domain of gains and convex in the domain of losses (*diminishing sensitivity*). Losses loom larger than gains, i.e. the value function is steeper in the domain of losses (*loss aversion*) (Kahneman and Tversky, 1979). Tversky and Kahneman (1992) describe the value function as

⁴ For an overview of studies see, for instance, Dhimi and Al-Nowaihi (2007), Kirchler (2007) and Kirchler et al. (2009).

⁵ See Allingham and Sandmo (1972).

$$V(X_i) = X_i^\beta \text{ if } X_i \geq 0$$

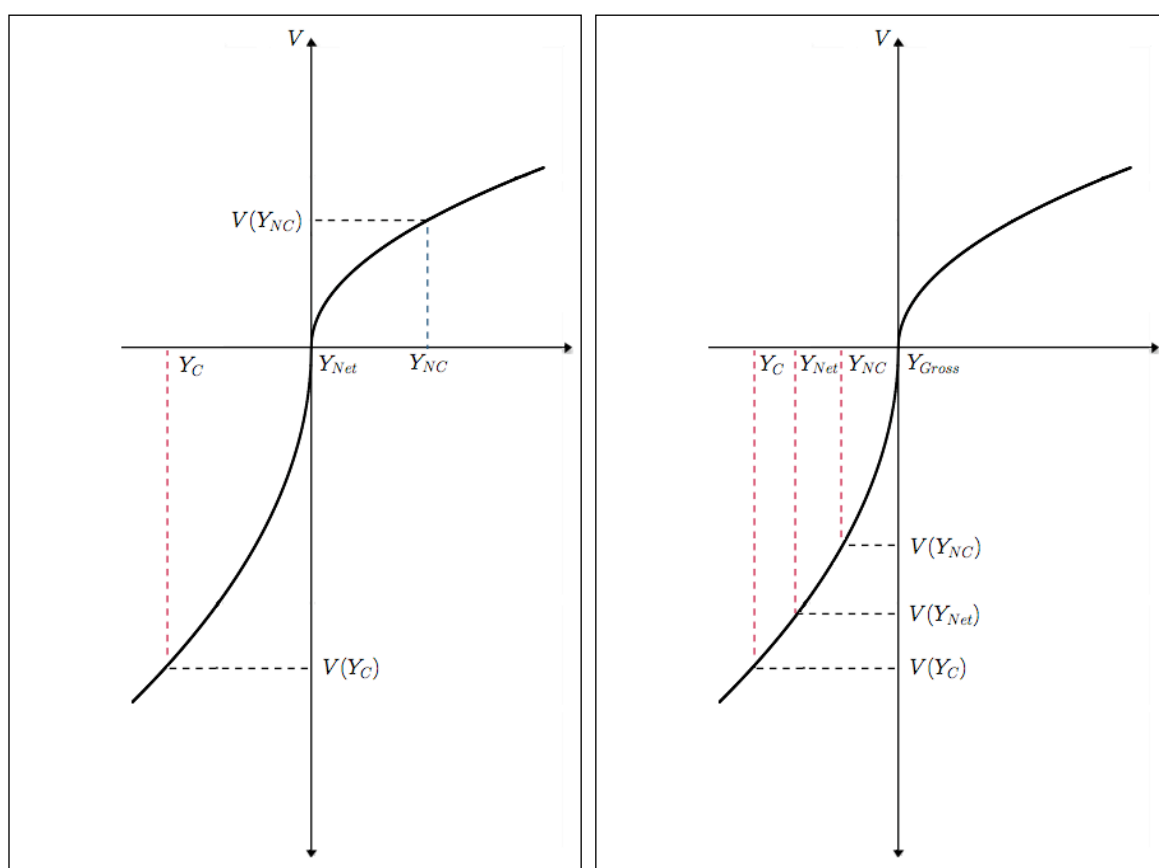
$$V(X_i) = -\theta(-X_i^\beta) \text{ if } X_i < 0$$

with preference parameters $\beta \in [0;1]$ and $\theta > 1$. As the taxpayer values her outcome X relative to the reference point R , we can refine X_i to $X_i = Y_i - R$, for $i = C$ or NC (Dhmi and Al-Nowaihi, 2007).

Kahneman and Tversky (1979) point out that the reference point usually corresponds to the current asset position, i.e. the *status quo*. Figure 1 depicts two plausible scenarios for the status quo that have been discussed in the tax literature. On the left hand side, *net income* serves as reference point (Dhmi and Al-Nowaihi, 2007). The taxpayer can either declare honestly and take her legal after-tax income (the safe alternative) or pick the risky choice, i.e. under-declare a certain amount of income ($Y_D < Y$). If the taxpayer is being audited in the latter case, she finds herself in the domain of losses, as $Y_C - [(1-t)Y] = -f(Y - Y_D) < 0$. Alternatively, the equation turns to $Y_{NC} - [(1-t)Y] = t(Y - Y_D) > 0$ (domain of gains) if tax evasion remains undetected.

On the other hand, Kirchler et al. (2009) propose that *gross income* serves as reference point for self-employed taxpayers who pay taxes “out of their own pocket” (p. 490). In this case (right hand side of Figure 1), the taxpayer is always in the domain of losses, regardless whether she declares honestly or chooses to declare an income that is smaller than the actual income. Generally, this implies risk-seeking, i.e. tax evasion (Kirchler et al., 2009).

Figure 1: Tax Evasion Under Prospect Theory



Dhami and Al-Nowaihi (2007) show that *net income* is the only plausible reference point as prospect theory reduces to rank-dependent expected utility theory when taxpayers are always in the domain of gains or losses. Thus, counterintuitive results of neoclassical theory occur if gross income is the reference. We follow Dhami and Al-Nowaihi (2007) and take net income as the status quo.

Besides taking current asset positions as reference points, there is the possibility of individuals valuing outcomes relative to what they expect or aspire (Kahneman and Tversky, 1979). Schepanski and Shearer (1995), for example, argue that expectations are based on the taxpayer's *withholding position*. In this case, the reference point would be the difference between the expected tax liability and the taxes paid in advance. In a recent study, Cullis et al. (2012) suggest that *social norms* may lead to an aspiration level.⁶ Based on a "normative principle" (p. 161), the individuals expect to pay a tax that

⁶ Wenzel (2004, p. 551) defines social norms as "moral standards attributed to a social group or collective". Social norms are hypothesized to have a mediating role with respect to deterrence, as they are likely to add social costs such as shame or embarrassment (Wenzel, 2004). Alm et al. (1999) further argue that voting on strict enforcement policies sends out a message that there is a social norm of paying taxes and that compliance will increase as a consequence.

is somehow fair in their view. This encompasses the notion that some taxes have to be paid in order to retain a certain level of welfare state.

To conclude, tax behavior strongly depends on the (nature of the) reference point. In the next section, we will argue that prior investments of time and effort can cause a shift of the value function away from the status quo to an expectation-based reference point. This is likely to induce risk seeking when the outcome lies in the domain of losses.

3.2. Effort-Contingent Valuation and Tax Evasion

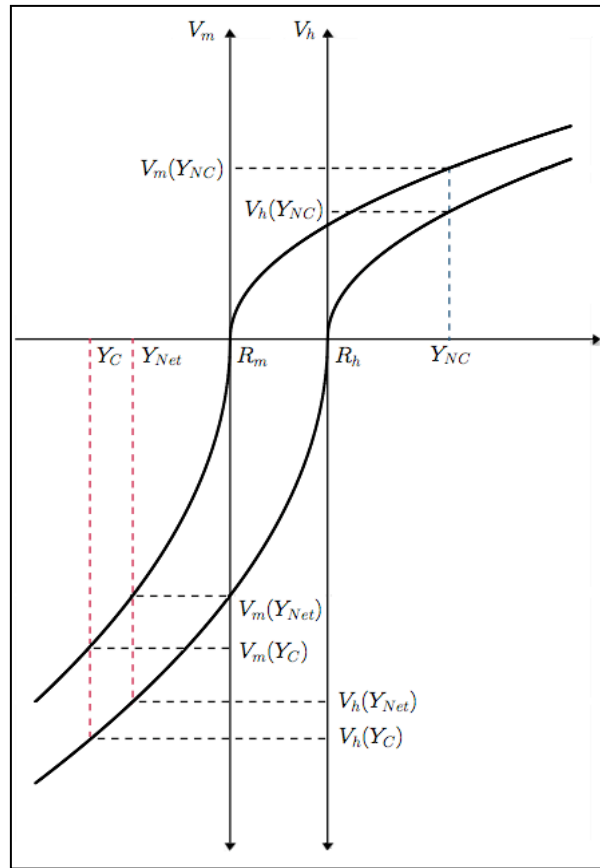
Recent experimental findings suggest that behavioral decision making is influenced by the level of effort invested previously. For instance, Cherry (2001) and Carlsson et al. (2012) show that offers in a dictator game are positively affected when the individuals' income is endowed rather than earned. The "IKEA effect" (Norton et al., 2012) links effort to the valuation of utilitarian or hedonic goods. If participants had to exert effort to assemble a product by themselves, they placed a much higher monetary value on it than participants that were supposed to value a comparable good in which they had invested no effort. Furthermore, Bühren and Pleßner's (2011) "trophy effect" shows that valuation of rewards for an effortful competition is excessively heightened.

In contrast to these results, economic theory suggests that decisions should only be based on incremental costs and benefits rather than on previous investments (Thaler, 1980). A common explanation for this discrepancy lies in the *sunk cost effect* (Arkes and Blumer, 1985), which describes a person's tendency to behave in a more risk-seeking fashion "once an investment in money, effort, or time has been made" (p. 124). Turning back to the assumptions of prospect theory, a previous investment in financial or behavioral sunk costs is likely to affect the nature of the reference point by creating aspirations (Zeelenberg and Van Dijk, 1997). Taxpayers that have to invest time and effort to earn an income may translate these costs into a monetary value or reservation wage.⁷ The aspiration level rises and the reference point is shifted away from the status quo (Boylan and Sprinkle, 2001; Durham et al., 2012).

Figure 2 shows a situation in which taxpayers have to invest a *moderate* level of effort, E_m , or a *high* level of effort, E_h , to earn income.

⁷ Yet Soman (2001) argues that the sunk cost effect for time is low because people cannot mentally account time.

Figure 2: The Role of Effort



When the taxpayer attaches a monetary value to the effort invested previously, the reference income shifts to $R_m = (1-t)Y + E_m$ or $R_h = (1-t)Y + E_h$, respectively. The net income is perceived as a sure loss relative to the effort-based reference points. The taxpayer thus faces a sure loss (represented by the net income) or an uncertain gain corresponding to Y_{NC} .

According to Kivetz (2003), there are two consistent effects under the assumptions of prospect theory leading to an increased preference for the risky choice in this situation. To illustrate these effects, we first take a look at the difference in the taxpayer's subjective valuation of the sure loss and the uncertain gain. If the taxpayer has to invest a moderate level of effort, the difference in valuation can be denoted by $V_m(Y_{Net}) - [pV_m(Y_C) + (1-p)V_m(Y_{NC})]$.⁸ For the hard working taxpayers, the equation turns to $V_h(Y_{Net}) - [pV_h(Y_C) + (1-p)V_h(Y_{NC})]$ due to the shift of the reference point. As we can see from Figure 2, the diminishing sensitivity of the gain and loss functions implies that the perceived difference in the subjective valuation for Y_{Net} and Y_{NC} is larger for taxpayers

⁸ Similar to Kivetz (2003), we use probabilities instead of a weighing function because the implications derived do not change.

with a high level of effort compared to taxpayers with a moderate level of effort, i.e. $V_h(Y_{Net}) - V_h(Y_{NC}) > V_m(Y_{Net}) - V_m(Y_{NC})$. The notion of loss aversion further implies that taxpayers are more likely to pick the risky choice when the sure alternative is perceived as a loss relative to the reference income. Increasing the level of effort required to earn an income thus increases the preference for the risky choice, as the perceived loss is larger for the reference point under high effort R_h . Therefore, we predict that tax evasion increases with the level of effort invested.

3.3. The Role of Endowed Incomes

The discussion on effort-based valuation implies that the sunk cost effect should be least emphasized when earning income does not involve any (behavioral) costs. This situation is likely to occur in the presence of endowed incomes. In this instance, the reference point is close or even equal to the status quo, and risk-seeking should play a minor role. However, a competing hypothesis which received some empirical support is that the presence of endowed money can induce *risk-seeking* instead of *risk-averse* behavior. Thaler and Johnson (1990) coined this contradictory finding the “house money effect” to capture the idea that people act in a more risk-seeking fashion when their decisions involve money from “the house” rather than from their “own pockets”. In the presence of prior gains, subsequent losses can be integrated with prior gains as long as they do not exceed the gains. This reduces the influence of loss aversion and enhances risk-seeking (Thaler and Johnson, 1990).⁹ Translated to the tax context, taxpayers could regard endowed money as an effortless gain. Thus, the perceived loss in case of being caught cheating can be set against the endowed income and the tendency to opt for the risky choice of evading taxes is strengthened (Kirchler et al., 2009).

Similarly, Weber and Zuchel (2005) argue that there are two competing hypotheses on the effects of prior gains and losses on risk-taking. *Escalation to commitment*, a phenomenon closely related to the sunk cost effect, implies risk-seeking after a preceding *loss*, whereas the house money effect implies risk-seeking after a preceding *gain*.

We suppose that both, the presence of sunk costs and the presence of endowed gains positively affect the taxpayer’s inclination to cheat on taxes. However, both effects should

⁹ In order to reduce the house money effect, Rosenboim and Shavit (2012) as well as Cárdenas et al. (2013) use a prepaid mechanism, in which participants receive their show up fee two resp. three weeks before the experiment.

be least emphasized when income is earned with an intermediate level of effort. In this case, the effort invested is smaller than for hard-earned income, which means that the sunk-cost effect is supposed to be weak. On the other hand, the level of effort is larger than for endowed income, which means that income is not necessarily perceived as an endowment and the house money effect should also be weak. Compared to income earned with a moderate level of effort, we expect cheating to be higher (1) for endowed incomes and (2) for hard-earned incomes.

4. Experiment

4.1. Participants and Procedure

We conducted the experiment at the experimental laboratory of the University of Hamburg in November 2012. 150 students participated in six sessions (two sessions per treatment): 49 in the endowed treatment, 50 in the moderate effort treatment, and 51 in the hard effort treatment (between-subject design). Participants were recruited via hroot (*Hamburg Registration and Organization Online Tool*) (Bock et al., 2012). On average, they were 25 years old and exactly half of the participants were male. About 90% of the students were from Germany. None of the demographic dimensions differed significantly between treatments.¹⁰

The experiment was fully computerized with z-Tree (Fischbacher, 2007). It consisted of three rounds. Every round included two parts: an earning phase and a tax declaration phase.

In the earning stage, participants were either endowed with 1.40 € (*endowed treatment*) or had to exert a moderate (*moderate effort treatment*) or high level of effort (*hard effort treatment*) to earn their income. In the effort treatments, the task was counting ones in several boxes filled with 150 digits (ones and zeros). We decided to choose this counting task because it has a number of desirable characteristics: 1) participants do not need any prior knowledge for the task, 2) performance can be measured easily, 3) there are no learning effects, 4) the task has a positive cost for the participants, 5) it is artificial and purposeless, and 6) the outcome of the task has no intrinsic value to the experimenter (Abeler et al., 2011). We vary the effort requirements by time and number of ones: Participants in the hard effort treatment had to count three times twelve minutes with

¹⁰ See Table 2 in Section 5.1.

an average of 60 ones per table. In the moderate effort treatment, they had to count three times four minutes with an average of 18 ones per table.¹¹ In both treatments, subjects earned 10 Cents per correct answer.

These parameters were derived from two pretests. In the first pretest, seven participants, that we did not pay, needed on average 15 seconds for each block in the moderate effort treatment, 33 seconds in the hard effort treatment, and 42 seconds in a very hard work treatment that we dropped in our main experiment. In the second pretest, we paid 16 participants in the moderate and hard effort treatment 10 Cents per correct answer. Average earnings did not differ significantly when subjects in the moderate work treatment counted four minutes per round and subjects in the hard work treatment twelve minutes per round. In our experimental design, subjects are supposed to get the same income across our three treatments as we try to avoid income effects on tax evasion. Nevertheless, average earnings per hour should differ in our experimental design as in the endowed treatment subjects are supposed to invest no effort or time to get their money and in the moderate (hard) effort condition subjects are supposed to invest a medium (large) amount of effort and time.

After each round of the earning phase, we asked our participants to declare their income. Subjects were not able to cheat on the earnings received in the counting task, i.e. they could not declare more income than they actually achieved. Yet they could evade taxes by under-declaring their income. We levied a 25% flat-tax on the income declared and informed that tax declarations would be controlled with a probability of 30%. Therefore, participants had to choose a number between one and ten and write it down in the tax declaration. Three numbers between one and ten were randomly generated. If the number chosen by a participant corresponded to one of the random numbers, her or his declaration was checked. We charged a penalty of 1.5 times the taxes evaded if the subject under-declared her or his income. Thereby, she or he had to pay the taxes on the true income plus the fine of 1.5 times the taxes evaded. The resulting income in this case is similar to Y_C in section 2.1.

To keep the setting as realistic as possible, we used explicit tax language throughout the whole experiment. The results of Baldry (1986) suggest that people are more likely to cheat on taxes when they are exposed to a gambling-like situation rather than a tax-

¹¹ The numbers were generated using a randomized Binomial distribution in the statistical software Stata 12.

related context. Further, Wartick et al. (1999) find that cheating increases in a non-tax context. Cadsby et al. (2006) argue that “gambling language” should be avoided: „[W]ithin this framework, underreporting is not cheating, but rather a legitimate action explicitly permitted by the rules of the game (...) [t]he results of such ‘invitation-to-gamble’ experiments may have little to do with actual tax compliance decisions (...)“

The experiment was followed by a comprehensive questionnaire on possible subject specific determinants of tax evasion (see Appendix A) and on the perceived effort that subjects invested in the treatments. After completing the questionnaire, participants received their earnings. Average earnings were 10.16 € per subject across treatments, including a show up fee of 5 €. The sessions lasted on average 30 minutes in the endowed treatment (average earnings: 10.60 €), 45 minutes in the moderate work treatment (average earnings: 9.84 €), and one hour in the hard work treatment (average earnings: 10.05 €).¹²

4.2. Hypothesis

In the endowed treatment, we suppose that there is no aspiration level resulting from effort requirements. The sunk cost effect is likely to be least emphasized in this instance. On the other hand, the income comes free and potential losses can be integrated according to the house money effect. Therefore, risk aversion is supposed to diminish and tax evasion will rise. In contrast to previous studies, we do not compare endowed income with effort-related income per se, but with income that results from a moderate level of effort. The moderate effort condition serves as a control treatment in our experimental design. Participants in the moderate effort treatment will not see income as a totally free gain because they have invested at least some effort to earn it. Further, their effort investments will not result in very high expectations. Therefore, we derive Hypothesis 1a:

H1a: Tax evasion will be higher for participants in the endowed treatment compared to the moderate effort treatment.

In the hard effort treatment, participants are required to devote a reasonably higher level of time and effort compared to the moderate effort treatment, while earnings are

¹² The differences in mean incomes are not statistically significant between the treatments (ANOVA F-test, $p=0.4016$).

about the same. The sunk-cost effect implies that expectations concerning the adequate outcome rise with effort requirements. Thereby, risk-seeking increases when the net income lies in the domain of losses. At the same time, loss-aversion is stronger for incomes linked with high levels of effort. From this, we get Hypothesis 1b:

H1b: Tax evasion will be higher for participants in the hard effort treatment compared to the moderate effort treatment.

We further suppose that participants who counted over half an hour are very unlikely to perceive their income as endowed. Thereby, the house money effect will be very small compared to the endowed treatment. As noted above, the sunk-cost effect is least strong for endowed incomes. Since both effects work in the same direction, we expect that tax evasion is about the same for the hard effort treatment and the endowed treatment.

H2: There will be no difference in tax evasion between the endowed treatment and the hard effort treatment.

5. Results

5.1. Descriptive Statistics

To start our analysis, we check if our sample is divided into homogeneous subgroups across treatments. As can be seen from Table 2, we do not find any significant differences by treatment with regard to control variables that measure individual characteristics likely to influence tax behavior (see section 5.2.).

Table 2: Control Variables by Treatment

| | Endowed | Moderate | Hard | p-value |
|--|-----------------|-----------------|-----------------|---------|
| Age (Mean) | 25.90 (0.77) | 24.28 (0.61) | 25.26 (0.63) | 0.2304 |
| Gender (% male) | 56.00 | 43.14 | 51.02 | 0.4270 |
| Nationality (% German) | 87.76 | 93.75 | 90.00 | 0.4677 |
| Risk classification (Mean; Scale: 0-10) | 4.37 (0.25) | 4.30 (0.26) | 3.98 (0.21) | 0.4750 |
| Tax morale (Mean; Scale: 1-5) | 3.62 (0.10) | 3.79 (0.09) | 3.67 (0.08) | 0.3686 |
| Effort norm (Mean; Scale: 1-5) | 3.39 (0.10) | 3.42 (0.10) | 3.51 (0.08) | 0.6061 |
| Social desirability (Mean; Scale: 0-10) | 4.92 (0.29) | 5.38 (0.29) | 5.43 (0.29) | 0.4008 |

Notes: p-values were derived from ANOVA F-tests except for gender and nationality (Pearson's χ^2); Standard errors in parenthesis.

To measure the perceived effort of our treatments, we used the *subjectively perceived effort scale* (SEA-scale¹³) (Eilers et al., 1986). The scale ranges from 0 (no effort) to 220 (extremely high effort). In the endowed treatment, the whole experiment was perceived to be *slightly exhausting* (48 on average), in the moderate working group *fairly exhausting* (80 on average), and in the hard working group *strongly exhausting* (139 on average). The perceived effort is significantly different by treatment according to a Kruskal-Wallis-test ($p < 0.000$). Further, the perceived effort (SEA) of the counting task was on average 101 in the moderate, and 157 in the hard effort treatment (two-sided Mann-Whitney-U-test, $p < 0.000$).

During the counting task, subjects in the moderate effort treatment needed 15.28 seconds on average per correct table and had a mean error quote of 14.30%. The hard workers had to count 38.50 seconds on average for a correct table and failed in 25.34% of the tables. These differences between the two treatments are highly significant (two-sided Mann-Whitney-U-tests: $p < 0.000$). Further, average earnings before taxes were nearly identical with just a small variance across subjects.

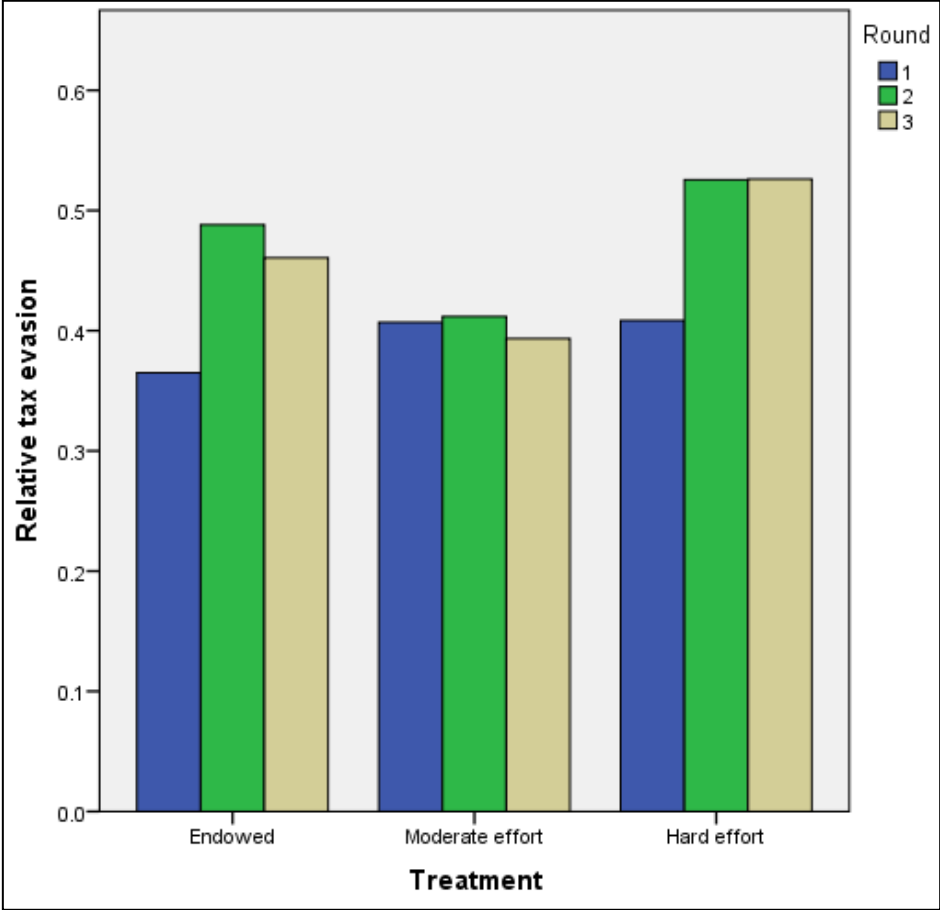
We use the following measures of tax evasion: a dummy variable that analyzes if a subject cheated at least *once* throughout the experiment, the *number* of dishonest decisions, and the *relative amount* of taxes evaded (i.e. taxes evaded divided by taxes due).

The proportion of subjects that cheated at least one time throughout the experiment is largest for the hard effort treatment (86.27%) and lowest for the moderate effort treatment (70%). In the endowed treatment, 81.63% of the participants were dishonest at least once. The difference between the moderate and the hard effort treatment is significant (Hypothesis 1b, two-sided Fisher's exact test: $p = 0.0566$). As supposed by Hypothesis 2, we do not find any significant difference between the endowed and the hard effort treatment. However, we failed to find support for Hypothesis 1a: Although tax evasion is larger in the endowed treatment compared to the moderate effort treatment, the difference is not significant. The number of dishonest decisions again turns out to be largest when individuals had to invest high effort. On average, subjects in the hard effort treatment cheated in 2.14 (out of three) rounds. In the moderate work treatment this occurred 1.82 times and in the endowed treatment 1.89 times.

¹³ SEA: Subjektiv Erlebte Anstrengung

Figure 3 shows that the relative level of tax evasion is lowest in the endowed treatment in round one (37%). Yet in round two and three, the relative tax evasion of the endowed and hard effort treatment is considerably higher than in the moderate effort treatment.¹⁴

Figure 3: Relative Tax Evasion by Round and Treatment



We find the highest tax evasion in the hard effort treatment in the last two rounds (after 24 resp. 36 minutes of counting) where subjects evaded on average 53% of their taxes – 6 percentage points more than in the endowed treatment and 13 percentage points more than the moderate workers. Having a look at the average values in the last two rounds, the relative tax evasion in the hard work treatment is significantly higher than in the moderate work treatment (Hypothesis 1b, two-sided Mann-Whitney-U-test: $p < 0.1$). With respect to relative tax evasion, we do not find any significant difference between the endowed and the moderate treatment (Hypothesis 1a) and between the endowed and the hard work treatment (Hypothesis 2).

¹⁴ The distribution of relative tax evasion can be found in Appendix B. It shows that most participants either choose to evade everything or nothing. Therefore, the variables discussed before (the dummy that measures if subjects cheat at least once and the number of dishonest decisions) already describe our results quite well.

5.2. Multivariate Analyzes

Previous theoretical and empirical works suggest that tax evasion is driven by a variety of subject-specific characteristics (e.g., Porcano, 1988; Torgler, 2007; Hofmann et al., 2008). Further, individuals are supposed to react on previous punishments (e.g., Boylan 2010). We apply multivariate analyzes to capture these effects. We restrict our analyses to rounds two and three in order to integrate a dummy variable that measures whether the subject has been fined in the previous round. Since observations are no longer independent in this model, we cluster standard errors at the individual level. We exclude observations for participants with inconsistent behavior in the Holt and Laury (2002) lotteries, which are applied as a proxy for the participants' risk aversion.¹⁵

In the first step, we analyze the participants' general propensity to cheat on their taxes, i.e. the decision to evade or not. This is captured by a dummy variable which takes on the value 1 if a subject cheated and 0 otherwise. Table 3 displays the Probit regression results (coefficients and marginal effects at sample averages). In line with our descriptive findings, the *hard effort* treatment effect turns out to be highly significantly positive (reference category: moderate effort). The marginal effect is 0.247, i.e. the probability for cheating is 24.7 percentage points higher for the hard workers compared to moderate workers when we control for individual differences on relevant dimensions that are supposed to influence tax evasion. Although with a positive sign, the effect for the endowed income treatment remains insignificant.

¹⁵ We used the Holt and Laury (2002) lotteries after our experiment and incentivized the answers. In regressions that control for risk aversion, we excluded inconsistent answers of the Holt and Laury procedure. We did not exclude them in the descriptive statistics.

Table 3: Probit Regression Results

| Dependent variable: Cheated | Coefficient (SE) | Marginal effect (SE) |
|-------------------------------------|------------------|----------------------|
| Treatment (<i>ref.: moderate</i>) | | |
| -Hard effort | 0.794*** (0.279) | 0.247*** (0.078) |
| -Endowed | 0.213 (0.271) | 0.071 (0.089) |
| Socio-demographics | | |
| -Gender (<i>ref.: male</i>) | -0.539** (0.229) | -0.183** (0.076) |
| -Age | -0.047* (0.024) | -0.016* (0.008) |
| -Income | -0.200 (0.263) | -0.068 (0.089) |
| Risk classification | 0.068 (0.074) | 0.023 (0.025) |
| Tax morale | -0.374** (0.165) | -0.128** (0.056) |
| Prescriptive effort norm | 0.100 (0.158) | 0.034 (0.054) |
| Social desirability | -0.075 (0.060) | -0.025 (0.021) |
| Fined in previous round? | 0.380 (0.235) | 0.120* (0.068) |
| Constant | 2.431** (1.211) | |
| No. observations | 264 | |
| No. clusters | 132 | |
| Log pseudolikelihood | -144.11 | |
| Wald χ^2 (10) | 21.38 | |
| Prob > χ^2 | 0.019 | |
| Pseudo R ² | 0.123 | |

Notes: Standard errors (in parenthesis) clustered at the individual level; * p<0.1, ** p<0.05, *** p<0.01. Marginal effects at sample averages.

The participants' *tax morale* has a significantly negative influence on tax evasion. The term *tax morale* basically covers the general attitude towards tax evasion (Schmolders, 1960) and has been linked to the intrinsic motivation to pay taxes (Frey, 1997). We assessed *tax morale* in the post-experimental questionnaire with eight items on a 5-point Likert scale (from very low to very high *tax morale*). We used the mean of the eight answers to obtain a single factor (Cronbach's α : 0.74).

With an additional year of *age*, the probability for cheating decreases by about 1.6 percentage points. In line with our results, Porcano (1988) suggests that older taxpayers react more sensitively to sanctions and behave in a more risk-averse fashion. In our experiment, a *female* participant is *ceteris paribus* 18.34 percentage points less likely to cheat than a male. Tittle et al. (2003) support this finding by arguing that women are more self-controlled in general and thus commit crimes less frequently than males. The influence of *income* is insignificant.

Surprisingly, the marginal effect of a *fine* in the previous round is significantly positive (0.12). It is important to notice that the probability of being caught was independent from previous rounds (see section 4.1.). A possible explanation is that some participants may still have believed that they would not be fined two times in a row, although the instructions were unambiguous in this respect.¹⁶ This phenomenon has been termed the “bomb-crater” effect by Mittone (2006). More closely to our reasoning in section 3, subjects could regard the fine as a cost and try to break even by taking more risk in the following round (Thaler and Johnson, 1980). Thereby, the fine loses the desirable effect of deterrence.

The participants’ behavior in the paid Holt and Laury (2002) lotteries does not alter the probability for tax evasion. Similarly, the *perceived value of effort* and the tendency to behave in a *socially desirable* way do not have any significant influence.

Table 4 shows the regression results when the level of tax evasion relative to the taxes due serves as the dependent variable. As relative tax evasion is censored between 0 and 1, we apply a Tobit regression. We obtain results very similar to those in our Probit regression. The hard effort treatment effect is significantly positive. This means that the hard workers do not only evade more frequently, they also evade to a higher degree compared to the moderate work condition.

The gender effect turns out to be significant on the 99% level, while the influence of tax morale is slightly less significant. In contrast to the Probit regression, the variable *social desirability* is significantly negative. We originally included the social desirability measure to ensure that the participants’ self-reported tax morale is not driven by the wish to appear in “a good light”, which is a major concern in surveys on sensitive topics like tax behavior (Tourangeau and Yan, 2007).¹⁷ Social desirability was measured with the German version of the Crowne and Marlowe (1960) scale (Stocké, 2003). We suppose that the negative sign of the coefficient simply reflects the fact that subjects with a wish to appear in a social desired way actually *behaved* in the desired way when paying taxes.

¹⁶ One participant in the pretest actually stated that after being detected he had not changed his control number (see section 4.1.) because the probability that this number was selected twice would be low.

¹⁷ We find a significantly positive, but only small correlation between tax morale and social desirability (Spearman’s $Rho=0.168$, $p=0.04$). The answers on the tax morale questions may thus be driven by some social desirability concerns, but these are of minor influence.

Table 4: Tobit Regression Results

| Dependent variable: Relative tax evasion | Coefficient (SE) | |
|--|------------------|---------|
| Treatment (<i>ref.: moderate</i>) | | |
| -Hard effort | 0.453** | (0.191) |
| -Endowed | 0.219 | (0.204) |
| Socio-demographics | | |
| -Gender (<i>ref.: male</i>) | -0.664*** | (0.170) |
| -Age | -0.033* | (0.018) |
| -Income | 0.023 | (0.162) |
| Risk classification | 0.018 | (0.049) |
| Tax morale | -0.192* | (0.105) |
| Prescriptive effort norm | -0.006 | (0.120) |
| Social desirability | -0.092** | (0.041) |
| Fined in previous round? | 0.240* | (0.144) |
| Constant | 2.462*** | (0.898) |
| <hr/> | | |
| No. observations | 264 | |
| No. clusters | 132 | |
| Log pseudolikelihood | -259.9222 | |
| F(10, 254) | 2.75 | |
| Prob > F | 0.003 | |
| Pseudo R ² | 0.096 | |

Notes: Standard errors (in parenthesis) clustered at the individual level; * p<0.1, ** p<0.05, *** p<0.01.

5.3. Robustness Checks

To check the robustness of our results, we repeated the multivariate analyses with the subjectively perceived effort in the counting task as an independent variable (Models 1a and 1b). A higher perceived effort should lead to an increase in tax evasion. In a second step, we exclude observations for participants who failed to answer a control question on details of our experimental settings correctly (Models 2a and 2b).

Table 5 shows that the influence of perceived effort is significantly positive. A ten-point increase on the SEA-scale raises the probability for tax evasion by 2 percentage points. Similarly, the relative level of tax evasion is positively affected by the perceived effort in the Tobit model. These findings strongly support our hypothesis that (in the presence of effort) higher levels of time and effort investment increase tax evasion. The results for the treatment effects remain the same when we exclude the observations for participants who did not answer the control question correctly.

Table 5: Robustness Checks

| | Model (1a) | | Model (1b) | Model (2a) | | Model (2b) |
|--|--------------------|--------------------|--------------------|---------------------|---------------------|---------------------|
| | Probit | | Tobit | Probit | | Tobit |
| | Coef. (SE) | Marg. (SE) | Coef. (SE) | Coef. (SE) | Marg. (SE) | Coef. (SE) |
| Perceived effort (<i>counting task</i>) | 0.005** (0.021) | 0.002** (0.000) | 0.003** (0.001) | | | |
| Treatment (<i>ref.: moderate</i>) | | | | | | |
| -Hard effort | | | | 0.977*** (0.300) | 0.288*** (0.075) | 0.526** (0.211) |
| -Endowed | | | | 0.303 (0.284) | 0.097 (0.087) | 0.313 (0.234) |
| Controls included? | | Yes | | | Yes | |
| Wrong answers (control question) excluded? | | No | | | Yes | |
| Constant | 1.663 (1.543) | | 1.830* (1.017) | 2.623** (1.266) | | 2.674*** (0.980) |
| No. observations | 180 | | 180 | 236 | | 236 |
| No. clusters | 90 | | 90 | 118 | | 118 |
| Pseudo R ² | 0.147 | | 0.113 | 0.162 | | 0.101 |

Notes: Standard errors (in parenthesis) clustered at the individual level; * p<0.1, ** p<0.05, *** p<0.01. Marginal effects at sample averages.

6. Discussion

In our paper, we raised the question whether the way in which income is earned systematically influences tax evasion. We applied a prospect theory framework to capture the effects of effort investments and the role of endowed incomes. An improvement of our experimental design compared to the majority of studies on tax evasion is that we presented participants with a real effort task, thereby adding realism to the experimental setting. Our results are completely different to those of Kirchler et al. (2009) who worked on the same research question with a hypothetical setting. Compared to previous experiments, we focused not only on the effect of endowed vs. earned incomes but also varied the effort requirements (moderate vs. hard effort). We were able to show that income earned with an intermediate level of effort is least likely to be under-declared. Our results indicate that especially hard-earned income, but also endowed income, can give rise to tax evasion. This may be a possible explanation for Boylan and Sprinkle (2001) not finding any significant differences in the level of tax

evasion between endowed and earned income. As outlined in section 2, participants in their experiment had to work for an hour in a multiplication task. We suppose that this real effort task is comparable to our hard effort treatment.

Our subjects' feedback strongly supports our results: A representative statement in our hard work condition was: "The task was too exhausting. The payoffs were too low for this difficult task". In the moderate effort condition, most subjects think that "[t]he experiment was fun and the payoffs were fair". Finally, in the endowed condition some subjects think that the experiment was too short but most of them describe the experiment as "cool".

An implication for future research is that experimenters should be aware of how subjects receive their income. Perceived effort of the experimental task considerably influences results. In our experiment, we find a significant marginal effect of perceived effort of considerable size (cf. section 5.3). Another important issue (at least in the area of tax compliance experiments) is that there are a number of subject-specific characteristics one needs to control for in order to get a clear picture of what drives tax evasion. Our regressions in section 5 and the description of our control variables in Appendix A can serve as a suggestion for future research on tax compliance.

Future experiments can try to generalize our findings to different subject pools, different tax systems, and different tasks.

We chose a convenient sample in our lab experiment as students are likely to fully understand the instructions and are generally homogeneous across treatments (Peterson, 2001). Furthermore, Alm et al. (2010) do not find any differences in tax behavior of students and "real taxpayers". Our recruiting software ensured a mixture of participants with different majors.

We tried to keep the tax declaration as simple as possible in order to focus on the effect of effort on tax evasion. Yet more realistic (and complex) tax systems can be implemented – e.g. taxes can be donated to charity organizations (Anderhub et al. 2001), part of the taxes can be used to finance a public good for the subjects, taxes can be reallocated among subjects, the probability of detection can be endogenous, and tax rates can be dependent on income. A progressive tax regime should emphasize our Hypothesis 1b even more.

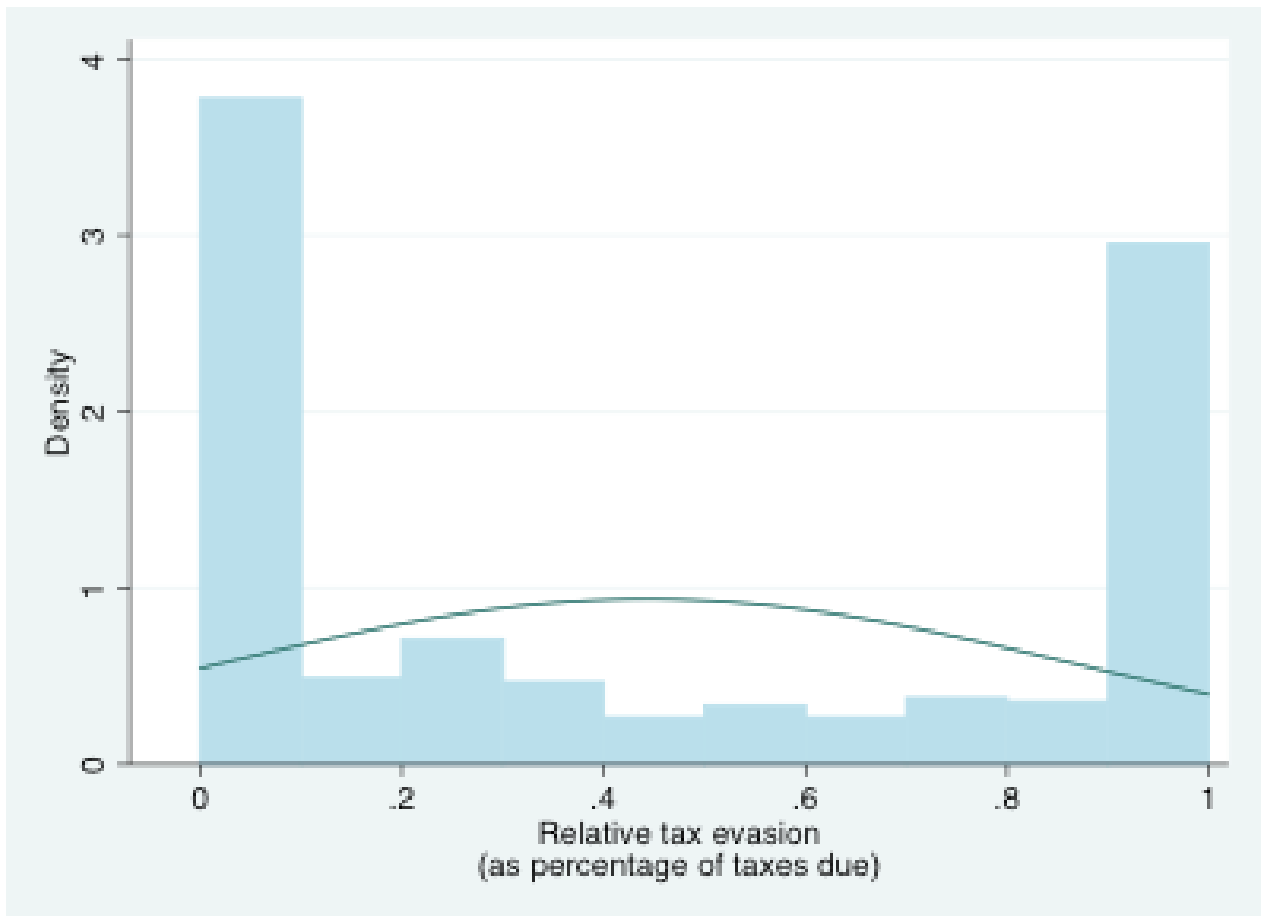
We could confirm the positive characteristics that Abeler et al. (2011) attributed to the counting task. We were able to effectively vary the perceived effort and there were only little differences across subjects with regard to their performance. However, future research can try to find tasks that relate (even) more to everyday work.

As a policy implication of our experiment, we suggest tax authorities to pay attention to tax declarations of endowed income (e.g. heritages) and to pay special attention to declarations of incomes that require hard work - probably a typical characteristic of industries like the construction sector. According to our results, we should expect the highest tax compliance in sectors with a moderate amount of work and wages that are perceived to be fair. This might be true for the middle management of small and medium-sized enterprises. Further, tax declarations of people who were caught cheating in previous years should be checked again in the next year(s): Our results suggest that those people are motivated to cheat again - probably in order to compensate the previous fine and break even.

Appendix A: Control Variables

| Variable name | Short description | Source(s) |
|---------------------|--|--|
| Risk classification | Participants' risk aversion; Measured with 10 paid lottery choices from which risk aversion can be directly derived. Holt and Laury (2002) sum up the number of relatively safe choices to measure risk aversion (0: highly risk seeking, 10: highly risk averse). | Holt and Laury (2002) |
| Tax morale | General attitude towards paying taxes; Measured with eight attitudinal items scaled from 1 to 5 (1: very low tax morale, 5: very high tax morale) that are partly based on Braithwaite and Ahmed (2005); The mean of the answers is used as a single indicator (Cronbach's $\alpha=0.74$). | Braithwaite and Ahmed (2005) |
| Effort norm | Prescriptive Effort Norm Scale; Measured with five items scaled from 1 to 5 (1: low value of effort, 5: high value of effort) that assess whether participants think that people who invest effort should be admired; The mean of the answers is used as a single indicator (Cronbach's $\alpha=0.69$). | McCrea et al. (2008) |
| Social desirability | Participants' tendency to answer/ behave in a socially desired way; Measured with ten items that can be answered with yes or no, taken from the Crowne and Marlowe (1960) scale; The German version was adopted from Stocké (2003); Yes-answers are summed up. | Crowne and Marlowe (1960); Stocké (2003) |
| Income | Gross round income | --- |
| Age | Self-reported age | --- |
| Gender | Dummy variable: 0=Male, 1=Female | --- |
| Fined | Dummy variable: 0=Not fined in previous round, 1=Fined in previous round | --- |

Appendix B: Distribution of Relative Tax Evasion



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