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Mental Accounting in Tax Evasion Decisions –
An Experiment on Underreporting and Overdeducting*

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Abstract

Although there is already a variety of papers analyzing tax evasion decisions, only little focus is put on tax evasion of gains and losses. As taxpayers can evade taxes by either underreporting their income or by overdeducting expenses, we study whether there is a significant difference if subject are confronted with a gain or a loss scenario. We find that individuals evade more in the first than in the latter case. As a consequence, subjects are more willing to evade taxes by underreporting income than by overdeducting expenses. We show that this finding can be explained by mental accounting and an asymmetric evaluation of tax payments and tax refunds. Our result is robust to treatment variation. However, if individuals have to complete only one tax declaration (but still decide on gains and losses) and we therefore expect subjects to use only one mental account, the effect vanishes. This provides strong evidence that mental accounting plays an important role in tax evasion decisions. Further results are presented and discussed.

Keywords

tax evasion, tax compliance, prospect theory, mental accounting, behavioral taxation, experimental economics

JEL-Classification

C91, D14, H24

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1 Introduction

Although there is already a variety of papers analyzing tax evasion decisions, only little focus is put on tax evasion of gains *and* losses. Up to now, studies mainly look at tax evasion decisions in which taxpayers are confronted with a positive income that has to be declared. However, in reality the tax declaration decision is not only composed by one dimension since taxpayers can evade taxes by either underreporting their income or by overdeducting expenses. In our paper, we want to analyze both dimensions and study whether there is a significant difference in tax evasion behavior if subject are confronted with a gain or a loss scenario.[1] Although the literature related to this research question is rather small, some papers give evidence for an asymmetric tax evasion behavior. Chang et al. (1987), for example, find that participants' behavior of tax evasion depends on whether taxes are framed as losses or reduced gains. Schepanski and Shearer (1995), Elffers and Hessing (1997) and Yaniv (1999) show that tax compliance behavior depends on whether the taxpayer is confronted with a tax payment or with a tax refund. Whereas in the first case subjects are likely to evade more taxes, subjects reveal lower tax evasion levels in the tax refund case. Torgler et al. (2008) reveal that tax morale has a greater impact on underdeclaration than on overdeduction. As a consequence, higher tax morale reduces tax evasion more in a gain than in a loss scenario. Torgler (2013) finds that people evade more taxes by deducting tax credits than by reporting income or wealth. In contrast to this finding, Kirchler and Maciejovsky (2001) find for self-employed that, while tax payments in a gain situation reduce tax compliance, tax refunds in a loss situation increase tax compliance.

With our study, we shed further light on this discussion. For this purpose we conduct a laboratory experiment with 84 participants. In each decision situation subjects are confronted with a gain scenario (i.e., income) and a loss scenario (i.e., expense) and have to make a tax evasion decision in each of the two cases. Our main results are threefold: First, we find that individuals evade more in the gain than in the loss scenario (Baseline treatment). As a consequence, subjects are more willing to evade taxes by underreporting income than by overdeducting expenses. We argue that this finding can be explained by an asymmetric evaluation of tax payments (i.e., losses) and tax refunds (i.e., gains) in accordance with prospect theory (Kahneman and Tversky, 1979).

[1] In our study, we use the words "expense" and "loss" synonymously. If a complete and unrestricted loss offset is provided (as we utilize in our experiment), the isolated tax effects of expenses and losses are identical. In both cases a taxpayer would receive a tax refund.

Second, our result is robust to a treatment variation in which the payoffs of the gain and loss scenario are aggregated (Aggregation treatment). From a theoretical perspective, in this modification it is irrelevant whether an individual evades taxes through underreporting gains or overdeducting losses. However, the design is modelled in such a way that the presented gain is clearly separated from the loss. Taking the literature on mental accounting (Thaler, 1985) into consideration, this setting initiates individuals to use two separate mental accounts for the gain and loss scenario resulting in the observed divergent tax evasion behavior. Third, if individuals have to complete only one tax declaration in which they still decide on reporting gains and deducting losses, but in which only one common taxable basis is calculated (One Tax Declaration treatment), we expect subjects to use only one mental account. Therefore, the mental accounting phenomenon does not play a role and no different tax evasion behavior should be observed in the gain and loss scenario. As hypothesized, we show that our initial effect vanishes. This provides strong evidence that mental accounting plays an important role in tax evasion decisions.

The remainder of the paper is organized as follows: In section 2, we provide a literature review on tax evasion related to our research question. In section 3, we describe our first experiment (i.e., the Baseline treatment), derive our hypothesis and present the results of this experiment. In section 4, we conduct our second experiment (i.e., Aggregation and One Tax Declaration treatment). Our results are summarized and discussed in section 5.

2 Literature

The literature on tax evasion is broad and manifold. Initiated by the seminal paper of Allingham and Sandmo (1972), the traditional focus in literature is based on tax parameters which influence tax evasion decisions. Many experiments are conducted which prove that penalty payments are negatively correlated to tax evasion decisions. Alm et al. (1995) find that with moderate or high audit probabilities, tax compliance increases. Further experiments such as Maciejovsky et al. (2001), Feld and Tyran (2002) and Cummings et al. (2009) support these results. Corresponding results are found for the impact of audit probability on tax evasion rates. Laboratory experiments such as Spicer and Thomas (1982), Beck et al. (1991), Alm et al. (1995), Maciejovsky et al. (2001), Cummings et al. (2009), Fortin et al. (2007) and Gërxhani and Schram (2006) reveal that an increasing audit rate leads to a decrease in tax evasion. These results are confirmed by data analysis. For example, Witte and Woodbury (1985) find that decreasing audit rates in the U.S. in the 1970s may have caused an increase in tax evasion. Similar results were presented by Dubin and Wilde (1988) who analyzed tax compliance with the 1969 IRS data set. Slemrod et al. (2001) evaluate the data of a controlled field experiment in Minnesota in which one group of taxpayers was informed about an upcoming tax audit. They discover that tax payments in this group rise for low and middle-income taxpayers in contrast to former year, whereas it fell for high-income taxpayers. Another focus is put on the influence of tax rate's height on tax evasion decisions. For tax rates the results of laboratory experiments are mixed. On the one hand, Friedland et al. (1987) and Collins and Plumlee (1991) show that an increasing tax rate leads to a rise in tax evasion. On the other hand, experimental studies of Beck et al. (1991) and Alm et al. (1995) find opposing results. They detect that there is a negative relation between the development of the tax rate and tax evasion decisions.[2]

Within the last twenty years a new focus was put in tax evasion literature. Among others, several studies show that social norms such as fairness and reciprocity play an important role in tax evasion decisions. For detailed overviews on tax compliance determinants see Alm et al (1995), Torgler (2002) and Hofmann et al. (2008). Further studies which proposed the question on why do people pay taxes reveal additional explanation for tax compliance behavior. Dhami and al-Nowaihi (2007) answer that question by first outlining that under common expected utility theory it cannot be explained why individuals are that tax compliant regarding actual audit probabilities and penalty rates. Thus, they prove in a second step that the alternative prospect theory provides considerable better explanation for tax compliance. Prospect theory was first introduced by Kahneman and Tversky (1979). Within this theory individual's choice is explained by a value function which combines three essential properties: It is defined around a reference point that divides gains and losses. Furthermore, the value function is concave for gains and convex for losses, thus representing individual's risk aversion for gains and risk-seeking for losses. Last, the function is steeper for losses than for gains as a loss is more harmful than a gain of the same size is advantageous (loss aversion). Kahneman and Tversky (1979) also show that individuals overweight small probabilities while underweighting larger ones. This overestimation that can also be applied on audit probabilities as well as loss aversion is the main explanation for tax compliance by Dhami and al-Nowaihi (2007). In this context, Alm et al. (1992) have demonstrated in an

2 As we are limited in presenting the whole literature on tax evasion and tax compliance, we recommend the paper of Andreoni et al. (1998) who describe the major theoretical and empirical findings for the elder literature, as well as of Alm (2012) who gives an overview of literature focusing on the question of measuring, explaining and controlling tax evasion.

experimental study that tax compliance occurs as their participants overweight the small probability of tax audit.

Within the context of prospect theory, there are numerous studies that explore the impact of tax payments on tax compliance. Chang et al. (1987), for example, hypothesize that participant's behavior of tax evasion depends on whether taxes are framed as losses or reduced gains. They conduct a laboratory experiment and detect that if tax payments are modelled as pure losses, participants are more risk-seeking by evading significantly more taxes. On the other hand, if tax payments are presented as reduced gains, individuals evade less taxes. Furthermore, Schepanski and Shearer (1995), Elffers and Hessing (1997) and Yaniv (1999) all argue that individuals who pay too much tax in advance are more compliant than those who pay too few taxes beforehand. This withholding phenomenon can be explained by the value function of prospect theory. If too much money as prepaid tax is withheld, individuals receive a tax refund at the year-end. This tax refund is regarded as a gain if the subject's reference point is its current asset position. Prospect theory predicts individuals to be risk-averse in a gain situation, thus they become more tax compliant. Opposing that, individuals who paid too few taxes in advance have to pay additional taxes at the year-end. Hence, they view further tax payments as losses and become risk-seeking, i.e. less tax compliant. These assumptions were proven by Schepanski and Shearer (1995) in a laboratory experiment and they provide evidence for these arguments. Furthermore, Elffers and Hessing (1997) find support for the theory that over-withholding leads to higher tax compliance. Yaniv (1999) applied a model to prove that sufficiently high prepaid taxes may induce a full compliance. These three studies which analyze the withholding phenomenon all argue that tax refunds, which occur due to the over-withholding of taxes, are perceived as gains rather than as losses. Although the individual still pays a reduced tax in total, she no longer detects this tax payment as a loss, but rather as a gain.

Although there is already a moderate number of literature on tax evasion of gains and losses in the context of tax withholding, only little focus is put on tax evasion of real gains and losses yet. As taxpayers can evade taxes by either underreporting their income or by overdeducting expenses, it is investigated whether there is a significant difference in tax evasion depending on the method of evasion. According to Torgler (2013) who examined Swiss taxpayers' underdeclaration of income and wealth and the overdeduction of tax credits in a field experiment, there is a discrepancy in the taxpayers' tax compliance concerning profits and losses. He finds that people evade more taxes by deducting tax credits than by reporting income or wealth. In another study, Torgler et al. (2008) investigate actual tax evasion behavior by analyzing data of the TOS that was conducted in the United States in 1987. He reveals that tax morale has a greater impact on underdecleration than on overdeduction. Thus, higher tax morale reduces tax evasion more in a gain than in a loss scenario. Though, the voluntariness to participate at this survey, the sensitivity of the topic of tax evasion and the probable unawareness of participants that they indeed illegally paid too few taxes, may lead to limitations of the results. Kirchler and Maciejovsky (2001) conduct an experiment with self-employed and business entrepreneurs in Austria to analyze tax compliance within the context of gains and losses as well as of the expected and current asset position. In contrast to Torgler (2013), they find for self-employed that, while tax payments in a gain situation reduce tax compliance, tax refunds in a loss situation increase tax compliance.

3 Experiment 1: Baseline Treatment

3.1 Experimental Design

Subjects have to make tax evasion decisions for ten independent periods.[3] In each of the ten periods, every participant receives a gain ($G_a \geq 0$) *and* a loss ($L_a \leq 0$) which are randomly drawn between 0 and 1,000 Lab-points and between 0 and -1.000 Lab-points respectively whereat only integer numbers appear.[4] Since both values are independently drawn, the amount in the gain scenario can either be greater than, equal to, or less than the (absolute) amount in the loss scenario. The individual has to make two independent choices on the given gain and loss in each period. In both cases, the subject decides on how much of this gain/loss she wants to declare. This decision task can be regarded as completing two separate tax declarations. In appendix A2, figure A1 gives an exemplary screenshot for this decision stage in the *Baseline* treatment.

In the gain scenario, a tax is raised with a rate (τ) of 50% based on the reported gain ($G_r \geq 0$), so that the tax payment T_G can be calculated as $T_G = G_r \cdot \tau \geq 0$. With a probability of $p = 0.3$, the reported gain is audited. If the subject is caught cheating, she has to pay a penalty (F_G) that is twice the evaded tax (i.e., $F_G = 2 \cdot \tau \cdot (G_a - G_r) \geq 0$). If the subject is not caught cheating, no consequences occur. Thus, the subject's payoff (P_G) in one period equals

3 The instructions of all treatments (used in our experiment) are available in appendix A1.

4 In order to abstract and simplify monetary values, we use Lab-points as currency units whereas 1 Lab-point exactly corresponds to 0.01 Euro.

$$P_G = G_a - G_r \cdot \tau \geq 0 \quad (1)$$

if no audit occurs and equals

$$P_G = G_a - G_r \cdot \tau - 2 \cdot \tau \cdot \left(G_a - G_r\right) \geq 0 \quad (2)$$

if an audit occurs in the gain scenario.

In the loss scenario, a tax refund is paid based on the reported loss ($L_r \leq 0$). The tax refund can be seen as a negative tax and is calculated as $T_L = L_r \cdot \tau \leq 0$. As we grant a complete loss offset, it holds that the higher the declared loss, the higher the tax refund. The rules on audit probability ($p = 0.3$), tax rate ($\tau = 0.5$), and penalty ($F_L = 2 \cdot \tau \cdot \left(L_a - L_r\right) \geq 0$) equal the ones in the case of a gain. The payoff of the period in the loss scenario (P_L) is therefore given by

$$P_L = L_a - L_r \cdot \tau \leq 0 \quad (3)$$

if no audit occurs and

$$P_L = L_a - L_r \cdot \tau - 2 \cdot \tau \cdot \left(L_a - L_r\right) \leq 0 \quad (4)$$

if an audit occurs.[5]

Table 1 presents an example for both scenarios for the case with and without an audit, respectively. Notice that two payoffs are calculated separately in each period (one payoff for the gain and one for the loss scenario) in the Baseline treatment. However, if an audit occurs, both the reported gain and loss are verified. Therefore, either no penalty is raised at all (no audit occurs) or a penalty is raised for both the gain and loss case (audit occurs) if an

[5] In the experiment subjects are confronted with some restrictions. In the gain scenario, the reported gain (G_r) has to be at least zero and may not exceed the actual gain (G_a), i.e. $0 \leq G_r \leq G_a$. The restriction $G_r \geq 0$ is applied to ensure that a subject does not report a loss in the gain scenario and is applied to avoid a negative tax burden (i.e., $T_G < 0$). The restriction $G_r \leq G_a$ is introduced to avoid a negative payoff (i.e., $P_G < 0$) in the case without an audit and to avoid negative penalties (i.e., $F_G < 0$) in the case with an audit. In line with the restrictions in the gain scenario, we limit the reported loss to: $\left|L_a\right| \leq \left|L_r\right| \leq \left|2 \cdot L_a\right|$ and $L_r, L_a \leq 0$. The restriction $L_r \leq 0$ is applied to ensure that a subject does not report a gain in the loss scenario and is applied to avoid a negative tax refund or, in other words, to avoid a positive tax burden (i.e., $T_G > 0$) in the loss scenario. The restriction $\left|L_a\right| \leq \left|L_r\right|$ is applied to avoid negative penalties (i.e., $F_L < 0$) in the case of an audit. The restriction $\left|L_r\right| \leq \left|2 \cdot L_a\right|$ is used to avoid a positive payoff (i.e., $P_L > 0$) in the case without an audit and ensures that the initial endowment (see below) is sufficient to compensate the highest potential loss in the case with an audit in the loss scenario.

individual evades taxes in both scenarios. If an individual evades only in one scenario and an audit occurs, the penalty is raised only in this scenario.

[Table 1]

The participant's payment is incentive based. At the beginning of the experiment each subject is provided with an initial endowment of 10 Euro. The resulting payoff from the experiment is offset against this initial endowment. To determine this payoff, the computer decides randomly which of the ten periods is relevant for the participant's payment at the end of the experiment. Thereafter, each participant has to throw a six-sided dice for deciding whether the gain or the loss scenario is decisive for the payment. If the numbers 1, 2, or 3 occur, the gain scenario is decisive. Otherwise, the loss scenario is decisive. The payoff of the relevant period in this scenario is converted into Euro and is then reckoned up with the initial endowment of 10 Euro.[6] This total payment is paid out in cash immediately.

At the beginning of each experiment the individuals are granted with two training periods which are not relevant for the final payment. After each period the participant is told on whether she was audited or not. Furthermore she is provided a summary of information, such as the actual and declared gain/loss, tax payment/refund, the after tax profit/loss, penalty and payoff of the period for the gain and loss scenario. In appendix A2, figure A2 gives an exemplary screenshot for this information stage. Although we use a simple setting, each participant receives a pocket calculator and a computerized "what-if"-calculator for own calculations. The latter allows subjects to automatically calculate their after tax income for the case with and without an audit. The experimental software was programmed and conducted with the software z-Tree (Fischbacher, 2007).

3.2 Hypothesis

Initiated by the seminal paper of Kahneman and Tversky (1979), a variety of studies successfully proved a different perception of gains (values above a certain reference point) and losses (values below a certain reference point) which influence the decision process decisively. In particular, subjects are risk-seeking if they are confronted with a loss, but risk-averse if they are confronted with a gain. Furthermore, the subjects' utility function is generally steeper for losses than for gains (loss aversion). Taking these observations into

[6] It was not possible to obtain a negative payoff due to our restrictions made for the reportable gain and loss. Thus, even if the subject is audited, the payoff in a period never deceeds -10 Euro and, therefore, the total payoff (after offsetting against the initial endowment) is at least zero.

account, we expect subjects to reveal a different tax evasion behavior in our experiment depending on whether they are confronted with a gain or a loss.

However, it is not obvious how the subjects will adjust their tax evasion behavior in both cases. If we assume that subjects evaluate the positive income in our gain scenario as a gain and the negative income in our loss scenario as a loss, subjects should be more risk averse in the first than in the latter case. This would lead us to hypothesize that the tax evasion level of the subjects is lower in the gain than in the loss scenario. However, a contrary hypothesis is possible as well. Subjects who face a positive income in our gain scenario have to pay a tax, whereas subjects who face a negative income in our loss scenario receive a tax refund. If we assume that subjects evaluate the tax payment (that reduces their payoff) as a loss and the tax refund (that increases their payoff) as a gain, we would expect them to be more risk seeking in the first than in the latter case. As a consequence, we would hypothesize a higher tax evasion level in our gain scenario (with the tax payment) than in our loss scenario (with the tax refund).

Although a clear prediction cannot be derived from a theoretical perspective, there is much empirical evidence that individuals will evade more taxes in our gain than in our loss scenario. Among others, studies analyzing the withholding phenomenon argue that subjects evade more taxes when they are confronted with a tax payment and evade less when they are confronted with a tax refund (Schepanski and Shearer, 1995, Elffers and Hessing, 1997, and Yaniv, 1999). In line with these results Kirchler and Maciejovsky (2001) show that tax refunds in a loss situation increase tax compliance while tax payments in a gain situation reduce tax compliance. This leads us to our first hypothesis:

Hypothesis 1: *In the Baseline treatment subjects evade more taxes in the gain than in the loss scenario.*

3.3 Sample

The experiment was conducted at the computerized experimental laboratory of the Leibniz University of Hannover with 84 student participants (44 female and 40 male subjects).[7] Each participant was assigned to one treatment only (between-subject design). Subjects earned on average 10.90 Euros in approximately 70 minutes (approximately 9.30 Euros per hour) with a minimum of 2.50 Euro and a maximum of 19.70 Euro. A show-up fee was not paid. At the end of the experiment, participants are asked to answer a questionnaire which collects socio-

[7] The experiment was organized and recruited with the software hroot (Bock et al. 2012).

demographic data and, for example, information on individual risk attitude and tax knowledge. Table 2 provides an overview on the main characteristics.

[Table 2]

3.4 Results

To analyze the tax evasion behavior in our experiment, we use different measures: (1) ratio of tax evasion in the gain scenario, (2) ratio of tax evasion in the loss scenario, (3) ratio of tax evasion difference, and (4) ratio of total tax evasion. The ratio of tax evasion in the gain (loss) scenario E^{gain} (E^{loss}) is calculated by dividing the difference of actual and reported gain (reported and actual loss) by the actual gain (loss):

$$E^{\text{gain}} = \frac{G_a - G_r}{G_a} \geq 0 \tag{5}$$

$$E^{\text{loss}} = \frac{L_r - L_a}{L_a} \geq 0 \tag{6}$$

Both measures equal zero if the income is declared truthfully and are greater than zero if an individual declares her income untruthfully. The ratio of tax evasion difference accounts for the difference between both scenarios and is calculated by subtracting the ratio of tax evasion in the gain scenario from the ratio of tax evasion in the loss scenario:

$$E^{\text{difference}} = E^{\text{gain}} - E^{\text{loss}} \tag{7}$$

To measure the tax evasion behavior on an aggregated level, we divide the aggregation of evaded gain ($G_a - G_r \geq 0$) and evaded loss ($|L_r - L_a| \geq 0$) by the potentially evadable amount ($G_a + |L_a| \geq 0$). Thus, the ratio of total tax evasion is given by:

$$E^{\text{total}} = \frac{G_a - G_r + |L_r - L_a|}{G_a + |L_a|} \geq 0 \tag{8}$$

Table 3 provides the statistic data for all four variables observed in the *Baseline* treatment. On average, subjects evade 36.0% of the potentially evadable amount which is in line with previous experimental studies on tax evasion.[8] The tax evasion level, however, differs between the gain and loss scenario. In the gain scenario, subjects evade 39.3% on average, whereas they only evade 32.7% in the loss scenario. The difference of these ratios is 6.6

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[8] See, for example, Fochmann and Kroll (2014).

percentage points and highly significant with a p-value of 0.001 (Wilcoxon signed-rank test, two-tailed). This implies that on average subjects evade approximately 20% ($= 39.3/32.7$) more in the case of gains. To sum up: In accordance with our expectation, we can show that individuals evade more in the gain than in the loss scenario. Hence, our hypothesis 1 is supported.

[Table 3]

4 Experiment 2: Aggregation and One Tax Declaration Treatment

In the following, we test how robust our finding that individuals evade more in case of gains than in case of losses is with respect to different design modifications. In particular, we first create an environment in which an individual still makes two separate tax evasion decisions for the gain and loss scenario (as in the Baseline treatment), but in which the resulting payoffs of both scenarios are now aggregated at the end of each period (Aggregation treatment). Second, we use an environment in which an individual completes only one tax declaration (One Tax Declaration treatment).

4.1 Treatments

We create two treatments which are very similar to the original baseline setting. In table 4 our modifications are highlighted. The *Aggregation* treatment differs from the *Baseline* treatment inasmuch as the payoffs of the gain and loss scenario are accumulated now in each period. Therefore, the individuals no longer have to throw the dice at the end of the experiment in order to determine which scenario is relevant for their payoff. Instead, their payoff in one period results from the accumulation of the payoffs in the gain and loss scenario in this period.[9] In appendix A3, figure A3 and A4 give exemplary screenshots for the decision and information stage.

Although the payoffs in the gain and loss scenario are aggregated at the end of a period, each individual decides separately how much she wants to declare in the gain scenario and how much she wants to declare in the loss scenario. Therefore, individuals make two separate decisions and are confronted both with paying a tax (gain scenario) and receiving a tax refund (loss scenario). As a consequence, two separate taxable bases still do exist in this setting (as in

[9] Even though the payoffs in the gain and loss scenario are accumulated in one period, it is still valid that only one period is chosen randomly by the computer at the end of the experiment to determine the payment of each individual as in the Baseline treatment.

the Baseline treatment). This can be regarded as completing two separate tax declarations. Formally, the aggregated payoff *P* is given by

$$P = P_G + P_L \,. \tag{9}$$

Compared to the Baseline treatment, we do not change the fiscal parameters (tax rate, penalty, and audit probability) or the audit process. If a participant is audited in a period, her declared gain and her declared loss are both verified as in the Baseline treatment. As a consequence, P_G and P_L presented in equation (1) to (4) are also valid for the Aggregation treatment. Subject's aggregated payoff in one period therefore equals

$$\begin{aligned} P &= \underbrace{G_a - G_r \cdot \tau}_{P_G} + \underbrace{L_a - L_r \cdot \tau}_{P_L} \\ &= G_a + L_a - \tau \cdot \left(G_r + L_r \right) \end{aligned} \tag{10}$$

if no audit occurs and equals

$$\begin{aligned} P &= \underbrace{G_a - G_r \cdot \tau - 2 \cdot \tau \cdot \left(G_a - G_r \right)}_{P_G} + \underbrace{L_a - L_r \cdot \tau - 2 \cdot \tau \cdot \left(L_a - L_r \right)}_{P_L} \\ &= G_a + L_a - \tau \cdot \left(G_r + L_r \right) - 2 \cdot \tau \cdot \left(G_a + L_a - G_r - L_r \right) \end{aligned} \tag{11}$$

if an audit occurs.

Obviously, in both constellations it is arithmetically immaterial in which scenario (gain or loss) taxes are evaded. In other words: It does not matter whether the individual evades taxes through underreporting gains or overdeducting losses. If the participant nevertheless evades more taxes in the gain scenario than in the loss scenario, she might succumbs certain possible biases. From an economic view, this treatment captures the fact that, for example, a firm owner with two companies or a CEO managing two companies is confronted with one company having generated a gain, whereas the other has generated a loss.

In contrast to the previous treatments, participants complete only one tax declaration in the *One Tax Declaration* treatment. Although each subject is confronted with a gain and a loss and has to declare her gain and her loss in each period (as before), the declared gain and the declared loss are now reckoned up to one amount which constitutes the base for the taxation (i.e., tax base equals $G_r + L_r$). Therefore, a subject is not confronted with paying a tax *and* receiving a tax refund as in the previous treatments, but *either* has to pay a tax if the declared gain is greater than the declared loss *or* receives a tax refund if the declared loss is greater than the declared gain.[10] Consequently, as only one common tax base is calculated, there is also only one mutual possible penalty and one payoff of the period. Formally, subject's payoff in one period equals

$$P = G_a + L_a - \tau \cdot \left(G_r + L_r\right) \tag{12}$$

if no audit occurs and equals

$$P = G_a + L_a - \tau \cdot \left(G_r + L_r\right) - 2 \cdot \tau \cdot \left(G_a + L_a - G_r - L_r\right) \tag{13}$$

if an audit occurs. Note that these payoff equations are identical to the corresponding equations (10) and (11) of the Aggregation treatment. Again, it does not matter whether an individual evades taxes through underreporting gains or overdeducting losses. By creating this setting, we control whether the participant's tax evasion behavior is still divergent although the arithmetical irrelevance how to evade taxes is undeniable visible. In contrast to the *Aggregation* treatment, the *One Tax Declaration* treatment accumulates declared gains and losses at such an early stage (before taxes are calculated) that observed cognitive biases should no longer exist in the latter treatment. This setting is economical applied to capture loss offset regulations which are common in most of the tax systems all over the world and which allow offsetting losses against gains.

[Table 4]

4.2 Hypotheses

In the Aggregation and One Tax Declaration treatment it is irrelevant whether the individual evades taxes through underreporting gains or overdeducting losses. Therefore, we should not observe a divergent tax evasion behavior in the gain and loss scenario. However, initiated by Thaler (1985), a variety of papers show that individuals underlie mental accounting and that the decision outcome depends on the mental account in which the decision is made (see, for example, Thaler, 1990, Thaler et al., 1997, and Thaler, 1999). With respect to our setting, mental accounting refers to the idea that individuals use two different mental accounts for their tax evasion decision: one for the gain scenario and one for the loss scenario.

In the Aggregation treatment, the design is modelled in such a way that the presented gains are clearly separated from the losses. This implies that gains and losses are kept isolated up to

[10] In appendix A4, figure A5 and A6 give exemplary screenshots for the decision and information stage in the One Tax Declaration treatment.

the aggregation and that the taxes and possible penalties are calculated individually for each scenario. This setting could lead individuals to use two separate mental accounts for the gain and loss scenario. In other words: Although the payoffs are aggregated at the end, an individual decides on the tax evasion in the gain scenario completely independently from her decision in the loss scenario as she might not have been aware of the subsequent aggregation when making her decision. From this perspective, this creates the same decision environment as in the Baseline treatment. Thus, we should also observe a higher tax evasion level in the gain than in the loss scenario. Our second hypothesis is therefore as follows:

Hypothesis 2: *In the Aggregation treatment subjects evade more taxes in the gain than in the loss scenario.*

In the One Tax Declaration treatment, the tax and possible penalty are only calculated for one common taxable basis for the gain and loss as they are accumulated right after the tax evasion decision. Therefore, there is conspicuously no difference in evading taxes by underreporting gains or overdeducting losses. Compared to the setting in the Aggregation treatment, the arithmetical irrelevance of how to evade taxes is more visible in the One Tax Declaration treatment. Hence, we expect subjects to use only one mental account in this treatment. Thus, the mental accounting phenomenon does no longer play a role. As a consequence, we should not observe a difference between the tax evasion behavior in the gain and loss scenario. Our third hypothesis is:

Hypothesis 3: *In the One Tax Declaration treatment the tax evasion behavior does not differ between the gain and loss scenario.*

4.3 Results

The result observed in the Baseline treatment that individuals significantly evade more taxes by underreporting gains than by overdeducting losses can also be found for the Aggregation treatment (see table 5 and figure 1). Although the level of the ratio of tax evasion difference decreases from 6.6% in the Baseline treatment to 3.2% in the Aggregation treatment, the difference of tax evasion in the gain and loss scenario remains significant at a 1%-level. Hence, the modification that the payoffs of the gain and loss scenario are aggregated so that both scenarios are decisive for the subject’s payment in each period does not cause the participants to change their divergent tax evasion behavior. On average, subjects evade approximately 8.3% ($=41.6/38.4$) more in the gain scenario than in the loss scenario. If we compare the Baseline and Aggregation treatment with respect to each tax evasion measure, we find no significant differences (see table 6). Overall, hypothesis 2 is supported.

In the One Tax Declaration treatment, we find that the difference in the ratio of tax evasion in the gain and in the loss scenario is no longer significant (p = 0.470). This supports our third hypothesis. The mean ratio of tax evasion is 25.7% in the gain scenario and 29.2% in the loss scenario. Thus, we can conclude that the observation that individuals significantly evade more taxes by underreporting gains than by overdeducting losses vanishes completely. If we compare the results of this treatment to the results of the other two treatments (see table 6), we observe that individuals evade significantly less (at least at a 5%-level) in the One Tax Declaration Treatment irrespective of whether we focus on the ratio of tax evasion in gain and loss scenario as well as on the ratio of total tax evasion. If we look at the ratio of tax evasion difference, we observe that this measure is significantly lower (at a 1%-level) in this treatment than in the other two treatments. This indicates that the difference between tax evasion in the gain and loss scenario has decreased significantly in the One Tax Declaration treatment.

[Table 5]

[Figure 1]

[Table 6]

In addition to the non-parametric tests, we run OLS regressions with the ratio of tax evasion difference as the dependent variable. To analyze the influence of our treatment variation, we use two dummy variables for each treatment. Each variable takes the value of 1 if the decision was made in the respective treatment (0 otherwise). In our model 1, we regress on these two dummy variables whereby the *Baseline* treatment serves as reference group. The results are presented in table 7 (robust standard errors in parentheses clustered at the subject level).[11] In line with our previous observations, we find a significant influence of the One Tax Declaration treatment dummy on the ratio of tax evasion difference, but not for the Aggregation treatment dummy.

In our model 2, we control for game specific and individual characteristics. Therefore, the following variables are additionally included: "last period audit" (1 if a subject was audited in the previous period, 0 otherwise), "what-if-calculations" (number of "what-if"-calculations, i.e., how often a subject used the computerized "what-if"-calculator in this period), "period"

[11] Besides these OLS regressions with robust standard errors clustered at the subject level, we also run panel regressions with random effects. The results observed are in line with the OLS results.

(gives the current period in the experiment), “gender” (female = 0, male = 1), “economics major” (1 if the subject studies economics or management, 0 otherwise), “degree” (1 if the subject studies in a bachelor’s degree program, 0 otherwise), “tax declaration” (1 if the subject completed at least one tax declaration on his own, 0 otherwise), “number of semesters”, “age”, “risk attitude” (gives the subject’s self-reported willingness to take risk, measured on an 11-point scale where 0 = not willing to take risk and 10 = highly willing to take risk), “income” (monthly income after fixed costs), “tax knowledge” (gives subject’s self-reported tax knowledge, measured on an 7-point scale where 1 = no knowledge and 7 = broad knowledge). Again, the coefficient of the One Tax Declaration treatment dummy is highly significant, but not the coefficient of the Aggregation treatment dummy. With respect to the other variables, only the variables “what-if-calculations” and “income” have a significant positive effect on our dependent variable on a 5%-level and 10%-level, respectively.

[Table 7]

Since the actual gain and loss are determined independently from each other in each period, the actual gain can be either equal, greater, or less than the absolute value of the actual loss. In the following, we will analyze tax evasion behavior with respect to the relation of actual gain and loss ($G_a \geq |L_a|$ or $G_a < |L_a|$). The analysis’ results can be found in table 8. Figure 2 depicts the mean ratio of tax evasion difference. In all constellations in which we observe significant differences between both relations ($G_a \geq |L_a|$ versus $G_a < |L_a|$), we find that individuals evade more in the $G_a \geq |L_a|$ relation than in the $G_a < |L_a|$ relation. This result holds irrespectively of whether we focus on E^{total}, E^{gain} or E^{loss}.

Our previous finding that individuals evade more in the gain than in the loss scenario (i.e., $E^{gain} > E^{loss}$) is also observed in the $G_a < |L_a|$ relation. In all treatments – even in the One Tax Declaration treatment – we find significant differences. However, in the $G_a \geq |L_a|$ relation, there is no significant difference between the ratio of tax evasion in the gain and loss scenario in the Baseline and Aggregation treatment. In contrast, we find a highly significant difference in the One Tax Declaration treatment (p = 0.003, Wilcoxon signed-rank test, two-tailed). However, we observe the opposite direction since individuals reveal a higher tax evasion level in the loss (35.2%) than in the gain (24.1%) scenario in this relation. Interestingly, the different decision pattern between the $G_a \geq |L_a|$ and $G_a < |L_a|$ relation in the One Tax

Declaration treatment was not caused by a change of the ratio of tax evasion in the gain scenario. This variable remains relatively constant at a rate of 24.1% and 26.9% whereby no statistically significant difference is observed. Instead, it is caused by a substantial difference within the tax evasion behavior in the loss scenario. While the ratio is low if $G_a < |L_a|$ (23.9%, thus lower than the ratio of tax evasion in the gain scenario of 26.9%), it is significantly higher if $G_a \geq |L_a|$ (35.2%, thus higher than the ratio of tax evasion in the gain scenario of 24.1%).

To wrap up: In the Baseline and Aggregation treatment in which individuals evade significantly more in the gain than in the loss scenario on an aggregated level, we observe this significant difference only in the $G_a < |L_a|$ relation. In the One Tax Declaration treatment, however, in which we did not find this significant result on an aggregated level, we observe a significantly higher tax evasion level in the gain than in the loss scenario in the $G_a < |L_a|$ relation. In contrast, individuals evade significantly more in the loss than in the gain scenario if $G_a \geq |L_a|$. This substantial difference is caused by a significantly higher tax evasion of losses in the $G_a \geq |L_a|$ than $G_a < |L_a|$ relation whereas the tax evasion of gains remains almost constant in both relations.

[Table 8]

[Figure 2]

5 Summary and Discussion

People can evade taxes by either underreporting their income, i.e. declaring less than their actual income, or by overdeducting expenses, i.e. declaring more than their actual expenses. Up to now, there is no experimental literature that examines whether the tax evasion behavior is different in both cases. Hence, we provide a tax evasion experiment that allows us to investigate this question. Individuals are confronted with a positive income (our gain scenario) where they have to pay a tax as well as with a negative income (our loss scenario) where they receive a tax refund. Our main result is that subjects are more willing to evade taxes by underreporting income than by overdeducting expenses. We argue that this finding can be explained by an asymmetric evaluation of tax payments and tax refunds. In accordance with prospect theory and the literature on the withholding phenomenon, we expect subjects to perceive a tax payment (that reduces their payoff) as a loss and a tax refund (that increases their payoff) as a gain. Consequently, we hypothesize (and observe) that subjects are more risk seeking and, therefore, reveal a higher tax evasion level in the first than in the latter case.

This result is robust to a treatment variation in which the payoffs of the gain and loss scenario are aggregated (Aggregation treatment). Although it is arithmetically irrelevant in which scenario the tax evasion takes place, subjects still evade more taxes by underreporting gains than by overdeducting losses. We argue that mental accounting is responsible for this divergent behavior. Since the design is modelled in such a way that the tax evasion decision in the gain scenario is clearly separated from the decision in the loss scenario, this setting could lead individuals to use two separate mental accounts (one for the gain and one for the loss scenario). In other words: Although the payoffs are aggregated at the end, an individual makes both tax evasion decisions completely independently from each other. If we take the initial asymmetric evaluation of tax payments and tax refunds into account, a higher tax evasion level in the gain scenario is to be expected (and observed) even in the Aggregation treatment.

If individuals have to complete only one tax declaration in which only one common taxable basis is calculated (One Tax Declaration treatment), subjects will be more aware of the irrelevance in which scenario the tax evasion takes place. Although there is no arithmetical difference to the Aggregation treatment, we expect subjects to use only one mental account in this treatment. Therefore, mental accounting should not matter here and no different tax evasion behavior should be observed in the gain and loss scenario. As hypothesized, we show that our initial effect vanishes. All in all, our study provides strong evidence for mental accounting playing an important role in tax evasion decisions.

Since the actual gain and loss are determined independently from each other in each period, we distinguished between the relations in which the actual gain is equal to or greater than the absolute value of the actual loss ($G_a \geq |L_a|$) and lower ($G_a < |L_a|$). If we observed significant differences between both cases in our data, we find that individuals evade more in the first than in the latter relation. Interestingly, in the Baseline and Aggregation treatment in which individuals evade more taxes by underreporting gains than by overdeducting losses on an aggregated level, we observe a significant difference only in the $G_a < |L_a|$ relation. Although we do not find this significant result on an aggregated level in the One Tax Declaration treatment, we observe that participants are more likely to evade taxes by underreporting gains if $G_a < |L_a|$, while they are more likely to evade taxes by overdeducting losses if $G_a \geq |L_a|$. This substantial difference is caused by a significantly higher level of overdeducting losses in the $G_a \geq |L_a|$ than $G_a < |L_a|$ relation whereas the level of underreporting gains remains almost constant in both cases.

Our experiment is unique in its object of study and reveals important information for politics and behavioral economics. We show that individuals evaluate tax payments and tax refunds asymmetrically and show that individuals may underlie mental accounting when making tax evasion decisions. Furthermore we find that individuals are more willing to evade taxes if confronted with gains than with losses. Thus, tax authorities are advised to pay more attention to the reporting of gains than to the deduction of losses.

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Table 1: Example

	gain scenario		loss scenario	
	no audit	**audit**	**no audit**	**audit**
actual gain/loss	600	600	-400	-400
reported gain/loss	350	350	-650	-650
tax	175	175	-325	-325
penalty	---	250	---	250
payoff	425	175	-75	-325

Note: This table provides an example for the calculation of the payoff in both scenarios for the case with and without an audit.

Table 2: Descriptive statistics for individual characteristics

	mean	median	standard deviation
female	52.38%		
economics major	27.38%		
bachelor's degree	71.43%		
exp. in tax declaration	23.81%		
no. of semesters studied	5.08	5.00	3.43
age	23.79	23.00	5.10
risk attitude	4.24	3.00	2.38
income (in Euro)	281.25	275.00	163.61
tax knowledge	2.46	2.00	1.40

Note: This table provides an overview on the individual characteristics of the 84 participants of the experiment. "Economics major" ("bachelor's degree") denotes whether a subject studies economics or management (in a bachelor's degree program). "Exp. in tax declaration" mirrors whether a participant ever did prepare its tax declaration. "Risk attitude" gives subject's self-reported willingness to take risk (measured on an 11-point scale where 0 = not willing to take risk and 10 = highly willing to take risk). "Income" is the monthly income after fixed cost. "Tax knowledge" displays the individual's self-reported proficiency concerning taxes (metered on a 7-point scale where 1 = no knowledge and 7 = wide knowledge).

Table 3: Tax evasion behavior in the Baseline treatment

statistics	**ratio of total tax evasion** (E^{total})	**ratio of tax evasion in gain scenario** (E^{gain})	**ratio of tax evasion in loss scenario** (E^{loss})	**ratio of tax evasion difference** ($E^{\text{difference}}$)
mean	0.360	0.393	0.327	0.066
median	0.246	0.299	0.132	0
standard deviation	0.359	0.397	0.390	0.372
minimum	0	0	0	-1
maximum	1	1	1	1
no. of subjects	34	34	34	34
no. of observations	340	340	340	340
Wilcoxon signed-rank test		p = 0.001		

Note: This table presents the descriptive statistics for the tax evasion behavior in the Baseline treatment. The Wilcoxon signed-rank test (non-parametric tests for dependent samples, two-tailed) analyzes whether two population mean ranks differ. Here the difference between the ratio of tax evasion in the gain and loss scenario is statistically analyzed.

Table 4: Treatment variations

<table>
<tr><th>treatment</th><th>payoff aggregation</th><th>number of tax declarations</th></tr>
<tr><td>Baseline</td><td>no aggregation of the payoffs of the gain and loss scenario</td><td rowspan="2">2 tax declarations</td></tr>
<tr><td>Aggregation</td><td rowspan="2">aggregation of the payoffs of the gain and loss scenario</td></tr>
<tr><td>One Tax Declaration</td><td>1 tax declaration</td></tr>
</table>

Note: This table highlights the differences between all three treatments.

Table 5: Tax evasion behavior in all treatments

treatment	statistics	ratio of total tax evasion (E^{total})	ratio of tax evasion in gain scenario (E^{gain})	ratio of tax evasion in loss scenario (E^{loss})	ratio of tax evasion difference ($E^{\text{difference}}$)
Baseline	mean	0.360	0.393	0.327	0.066
	median	0.246	0.299	0.132	0
	standard deviation	0.359	0.397	0.390	0.372
	minimum	0	0	0	-1
	maximum	1	1	1	1
	no. of subjects	34	34	34	34
	no. of observations	340	340	340	340
	Wilcoxon signed-rank test		p = 0.001		
Aggregation	mean	0.390	0.416	0.384	0.032
	median	0.279	0.251	0.221	0
	standard deviation	0.387	0.435	0.410	0.342
	minimum	0	0	0	-1
	maximum	1	1	1	1
	no. of subjects	23	23	23	23
	no. of observations	230	230	230	230
	Wilcoxon signed-rank test		p = 0.009		
One Tax Declaration	mean	0.260	0.257	0.292	-0.035
	median	0.068	0.009	0.010	0
	standard deviation	0.348	0.366	0.395	0.295
	minimum	0	0	0	-1
	maximum	1	1	1	0.893
	no. of subjects	27	27	27	27
	no. of observations	270	270	269	269
	Wilcoxon signed-rank test		p = 0.470		

Note: This table presents the descriptive statistics for the tax evasion behavior in all three treatments. The Wilcoxon signed-rank test (non-parametric test for dependent samples, two-tailed) analyzes whether two population mean ranks differ. Here the difference between the ratio of tax evasion in the gain and loss scenario is statistically analyzed in each treatment. There is one observation missing for the ratio of tax evasion in the loss scenario in the One Tax Declaration treatment. This is due to the division of the terms described in section 3.4 through an actual loss of zero.

Table 6: Differences between the treatments

Treatment	Aggregation				One Tax Declaration			
	ratio of total tax evasion (E^{total})	**ratio of tax evasion in gain scenario** (E^{gain})	**ratio of tax evasion in loss scenario** (E^{loss})	**ratio of tax evasion difference** ($E^{difference}$)	**ratio of total tax evasion** (E^{total})	**ratio of tax evasion in gain scenario** (E^{gain})	**ratio of tax evasion in loss scenario** (E^{loss})	**ratio of tax evasion difference** ($E^{difference}$)
Baseline	-0.030 (0.892)	-0.022 (0.894)	-0.057 (0.592)	0.035 (0.809)	0.100*** (0.000)	0.137*** (0.000)	0.035** (0.022)	0.102*** (0.003)
Aggregation					0.130*** (0.001)	0.159*** (0.000)	0.092** (0.017)	0.067*** (0.008)

Note: This table shows the mean differences between the treatments for each tax evasion variable. The differences are derived from table 5. For example, the value in the first cell, -0.030, is given by the following calculation: ratio of total tax evasion in the Baseline treatment (0.360) minus ratio of total tax evasion in the Aggregation treatment (0.390). Each number in brackets presents the two-tailed p-value resulting from a Mann-Whitney U test. For each tax evasion measure, this non-parametric test analyzes statistically whether the measure differs between two treatments. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Table 7: Linear regressions (dependent variable: ratio of tax evasion difference)

	model 1	model 2
Aggregation treatment	-0.0346	-0.0612
	(0.0429)	(0.0452)
One Tax Declaration treatment	-0.1019***	-0.1267***
	(0.0361)	(0.0390)
last period audit		-0.0020
		(0.0309)
what-if-calculations		0.0170**
		(0.0073)
period		0.0055
		(0.0038)
gender		-0.0055
(female = 1)		(0.0386)
economics major		0.0163
(major in economics = 1)		(0.0355)
degree		0.0037
(bachelor = 1)		(0.0424)
tax declaration		-0.0679
(tax declaration completed = 1)		(0.0432)
number of semesters		0.0009
		(0.0049)
age		-0.0030
		(0.0039)
risk attitude		-0.0054
		(0.0077)
income		0.0002*
		(0.0001)
tax knowledge		0.0013
		(0.0154)
constant	0.0665**	0.1059
	(0.0276)	(0.1273)
no. of observations	839	839
no. of subjects	84	84
R-squared	0.016	0.046

Note: In this table, the results of linear regression analyses are presented with the ratio of tax evasion difference as dependent variable (regression coefficients, robust standard errors in parentheses clustered at the subject level). To analyze the influence of our treatment variation, we use two dummy variables for each treatment. Each variable takes the value of 1 if the decision was made in the respective treatment (0 otherwise). In our model 1, we regress on these two dummy variables whereby the Baseline treatment serves as reference group. In our model 2, we control for game specific and individual characteristics. Therefore, the following variables are additionally included: “last period audit” (1 if a subject was audited in the previous period, 0 otherwise), “what-if-calculations” (number of “what-if”-calculations, i.e., how often a subject used the computerized “what-if”-calculator in this period), “period” (gives the current period in the experiment), “gender” (female = 0, male = 1), “economics major” (1 if the subject studies economics or management, 0 otherwise), “degree” (1 if the subject studies in a bachelor’s degree program, 0 otherwise), “tax declaration” (1 if the subject completed at least one tax declaration on his own, 0 otherwise), “number of semesters”, “age”, “risk attitude” (gives the subject’s self-reported willingness to take risk, measured on an 11-point scale where 0 = not willing to take risk and 10 = highly willing to take risk), “income” (monthly income after fixed costs), “tax knowledge” (gives subject’s self-reported tax knowledge, measured on an 7-point scale where 1 = no knowledge and 7 = broad knowledge). *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Table 8: Tax evasion behavior with respect to the gain-loss-relation

treatment	**statistics**	**actual gain ≥ |actual loss|** $(G_a \geq \lvert L_a \rvert)$	**actual gain < |actual loss|** $(G_a < \lvert L_a \rvert)$	**Mann-Whitney U test**
Baseline	E^{total}	0.404	0.316	**p = 0.031**
	E^{gain}	0.420	0.366	p = 0.157
	E^{loss}	0.368	0.285	**p = 0.081**
	$E^{\text{difference}}$	0.052	0.082	p = 0.124
	Wilcoxon signed-rank test	p = 0.197	**p = 0.001**	
	no. of observations	171	169	
Aggregation	E^{total}	0.373	0.404	p = 0.518
	E^{gain}	0.394	0.434	p = 0.539
	E^{loss}	0.371	0.395	p = 0.433
	$E^{\text{difference}}$	0.024	0.039	p = 0.621
	Wilcoxon signed-rank test	p = 0.109	**p = 0.038**	
	no. of observations	106	124	
One Tax Declaration	E^{total}	0.272	0.249	**p = 0.086**
	E^{gain}	0.241	0.269	p = 0.360
	E^{loss}	0.352	0.239	**p = 0.006**
	$E^{\text{difference}}$	-0.111	0.030	**p < 0.001**
	Wilcoxon signed-rank test	**p = 0.003**	**p = 0.045**	
	no. of observations	125	144	

Note: In this table, we present the means of our tax evasion variables separated by the relation where either the actual gain is equal to or greater than the absolute value of the actual loss ($G_a \geq \lvert L_a \rvert$) or the actual gain is lower than the actual loss ($G_a < \lvert L_a \rvert$).The Wilcoxon signed-rank test (non-parametric test for dependent samples, two-tailed) analyzes whether the difference between the ratio of tax evasion in the gain and loss scenario is statistically significant. The Mann-Whitney U test (non-parametric test for independent samples) analyzes whether the difference of one tax evasion variable between the $G_a \geq \lvert L_a \rvert$ relation and $G_a < \lvert L_a \rvert$ relation is statistically significant.

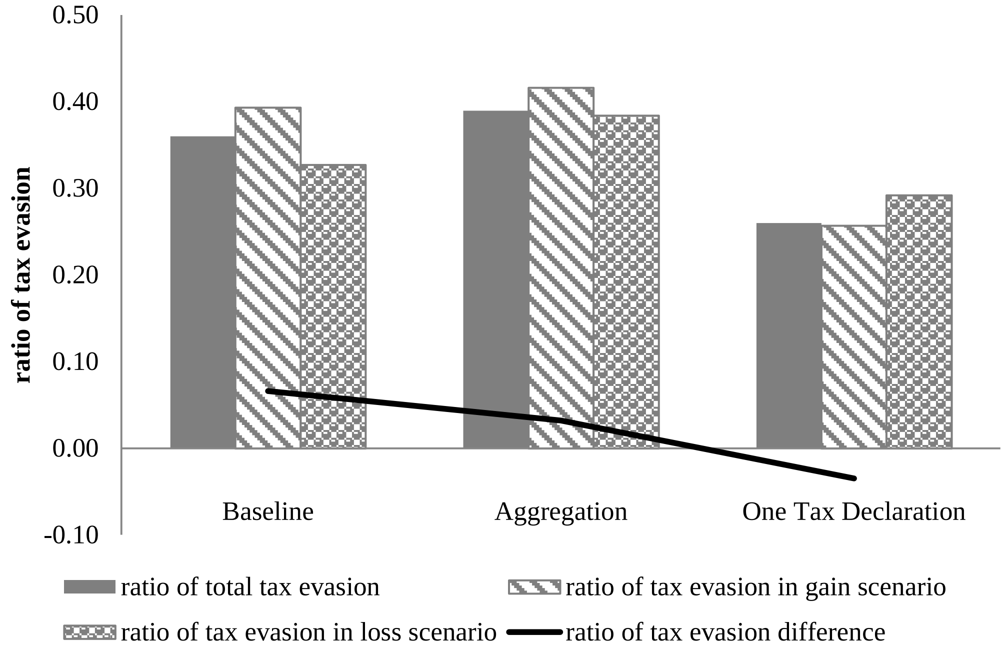

Figure 1: Tax evasion behavior in all treatments

Note: In this figure the mean of each tax evasion variable is depicted for each treatment.

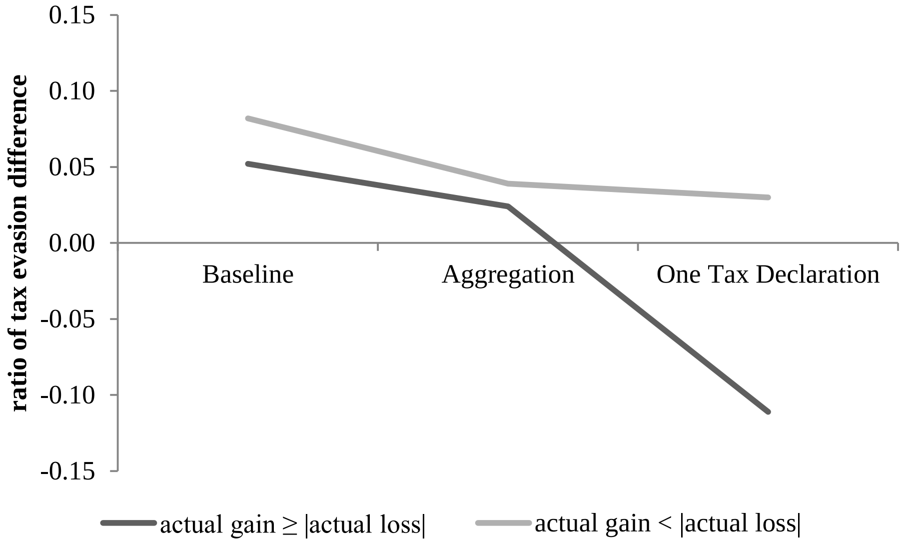

Figure 2: Ratio of tax evasion difference

Note: In this figure the mean ratio of tax evasion difference is depicted for each treatment separated for the $G_a \geq |L_a|$ and $G_a < |L_a|$ relation.

Appendix

A1 Instructions

We divided the instructions into different parts. The beginning part is identical in all treatments, whereas the following parts differ between the treatments. In the following, the instructions (originally written in German) are presented.

A1.1 Beginning Instructions of All Treatments

Thank you for participating at the today's experiment. For you participation you receive 10 Euros in advance (starting capital). Your overall earnings can either increase or decrease in the course of the experiment. How much you earn in total depends on your decisions and on chance. This instruction elucidates how you may influence the money you earn in this experiment by your decisions. Thus, read carefully throughout the following paragraphs.

We would like to inform you that you are not allowed to communicate with other participants or leave your seat throughout the whole experiment. If you have questions please raise your hand. We will come up to you to answer your questions.

For reasons of simplification we will not calculate with Euro-amounts in the experiment, but with lab-points. Thereby 1 lab-point exactly corresponds to 1 Euro-cents. That means 100 lab-points exactly correspond to 1 Euro.

The experiment consists of 10 periods in total which are independent from each other. At the end of the experiment one period is randomly drawn that determines your payoff.

A1.2 Specific Instructions of the Baseline Treatment

1. Gain and Loss Scenario

In every period you are assigned a pre-tax-gain as well as a pre-tax-loss. The respective amounts of the pre-tax-gain and pre-tax-loss are randomly drawn by the computer and may take on integer numbers between 0 and 1000 lab-points. As the computer independently draws the amounts of the pre-tax-gain and pre-tax-loss, these two amounts can differ in height. Furthermore, it pertains: From one period to another the amount of the pre-tax-gain as well as of the pre-tax-loss can differ and will be displayed to you before every single decision.

You are assigned one pre-tax-gain and one pre-tax-loss in every period. However only one of those amounts is relevant for the payoff the end of the experiment. Whether the gain or the loss scenario is relevant for your payoff is not known to you before your decision but is dependent on chance. The gain and the loss scenario both occur with a probability of 50%, respectively.

Please remember: In both scenarios the amount is positive (thus greater than zero), but in the gain scenario the amount concerns a gain and in the loss scenario it concerns a loss. Therefore it holds that your starting capital of 10 Euros is increased by a gain but decreased by a loss. How you starting capital exactly changes is described hereafter.

2. Tax Declaration

In every period there is a tax with a tax rate of 50%. The amount of the tax is assessed according to your pre-tax-amount that you are asked to declare for the gain scenario as well as for the loss scenario. Hereto, you just assess how much of the actual pre-tax-gain and of the pre-tax-loss you want to declare. Only integer values are possible to be declared. Please remember that the declaration of your pre-tax-gain is independent of the declaration of your pre-tax-loss. Thus, both declarations can deviate from each other. (Please note: The declaration of your pre-tax-gain as well as of your pre-tax-loss are the only two decisions that you have to take in a period.)

The following constraint holds: Your declared pre-tax-gain may not exceed your actual pre-tax-gain, but may also not be smaller than zero. Your declared pre-tax-loss may not deceed your actual pre-tax-loss, but may also not exceed twice as much as your actual pre-tax-loss.

Please remember: The tax is due in both, the gains and the loss scenario. However, the effect of the tax is a bit different: In the gain scenario you have to pay a tax so that your gain is decreasing. In the loss scenario you receive a tax refund so that your loss decreases.

The tax payment and the tax refund are thus calculated the following:

In the gain scenario: tax payment = 0,5 x *declared* pre-tax-gain

In the loss scenario: tax refund = 0,5 x *declared* pre-tax-loss

Your after-tax-gain and after-tax-loss are thus calculated the following:

In the gain scenario: after-tax-gain = *actual* pre-tax-gain - tax payment

In the loss scenario: after-tax-loss = *actual* pre-tax-loss - tax refund

3. Audit of your tax declaration

With a probability of 30% both of your declarations on your pre-tax-gain and pre-tax-loss are audited. With a probability of 70% your declarations are not audited. If you are audited and the actual and declared pre-tax-gain or pre-tax-loss do not coincide, a penalty is charged. The penalty amounts to twice the evaded tax in the gain scenario and twice the overpaid obtained tax refund in the loss scenario:

In the gain scenario: penalty = 2 x evaded tax

In the loss scenario: penalty = 2 x overpaid obtained tax refund

Thereby it holds:

evaded tax = 0,5 x (*actual* pre-tax-gain - *declared* pre-tax-gain)

overpaid obtained tax refund = 0,5 x (*declared* pre-tax-gain - *actual* pre-tax-gain)

Please remember: As either the gain or the loss scenario is present the penalty only has to be paid once for the respective applicable scenario. Please also remember: If the declared and actual pre-tax-amount coincide no penalty is charged as the difference of actual and declared pre-tax-amount is zero.

Your yield of the period in case of an *audit* is thus calculated the following:

In the gain scenario: yield of the period (gain) = after-tax-gain - penalty

In the loss scenario: yield of the period (loss) = after-tax-loss + penalty

Please remember: In the gain scenario the penalty results in a decrease of the gain. In the loss scenario the penalty results in an increase of the loss.

Your yield of the period in case of *no audit* is thus calculated the following:

In the gain scenario: yield of the period (gain) = after-tax-gain

In the loss scenario: yield of the period (loss) = after-tax-loss

After every period you are informed whether you have been audited or not. Furthermore, you are granted an overview of all important values as well as of your yield of the period in the gain and loss scenario.

4. What-if calculator

For both decisions on how much of the pre-tax-gain and pre-tax-loss you want to declare, you have the possibility to perform what-if calculations on the computer (bottom screen). For this purpose enter the pre-tax-gain and pre-tax-loss that you wish to declare. Afterwards the yield of the period for the gain and the loss scenario is announced to you for the case with and without an audit. Please remember, that what-if calculations are not relevant for your payoff of the experiment.

In addition you can use the pocket calculator that is provided at your site for own calculations.

5. Total payoff from the experiment

After you have made your decisions in all 10 periods *one* period is randomly drawn by the computer at the end of the experiment and presented to you on the screen. To determine whether there is a gain or loss scenario in this period you are asked to throw a six-sided dice at the experimenters' desk. If you dice a 1, 2 or 3 you are in a gain scenario, if you dice a 4, 5 or 6 you are in a loss scenario. The yield of the period that resulted in the respective period for the diced scenario is converted into Euro and reckoned up with your starting capital of 10 Euro. If there is a gain scenario your starting capital increases by the amount. If there is a loss scenario your starting capital decreases by the amount. The resulting total payoff is cashed out to you subsequent to the experiment.

Please remember: It is ensured that you may never sustain any loss after your starting capital is reckoned up with the yield of the period.

6. Training periods

Bevor the real experiment with 10 periods starts there is a rehearsal with 2 training periods. The decisions you make in these training periods have no influence on the payoff of the experiment.

A1.3 Specific Instructions of the Aggregation Treatment

1. Pre-Tax-Gain and Pre-Tax-Loss

In every period you are assigned a pre-tax-gain as well as a pre-tax-loss. The respective amounts of the pre-tax-gain and pre-tax-loss are randomly drawn by the computer and may take on integer numbers between 0 and 1000 lab-points. As the computer independently draws the amounts of the pre-tax-gain and pre-tax-loss, these two amounts can differ in height. Furthermore, it pertains: From one period to another the amount of the pre-tax-gain as well as of the pre-tax-loss can differ and will be displayed to you before every single decision.

Please remember: In both scenarios the amount is positive (thus greater than zero), but in the gain scenario the amount concerns a gain and in the loss scenario it concerns a loss. Therefore it holds that your starting capital of 10 Euros is increased by a gain but decreased by a loss. How you starting capital exactly changes is described hereafter.

2. Tax Declaration

In every period there is a tax with a tax rate of 50%. The amount of the tax is assessed according to your pre-tax-amount that you are asked to declare for the gain scenario as well as for the loss scenario. Hereto, you just assess how much of your actual pre-tax-gain and of your pre-tax-loss you want to declare. Only integer values are possible to be declared. Please remember that the declaration of the pre-tax-gain is independent of the declaration of the pre-tax-loss. Thus, both declarations can deviate from each other. (Please note: The declaration of your pre-tax-gain as well as of your pre-tax-loss are the only two decisions that you have to take in a period.)

The following constraint holds: Your declared pre-tax-gain may not exceed your actual pre-tax-gain, but may also not be smaller than zero. Your declared pre-tax-loss may not deceed your actual pre-tax-loss, but may also not exceed twice as much as your actual pre-tax-loss.

Please remember: The tax is due in both, the gains and the loss scenario. However, the effect of the tax is a bit different: In the gain scenario you have to pay a tax so that your gain is decreasing. In the loss scenario you receive a tax refund so that your loss decreases.

The tax payment and the tax refund are thus calculated the following:

In the gain scenario: tax payment = 0,5 x *declared* pre-tax-gain

In the loss scenario: tax refund = 0,5 x *declared* pre-tax-loss

Your after-tax-gain and after-tax-loss are thus calculated the following:

In the gain scenario: after-tax-gain = *actual* pre-tax-gain - tax payment

In the loss scenario: after-tax-loss = *actual* pre-tax-loss - tax refund

3. Audit of your tax declaration

With a probability of 30% both of your declarations on your pre-tax-gain and pre-tax-loss are audited. With a probability of 70% your declarations are not audited. If you are audited and the declared and actual pre-tax-gain or pre-tax-loss do not coincide, a penalty is charged. The penalty amounts to twice the evaded tax in the gain scenario and twice the overpaid obtained tax refund in the loss scenario:

In the gain scenario: penalty = 2 x evaded tax

In the loss scenario: penalty = 2 x overpaid obtained tax refund

Thereby it holds:

evaded tax = 0,5 x (*actual* pre-tax-gain - *declared* pre-tax-gain)

overpaid obtained tax refund = 0,5 x (*declared* pre-tax-gain - *actual* pre-tax-gain)

Please remember: If the declared and actual pre-tax-amount coincide no penalty is charged as the difference of actual and declared pre-tax-amount is zero.

Your yield of the period in case of an *audit* is thus calculated the following:

In the gain scenario: yield of the period (gain) = after-tax-gain - penalty

In the loss scenario: yield of the period (loss) = after-tax-loss + penalty

Please remember: In the gain scenario the penalty results in a decrease of the gain. In the loss scenario the penalty results in an increase of the loss.

Your yield of the period in case of *no audit* is thus calculated the following:

In the gain scenario: yield of the period (gain) = after-tax-gain

In the loss scenario: yield of the period (loss) = after-tax-loss

After every period you are informed whether you have been audited or not. Furthermore, you are granted an overview of all important values as well as of your yield of the period in the gain and loss scenario.

4. Yield of the period (total):

Your aggregated yield of the period, the yield of the period (total), is calculated the following:

Yield of the period (total) = yield of the period (gain) - yield of the period (loss)

This amount is relevant for the payoff at the end of the experiment.

5. What-if calculator

For both decisions on how much of the pre-tax-gain and pre-tax-loss you want to declare, you have the possibility to perform what-if calculations on the computer (bottom screen). For this purpose enter the pre-tax-gain and pre-tax-loss that you wish to declare. Afterwards the yield of the period is announced to you for the case without and with an audit. Please remember, that what-if calculations are not relevant for your payoff of the experiment.

In addition you can use the pocket calculator that is provided at your site for own calculations.

6. Total payoff from the experiment

After you have made your decisions in all 10 periods *one* period is randomly drawn by the computer at the end of the experiment and presented to you on the screen. The yield of the period (total) that resulted in the respective period is converted into Euro and reckoned up with your starting capital of 10 Euro. The resulting total payoff is cashed out to you subsequent to the experiment.

Please remember: It is ensured that you may never sustain any loss after your starting capital is reckoned up with the yield of the period (total).

7. Training periods

Bevor the real experiment with 10 periods starts there is a rehearsal with 2 training periods. The decisions you make in these training periods have no influence on the payoff of the experiment.

A1.4 Specific Instructions of the One Tax Declaration Treatment

1. Gain and Loss

In every period you are assigned a gain as well as a loss. The respective amounts of the gain and loss are randomly drawn by the computer and may take on integer numbers between 0 and 1000 lab-points. As the computer independently draws the amounts of the gain and loss, these two amounts can differ in height. Furthermore, it pertains: From one period to another the amount of the gain as well as of the loss can differ and will be displayed to you before every single decision.

The difference between actual gain and actual loss results in the actual pre-tax-amount:

actual pre-tax-amount = *actual* gain - *actual* loss

Please remember: As the actual gain can be both, greater as well as smaller, than the actual loss the actual pre-tax-amount can be positive as well as negative.

2. Tax Declaration

In every period there is a tax with a tax rate of 50%. The amount of the tax is assessed according to your declared pre-tax-amount that you are asked to declare. Hereto, you just assess how much of your actual gain and loss you want to declare. Only integer values are possible to be declared. Please remember that the declaration of the gain is independent of the declaration of the loss. (Please note: The declaration of your gain as well as of your loss are the only two decisions that you have to take in a period.)

The declared pre-tax-amount is calculated the following:

declared pre-tax-amount = *declared* gain - *declared* loss

Please remember: As the declared gain can be both, greater as well as smaller, than the declared loss the declared pre-tax-amount can be positive as well as negative.

The following constraint holds: Your declared gain may not exceed your actual gain, but may also not be smaller than zero. Your declared loss may not deceed your actual loss, but may also not exceed twice as much as your actual loss.

The tax amounts to 50% of your declared pre-tax-amount, that means:

tax = 0,5 x *declared* pre-tax-amount

Your after-tax-amount is thus calculated the following:

after-tax-amount = *actual* pre-tax-amount - tax

Please remember: The tax is due for both, a positive as well as a negative declared pre-tax-amount. However the effect of the tax is a bit different: For a positive pre-tax amount the tax is positive. That means you have to pay a tax and your after-tax-amount decreases. For a negative pre-tax amount the tax is negative. That means you receive a tax refund and your after-tax-amount increases.

3. Audit of your tax declaration

With a probability of 30% the declaration on your declared pre-tax-amount is audited. With a probability of 70% your declaration is not audited. If you are audited and the declared and actual pre-tax-amount does not coincide, a penalty is charged. The penalty amounts to twice the evaded tax:

penalty = 2 x evaded tax

Thereby it holds:

evaded tax = 0,5 x (*actual* pre-tax-amount - *declared* pre-tax-amount)

Please remember: If the declared and actual pre-tax-amount coincide no penalty is charged as the difference of actual and declared pre-tax-amount is zero.

Your yield of the period in case of an *audit* is thus calculated the following:

yield of the period = after-tax-amount - penalty

Your yield of the period in case of *no audit* is thus calculated the following:

yield of the period = after-tax-amount

After every period you are informed whether you have been audited or not. Furthermore, you are granted an overview of all important values as well as of your yield of the period.

Please remember that your yield of the period can also be negative. In that case your starting capital decrease by this amount. If the yield of the period is positive your starting capital increases by this amount.

4. What-if calculator

For both decisions on how much of the gain and loss you want to declare, you have the possibility to perform what-if calculations on the computer (bottom screen). For this purpose enter the gain and loss that you wish to declare. Afterwards the yield of the period is announced to you for the case without and with an audit. Please remember, that what-if calculations are not relevant for your payoff of the experiment.

In addition you can use the pocket calculator that is provided at your site for own calculations.

5. Total payoff from the experiment

After you have made your decisions in all 10 periods *one* period is randomly drawn by the computer at the end of the experiment and presented to you on the screen. The yield of the period that resulted in the respective period is converted into Euro and reckoned up with your starting capital of 10 Euro. The resulting total payoff is cashed out to you subsequent to the experiment.

Please remember: It is ensured that you may never sustain any loss after your starting capital is reckoned up with the yield of the period.

6. Training periods

Bevor the real experiment with 10 periods starts there is a rehearsal with 2 training periods. The decisions you make in these training periods have no influence on the payoff of the experiment.

A2 Screenshots of the Baseline Treatment

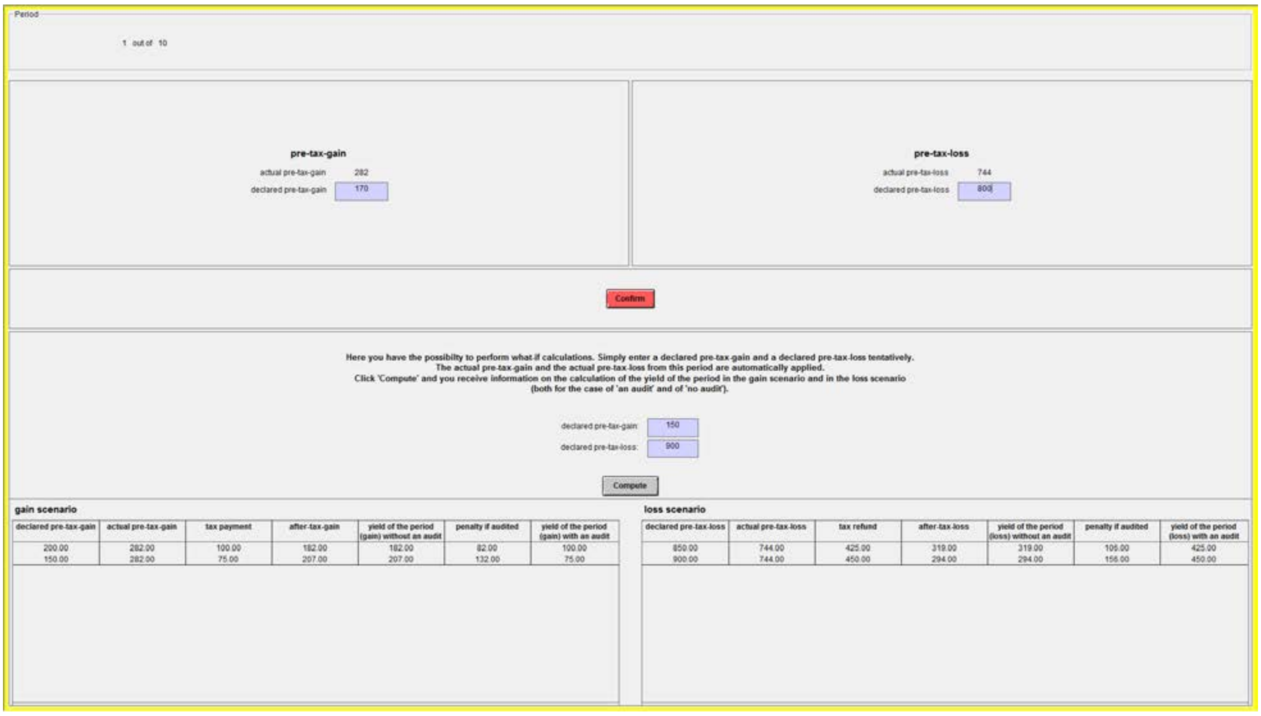

Figure A1: Exemplary screenshot for the decision stage of the Baseline treatment

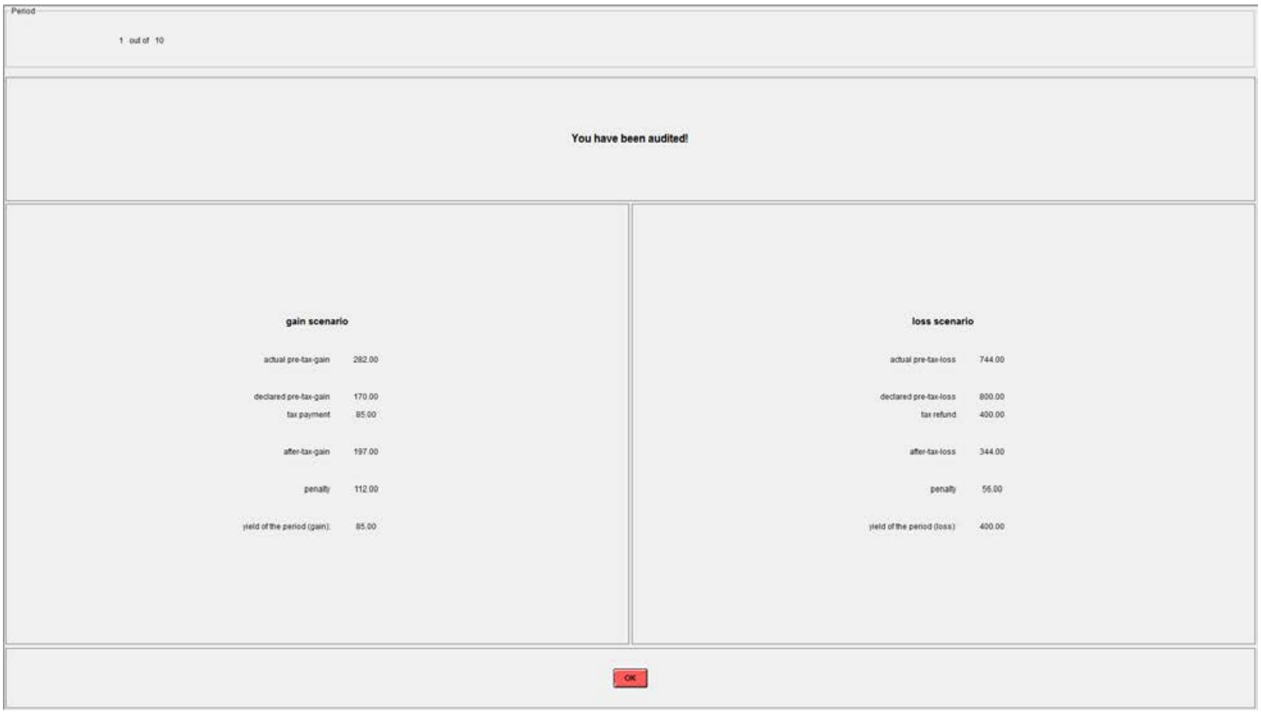

Figure A2: Exemplary screenshot for the information stage of the Baseline treatment

A3 Screenshots of the Aggregation Treatment

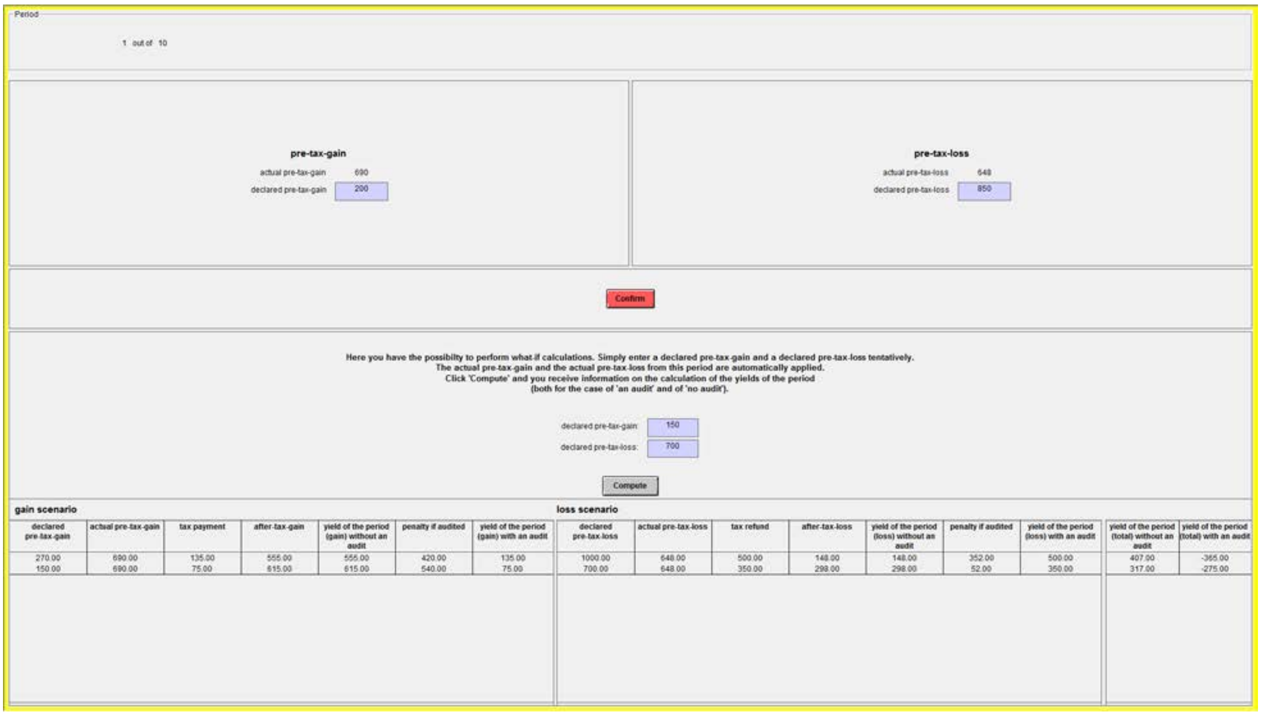

Figure A3: Exemplary screenshot for the decision stage of the Aggregation treatment

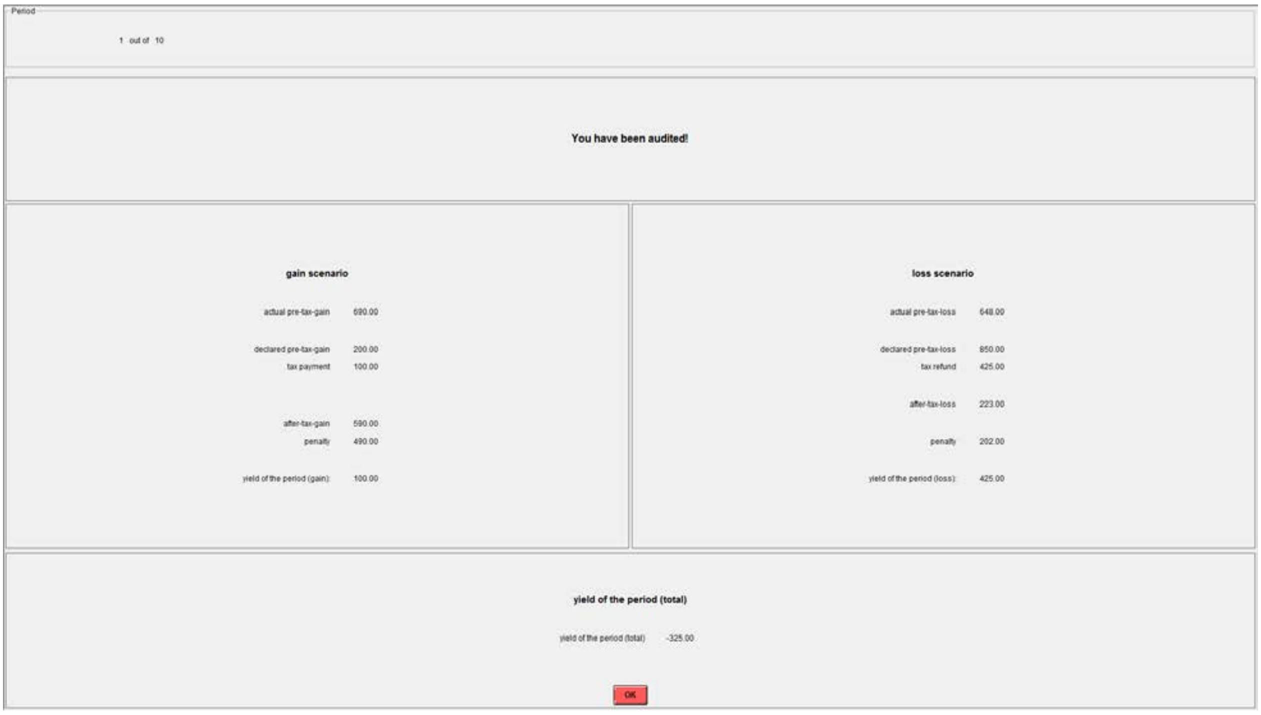

Figure A4: Exemplary screenshot for the information stage of the Aggregation treatment

A4 Screenshots of the One Tax Declaration Treatment

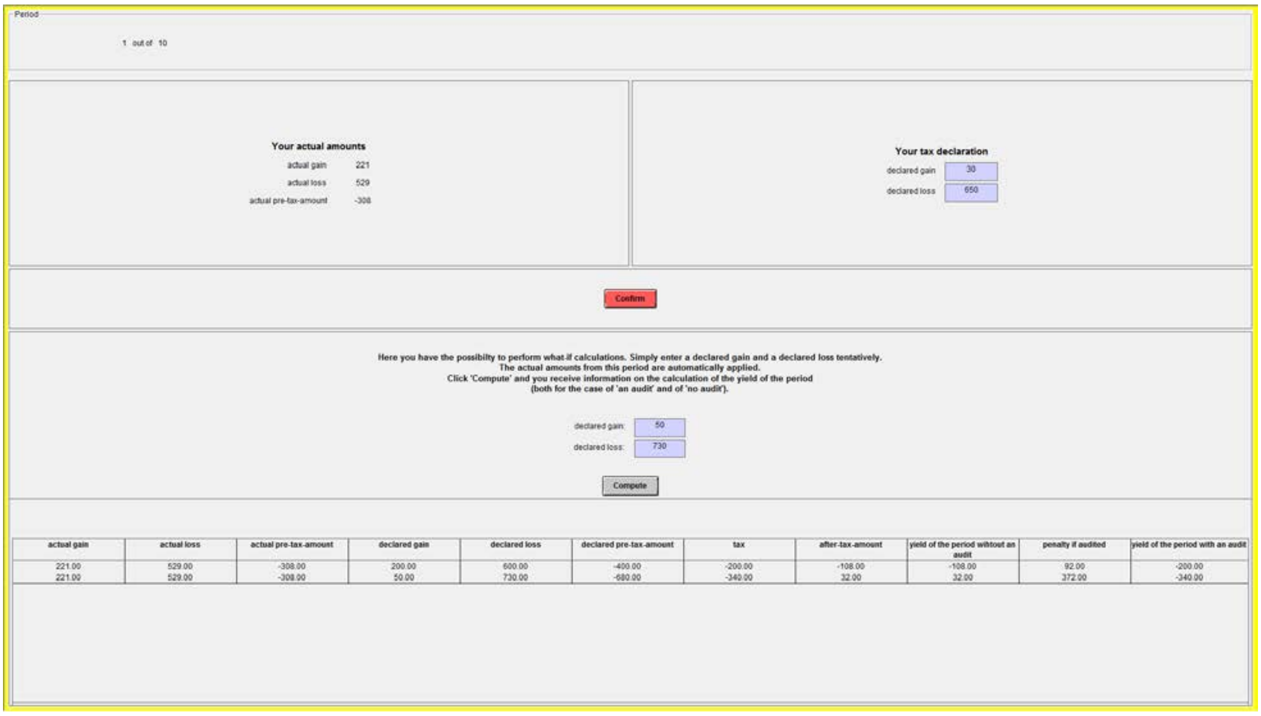

Figure A5: Exemplary screenshot for the decision stage of the One Tax Declaration treatment

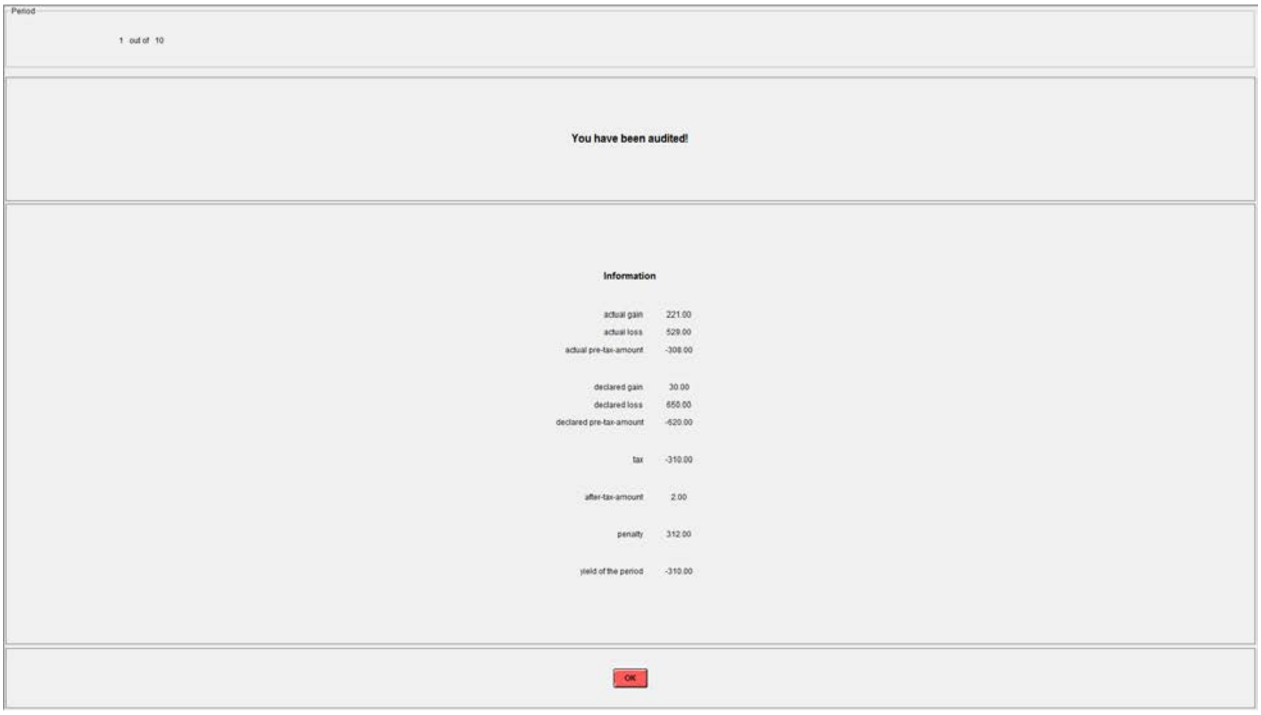

Figure A6: Exemplary screenshot for the information stage of the One Tax Declaration treatment

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