Tax Evasion and Risky Investments in an Intertemporal Context* — An Experimental Study —

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Abstract

In this experimental study of tax evasion and its determinants participants earn their income in a complex stochastic intertemporal environment including the possibility to invest into a risky asset. The earned income has to be declared in four tax returns which are randomly verified. If tax evasion is detected, penalty depends on evaded taxes. Twice the tax revenue is donated to charity organizations. Our main results show that higher income induces tax fraud and that gender differences exist.

*We are especially grateful to Prof. Dr.Werner Güth for helpful comments and useful suggestions. We are greatly indebted to Dr.Vital Anderhub, who developed the software used in the experiment, for his invaluable input. The financial support of the Deutsche Forschungsgemeinschaft (SFB 373, C5) and TMR-project "Savings and Pensions" by the European Commission is gratefully acknowledged. All errors and opinions are of course our own.

1. Introduction

In Germany, as well as elsewhere, the phenomenon of tax evasion behavior is continually on the rise. Actually, 7,969 judgements and orders of summary punishment referring to taxes from income and property and taxes on transaction imposed in 1998[1] are connected with tax fraud. They include 1,492 years of imprisonment and a total amount of 88,378,073 DM in fines[2]. These proceedings counter the underlying sum of 1,160,306,937 DM in evaded taxes[3]. Surely, one can imagine the loss in tax revenue, which the government has to compensate.

The problem becomes worse because more and more citizens seem to get used to consume public goods without contributing. Defining a tax evader as a freerider[4], who claims public services at the expense of others, it must surprise that the society does not challenge such behavior fundamentally. A survey conducted by Schmölders (1964)[5] revealed that 50% of the interrogated individuals mark a tax evader as a "peccadillo", whereas only 20% voted for "larcenist", and 3% in each case chose the extreme positions "man of honor" or "criminal".

Furthermore, the survey from Kirchler (1998), where tax evaders were described as clever and honest taxpayers as stupid and lazy, shows other circumstantial evidence for low tax morality. The results elucidate decreasing tax morality which means the taxpayer's attitude towards tax offences, the system of taxation, and tax application.

It seems commonly accepted among psychologists that individuals perceive taxes as an evil[6]. The non-acceptance of the system increases dramatically. Several arguments could be:

- an unnecessarily complicated, instead of a clear and fair, tax law

[1] see BMF (1999)
[2] According to German tax law (§ 370 Abgabenordnung) tax evasion is a crime.
[3] These cases of detected tax evasion represent only the tip of the iceberg.
[4] see Van de Braak (1993), Williamson and Wearing (1996), Bosco and Mittone (1997)
[5] see Frankfurter Allgemeine Zeitung (1964)
[6] see Kottke (1991)

- improper tax application through the public authorities
- budgetary expansionism.

Because of the importance of tax cheating, it is necessary to understand the determinants of tax evasion and their effects on tax morality.

In recent years there has been a growing attention on tax evasion behavior in economics, sociology, psychology, political science, and law. Theoretical investigations, surveys of representative citizens and experimental studies were used to shed light on evasion behavior. Frequently, while investigating the impact of tax rate, auditing probability, income, and penalty rate the standard model of tax evasion (Allingham and Sandmo, 1972, Srinivasan, 1973, Yitzhaki, 1974) seems to view the evasion decision as a problem of expected utility maximization[7].

However, empirical and experimental investigations often disclose considerable deviation between taxpayers' actual and optimal behavior. According to Clotfelter (1983) tax evasion increases with tax rates in contrast to Yitzhaki's (1974) theoretical analysis who assumes that penalties increase with the amount of evaded taxes. Friedland et al. (1978), Kaplan and Reckers (1985), and Baldry (1986) showed that, unlike in the expected utility maximization, some taxpayers do not evade even if tax evasion is more than a fair gamble. This implies that economic factors are not sufficient to reveal the whole phenomenon of tax evasion.

Therefore, many studies examine various socioeconomic and psychological factors in order to enrich the economic model. In their pioneering study Friedland et al. (1978) analyze economic and socioeconomic factors (e.g. age, gender, marital status, and ethnic background among others). Numerous experimental studies investigate psychological factors and their influences on evasion decisions, such as perceived inequity of the tax system (see e.g. Spicer and Becker, 1980, Webley, Morris, and Amstutz, 1985, Hite, 1990), perceived opportunity of tax cheating (see e.g. Robben et al., 1990), and the influence of the number of tax evaders

[7] see Theoretical Framework

personally known and experiences with auditing and punishment (see e.g. Spicer and Lundstedt, 1976, Spicer and Hero, 1985).

The following experimental study examines the influences of variable income, gender, analytic capabilities, and the attitude towards risk on tax declaration behavior.

Experimental investigations are useful but not the only method to explore the determinants of tax evasion behavior. Many studies are based on surveys which, because of numerous methodical defects, should be interpreted carefully. It seems possible that interviewed individuals do not remember former declaration decisions perfectly. Subtle questions could be left unanswered or at least not truthfully answered if someone feels threatened. Moreover, data of surveys are generally difficult to interpret if individuals are asked to report on former evasion activities or on actions that reveal their attitudes towards tax evasion. None of those studies were able to give information on precise tax rates, penalties, and auditing variables.

In contrast, experimental investigations allow a detailed examination of the current tax morality and their influencing variables because they allow us to introduce independent variables and to exclude irrelevant variables. Thus one makes the causalities more transparent. Besides, experiments offer the possibility to observe the individual's real tax evasion behavior which is normally illegal or undesirable in society.

The price of the experimental method is the artificial situation which makes it difficult to generalize results on tax evasion behavior[8]. Participants' behavior may differ from reality, e.g. by assessing the experiment as a pure game. Baldry (1987) pointed out rightly "... it cannot be automatically presumed that they therefore act in a game differently from the way they would act in the real business of tax evasion (which some taxpayers may treat as a game as well!)".

All in all, to examine individual evasion behavior, experiments are extremely attractive and becoming more and more popular. Regarding cost and time, experimental studies can be more effective than surveys.

[8] In experimental economics one discusses this as "parallelism", see e.g. Smith (1982).

2. Theoretical Framework

The standard theory of tax evasion is based on the model of Allingham and Sandmo (1972)[9]. It is supposed that a taxpayer has already made all of the decisions which influence his taxable income. The taxpayer is confronted with two alternatives: (1) true declaration or (2) concealment of a fixed amount. It is possible to define tax evasion as a special form of gambling, a decision under uncertainty maximizing expected utility[10]. This basic model comes to the following predictions: Declared income increases with rising probability of detection and penalties. The influence of gross income and tax rate depends on the taxpayer's attitude towards risk[11].

One problem of these theoretical analyses is indicated by Yitzhaki (1974): If it is assumed that penalties are imposed on the amount of tax evaded[12] and absolute risk aversion is declining, the model predicts that higher tax rates will lead to decreased tax evasion. Intuitively and verified by empirical results an increasing evasion seems to be realistic[13]. Another problem is the assumption that a taxpayer maximizes his expected utility according to the von Neumann/Morgenstern axioms[14]. This theory is often criticized because of descriptive misfits[15] and refutable assumptions[16].

Therefore, there is a good reason to suppose that the Prospect Theory (Kahnemann and Tversky, 1979), which can be viewed as an extension to the expected utility theory, seems more suitable to predict decisions under risk and uncertainty. Now the expected income is not the only determinant of the utility function. The form can be influenced by the taxpayer's evaluation of gains and losses (taxpaying

[9] Srinivasan (1973) worked out a nearly similar model at the same time.

[10] The only variable in the expected utility function is the expexted income.

[11] The basic model was extended in different ways. See, e.g., Pencavel (1979), Sandmo (1981), Cowell (1985), Alm (1988), and Myles and Naylor (1996). Cowell (1990) provides an interesting overview of the theoretical models.

[12] This fixing of penalties seems to be more realistic, see the tax systems in the USA or Germany.

[13] see e.g. Benjamini and Maital (1985)

[14] see von Neumann and Morgenstern (1947), for other axioms see, e.g., Luce and Raiffa (1957)

[15] see e.g. Frey and Eichenberger (1989)

[16] see e.g. Allais (1953), Laux (1998)

as a loss or a reduced gain) in relation to a reference point. Another difference to the von Neumann/Morgenstern axioms is the overestimation of small probabilities by decision makers. However, this approach does not consider nonfinancial aspects as arguments of the utility function.

The dilemma can be outlined as follows: Noneconomic variables of the taxpayers' theoretical calculations threaten to falsify the original models. But investigating only financial targets fails to explain the observed correlations. To show that tax evasion is not a pure gamble the following questions should be examined by experimental investigations:

- Does higher income induce tax evasion?
- Provided that there are gender differences in attitude towards risk, what are the distinctions in evasion and investment behavior?
- Do risky investments crowd out tax evasion?
- What influences do monitoring, penalties and cleverness have on declaration behavior?

3. Experimental Design

Our experiment consists of two parts. In the computerized first part participants earn their income by playing the "saving game" (similar to Anderhub et al., mimeo). In contrast to randomly assigned income levels, they must earn it[17]. The saving game is a complex stochastic intertemporal allocation task (Anderhub et al., 1999) involving a risky investment (Anderhub et al., mimeo). It guarantees variable earnings which makes it possible to make an analysis of several income levels.

[17] based on the idea of Webley et al. (1991) who let participants earn their incomes before tax declaring

The participants have to distribute a given monetary amount of $S = 11.92$ ECU (1 Experimental Currency Unit = DM .03) over an uncertain number of periods. The minimum is 3 and the maximum is 6 periods ($t = 1, 2, ..., T; 3 \leq T \leq 6$). Several dice show the termination probabilities:

$$\text{red die: } \frac{1}{2}$$

$$\text{yellow die: } \frac{1}{3}$$

$$\text{green die: } \frac{1}{6}$$

Additional to the 1^{st} consumption choice x_1 with $0 \leq x_1 \leq 11.92$ participants are able to invest a share i of $S - x_1$ in a risky asset where $0 \leq i \leq S - x_1$. With probability of $p = \frac{2}{3}$ earnings are $\frac{4}{3}i$ and in case of unlucky investment ($p = \frac{1}{3}$) earnings are $\frac{2}{3}i$ in the 2^{nd} period. This means

$$S_2 = 11.92 - x_1 + \frac{i}{3} \text{ with a probabilty of } \frac{2}{3}$$

and

$$S_2 = 11.92 - x_1 - \frac{i}{3} \text{ with a probability of } \frac{1}{3}.$$

In each case after the 1^{st} and after the 2^{nd} period one of the three dice is eliminated. From the 3^{rd} period on participants know which die (and its probability) randomly decides whether $T = 3, 4, 5,$ or 6. The payoff is then

$$\Pi = \prod_{t=1}^{T} x_t = x_1 \cdot x_2 \cdot ... \cdot x_T.$$

In case of termination all saved money is lost. Because of uncertain lifetime there is a basic rationality requirement[18] participants should satisfy:

$$x_t > x_{t+1} \text{ for } t \geq 3.$$

[18]There is a boundary solution for $t \geq 4$ when the optimal investment is lost and the red or yellow die applies. Now the optimal decision is represented by $x_t = x_{t+1} = 0$. None of the participants satisfied this criterion.

A play $x_1, i, x_2, ..., x_T$ is called a round r. Participants play altogether 12 such rounds ($r = 1, ..., 12$). The second part of our experiment relies on pen and paper. After each third of the altogether 12 rounds participants have to declare their income (accumulated payoff in the three preceding rounds of the saving game). This intertemporal context allows to examine the existence of constant behavior.

On the cover page of the declaration form (see Appendix B) some personal data (age, gender, religion, intended profession, study and semester) was to be filled in. In addition participants were able to choose a charity organization which receives twice their tax payments. This form of public spending should induce feelings of guilt in the case of evasion[19]. In the view of the participants taxes are not wasted[20].

On the second page (see Appendix B, 1^{st} tax declaration form) participants have to declare their income[21]. The tax table (see Appendix C) shows tax dues and penalties.

Each declaration was checked with an audit probability of $\frac{1}{3}$. Let G denote the real accumulated payoff in the three preceding rounds of the saving game, $\hat{G}$ the declared one, $T(\cdot)$ the tax function, $\hat{T}$ the evaded tax, i.e. $\hat{T} = T(G) - T(\hat{G})$, and P the penalty. Then the payoff from three rounds after tax declaration is

$$\begin{array}{ll} G - T(\hat{G}) & \text{in case of no monitoring} \\ \left.\begin{array}{l} G - T(\hat{G}) \text{ for } \hat{G} = G \\ G - T(G) - P \text{ for } \hat{G} < G \end{array}\right\} & \text{in case of monitoring} \end{array}$$

In case of monitoring and tax evasion

$$P = \begin{cases} 50 & \text{if } 0 < \hat{T} \leq 30 \\ 75 & \text{if } 30 < \hat{T} \leq 60 \\ 100 & \text{if } 60 < \hat{T} \leq 90 \\ 125 & \text{if } 90 < \hat{T} \leq 120 \\ 150 & \text{if } \hat{T} > 120 \end{cases}$$

[19] By doubling we provide an incentive to "donate" via taxes.

[20] Monetary transfers to charity organizations were introduced by Ahlert (1996) to give them an ethical appeal.

[21] Whereas they were able to cheat !

Penalties are not donated to charity organizations. Participants know that penalties are collected by the "revenue authorities"[22]. Before starting the saving game for the next three rounds, each participant is fully informed about the monitoring of his last declaration.

A short postexperimental questionnaire (see Appendix D) examines the attitude towards tax justice and evasion. To reveal participant's willingness of risk-taking a simple lottery is added.

38 students of Humboldt-University in Berlin took part in altogether 4 sessions $(10 + 12 + 7 + 9)$. Most participants (19 female, 19 male) were student beginners (2^{nd} semester). The experiment took about one hour, average earning amounts to ECU 353.35 (DM 10.60).

4. Results

For evaluation we have 152 tax declaration forms (38 participants with 4 declarations each). 108 of 152 (71.05%) are truthful, 39 of 152 (25.66%) committed tax fraud[23] and a considerable share of 5 of 152 (3.29%) are overdeclarations[24].

Gross "national" income, generated by playing the "saving game", amounts to $18,227.02$ ECU. Only $1,856.23$ ECU (40.89%) of the thereby resulting real tax burden ($4,539.72$ ECU) were paid. Figure IV.1. presents the real income before taxes, the real tax burden, and the declared taxes (arranged by income).

[22] Penalized tax evasion should not generate a clear conscience.

[23] Only in 111 of 152 cases is the income G larger than the tax-exempt amount of 60 ECU!

[24] Possible reasons could be misunderstanding of the task, spelling mistakes or flaws in one's reasoning. See Robben et al. (1990) who observed overdeclarations, too.

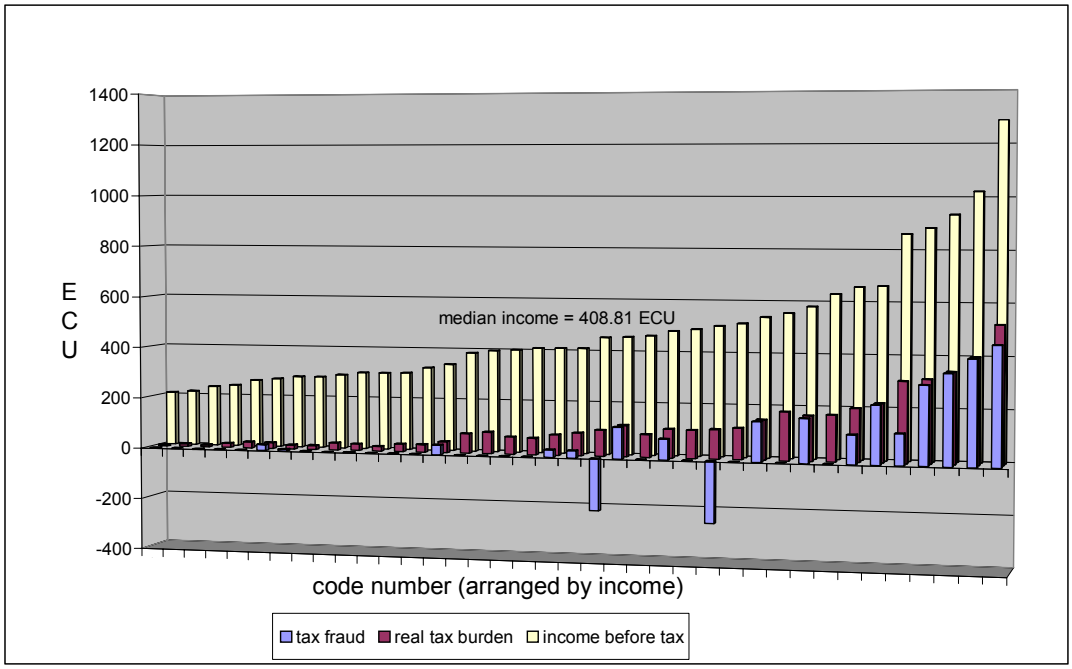

Figure IV.1: Tax burden and evaded taxes depending on income

Table IV.1. demonstrates different tax evasion behavior (tax evaders[25] and participants who declare always honestly) of participants who earned a high ($G_\Sigma >$ 408.81 ECU) or low ($G_\Sigma < 408,81$ ECU) income as well as for female and male (19 participants in both cases). When tax fraud is negative, this reveals overdeclaration.

	number of tax evaders	number of honestly declaring	all cases
low income ($G_\Sigma < 408.81$)	5(27.8%)	14(70.0%)	19
high income ($G_\Sigma > 408.81$)	13(72.2%)	6(30.0%)	19
	18(100%)	20(100%)	38
female	6(33.3%)	13(65.0%)	19
male	12(66.7%)	7(35.0%)	19
	18(100%)	20(100%)	38

Table IV.1: Tax evasion depending on income and gender

[25]participants who evaded at least once

To test how income influences tax evasion, we exclude overdeclarations (5) as well as all cases of real accumulated income G of the three preceding rounds with $G \leq 60$ ECU (honesty cannot be assumed automatically because of missing possibility to cheat), yielding a total sample of 111 declaration forms. Using the t-test the hypothesis that there is no difference in average taxable income of evaders and non-evaders must be rejected ($p = .000$). In view of Table IV.1 honesty becomes rare when income increases what justifies

Regularity 1: Tax evasion increases significantly with income.

As another determinant of tax evasion we examine gender. With regard to former results of Anderhub et al. (1999) we realize that men tend to evade more than women do (see Table IV.1). Men tried to evade $2,432.54$ ECU (75.07%) of their real tax burden ($3,240.51$ ECU), whereas women tried to evade "only" 250.95 ECU (19.32%). In view of Table IV.1 we conclude

Regularity 2: Men underdeclare significantly more often than women and they cheat to a larger extent.

To check the H_0-hypothesis of independence between gender and evasion, we exclude all overdeclarations and data with $G \leq 60$ ECU (see above). Regularity 2 is confirmed by the chi-square-test ($p = .000$). Former experimental results by Friedland et al. (1978) and Güth and Mackscheidt (mimeo), which concluded that women underdeclare more often than men but when they cheat they do it to a lower extent, are not fully supported.

The following paragraphs examine a few possible factors that may explain different declaration behavior of women and men such as income, willingness of risk-taking, and expected utility maximization. Table IV.2. reveals different income levels depending on gender, which might have a strong effect on declaration behavior besides moral aspects.

	female	male
low income ($G_\Sigma < 408.81$)	13(68.4%)	6(31.6%)
high income ($G_\Sigma > 408.81$)	6(31.6%)	13(68.4%)
	19(100%)	19(100%)

Table IV.2: Income depending on gender

With an average gross income of 380.34 ECU, women earn significantly less than men, who have earned on average 578.98 ECU[26](t-test; $p = .011$). Income levels are determined by each person's willingness of risk-taking while playing the saving game. As a measure of that we compared chosen investments per round (mean investment $= \emptyset i = 5.77$ ECU, optimal investment $i^* = 9.93$ ECU), realizing that the investment behavior of women is quite different from the one of men.

	female	male
low investment ($i < 5.77$)	141(61.8%)	83 (36.4%)
high investment ($i > 5.77$)	87 (38.2%)	145(63.6%)
	228(100%)	228(100%)

Table IV.3: Investment per round depending on gender

Using the t-test the H_0-hypothesis of no different investment behavior must be rejected ($p = .000$).

Regularity 3: Referring to the investment decisions, women behave less risky (mean investment = 4.51) than men (mean investment = 7.02).

Women, who invest less tend to express a high willingness to pay for a trivial lottery[27]. Men showed a positive correlation.

[26] all earnings before tax

[27] For gender differences in risk attitudes concerning financial decision-making see also Schubert et al. (1999).

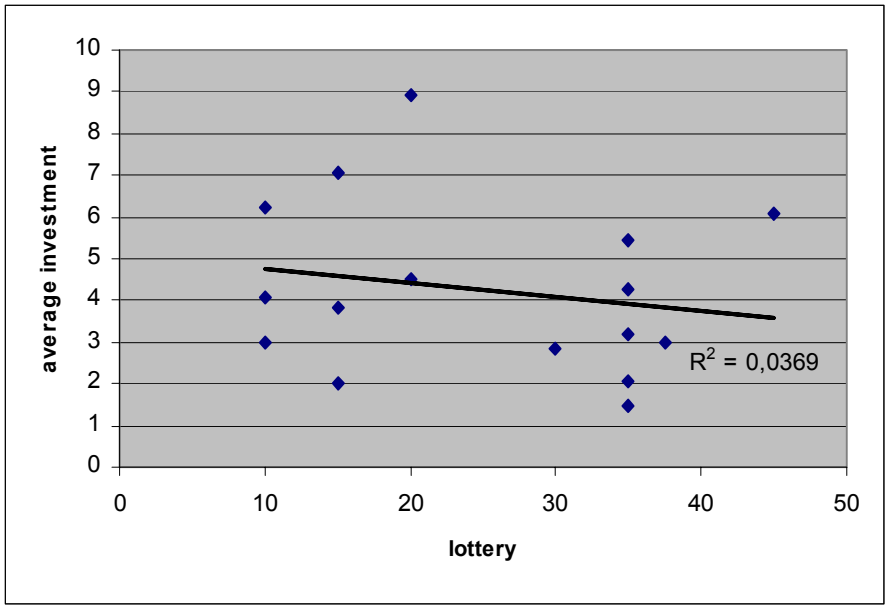

Figure IV.2: Correlation between investment and lottery (women)

Rounds which end with an evasion decision show an average investment of 7.77 ECU, whereas honest taxpayers invest on average 4.83 ECU (rounds with $G \leq$ 60 ECU are excluded). Table IV.4 reveals the relationship between investment, income, and tax declaring type. In 42 of 57 cases, participants who made low average investments earned a lower income than those who invested more than 5.77 ECU. Cases of high investment (low investment) and low income (high income) could be caused by bad (good) luck while playing the "saving game" or by making less clever consumption choices. Table IV.4 underlies Regularity 1. Participants of group A tend significantly more often to evade taxes than participants of group C. Comparing the tax declaration behavior of the groups C and D ($\emptyset i <$ 5.77 ECU)

Regularity 6: Honest taxpayers make significantly lower investments

is justified (t-test, $p = .000$). According to group A, high investments do not crowd out tax evasion, contrary to group B. One possible reason for the behavior in group B is e.g. that tax evasion would not pay because of missing incentive to evade according to maximization of expected payoff.

			tax declaring type		
investment	income	group	never	at least once	all cases
high	high($G_\Sigma > 408.81$)	A	11(30.6%)	25(69.4%)	36(100%)
$\emptyset i > 5.77$ ECU	low($G_\Sigma < 408.81$)	B	15(83.3%)	3(16.7%)	18(100%)
low	high($G_\Sigma > 408.81$)	C	7(46.7%)	8(53.3%)	15(100%)
$\emptyset i < 5.77$ ECU	low($G_\Sigma < 408.81$)	D	39(92.9%)	3(7.1%)	42(100%)
all cases			72(64.9%)	39(35.1%)	111(100%)

Table IV.4: Tax declaring type depending on investments

Now we examine the relation between behavior in the "saving game" and the related tax declaring type as another determinant of tax evasion. According to the observation of the basic rationality requirement (see above), Table IV.6 illustrates the comparison between hard-core nonevaders and those participants who underdeclared at least once. Except for the simple case of $x_3 > x_4$ participants who "never" underdeclare do not meet the requirement if it gets more complex.

	tax declaring type		
	never	at least once	all cases
4 periods ($x_3 > x_4$)	49/62(79.0%)	30/41(73.2%)	79/103
5 periods ($x_3 > x_4 > x_5$)	12/26(46.2%)	23/36(63.9%)	35/62
6 periods ($x_3 > x_4 > x_5 > x_6$)	25/85(29.4%)	31/73(42.5%)	56/158
all cases	86/173 (49.7%)	84/150 (56.0%)	170/323 (52.6%)

Table IV.5: Basic rationality requirements

This justifies

Regularity 5: Honest taxpayers are slightly less clever than tax evaders

which is supported by Table IV.6. There we subdivide the tax declaring type "at least once" into "sometimes" and "always". The average payoff per round and the average investment values are used as indicators of attitudes towards risk and of cleverness, nevertheless this is also depending on luck. The average number of different x_1, i, and $x_1 + i$ values shows the relation between tax declaring type and constancy of behavior.

	tax declaring type			
	never	sometimes	always	all cases
∅payoff per round (ECU)	30.92	45.77	56.73	39.97
∅ i-values	4.75	5.96	8.35	5.77
number of different i-values	2.90	3.18	3.14	3.03
number of different x_1–values	3.60	4.27	3.57	3.69
number of different $x_1 + i$-values	3.95	3.91	3.29	3.82

Table IV.6: Declaring type and the "saving game"

Clear results about the influences of audits (and penalties) as determinants of the evasion decision have not been noted due to the high percentage of hard-core nonevaders and many taxable incomes G with $G \leq 60$ ECU. Remarkable is that only 3 audited participants changed from underdeclaring to truthfully declaring and that 3 did it in the opposite way.

In the analysis of penalty-classes, a difference in maximizing the expected payoff when declaring income can be seen. According to Figure IV.3, the expected payoff is not maximized in 53.85% of all evasion decisions whereas this is true for 75.00% of all honest declarations[28]. Increasing complexity of maximizing in the evasion case could be one reason. Tax evasion rises with income (see above) and participants have to consider penalty-classes.

A regression analysis reveals that the best prediction (adjusted $R^2 = .714$, F-test, $p = .000$) of the amount of evaded tax as dependent variable is given by income (t-test, $p = .000$) and gender (t-test, $p = .012$).[29]

The differences in the expected payoff maximization of the individuals increase with income. 79.17% of all declarations (with $G > 60$ ECU) by participants with $G_\Sigma < 408.81$ ECU (median income) and only 53.97% for $G_\Sigma > 408.81$ ECU correspond to expected payoff maximization.

[28] only with $G > 60$ ECU, see above

[29] It is possible that these findings are influenced by multicollinearity.

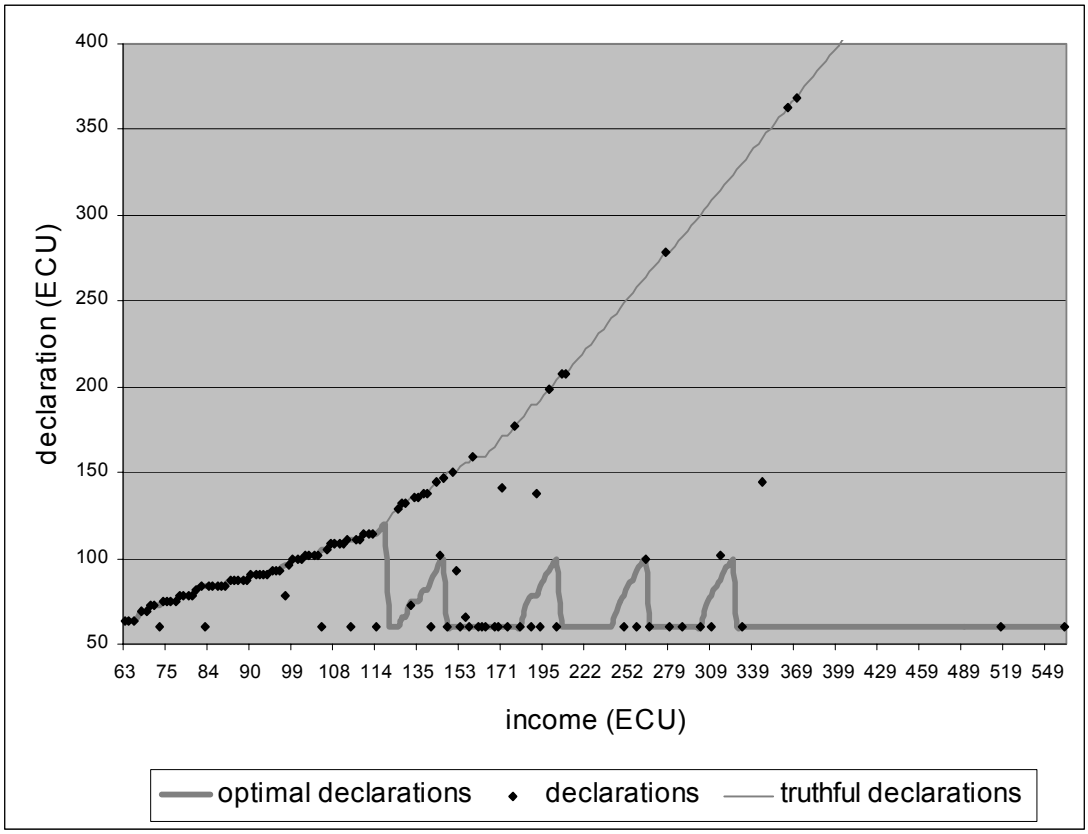

Figure IV.3: Declaration decisions and the maximized expected payoff

Figure IV.3 clearly reveals non-or-all behavior concerning the tax declarations. This means a taxpayer either declares honestly or conceals all of his real tax due $T(G)$. Only 10 of 111 cases (9.01%) deviate from this strategy[30].

The following figure which is derived from Figure IV.3 shows the distribution of honest declarations and underdeclarations for different income levels. This underlines Regularity 1, which states that the share of underdeclarations rises with income.

[30] See Alm, McClelland, and Schulze (1992) who observed this behavior too.

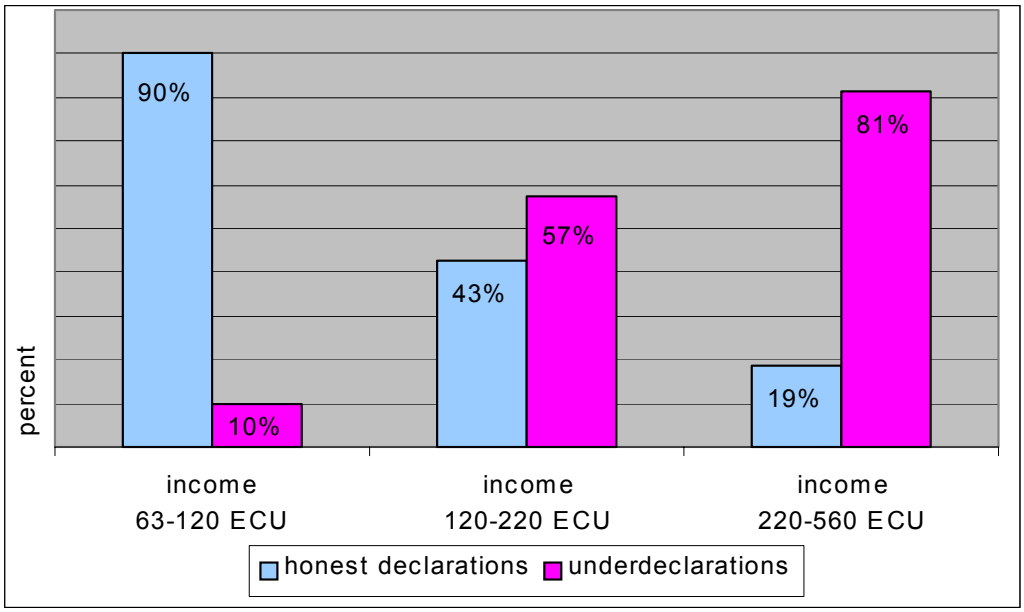

Figure IV.4: Declaration behavior depending on income levels

5. Conclusion

In this experimental study of tax evasion and its determinants participants earn their income by solving a complex stochastic intertemporal allocation problem. Taxes are not wasted since twice the individual tax revenue was donated to the following charity organizations[31]: Red Cross (25.19%), World Wildlife Fund (16.46%), German Animal Protectionists (2.67%), UNICEF (20.98%), and Supporters of Humboldt University's Economics Faculty (34.7%).

The responses of the post-experimental questionnaire reveal that only 5.3% of the participants assess the German tax system as fair. The violation of the ability-to-pay principle caused by too many "loopholes" was often criticized. 55.6% of the 18 participants who are less satisfied with government services evaded taxes at least once. 36.8% voted for the statement that tax evaders take a high risk. Most of the participants who disapproved (83.3%) evaded at least once, whereas

[31] Note that there is no significant relationship between chosen organization and declaration decision.

21.4% of the participants who approved evaded taxes. If participants neither approved nor disapproved (26.3%), half of them evaded taxes. Actually, 57.9% of the participants have not handed in a real tax declaration before.

This paper uses data from a laboratory experiment to examine the determinants of tax evasion, such as income, gender, risky investments, cleverness, and experiences with audits or punishment.

One main result of this study is that tax evasion appears to depend on income and gender. The higher a participant's income is the more likely is tax evasion. Experiences with audits or fines did not reveal a significant influence on tax evasion behavior. A large proportion of the participants were hard-core nonevaders. On average they earned less than those participants who evaded taxes. Their honesty is probably due to the conscience, threatened fines or financial loss, or knowledge about the consequences for the state. An important fact is that more hard-core nonevaders made an optimal tax declaration concerning the expected payoff than tax evaders (see Figure IV.3), but in regard of investments and the basic rationality requirement which provides more complexity this did not apply. Participants with a high income had to take several penalty-classes into consideration, which made their declaration decision more complex. It is highly probable that the more complex a task is the more decisions differ from the expected payoff maximization and the more they are guided by rules of thumb.

According to the gender effect, it was noticeable that women made lower investments and that they earned lower incomes. Table V.1 reveals that this seems to result from attitudes towards risk but not from less cleverness.

	gender		
	female	male	all cases
4 periods ($x_3 > x_4$)	47/59(79.7%)	32/44(72.7%)	79/103
5 periods ($x_3 > x_4 > x_5$)	21/30(70.0%)	14/32(43.8%)	35/62
6 periods ($x_3 > x_4 > x_5 > x_6$)	29/83(34.9%)	27/75(36.0%)	56/158
all cases	97/172 (56.4%)	73/151 (48.3%)	170/323 (52.6%)

Table V.1: Basic rationality requirements according to gender

Women are more honest in paying taxes than men and even when they cheated they did it to a lower extent. Experimental data should be interpreted carefully as to derive implications for reality. Nevertheless, we found an interesting correlation: Of the 14,025 judgments concerning tax fraud in 1997 11,562 (82.4%) referred to men and 2,463 (17.6%) referred to women (see Statistisches Bundesamt, 1998). Our data identified a nearly identical distribution. 79.5% of the 39 underdeclarations go back to men and 20.5% to women[32].

The findings support that a single focus upon the influences of economic factors will not provide a specification of tax evasion behavior. Not only economic factors, but also socioeconomic and psychological factors seem to have an effect on tax declaring behavior. Future studies hold promise for explaining exactly the roles played by these factors.

[32]Note that these are only quantitative statements not including the amounts evaded.

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6. Appendix A – Instructions

Instructions

This experiment consists of two parts. First, you will participate in a computer experiment. The gains represent your income which has to be declared in a tax return. Altogether the experiment lasts 12 rounds where every single round consists of at least three and at most 6 Periods. After every three rounds there is a break and you have to fill out the tax return.

Please, read now the instructions for the computer experiment, the information about the tax return is provided when you get the tax return.

Part 1 - Computer

These instructions will be available on your screen via the menu item "Game/Instructions". To quit the instructions, click the small green square in the upper left corner of this window or press <Esc>.

Each of the following rounds has the same course. You are able to earn income in ECU (Experimental Currency Unit). Your task in every round is to distribute an amount of money as good as possible over several periods. The better you do this, the higher is your payoff. In addition, you can invest any amount of the remaining money in the first period to a profitable but risky prospect, in order to enlarge your disposable amount in period 2 when you are lucky or to reduce it when you are unlucky. All amounts which are not spent during one round are lost.

Your payoff is determined by the product of all amounts you have spent in the periods you actually reached. For example, if you have reached exactly four periods, your payoff is determined by:

$$\text{Payoff from the round } G = x_1 \cdot x_2 \cdot x_3 \cdot x_4.$$

If you have reached all six periods, your payoff is:

$$\text{Payoff from the round } G = x_1 \cdot x_2 \cdot x_3 \cdot x_4 \cdot x_5 \cdot x_6.$$

The difficulty is, that there is no certainty about the number of periods you have to distribute your money. The game can last for three, four, five, or six periods. Every round will last at least three periods. Whether you reach the fourth, fifth, or sixth period, will be determined by throwing a die. There are altogether three different dice with the colors red, yellow, and green. The following table shows, in which cases you reach the next period.

Color of die	no further period if die shows	new period if die shows
red	1,2,3	4,5,6
yellow	1,2	3,4,5,6
green	1	2,3,4,5,6

The number of periods of one round cannot be higher than six. At the beginning of a round you do not know which die is used for you. You get this information after you have made some decisions. The general course of the game is as follows:

1st period) You will get a total amount of money $S = 11.92$ ECU, which you can spend in the coming periods. Altogether you can only spend this total amount. You can choose an amount x_1, which you want to spend in the first period. Think very carefully, how much you want to spent and how much you want to save for the following periods. In addition, you have (only) in the first period the opportunity to invest any amount of the remaining money $S - x_1$. You choose an amount i with $0 \leq i \leq S - x_1$. Now a die is thrown. If the die shows 1, 2, 3, or 4 the amount invested will be enlarged by 1/3. If the die shows 5 or 6 the amount invested will be reduced by 1/3. Accordingly, your disposable amount for the second is higher or lower. After your decision one of the three dice is excluded. Now you know, that only the two other dice are candidates for the chance to move on to the fourth, fifth, and sixth period.

2nd period) You are choosing an amount x_2, which you want to spend in the second period. You cannot spend more than you have left from the total amount after the first period. After your decision another die is excluded. Now you know, which die remains to be thrown for the fourth, fifth, and sixth period.

3rd period) You are choosing an amount x_3, which you want to spend in the third period. After this decision the computer will throw the remaining die in order to decide whether you reach the fourth period. If you do not reach the fourth period, the round ends here. The amount which is not spent until now is lost.

4th period) If you have reached the fourth period, you choose an amount x_4. For reaching the fifth period, the die will be thrown again.

5th period) If you have reached the fifth period, you choose an amount x_5. For reaching the sixth period, the die will be thrown again.

6th period) If you have reached the sixth period, you do not have to make a decision, because all remaining money is spent automatically.

Your payoff is calculated by the product of all the amounts that you have spent in the periods you reached. For instance, if you have finished exactly four periods, your payoff is determined by $G = x_1 \cdot x_2 \cdot x_3 \cdot x_4$. When you have reached, for instance, all six periods, your payoff is determined by $G = x_1 \cdot x_2 \cdot x_3 \cdot x_4 \cdot x_5 \cdot x_6$ where x_6 is the amount you have left after the fifth period. Please think about the following: If you spend in one period an amount of 0, your payoff will be also 0 because one of the factors is 0. This can happen, for instance, if you spend all money in the fourth period and reach the sixth period. Then you have to spend 0 in the fifth and perhaps also in the sixth period and therefore you get the payoff 0. You have to weigh the risk of spending all your money early or making your money useless if the game ends.

Part 2 – Tax return

Please fill in the tax return cover truthfully.

You have played 3 rounds of the experiment at the computer and you have received a payoff each round. Clicking the menu item "Game" and "Protocol", you will find your various payoffs up to now. At the end of the "Protocol" you will find the sum of the (last) 3 payoffs. This is your earned profit before tax that you have to declare. Your tax due is shown on the tax table. All in all, you fill in four tax returns.

Please note that there is a tax table, showing the tax rate for each personal income.

Your tax return will be checked with a probability of 1/3 by throwing a die. Only if the die shows "1" or "6" your tax return will be checked. In case of detected tax fraud you will have to pay a fixed penalty depending on the evaded taxes in addition to your personal tax. Your income will be:

$$I = \text{earnings} - \text{penalty} - \text{tax}$$

$$Penalty \text{ (ECU)} = \begin{cases} 50 & \text{if} \quad 0 < \text{evaded tax (ECU)} \leq 30 \\ 75 & \text{if} \quad 30 < \text{evaded tax (ECU)} \leq 60 \\ 100 & \text{if} \quad 60 < \text{evaded tax (ECU)} \leq 90 \\ 125 & \text{if} \quad 90 < \text{evaded tax (ECU)} \leq 120 \\ 150 & \text{if} \quad \text{evaded tax (ECU)} > 120 \end{cases}$$

Your declaration will be acknowledged automatically in case of tax evasion, but no monitoring. The personal tax due will then be as declared. If your income ≤ 60 ECU there exists no tax due.

If you declared correctly, you will have to pay the declared tax in case of monitoring and no monitoring as well. Your income now is:

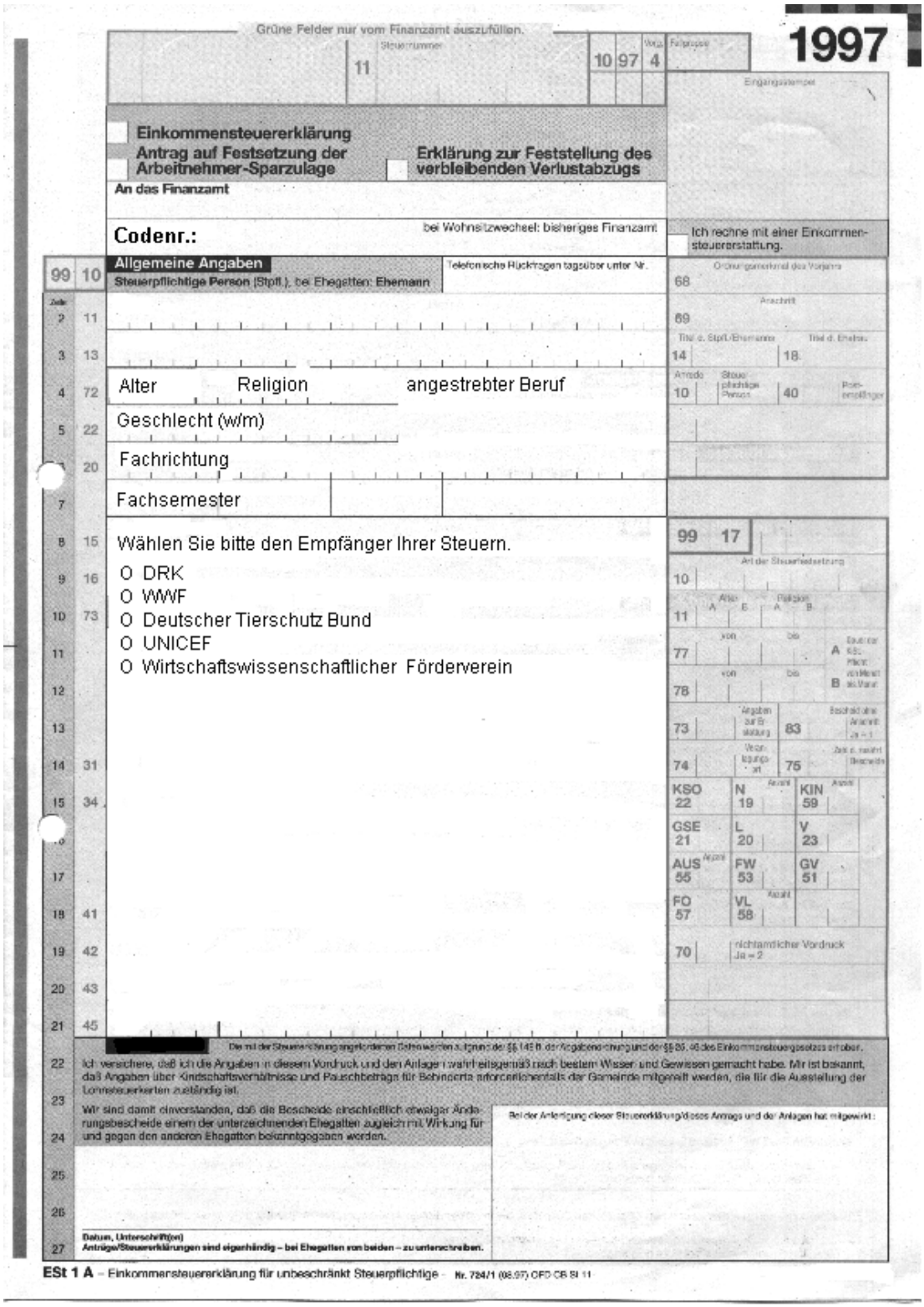
$$I = \text{earned income} - \text{tax}$$

Twice the tax revenue will be donated to charity, whereas penalties are sunk costs of the tax authorities. Select your preferred charity organization while filling in the cover of the declaration form.

Before and after the 2^{nd} part of the experiment you will be asked to answer some questions concerning your person and the experiment. Among other things, we are going to ask you whether certain personal attributes apply to you. You will be presented several scales, each of them labelled with two extreme characteristics. You are then asked to click the position between the extremes which matches your personality best. All of your statements are anonymous, only your code number (but not your name) is assigned to your data. Please answer truthfully and completely. The rate of exchange is 1 ECU=.03 DM.

If you have any questions concerning the experiment, please raise your hand. We will try to answer your questions privately. Please do not speak with your neighbors, any communication with them would make the data useless for us. In this case we would have to exclude you from participation and could not pay you.

Appendix B – Declaration Form (cover page)



Grüne Felder nur vom Finanzamt auszufüllen.

1997

Steuernummer 11 | 10 97 | Vorg. 4 | Fallgruppe

Eingangsstempel

Einkommensteuererklärung
Antrag auf Festsetzung der Arbeitnehmer-Sparzulage
Erklärung zur Feststellung des verbleibenden Verlustabzugs

An das Finanzamt

Codenr.:

bei Wohnsitzwechsel: bisheriges Finanzamt

Ich rechne mit einer Einkommensteuererstattung.

99 10 Allgemeine Angaben

Steuerpflichtige Person (Stpfl.), bei Ehegatten: Ehemann

Telefonische Rückfragen tagsüber unter Nr.

Ordnungsmerkmal des Vorjahrs 68

Anschrift 69

Titel d. Stpfl./Ehemanns 14 | Titel d. Ehefrau 18

Anrede 10 | Steuerpflichtige Person 40 | Postempfänger

Zeile

2 11

3 13

4 72 Alter | Religion | angestrebter Beruf

5 22 Geschlecht (w/m)

6 20 Fachrichtung

7 Fachsemester

8 15 Wählen Sie bitte den Empfänger Ihrer Steuern.

9 16 O DRK

10 73 O WWF

O Deutscher Tierschutz Bund

O UNICEF

O Wirtschaftswissenschaftlicher Förderverein

11

12

13

14 31

15 34

17

18 41

19 42

20 43

21 45

99 17

Art der Steuerfestsetzung 10

Alter A | Alter B | Religion A | Religion B 11

77 von | bis | A

78 von | bis | B

73 Angaben zur Einkommensteuer | 83 Bescheid ohne Anschrift Ja = 1

74 Veranlagungsart | 75 Zus. z. gem. Bescheid

KSO 22 | N 19 Anzahl | KIN 59 Anzahl

GSE 21 | L 20 | V 23

AUS 55 Anzahl | FW 53 | GV 51

FO 57 | VL 58 Anzahl

70 nichtamtlicher Vordruck Ja = 2

Die mit der Steuererklärung angeforderten Daten werden aufgrund der §§ 149 ff. der Abgabenordnung und der §§ 25, 46 des Einkommensteuergesetzes erhoben.

22 Ich versichere, daß ich die Angaben in diesem Vordruck und den Anlagen wahrheitsgemäß nach bestem Wissen und Gewissen gemacht habe. Mir ist bekannt, daß Angaben über Kindschaftsverhältnisse und Pauschbeträge für Behinderte erforderlichenfalls der Gemeinde mitgeteilt werden, die für die Ausstellung der Lohnsteuerkarten zuständig ist.

23 Wir sind damit einverstanden, daß die Bescheide einschließlich etwaiger Änderungsbescheide einem der unterzeichnenden Ehegatten zugleich mit Wirkung für und gegen den anderen Ehegatten bekanntgegeben werden.

24 Bei der Anfertigung dieser Steuererklärung/dieses Antrags und der Anlagen hat mitgewirkt:

25

26

27 Datum, Unterschrift(en)
Anträge/Steuererklärungen sind eigenhändig – bei Ehegatten von beiden – zu unterschreiben.

ESt 1 A – Einkommensteuererklärung für unbeschränkt Steuerpflichtige – Nr. 724/1 (08.97) OFD CB St 11

1^{st} Tax Declaration Form (round 1–3)

Please only fill in the three columns of the participants part (all in ECU)

Participants

declared income

Experimenters

inspection		true income	penalty	real tax	sum
yes	no				

Appendix C – Tax Tables

For $income > 300ECU$: tax $= 0.5(income - 60ECU)$. Round up your income to the values in the table.

income	tax rate	tax
0-60	0%	0.00
63	20%	0.60
66	21%	1.26
69	22%	1.98
72	23%	2.76
75	24%	3.60
78	25%	4.50
81	26%	5.46
84	27%	6.48
87	28%	7.56
90	29%	8.70
93	30%	9.90
96	31%	11.16
99	32%	12.48
102	33%	13.86
105	34%	15.30
108	35%	16.80
111	36%	18.36
114	37%	19.98
117	38%	21.66
120	39%	23.40
123	40%	25.20
126	41%	27.06
129	42%	28.98
132	43%	30.96
135	44%	33.00
138	45%	35.10
141	46%	37.26
144	47%	39.48
147	48%	41.76
150	49%	44.10
153	50%	46.50
156	50%	48.00
159	50%	49.50
162	50%	51.00
165	50%	52.50
168	50%	54.00

income	tax rate	tax
171	50%	55.50
174	50%	57.00
177	50%	58.50
180	50%	60.00
183	50%	61.50
186	50%	63.00
189	50%	64.50
192	50%	66.00
195	50%	67.50
198	50%	69.00
201	50%	70.50
204	50%	72.00
207	50%	73.50
210	50%	75.00
213	50%	76.50
216	50%	78.00
219	50%	79.50
222	50%	81.00
225	50%	82.50
228	50%	84.00
231	50%	85.50
234	50%	87.00
237	50%	88.50
240	50%	90.00
243	50%	91.50
246	50%	93.00
249	50%	94.50
252	50%	96.00
255	50%	97.50
258	50%	99.00
261	50%	100.50
264	50%	102.00
267	50%	103.50
270	50%	105.00
273	50%	106.50
276	50%	108.00
279	50%	109.50

income	tax rate	tax
282	50%	111.00
285	50%	112.50
288	50%	114.00
291	50%	115.50
294	50%	117.00
297	50%	118.50
300	50%	120.00

Appendix D – Postexperimental questionnaire

Please answer the following questions by marking it with a cross and give a short reason for your answer.

	is true		is wrong
The taxation in Germany is fair. Reason: ...	◯	◯	◯
Tax evaders take a high risk. Reason: ...	◯	◯	◯
I have already done a real tax return.	◯	◯	◯

Reflecting to the following lottery, how much are you willing to invest?

- with probability $p = 1/3$ you will earn 60 ECU
- with probability $p = 2/3$ you will earn 15 ECU

The lottery starts with a stake from 20 ECU up.

..... ECU

(The result is not influencing the payment of the experiment!)

7. Appendix E – Optimal declaration G* (ECU)

G	G^*	$T(G^*)$	$T(G) - T(G^*)$
0-60	0-60	0.00	0.00
63	63	0.60	0.00
66	66	1.26	0.00
69	69	1.98	0.00
72	72	2.76	0.00
75	75	3.60	0.00
78	78	4.50	0.00
81	81	5.46	0.00
84	84	6.48	0.00
87	87	7.56	0.00
90	90	8.70	0.00
93	93	9.90	0.00
96	96	11.16	0.00
99	99	12.48	0.00
102	102	13.86	0.00
105	105	15.30	0.00
108	108	16.80	0.00
111	111	18.36	0.00
114	114	19.98	0.00
117	117	21.66	0.00
120	120	23.40	0.00
123	60	0.00	25.20
126	60	0.00	27.06
129	60	0.00	28.98
132	66	1.26	29.70
135	75	3.60	29.40
138	81	5.46	29.64
141	87	7.56	29.70
144	93	9.90	29.58
147	99	12.48	29.28
150	60	0.00	44.10
153	60	0.00	46.50
156	60	0.00	48.00
159	60	0.00	49.50
162	60	0.00	51.00
165	60	0.00	52.50
168	60	0.00	54.00

G	G^*	$T(G^*)$	$T(G) - T(G^*)$
171	60	0.00	55.50
174	60	0.00	57.00
177	60	0.00	58.50
180	60	0.00	60.00
183	69	1.98	59.52
186	75	3.60	59.40
189	78	4.50	60.00
192	84	6.48	59.52
195	87	7.56	59.94
198	93	9.90	59.10
201	96	11.16	59.34
204	99	12.48	59.52
207	60	0.00	73.50
210	60	0.00	75.00
213	60	0.00	76.50
216	60	0.00	78.00
219	60	0.00	79.50
222	60	0.00	81.00
225	60	0.00	82.50
228	60	0.00	84.00
231	60	0.00	85.50
234	60	0.00	87.00
237	60	0.00	88.50
240	60	0.00	90.00
243	69	1.98	89.52
246	75	3.60	89.40
249	78	4.50	90.00
252	84	6.48	89.52
255	87	7.56	89.94
258	93	9.90	89.10
261	96	11.16	89.34
264	99	12.48	89.52
267	60	0.00	103.50
270	60	0.00	105.00
273	60	0.00	106.50
276	60	0.00	108.00
279	60	0.00	109.50

G	G^*	$T(G^*)$	$T(G) - T(G^*)$
282	60	0.00	111.00
285	60	0.00	112.50
288	60	0.00	114.00
291	60	0.00	115.50
294	60	0.00	117.00
297	60	0.00	118.50
300	60	0.00	120.00
303	69	1.98	119.52

G	G^*	$T(G^*)$	$T(G) - T(G^*)$
306	75	3.60	119.40
309	78	4.50	120.00
312	84	6.48	119.52
315	87	7.56	119.94
318	93	9.90	119.10
321	96	11.16	119.34
324	99	12.48	119.52
>324	60	0.00	

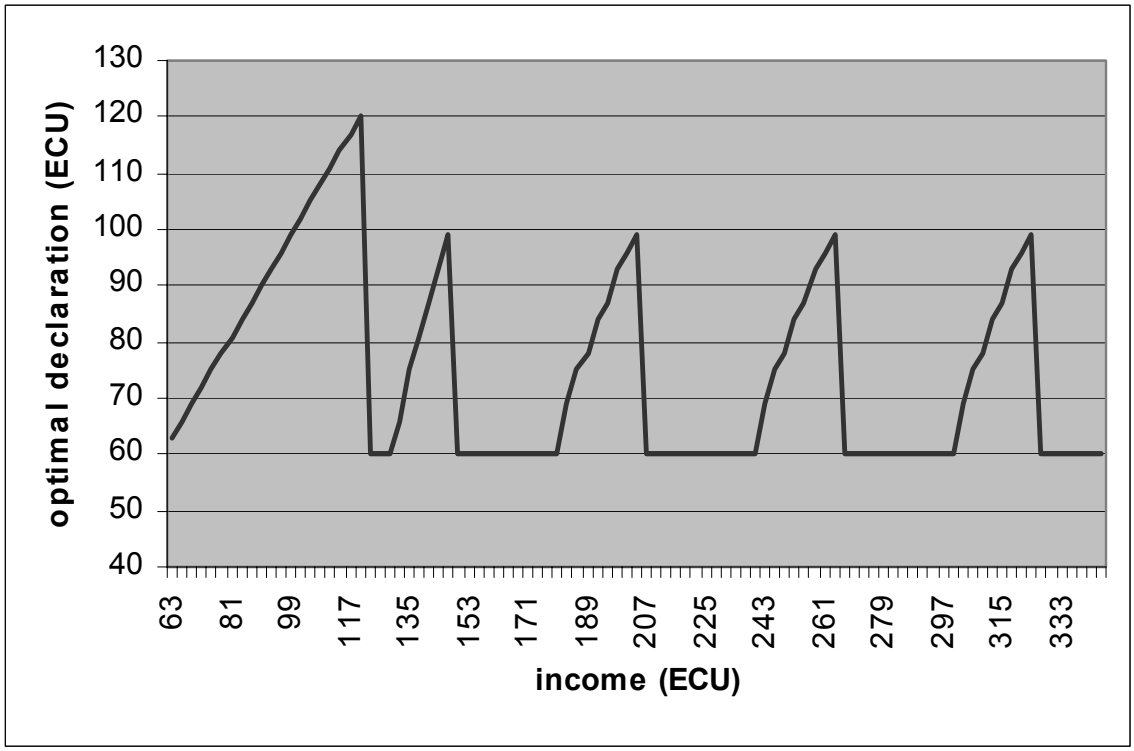


Figure E.1: Optimal income declaration