Arbeitskreis Quantitative Steuerlehre

Quantitative Research in Taxation – Discussion Papers

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arqus Discussion Paper No. 185

April 2015

www.arqus.info

ISSN 1861-8944

How does the type of subsidization affect investments: Experimental evidence*

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7th April 2015

Abstract

I study how different types of subsidization affect investment decisions in a laboratory experiment. Even though the expected profit is identical in all treatments, I find highly significant differences between them. In particular, when investment alternatives get subsidized with tax credits the willingness to invest in the subsidized alternative increases remarkably. In addition, the willingness to take risks increases in general, when tax credits are introduced. Hence, tax credits might be more effective in promoting investments.

Keywords: behavioral economics, subsidies, tax incentives, distorting subsidization, real investment, risk-taking behavior

JEL-Codes: C91, D14, H25

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*I would like to thank Sebastian Schanz for the great support in this project. I would also like to thank Abdolkarim Sadrieh, Sebastian Eichfelder, André Renz and Benedikt Mihm for useful discussions and suggestions as well as the participants of the "arqus" seminar for doctoral students 2013 and 2014 for helpful comments.

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1 Introduction

Granting a tax incentive can be understood as the opposite of taxation. If governments subsidize in order to spur investments, the fiscal budget decreases. To keep the costs of a promotion program as low as possible, governments are interested in a most effective type of subsidization. The theory of investment behavior of firms was developed by Jorgenson (1963) respectively Hall and Jorgenson (1967).[1] In simple terms, they explain that investments will take place as long as the cost of an investment is smaller than the additional benefit of it. Tax incentives reduce the cost respectively increase the benefit of the investment and should therefore encourage investments. Hence, when the financial benefit is equal between different types of subsidization, the neo-classic investment theory predicts the same impact on investment behavior, independent from the chosen type of subsidization. While many empirical studies confirm this general relationship, they do not allow for comparisons between different types of subsidization.[2]

Nevertheless, when governments promote firms to spur investments, they often use different types of subsidization. Depending on the type of the incentive, the fiscal authority pays an amount to the firm (grant) or subsidizes through a reduction of the tax liability of the firm (e.g. by a reduction of the tax base or a reduced tax rate). Yet, there are only a few studies focusing on the mechanism of different types of subsidization. Pennings (2000) shows in a real-option model, that a tax reduction is more effective in attracting investments than equivalent investment subsidies. Danielova and Sarkar (2011) argue that a combination of lower taxes and investment subsidies spurs investments at most. In a review of tax policy literature Morisset and Pirnia (2001) argue that governments are well-advised to use different types of intervention for different purposes. They emphasize that export-oriented

[1] Other key theoretical studies include Tobin (1969); Hayashi (1982); Abel and Eberly (1994).

[2] Cummins and Hassett (1992); Cummins et al. (1994); Hassett and Hubbard (2002); Chirinko and Wilson (2008); Hassett and Newmark (2008).

firms are more attracted by reduced tax rates than those seeking the domestic market, start-up firms are more responsive to incentives that reduce their initial expenses, while expanding firms will prefer tax incentives that reduce the tax burden on profits, and small firms react stronger on tax incentives than large ones because taxes play a more important role in small firms.

The existing empirical literature provides evidence that the effectiveness of subsidies may depend on the chosen mechanism of subsidization. Bernstein and Shah (1995) examine different types of tax incentives regarding their impact in attracting investments in developing countries. They conclude that a specific subsidization is more effective than general incentives. Selective interventions such as special tax credits for investments or R&D, and special depreciation rules for particular capital goods are more effective than a general corporate tax rate reduction or tax holidays. Wells and Allen (2001) expose that tax holidays have only a weak influence by attracting investments. Yu et al. (2007) compare the effects of entry cost subsidies and tax rate reductions on foreign direct investments. They come to the conclusion that entry cost subsidies, such as providing cheaper land, are more effective than equivalent tax rate reductions.

All of these studies concern rational decision makers. This assumption is at least questionable. Some experimental literature suggests that there is a perception bias of tax rules which may affect economic decision-making. Swenson (1989) as well as King and Wallin (1990) pronounced that proportional taxes lead to higher risky investments than progressive taxes. The studies of Epley et al. (2006) and Epley and Gneezy (2007) indicate that a bonus (grant) is valued more than a equivalent tax rebate. Blaufus et al. (2013) argue that higher tax rates result in a higher perceived tax burden than equivalent changes in the tax base. It seems likely that these findings are not only relevant for the taxation of business but also for subsidization. Nevertheless, an empirical investigation on the behavioral effects of a broad selection of different investment subsidies is still missing.

Hence, there remains uncertainty regarding the effectiveness of different types of subsidization. In most empirical studies, the effect of a subsidy is measured by a comparison of the situation before the subsidy was introduced with the situation thereafter or with a situation which is very similar (difference-in-differences methodology). Changes in tax provisions often coincide with other changes in the tax law which also can influence investment behavior. Due to the coincidence of different changes in the tax law, the impact of a single tax provision should be hard to measure (see for instance Hulse and Livingstone (2010) or Black et al. (2010)).

In contrast to archival studies, laboratory experiments can focus on the different types of subsidization in investment decisions. Other disturbing influences can be excluded. Hence, this approach should be most well suited to identify behavioral effects of different types of subsidization. To my knowledge, there are no experimental studies to date which focus on the impact of different types of subsidization on risky investments. This paper will continue at this point of research.

I build up a laboratory experiment in which participants have to make portfolio choices in an investment setting. In five laboratory treatments I study five different types of subsidization and their influence on the choice between risky and risk-free assets. The tested types of subsidization are: *grant*, *tax exemption*, *tax allowance*, *tax credit* and *tax rate relief*. Other types of subsidization which include a time component, such as tax holidays, guarantees, loss-offset rules or accelerated depreciation rules will not be considered. Although the expected profit is identical in all treatments, I find highly significant differences in the willingness to take risks between the different types of intervention. Indeed, participants seem to perceive the benefit through the subsidization differently. The highest amount which was invested in the subsidized risky alternative could be observed when investments were subsidized with tax credits. Therefore tax credits seem to be most effective.

The paper is organized as follows. In Section 2 the setting of the experiment, the analyzed types of subsidization and the hypotheses are described. The results are described in Section 3. In the following Section 4 the results will be discussed before the study ends with a conclusion in Section 5.

2 Experimental design and hypotheses

In order to identify the effect of subsidization on risky investments, I conducted a laboratory experiment. Experimentations allow to focus on concrete questions. In the experiment I have stronger control over extraneous influences, which can affect investment decisions outside the laboratory. It permits a direct test of theory and a focus on the different opportunities to subsidize.

2.1 Design of the experiment

The experiment has been conducted in order to investigate the impact of five different types of subsidization. Therefore, the experiment consists of five separate treatments. Only one type of subsidization was considered per treatment. The participants take part in only one of the five treatments ("between-subject design"). For each investment choice, the participants have to choose between three investment alternatives (alternative A, B, and C) and have no time limitations in making their choice. At the beginning of each investment decision, participants receive an endowment of 100 Lab-points where 1 Lab-point corresponds to 1 Euro Cent. In each investment decision, participants have to invest their endowment of 100 Lab-points in three alternatives. Thereby, they have to choose the amount that should be invested in objects of alternative A and alternative B. The remaining amount will automatically be invested in objects of alternative C. The price for one object of each type is always 1 Lab-point. It was a one-shot game and therefore the decisions are independent. No time effects can occur.

The investment alternatives are designed in such a way that they vary in risk. The risk can be measured by the difference between the highest and smallest payoff, the probability of a payoff, and the number of states of environment. Eight equally probable states of environment are possible.[3] While alternative A and alternative B are risky investments, alternative C is risk-free. Therefore the return of alternative C is equal in every state of environment. Alternative B is more risky than alternative A, because the difference between the highest and smallest payoff is higher. Without subsidization, the expected payoff of each alternative is equal. They differ only in the variance of the payoff.

When investments differ in risk, risk-averse investors require a risk premium to purchase the more risky alternative. Without such risk premium, the demand for the most risky alternative B would decrease. Therefore, I include a subsidy for alternative B. Investors should find subsidized alternatives more attractive, and the amount invested in alternative B should rise. The type of subsidization which result in the highest investment in alternative B should be the most effective one with the highest impact in attracting investments. Therefore I need no baseline treatment. However, in a previous work, Ackermann et al. (2013) found out that subsidization could result in a decreased willingness to take risks because of complexity. If there are some participants who want to invest risky but are discouraged by the complexity of subsidization, there might invest in the alternate risky alternative A.

Taxation is considered in every investment decision. For simplification, the tax rate is fifty percent. The payment to the participants after the experiment depends on the net payoff of the investment decisions. Therefore, participants are interested in maximizing possible net payoffs. During the treatment the participants face only the gross payoff and the type of subsidization. To calculate the net payoff, participants have to subtract the tax burden from the gross payoff. The tax burden is calculated by multiplying the tax base with the tax rate. The tax base is the gross payoff minus the invested endowment.

[3] The probability of the states of environment is therefore: $p = \frac{1}{8}$.

State of environment	Decision task (without subsidization)											
	Alternative A				Alternative B				Alternative C			
	gross	tax base	tax	net	gross	tax base	tax	net	gross	tax base	tax	net
1	11.20	10.20	5.10	6.10	9.80	8.80	4.40	5.40	14.00	13.00	6.50	7.50
2	12.00	11.00	5.50	6.50	11.00	10.00	5.00	6.00	14.00	13.00	6.50	7.50
3	12.80	11.80	5.90	6.90	12.20	11.20	5.60	6.60	14.00	13.00	6.50	7.50
4	13.60	12.60	6.30	7.30	13.40	12.40	6.20	7.20	14.00	13.00	6.50	7.50
5	14.40	13.40	6.70	7.70	14.60	13.60	6.80	7.80	14.00	13.00	6.50	7.50
6	15.20	14.20	7.10	8.10	15.80	14.80	7.40	8.40	14.00	13.00	6.50	7.50
7	16.00	15.00	7.50	8.50	17.00	16.00	8.00	9.00	14.00	13.00	6.50	7.50
8	16.80	15.80	7.90	8.90	18.20	17.20	8.60	9.60	14.00	13.00	6.50	7.50
E(X)				7.50				7.50				7.50
σ_i				0.98				1.47				0.00

Table 1 Payoffs without subsidization

This calculation remains the same in all of the five treatments. Table 1 shows an example for calculating the net payoff without subsidization. Without subsidization the expected net value is equal in all cases, while the standard deviation remains constant.

As mentioned above, the introduction of a tax incentive on alternative B increases the expected net payoff of alternative B above that of alternative A and alternative C. The amount exceeding the expected value of alternative B results only from the subsidization. The benefit through the subsidization is identical in all of the five treatments. Therefore, the expected net payoff is identical between the different treatments. They differ only in the way of subsidization. Table 2 shows an example for calculating the net payoff with subsidization. Alternative B gets subsidized with a *grant* (subsidization rate = 10%).

To learn more about the perception of the different types of subsidization, I vary the level of subsidization and the level of risk. Four rates of subsidization (sub-rates) were considered (10%, 15%, 20% and 25%). For

State of environment	Decision task (Alternative B gets subsidized with a grant)												
	Alternative A				Alternative B					Alternative C			
	gross	tax base	tax	net	gross	tax base	tax	subsidy	net	gross	tax base	tax	net
1	11.20	10.20	5.10	6.10	9.38	8.38	4.19	0.75	5.94	14.00	13.00	6.50	7.50
2	12.00	11.00	5.50	6.50	10.70	9.70	4.85	0.75	6.60	14.00	13.00	6.50	7.50
3	12.80	11.80	5.90	6.90	12.02	11.02	5.51	0.75	7.26	14.00	13.00	6.50	7.50
4	13.60	12.60	6.30	7.30	13.34	12.34	6.17	0.75	7.92	14.00	13.00	6.50	7.50
5	14.40	13.40	6.70	7.70	14.66	13.66	6.83	0.75	8.58	14.00	13.00	6.50	7.50
6	15.20	14.20	7.10	8.10	15.98	14.98	7.49	0.75	9.24	14.00	13.00	6.50	7.50
7	16.00	15.00	7.50	8.50	17.30	16.30	8.15	0.75	9.90	14.00	13.00	6.50	7.50
8	16.80	15.80	7.90	8.90	18.62	17.62	8.81	0.75	10.56	14.00	13.00	6.50	7.50
E(X)				7.50					8.25				7.50
σ_i				0.98					1.62				0.00

Table 2 Payoffs with subsidization (sub-rate = 10%)

example, in the 10% sub-rate decisions, the economic impact caused by the subsidization amounts to 10% of the expected net value of the investment without subsidization, respectively 0.75 for an expected value of 7.50. The risk was varied by increasing the difference between the highest and the smallest payoff level in the investment situations. In sum four rates of risk (risk-rates) are considered. During the treatments four different risk-rates were combined with four different sub-rates. Therefore 16 decision situations were analyzed in 16 rounds (one decision situation per round). The investment choices were presented randomly to the participants. This is done to minimize learning effects. Table 3 provides an overview of the different decision situations. The table presents the different expected net values E(X) and the standard deviations σ_i.

In each decision, participants had to chose their individual ratio between the risky alternatives (low-risk alternative A and high-risk subsidized alternative B) and the risk-free alternative C. The design allows to observe the link between increasing risk and the benefit of subsidization. Furthermore, the design allows to observe the spillover effect toward alternative B caused by

The investment decisions												
	sub-rate 10%			sub-rate 15%			sub-rate 20%			sub-rate 25%		
	A	B	C	A	B	C	A	B	C	A	B	C
E(X)	7.50	8.25	7.50	7.50	8.63	7.50	7.50	9.00	7.50	7.50	9.38	7.50
σ_i	0.98	*1.62*	0.00	0.98	*1.69*	0.00	0.98	*1.76*	0.00	0.98	*1.84*	0.00
E(X)	7.50	8.25	7.50	7.50	8.63	7.50	7.50	9.00	7.50	7.50	9.38	7.50
σ_{ii}	0.98	*2.16*	0.00	0.98	*2.25*	0.00	0.98	*2.35*	0.00	0.98	*2.45*	0.00
E(X)	7.50	8.25	7.50	7.50	8.63	7.50	7.50	9.00	7.50	7.50	9.38	7.50
σ_{iii}	0.98	*2.69*	0.00	0.98	*2.82*	0.00	0.98	*2.94*	0.00	0.98	*3.06*	0.00
E(X)	7.50	8.25	7.50	7.50	8.63	7.50	7.50	9.00	7.50	7.50	9.38	7.50
σ_{iv}	0.98	*3.23*	0.00	0.98	*3.38*	0.00	0.98	*3.53*	0.00	0.98	*3.67*	0.00

Table 3 Expected net payoff and standard deviation per decision with subsidization

subsidization. Note that the gross payoff is transformed in a manner that the net payoff is the same in all treatments. Furthermore, the gross payoff is designed in such a way that it is not obvious whether the expected net payoff of alternative B exceeds the expected net payoff of alternative A or the certain payoff of alternative C.

2.2 Types of subsidization

2.2.1 Grant

In the treatment *grant* participants receive a tax-free direct subsidy. Because of the different rates of subsidization, the *grant* ranges between 0.75 (sub-rate: 10%) up to 1.88 (sub-rate: 25%) and may set to: 0.75, 1.13, 1.50 and 1.88. The *grant* depends on the expected payoff without subsidization and not on the realized payoff. The net payoff for one Lab-point invested in alternative B is defined as:

$$net = gross + S_g - [gross - P] \times t \tag{1}$$

where:

gross	=	gross payoff
S_g	=	subsidization type: tax-free direct subsidy
P	=	paid price for purchased objects (cost per object = 1)
t	=	tax rate

2.2.2 Tax exemption

A different way to subsidize investments is to reduce the tax base. In the treatment *tax exemption*, a fraction of the gross payoff is exempt from the tax base. The tax exemption corresponds with the rate of subsidization. In the 10% sub-rate decisions, 10% of the gross payoff is tax-free. The net payoff for one Lab-point invested in alternative B is defined as:

$$net = gross - [gross \times (1 - S_e) - P] \times t \tag{2}$$

where:

S_e	=	subsidization type: exempted fraction of the gross payoff

2.2.3 Tax allowance

Principally, the tax base is the difference between the gross payoff and the invested amount. If the gross payoff is for example 9.38 for an invested amount of one Lab-point, the tax base amounts to 8.38. In the treatment *tax allowance*, the tax base is the gross payoff minus a multiple of the invested amount.[4] The deductible amount increases to 500% in the 25% sub-rate decisions. Therefore,

[4] Deductible amount in the 10% sub-rate decisions = 250% of the invested amount = 250% × 1 Lab-point = 2.5 Lab-points.

in the treatment *tax allowance* the net payoff to the investor for one Lab-point invested in alternative B is defined as:

$$net = gross - [gross - S_a \times P] \times t \tag{3}$$

where:

S_a = subsidization type: deductible amount from the tax base

2.2.4 Tax credit

The subsidization with a *tax credit* implies a direct reduction of the tax due. The *tax credit* is a credited amount against the calculated tax payment. The deduction from the tax payment is 0.75 in the 10% sub-rate decisions and increases to 1.88 in the 25% sub-rate decisions. The deduction may set to: 0.75, 1.13, 1.50 and 1.88. The gross payoffs are chosen in such a way, that the tax due is always bigger than the *tax credit*. In the treatment *tax credit* the net payoff to the investor for one Lab-point invested in alternative B is defined as:

$$net = gross - [(gross - P) \times t - S_c] \tag{4}$$

where:

S_c = subsidization type: creditable amount against the tax due

2.2.5 Tax rate relief

In the treatment *tax rate relief* a reduced tax rate is applied to the realized tax base of alternative B, while the standard tax rate of 50% is applied for alternative A and C. The reduced tax rates range from 45% (in the 10% sub-rate decisions) down to 35% (in the 25% sub-rate decisions) and may set to: 45%, 43%, 40% and 35%. In the treatment *tax rate relief* the payoff to the investor for one Lab-point invested in alternative B is defined as:

$$net = gross - [gross - P] \times t_{s,r} \tag{5}$$

where:

$t_{s,r}$ = reduced tax rate

Table 4 shows an example for every type of subsidization. The decision situation with the lowest risk-rate and lowest sub-rate is presented. The gross payoffs from alternative A and alternative C are given in Table 1 and stay constant during the whole experiment. Small differences in the gross payoff of alternative B are inevitable due to the different types of subsidization. However, as investors should be interested in the expected net payoffs, the small deviations in the gross payoff can be neglected. It becomes clear that the expected net payoff is identical for the different types of intervention.

2.3 Hypotheses

There are no differences in the net payoff and the economic impact of the subsidization is equal between the different subsidy types. Therefore, if investors are rational and focus on the user-costs of capital, the amount invested in alternative B should be the same across all treatments. This leads to my first hypothesis:

Hypothesis 1. *The investment in alternative B is identical in all of the five treatments.*

In the experiment, four different sub-rates were considered. The benefit that results from the subsidization increases from 10% up to 25%. If there is no perception bias, the amount invested in alternative B should increase in the subsidy level. This leads to my second hypothesis:

State of environment	High risk subsidized alternative B																					
	grant					tax exemption				tax allowance				tax credit					tax rate relief			
	gross	tax base	tax	grant	net	gross	tax base	tax	net	gross	tax base	tax	net	gross	tax base	tax	credit	net	gross	tax base	tax	net
1	9.38	8.38	4.19	0.75	5.94	9.89	7.90	3.95	5.94	9.38	6.88	3.44	5.94	9.38	8.38	4.19	0.75	5.94	9.98	8.98	4.04	5.94
2	10.70	9.70	4.85	0.75	6.60	11.09	8.98	4.49	6.60	10.70	8.20	4.10	6.60	10.70	9.70	4.85	0.75	6.60	11.18	10.18	4.58	6.60
3	12.02	11.02	5.51	0.75	7.26	12.29	10.06	5.03	7.26	12.02	9.52	4.76	7.26	12.02	11.02	5.51	0.75	7.26	12.38	11.38	5.12	7.26
4	13.34	12.34	6.17	0.75	7.92	13.49	11.14	5.57	7.92	13.34	10.84	5.42	7.92	13.34	12.34	6.17	0.75	7.92	13.58	12.58	5.66	7.92
5	14.66	13.66	6.83	0.75	8.58	14.69	12.22	6.11	8.58	14.66	12.16	6.08	8.58	14.66	13.66	6.83	0.75	8.58	14.78	13.78	6.20	8.58
6	15.98	14.98	7.49	0.75	9.24	15.89	13.30	6.65	9.24	15.98	13.48	6.74	9.24	15.98	14.98	7.49	0.75	9.24	15.98	14.98	6.74	9.24
7	17.30	16.30	8.15	0.75	9.90	17.09	14.38	7.19	9.90	17.30	14.80	7.40	9.90	17.30	16.30	8.15	0.75	9.90	17.18	16.18	7.28	9.90
8	18.62	17.62	8.81	0.75	10.56	18.29	15.46	7.73	10.56	18.62	16.12	8.06	10.56	18.62	17.62	8.81	0.75	10.56	18.38	17.38	7.82	10.56
E(X)					8.25				8.25				8.25					8.25				8.25
σ_i					1.62				1.62				1.62					1.62				1.62

Table 4 Different types of intervention (sub-rate 10%)

Hypothesis 2. *Higher rates of subsidization result in higher amounts invested in alternative B.*

The impact of different subsidy types is measured by a comparison of the separate treatments. One can assume that the treatment with the highest average investment in alternative B provides the type of subsidization with the highest impact in promoting risky investments. However, a subsidization of alternative B might also reduce the investments in other risky alternatives. To examine the overall impact on risk-taking resulting on the different tax incentives, the invested amount in risky assets (invested amount in alternative A plus alternative B) has to be investigated. If there is no perception bias, the risky invested amount should be equal across all treatments. To investigate this assumption, I formulate my third hypothesis:

Hypothesis 3. *The risky invested amount (amount invested in the alternatives A and B) is identical in all of the five treatments.*

Besides, the risk of alternative B was varied by increasing the differences between the highest and the smallest payoff. Increasing risk should reduce the amount invested in alternative B. The fourth hypothesis is therefore:

Hypothesis 4. *Higher rates of risk result in lower amounts invested in alternative B.*

2.4 Risk preference lottery

To make sure that deviations between the different risky invested amounts are attributable to the different types of subsidization, the participants in the different treatments must be identical in their willingness to take risks. The risk preferences of the participants were tested with a method introduced by Holt and Laury (2002). I used a multiple price-list to infer the risk aversion. Subjects were faced with ten choices between paired lotteries presented in Table 5 (the expected payoff differences were not shown).

Option A							Option B							Expected payoff difference
1/10	of	4.00	and	9/10	of	3.60	1/10	of	7.70	and	9/10	of	0.20	2.69
2/10	of	4.00	and	8/10	of	3.60	2/10	of	7.70	and	8/10	of	0.20	1.98
3/10	of	4.00	and	7/10	of	3.60	3/10	of	7.70	and	7/10	of	0.20	1.27
4/10	of	4.00	and	6/10	of	3.60	4/10	of	7.70	and	6/10	of	0.20	0.56
5/10	of	4.00	and	5/10	of	3.60	5/10	of	7.70	and	5/10	of	0.20	-0.15
6/10	of	4.00	and	4/10	of	3.60	6/10	of	7.70	and	4/10	of	0.20	-0.86
7/10	of	4.00	and	3/10	of	3.60	7/10	of	7.70	and	3/10	of	0.20	-1.57
8/10	of	4.00	and	2/10	of	3.60	8/10	of	7.70	and	2/10	of	0.20	-2.28
9/10	of	4.00	and	1/10	of	3.60	9/10	of	7.70	and	1/10	of	0.20	-2.99
10/10	of	4.00	and	0/10	of	3.60	10/10	of	7.70	and	0/10	of	0.20	-3.70

Table 5 Ten paired lottery-choice decisions

The potential payoffs for Option A in this lottery have a lower variance than the payoffs for Option B. In the first decision, the probability of the high payoff is 1/10 in Option A and in Option B. Therefore, only a participant with a high willingness to take risks would choose Option B. The expected payoff incentive choosing Option A in the first decision is 2.69 et cetera. In the next decision the probability of the high payoff increases. When the probability is sufficiently high, participants should switch to Option B. In every treatment participants have to play the same lottery. After the experiment, one randomly chosen decision gets paid out to the subjects.

On average, the participants of the five treatments shift between the sixths and seventh decision from Option A to Option B.[5] All groups seem to be risk-averse. There are no significant differences between the treatment-groups. Hence, one can assume that the different groups have the same willingness to take risks.

2.5 Complexity reduction methods

At the beginning of each treatment, the instructions were read out loud. In the instructions, the procedure of the treatment and the payoff to the

[5] For further details see Table 11 in the appendices.

participants were explained. Furthermore, the instructions contain a special example related to the relevant type of subsidization. In this example, the calculation of the total net payoff of a specific investment in the alternatives A, B, and C was explained. The participants had as much time as they needed to read the instructions for their own and to ask questions.

After reading the instructions, participants faced a comprehension test. During the test, participants had to answer questions about a different investment situation and had to calculate the total net payoff. The test was completed after all questions were answered correctly. Because of the somewhat difficult calculations, the participants were handed a pocket calculator. They were allowed to use it during the whole experiment. I ran the comprehension test to check and to ensure that the participants were able to understand the calculations, which they faced during the treatment.

After the comprehension test, the actual treatment got started. In order to support participants decision-making, a "what-if-calculator" was implemented in the experiment. With the help of the "what-if-calculator" participants were able to calculate the total net payoff for every possible decision, depending on the state of environment. The calculator could be used as often as required. Table 6 shows the frequency of how often the "what-if-calculator" was used per decision on average.

grant	tax exemption	tax allowance	tax credit	tax rate relief
6.66	3.56	4.78	4.21	4.89

Table 6 Intensity of using the calculator per decision

One can see that participants used the calculator very often. Before an investment decision was made, the "what-if-calculator" was used at least four times on average. After the treatments, participants had to answer a questionnaire which included information such as gender, age, and education.

2.6 Experimental setup

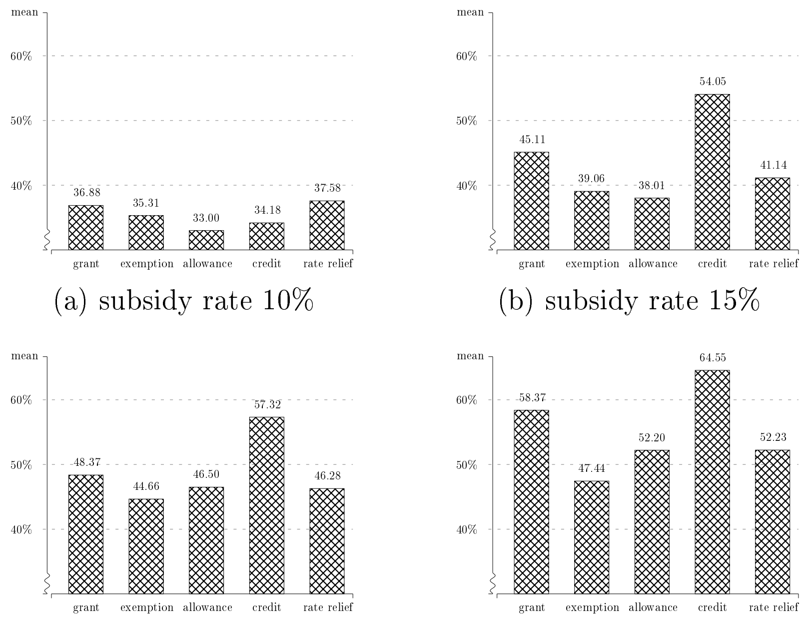
All treatments were conducted at the computerized experimental laboratory at the Otto-von-Guericke-University Magdeburg (MaXLab) in January 2013 and were programmed with z-Tree (Fischbacher, 2007). In sum, 112 students participated in the five treatments (43 female and 69 male subjects). The students were recruited with ORSEE (Greiner, 2004). Most of the students majored in Economics and Management. The participants completed the tasks at individual speed but all treatments took nearly $1\frac{3}{4}$ hours on average. After the treatment, the participants were paid their earnings in cash. To avoid income effects, the amount earned in the risk-preference lottery was paid out after the whole treatment. Until the end of the treatment, participants did not know their payoff. In addition, they received the profit from only one randomly drawn and played out investment choice. The participants earned a aggregated payoff between 9.60 Euros and 18.40 Euros, with an average of 13.63 Euros.

3 Results

3.1 Descriptive statistics

Figure 1 depicts the average amount invested in the high-risk subsidized alternative B for different subsidy rates and treatments. The amount invested in alternative B differs between the treatments. In the 10%-decisions, there are no significant differences between the different treatments (see Table 18 in the appendix for the corresponding Mann-Whitney-U test).

With increasing sub-rate, the amount invested in alternative B increases as expected. However, the increase is not the same among all treatments. It is much stronger in the treatment *tax credit* and the treatment *grant*. In the 25% sub-rate decisions, 64.55% of the endowment will be invested in alternative B on average, if it gets subsidized with a *tax credit*. This represents an increase



(a) subsidy rate 10% (b) subsidy rate 15%

(c) subsidy rate 20% (d) subsidy rate 25%

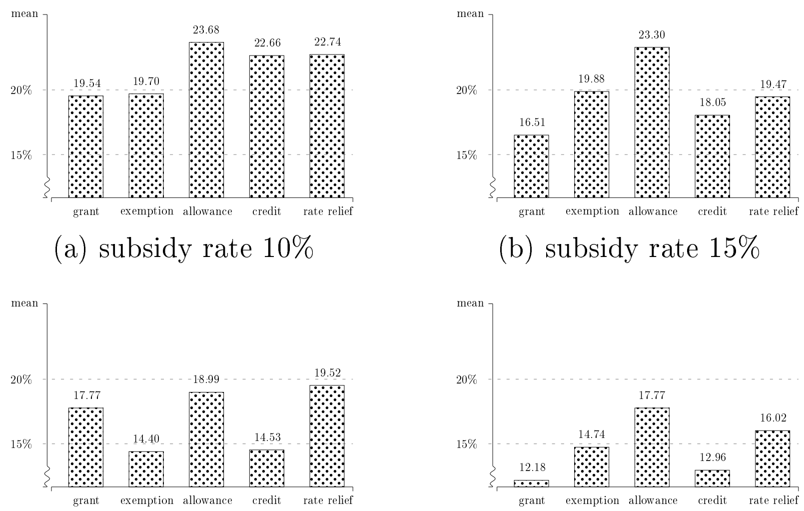
Figure 1 Average high-risk subsidized investment B

compared to the 10%-sub-rate decisions of 30.37 percentage points. In the treatment *grant* the average amount is still as high as 58.37% (increase of 21.49 percentage points).

While in the 10%-sub-rate decisions no significant differences between the treatments could be observed, this changed when sub-rates are increased. Especially when investments got subsidized with a *tax credit*, the share invested in alternative B increases significantly above that of the other treatments (see the Tables 18 to 21 in the appendix for the corresponding Mann-Whitney-U tests). *Hypothesis 1* is therefore rejected when the subsidy rate exceeds 10%.

Higher incentives result in an increase in the share invested in alternative B, regardless to the type of subsidization. Obviously, the increasing sub-rate was perceived in all treatments. The *hypothesis 2* is therefore confirmed.

By contrast, Figure 2 illustrates that the increasing subsidy rate on investments in alternative B results in a decrease in the share invested in alternative A on average (see also Table 12 in the appendix). Figure 2 depicts the share invested in the low-risk alternative A for each subsidy rate and treatment on average. The endowment invested in alternative A differs among the treatments. However, even with an increase in the rate of subsidization, the differences are not significant (see the Tables 18 to 21 in the appendix). Hence, two important insights can be obtained. On the one hand, increasing rates of subsidization result in a decrease of the share invested in alternative A, regardless of the type of subsidization. However, the decrease in alternative A is not quite as strongly as the increase in alternative B. The strongest decrease in alternative A can be observed as the treatment *credit* with a decrease of 9.70 percentage points (corresponding with an increase in alternative B of 30.37 percentage points; see the Tables 12 and 13 in the appendix). On the other hand, the differences in the extent to which the investment in alternative A decline among the treatments are not significant.



(a) subsidy rate 10%

(b) subsidy rate 15%

(c) subsidy rate 20%

(d) subsidy rate 25%

Figure 2 Average low-risk investment A

Comparing the results of the investments in alternative A and alternative B, it can be stated that the greater the sub-rate is, the greater the crowding out by alternative A towards alternative B will be. The effect is particularly strong in the treatments *tax credit* and *grant*. This is in line with the stronger effects of *tax credit* and *grant* on investments in alternative B.

Nevertheless, the amount of the risky investment (amount invested in alternative A plus the amount invested in alternative B) increases with increasing subsidization. Since the increase in B is generally higher than the decrease in A, the share invested in alternative C must decrease with increasing subsidization. This is illustrated by Figure 3 (see also Table 14 in the appendix).

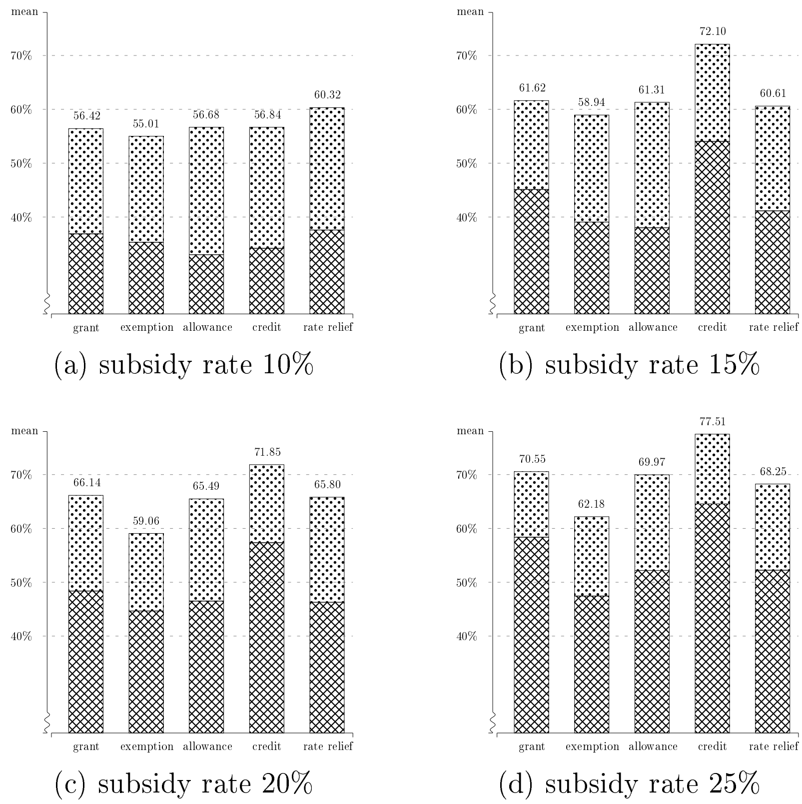


Figure 3 Average total risky investment (A+B)

In the 10%-sub-rate decisions 55%-60% of the budget will be invested risky. There are no significant differences between the treatments. This changes with increasing rates of subsidization. The risky invested amount is significantly higher when investments get subsidized with a *tax credit* and the sub-rate is

15% or higher (see the Tables 18 to 21 in the appendix for the corresponding Mann-Whitney-U tests). The difference between the treatment *tax credit* to the other treatments is up to 13 percentage points . Hence, *tax credits* have a stronger effect on aggregated risky investments compared to other subsidy types. The *hypothesis 3* must therefore be rejected. In the other treatments the risky invested amount increases to a smaller extent.

By contrast, in the treatment *tax exemption* the average risky invested amount lags behind the other treatments when the sub-rate exceeds 15%. No significant differences can be observed between the treatments *grant*, *tax allowance*, *tax exemption* and *tax rate relief* (compare the Tables 18 to 21 in the appendix). The amount differs only in the composition of the low-risk investment A and the high-risk investment B.

The standard economic theory predicts a decrease in the willingness to invest risky, if the risk increases. In the experiment, the risk of alternative B was increased by increasing the differences between the highest and the smallest income chance in the decision situations. Table 3 depicts the increasing risk, represented by the standard deviation, of the 16 situations. In the experiment, the participants react as predicted by the theory. Table 7 presents the share of endowment invested in the high-risk subsidized alternative B on average for all treatments and risk rates.

Alternative B	grant	tax exemption	tax allowance	tax credit	tax rate relief
σ_i	53.25	44.38	44.44	58.67	47.61
σ_{ii}	50.52	42.25	42.52	49.23	46.32
σ_{iii}	44.64	40.06	40.98	54.21	43.70
σ_{iv}	40.32	39.78	41.77	48.00	39.59
average	47.18	41.62	42.43	52.53	44.31
$\Delta_{(4-1)}$	-12.93	-4.60	-2.67	-10.67	-8.02

Table 7 Average high-risk subsidized investment B by risk-rates

The increasing risk results in a decrease in the willingness to invest in the high-risk alternative B, regardless of the type of subsidization. The participants seem to be risk-averse. The *hypothesis 4* is therefore confirmed. In the treatments *grant* and *tax credit* the participants react more sensitive to higher rates of risk.

It can be noted that the participants of the experiment increase risky investments for higher sub-rates and reduce risky investments for higher risk-rates. They behave like the standard economic theory predicts. Deviating from the standard economic theory, it can further be stated that the different types of subsidization have a different impact on risky investments. If investments were subsidized with a *tax credit*, the risky invested amount was significantly higher than in the other treatments. This is mainly due to the fact that the share invested in alternative B rises significantly above that of the other treatments when B is subsidized with a *tax credit*.

3.2 Regression results

To confirm the results from the descriptive statistics I run six linear regressions. The regression variables are explained in Table 8 and the regression results are presented in Table 9. To check the influence of the different types of subsidization on the risk-taking behavior I consider three different dependent variables: average of the investment in the low-risk alternative A (the first two regressions), average of the investment in the high-risk subsidized alternative B (third and fourth regression), and average of the investment in the total risky investment (amount invested in alternative A plus the amount invested in alternative B; fifth and sixth regression). I use an ordinary least-square estimation (OLS) with normal standard errors.[6]

The treatment *grant* is the default, and therefore the coefficients of the variables measure the differences between the respective treatments and the treatment *grant*. Similar to the previous results, the investment in alternative

[6] I checked also with robust standard errors. No significant differences appeared.

Variable	explanation

type of subsidization	grant (=1); tax exemption (=2);
	tax allowance (=3); tax credit (=4);
	tax rate relief (=5)

rate of subsidization (sub-rate)	0.1; 0.15; 0.2; 0.25
rate of risk (risk-rate)	standard deviation (see Table 3)
age	in years (19 to 29)
gender	female = 0; male = 1
economic major (econ major)	1 = study with a major in economics; 0 = elsewise
decision time	in seconds (1 to 911)

Table 8 Regression variables

A in the treatments *tax credit*, *tax exemption*, and *grant* is approximately at the same level (model 1). Merely in the treatments *tax allowance* and *tax rate relief* subjects chose a significantly higher investment level in alternative A. The coefficients are significant at a 1% level respectively at a 5% level.

In model 2, I regressed the investment in the low risk alternative A on the different types of subsidization, the rate of subsidization, the rate of risk, the age, the gender, the academic major and the decision time of the subjects. The regression indicates a significant negative influence (at a 1% level) of the variables sub-rate, age, and gender. The investment level in alternative A decreases significantly with increasing subsidization of alternative B, supporting my previous results. The older and especially the male participants invested significantly less in alternative A.

In model 3 and 4, I regress the average of the investment in the high risk subsidized alternative B on the different types of subsidization and additionally on the other variables. The results support my prior findings. Subsidization

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	low risk (A)	low risk (A)	high risk subsidized (B)	high risk subsidized (B)	total risky investment (A+B)	total risky investment (A+B)
Constant	16.500***	44.980***	47.180***	27.160***	63.680***	72.150***
	(0.926)	(4.559)	(1.587)	(7.710)	(1.417)	(7.138)
tax credit	0.549	0.131	5.345**	6.063***	5.894***	6.194***
	(1.310)	(1.254)	(2.244)	(2.120)	(2.005)	(1.963)
tax exemption	0.676	-0.332	-5.566**	-4.284**	-4.889**	-4.616**
	(1.325)	(1.279)	(2.270)	(2.164)	(2.027)	(2.003)
tax allowance	4.432***	2.750**	-4.753**	-2.572	-0.321	0.178
	(1.325)	(1.277)	(2.270)	(2.159)	(2.027)	(1.999)
tax rate relief	2.935**	-0.310	-2.875	1.838	0.060	1.528
	(1.325)	(1.296)	(2.270)	(2.192)	(2.027)	(2.030)
sub-rate		-48.900***		137.900***		88.970***
		(7.299)		(12.340)		(11.430)
risk-rate		1.010		-4.190***		-3.180***
		(0.623)		(1.054)		(0.976)
age		-0.633***		-0.180		-0.813***
		(0.168)		(0.284)		(0.263)
gender (male = 1)		-9.377***		14.250***		4.875***
		(0.860)		(1.455)		(1.347)
econ major (major in economics = 1)		-0.092		-3.084*		-3.175**
		(0.958)		(1.620)		(1.500)
decision time		-0.013**		0.019*		0.006
		(0.006)		(0.011)		(0.010)
Observations	1,792	1,792	1,792	1,792	1,792	1,792

Standard errors in parentheses; $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$

Table 9 Linear Regressions

with a *tax credit* increases the investment level in alternative B significantly (at a 1% level) above the level of the grant, whereas a subsidization with a *tax exemption* results in a significantly (at a 5% level) lower investment level in alternative B. The invested amount in alternative B in the other types is nearly at the same level. At a 1% level, the variables sub-rate, risk-rate and gender have a significant influence on the investment in alternative B. Higher rates of subsidization increase the investment in alternative B, whereas a higher risk decreases the investment in alternative B, supporting my previous observations and the visualization in Figure 1. The males in the experiment invest significantly more in the high-risk subsidized alternative B than females do. This result is in line with the assumption that women are more risk-averse than men.[7]

In model 5 and 6, I put the alternative A and alternative B together and regressed the total risky investment on the different types of subsidization (model 5) and additionally on the control variables (model 6). In both models, the investment level increases significantly (at a 1% level) if alternative B gets subsidized with a *tax credit*. In the treatment *tax exemption* the investment level decreases significantly (at a 5% level). The investment level in the other treatments is approximately equal. The variables sub-rate, risk-rate, age and gender have a significant influence on the total risky investment (at a 1% level).

More regressions are presented in the appendix (compare the Tables 22 to 26 in the appendix). The regressions include different interaction terms. In particular it should be noted that the interaction terms consisting of the different types of subsidization and the rates of subsidization, do not have a significant influence on the risky investments of the participants (see Table 22). Therefore, the results of Table 9 are not driven by the rate of subsidization but by the type of subsidization. The regressions confirm my prior results.

4 Discussion

This article contributes to the understanding of the deviant behavior of the recipients of subsidization. The results of the experiment indicate that the economic impact of subsidization may differ between different types of subsidization. This means that the design of the subsidization can generate real economic effects in spite of a constant subsidy payoff. In my view, mainly two effects could explain the results: the *tax aversion bias* and the *salience effect*.

Tax payments are not on a voluntary basis. Additionally, there is a lack of a specific compensation. It is not identifiable to what purposes the paid taxes

[7] See Croson and Gneezy (2009) for a excellent overview to this topic.

will be used for. Therefore, many people dislike paying taxes. Their desire to avoid taxes is much stronger than their desire to avoid an economic equivalent payment (Fennell and Fennell, 2003; McCaffery and Baron, 2006; Löfgren and Nordblom, 2009; Hill, 2010; Sussman and Olivola, 2011). The tendency of tax evasion increases with the increasing number of possibilities to evade taxes, in spite of threatened penalization (Kleven et al., 2011). It seems that there is an internal desire to reduce individual tax payments which is beyond of the pure willingness to maximize the individual wealth. As all treatments are equally affected by the taxation there should be no differences between them. However, only the *tax credit* offers a legal possibility to reduce the disliked tax burden directly. People value this possibility even more than other equivalent subsidies. Recent studies from Hundsdoerfer and Sichtmann (2009); Lozza et al. (2010); Blaufus and Möhlmann (2014) also find an preference for tax reductions. Insofar, the stronger effect of the *tax credit* in investment decisions confirms these prior results.

Besides, the *salience effect* may play an important role. If taxes are not salient, people seem to neglect their tax aversion, respectively people do not take taxes into account in their decision making process (Sausgruber and Tyran, 2005; Finkelstein, 2009; Chetty et al., 2009). Applying these findings on subsidization, subsidies in which the benefit is clearly visible may have the strongest effect on investment decisions. Increasing visibility of subsidization will enhance the decision performance (Rupert and Wright, 1998). The best visibility of the subsidy payoff is provided by the subsidization types *tax credit* and *grant*. Here, the benefit of the subsidization can directly be recognized, whereas in the other treatments the benefit has to be calculated. Indeed, the largest effects have been observed when investments gets subsidized with a *tax credit* or a *grant*. Then the average amount invested in the high-risk subsidized investment B is at its greatest level. However, when alternative B gets subsidized with a *grant* there seems to be a lack of the perceived reduction of the tax burden although the *grant* is tax-free. Therefore, the *tax credit* results in a higher amount invested risky.

After the experiment participants were asked to assess the level of difficulty of the treatments. The average of the answers range between 1.7 and 2.0 whereas 1 stands for easy, 2 for middle and 3 for difficult. The differences between the treatments are significant (see Table 27 in the appendix). The treatment *grant* were perceived as easiest whereas the other treatments were perceived as significantly more difficult. The *tax credit* were perceived as most difficult. Therefore, the results of the experiment seem not to be a result of complexity.

5 Conclusion

I conducted an experiment to investigate the impact of different types of subsidizations on risky investments. Five different types of subsidization were considered: *grant*, *tax exemption*, *tax allowance*, *tax credit* and *tax rate relief*. The participants chose between three investment alternatives: A, B and C. The alternatives A and B are risky investments whereas alternative C is free of risk. Alternative B is riskier than alternative A and investments in alternative B get subsidized. The investments in the different treatments have the same expected net value. The benefits resulting from the different types of subsidization are equal. Additionally, the participants in the treatments have the same average willingness to take risks.

Nevertheless, the risky invested amount differs markedly between the treatments. There seems to be a bias in the perception of the different types of subsidization. If investments get subsidized with a *tax credit*, the risky invested amount increases significantly above that of the other treatments. This is mainly due to the fact that the investment in alternative B increases much stronger than in the other treatments. With increasing benefit through the subsidization participants shift investments from alternative A and alternative C towards alternative B. Besides, if investments get subsidized with a *tax exemption*, the risky invested amount decreases significantly below that of the other treatments. All treatments have in common that an increasing risk-rate and an increasing sub-rate were perceived as the standard economic theory predicts.

The results of the experiment are clear and highly significant. Nevertheless, the results provide only an indication on the real behavior of investors. Most investors will be advised by tax consultants who can calculate the real benefit caused by the subsidization. However, especially small enterprizes or company founder could be influenced by such governmental interventions. They often do not mandate tax consultants because of the high expenses. This might be exploited by governments. The fiscal authority in the U.S. offer more than 20 different business tax credits for small businesses and self-employed persons.[8] Besides special deduction rules, tax credits are the most important tools to promote investments in the U.S.. Maybe this is the right way to subsidize. Further research has to be done on this topic.

[8] See IRS-Homepage, http://www.irs.gov/Businesses/Small-Businesses-&-Self-Employed/Business-Tax-Credits (7th April 2015).

Figures and tables

Figures

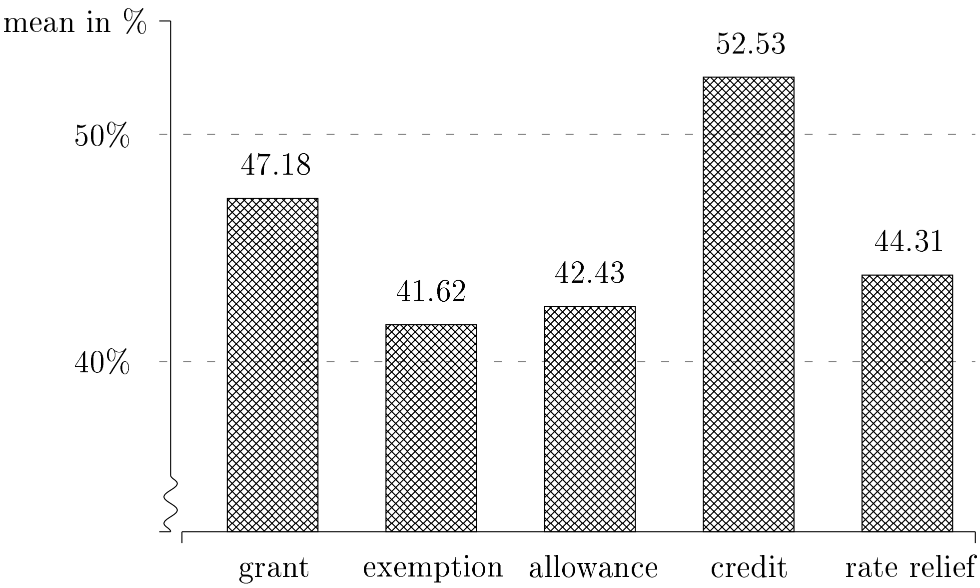


Figure 4 Mean of the invested amount in high risk subsidized investment B

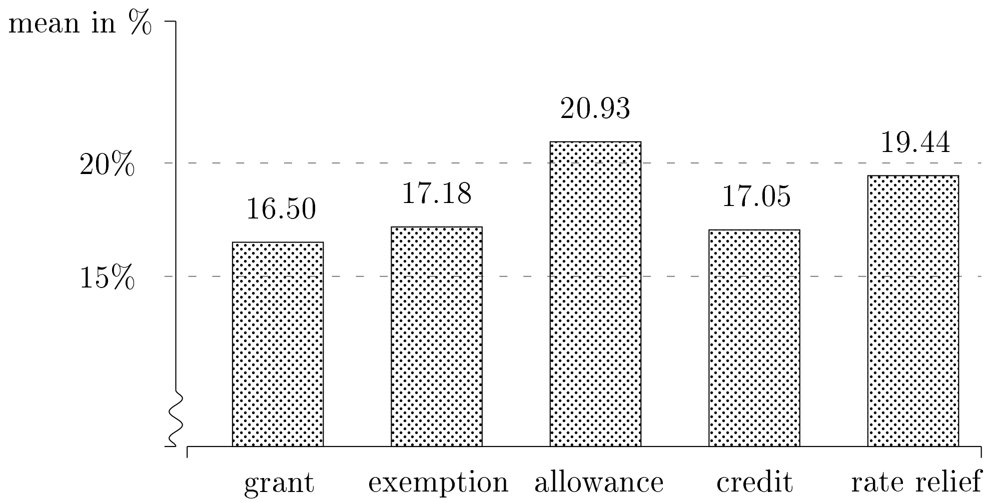


Figure 5 Mean of the invested amount in low risk investment A

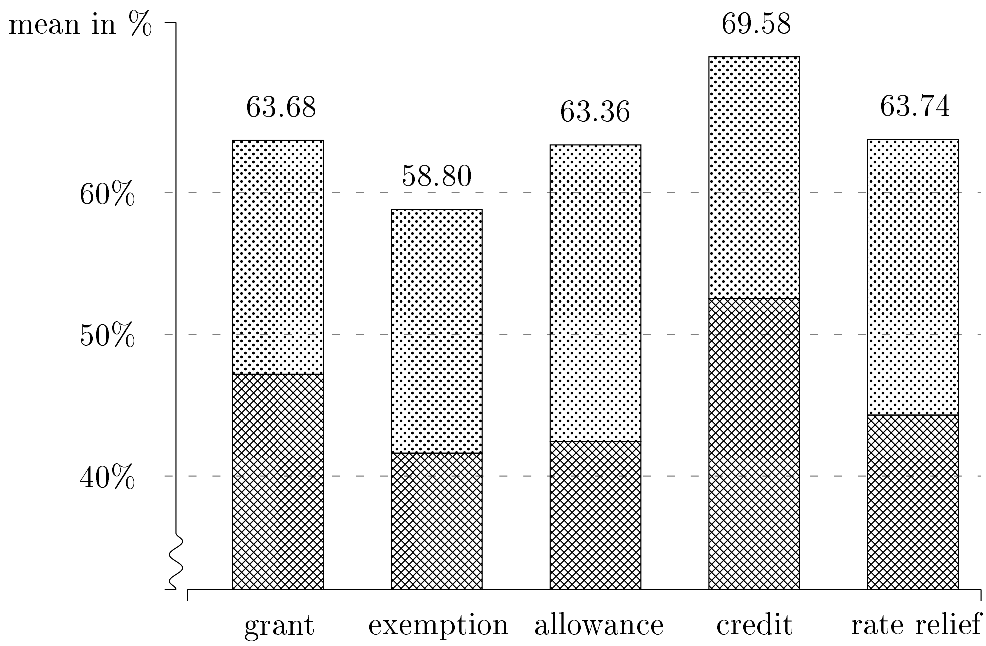


Figure 6 Mean of total risky investment (A + B)

Tables

Expected net value without subsidization per alternative												
	A	B	C	A	B	C	A	B	C	A	B	C
E(X)	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
σ_i	0.98	1.47	0.00	0.98	1.47	0.00	0.98	1.47	0.00	0.98	1.47	0.00
E(X)	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
σ_{ii}	0.98	1.96	0.00	0.98	1.96	0.00	0.98	1.96	0.00	0.98	1.96	0.00
E(X)	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
σ_{iii}	0.98	2.45	0.00	0.98	2.45	0.00	0.98	2.45	0.00	0.98	2.45	0.00
E(X)	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
σ_{iv}	0.98	2.94	0.00	0.98	2.94	0.00	0.98	2.94	0.00	0.98	2.94	0.00

Table 10 Expected value without subsidization and after taxation

Decision number	grant	exemption	allowance	credit	rate relief	Expected payoff difference
1.						2.69
2.			1			1.98
3.						1.27
4.		3	1	2	2	0.56
5.	5	2	4	2	2	-0.15
6.	10	12	7	11	3	-0.86
7.	7	4	5	4	10	-1.57
8.	1		2	2	3	-2.28
9.		1			2	-2.99
10.						-3.70
Σ	23	22	20	21	22	
ø-shift	**6.2**	**6.0**	**6.0**	**6.1**	**6.7**	

Table 11 Risk preference lottery: depiction of the decision number when participants shift from Option A to Option B

Alternative A	sub-rate 10%	sub-rate 15%	sub-rate 20%	sub-rate 25%	average	$\Delta_{(4-1)}$
grant	19.54	16.51	17.77	12.18	16.50	-7.36
exemption	19.70	19.88	14.40	14.74	17.18	-4.96
allowance	23.68	23.30	18.99	17.77	20.93	-5.91
credit	22.66	18.05	14.53	12.96	17.05	-9.70
rate relief	22.74	19.47	19.52	16.02	19.44	-6.72

Table 12 Reaction to increasing subsidization on low risk investment A

Alternative B	sub-rate 10%	sub-rate 15%	sub-rate 20%	sub-rate 25%	average	$\Delta_{(4-1)}$
grant	36.88	45.11	48.37	58.37	47.18	21.49
exemption	35.31	39.06	44.66	47.44	41.62	12.13
allowance	33.00	38.01	46.50	52.20	42.43	19.20
credit	34.18	54.05	57.32	64.55	52.53	30.37
rate relief	37.58	41.14	46.28	52.23	44.31	14.65

Table 13 Reaction to increasing subsidization on high risk subsidized investment B

Altern. A + B	sub-rate 10%	sub-rate 15%	sub-rate 20%	sub-rate 25%	average	$\Delta_{(4-1)}$
grant	56.42	61.62	66.14	70.55	63.68	14.13
exemption	55.01	58.93	59.06	62.18	58.80	7.17
allowance	56.68	61.31	65.49	69.98	63.36	13.30
credit	56.68	72.11	71.85	77.51	69.58	20.83
rate relief	60.32	60.60	65.81	68.25	63.74	7.93

Table 14 Reaction to increasing subsidization on total risky investment (A+B)

Alternative A	grant	exemption	allowance	credit	rate relief
σ_i	14.73	15.97	19.55	14.22	19.90
σ_{ii}	15.68	15.15	21.68	18.35	20.76
σ_{iii}	16.72	19.27	21.99	17.37	19.48
σ_{iv}	18.88	18.33	20.52	18.27	17.61
average	16.50	17.18	20.93	17.05	19.44
$\Delta_{(4-1)}$	4.15	2.36	0.97	4.05	-2.29

Table 15 Reaction to increasing risk on low risk investment A

Alternative B	grant	exemption	allowance	credit	rate relief
σ_i	53.25	44.38	44.44	58.67	47.61
σ_{ii}	50.52	42.25	42.52	49.23	46.32
σ_{iii}	44.64	40.06	40.98	54.21	43.70
σ_{iv}	40.32	39.78	41.77	48.00	39.59
average	47.18	41.62	42.43	52.53	44.31
$\Delta_{(4-1)}$	-12.93	-4.60	-2.67	-10.67	-8.02

Table 16 Reaction to increasing risk on high risk subsidized investment B

Altern. A + B	grant	exemption	allowance	credit	rate relief
σ_i	67.98	60.34	63.99	72.89	67.51
σ_{ii}	66.21	57.40	64.20	67.58	67.08
σ_{iii}	61.36	59.33	62.97	71.58	63.18
σ_{iv}	59.20	58.11	62.30	66.27	57.20
average	63.68	58.80	63.36	69.58	63.74
$\Delta_{(4-1)}$	-8.78	-2.23	-1.69	-6.62	-10.31

Table 17 Reaction to increasing risk on total risky investment (A+B)

			low risk (A)	high risk subsidized (B)	total risky investment (A + B)
credit	-	grant	0.4860	0.1636	0.4880
credit	-	exemption	0.3869	0.6562	0.5731
credit	-	allowance	0.4290	0.2723	0.3272
credit	-	rate relief	0.9095	0.0889	0.8482
exemption	-	grant	0.6752	0.2494	0.8788
exemption	-	allowance	0.0565	0.5503	0.9715
exemption	-	rate relief	0.2444	0.1988	0.3585
grant	-	allowance	0.1566	0.5757	0.8265
grant	-	rate relief	0.3730	0.7948	0.2727
allowance	-	rate relief	0.6007	0.3750	0.1432

Table 18 Mann-Whitney U-Test (p-values, sub-rate 10%)

			low risk (A)	high risk subsidized (B)	total risky investment (A + B)
credit	-	grant	0.9127	0.1219	0.0018
credit	-	exemption	0.4229	0.0024	0.0034
credit	-	allowance	0.0240	0.0043	0.0002
credit	-	rate relief	0.4545	0.0236	0.0015
exemption	-	grant	0.2712	0.0611	0.8574
exemption	-	allowance	0.2128	0.5379	0.8713
exemption	-	rate relief	0.8785	0.2684	0.9160
grant	-	allowance	0.0142	0.1186	0.7306
grant	-	rate relief	0.2880	0.4370	0.8506
allowance	-	rate relief	0.2241	0.4581	0.5172

Table 19 Mann-Whitney U-Test (p-values, sub-rate 15%)

			low risk (A)	high risk subsidized (B)	total risky investment (A + B)
credit	-	grant	0.0501	0.0708	0.0303
credit	-	exemption	0.5271	0.0054	0.0038
credit	-	allowance	0.0541	0.0342	0.0028
credit	-	rate relief	0.0414	0.0249	0.0311
exemption	-	grant	0.2085	0.1814	0.2680
exemption	-	allowance	0.1623	0.2363	0.4899
exemption	-	rate relief	0.1106	0.3326	0.2613
grant	-	allowance	0.9895	0.8248	0.6216
grant	-	rate relief	0.5567	0.6787	0.8209
allowance	-	rate relief	0.7148	0.8052	0.3767

Table 20 Mann-Whitney U-Test (p-values, sub-rate 20%)

			low risk (A)	high risk subsidized (B)	total risky investment (A + B)
credit	-	grant	0.4962	0.1506	0.0053
credit	-	exemption	0.2831	0.0005	0.0003
credit	-	allowance	0.0386	0.0049	0.0005
credit	-	rate relief	0.1197	0.0055	0.0011
exemption	-	grant	0.4661	0.0054	0.1331
exemption	-	allowance	0.3419	0.1719	0.2792
exemption	-	rate relief	0.6899	0.1567	0.3270
grant	-	allowance	0.0955	0.1256	0.7159
grant	-	rate relief	0.1875	0.1363	0.8299
allowance	-	rate relief	0.6490	0.9219	0.8183

Table 21 Mann-Whitney U-Test (p-values, sub-rate 25%)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	low risk (A)	low risk (A)	high risk subsidized (B)	high risk subsidized (B)	total risky investment (A+B)	total risky investment (A+B)
Constant	16.500***	44.000***	47.180***	26.070***	63.680***	70.070***
	(0.926)	(5.173)	(1.587)	(8.730)	(1.417)	(8.090)
tax credit	0.549	4.481	5.345**	-3.504	5.894***	0.977
	(1.310)	(4.113)	(2.244)	(6.942)	(2.005)	(6.433)
tax exemption	0.676	-0.333	-5.566**	4.558	-4.889**	4.225
	(1.325)	(4.163)	(2.270)	(7.026)	(2.027)	(6.510)
tax allowance	4.432***	3.359	-4.753**	-2.204	-0.321	1.155
	(1.325)	(4.162)	(2.270)	(7.023)	(2.027)	(6.508)
tax rate relief	2.935**	-0.368	-2.875	8.141	0.060	7.773
	(1.325)	(4.169)	(2.270)	(7.036)	(2.027)	(6.520)
sub-rate		-43.170***		144.000***		100.900***
		(15.890)		(26.820)		(24.850)
risk-rate		1.010		-4.190***		-3.180***
		(0.624)		(1.053)		(0.975)
age		-0.633***		-0.180		-0.813***
		(0.168)		(0.283)		(0.263)
gender (male = 1)		-9.376***		14.250***		4.875***
		(0.861)		(1.452)		(1.346)
econ major (major in economics = 1)		-0.091		-3.085*		-3.176**
		(0.959)		(1.618)		(1.499)
decision time		-0.013**		0.019*		0.006
		(0.006)		(0.011)		(0.010)
sub_inter_credit		-24.860		54.670		29.810
		(22.390)		(37.790)		(35.020)
sub_inter_exemption		-0.001		-50.520		-50.520
		(22.640)		(38.210)		(35.410)
sub_inter_allowance		-3.488		-2.092		-5.580
		(22.640)		(38.210)		(35.410)
sub_inter_rate relief		0.329		-36.010		-35.690
		(22.640)		(38.220)		(35.410)
Observations	1,792	1,792	1,792	1,792	1,792	1,792

Standard errors in parentheses; $***p \leq 0.01$, $**p \leq 0.05$, $*p \leq 0.1$

Table 22 Linear regression with interaction terms: sub-rate $\times$ sub-form

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	low risk (A)	low risk (A)	high risk subsidized (B)	high risk subsidized (B)	total risky investment (A+B)	total risky investment (A+B)
Constant	16.500***	41.540***	47.180***	35.610***	63.680***	77.150***
	(0.926)	(5.507)	(1.587)	(9.315)	(1.417)	(8.622)
tax credit	0.549	2.461	5.345**	-4.686	5.894***	-2.225
	(1.310)	(5.099)	(2.244)	(8.626)	(2.005)	(7.984)
tax exemption	0.676	0.733	-5.566**	-14.680*	-4.889**	-13.950*
	(1.325)	(5.160)	(2.270)	(8.728)	(2.027)	(8.079)
tax allowance	4.432***	7.627	-4.753**	-17.730**	-0.321	-10.110
	(1.325)	(5.158)	(2.270)	(8.726)	(2.027)	(8.077)
tax rate relief	2.935**	9.048*	-2.875	-4.684	0.060	4.364
	(1.325)	(5.164)	(2.270)	(8.735)	(2.027)	(8.085)
sub-rate		-48.900***		137.900***		88.970***
		(7.298)		(12.340)		(11.430)
risk-rate		2.355		-7.476***		-5.121***
		(1.355)		(2.291)		(2.121)
age		-0.634***		-0.178		-0.811***
		(0.168)		(0.284)		(0.263)
gender (male = 1)		-9.376***		14.250***		4.875***
		(0.860)		(1.455)		(1.347)
econ major (major in economics = 1)		-0.091		-3.085*		-3.175**
		(0.958)		(1.620)		(1.500)
decision time		-0.013**		0.019*		0.006
		(0.006)		(0.011)		(0.010)
risk_inter_credit		-0.900		4.151		3.251
		(1.909)		(3.229)		(2.989)
risk_inter_exemption		-0.412		4.015		3.603
		(1.930)		(3.265)		(3.022)
risk_inter_allowance		-1.884		5.856*		3.971
		(1.930)		(3.265)		(3.022)
risk_inter_rate relief		-3.614*		2.519		-1.095
		(1.930)		(3.265)		(3.022)
Observations	1,792	1,792	1,792	1,792	1,792	1,792

Standard errors in parentheses; $***p \leq 0.01$, $**p \leq 0.05$, $*p \leq 0.1$

Table 23 Linear regression with interaction terms: risk-rate × sub-form

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	low risk (A)	low risk (A)	high risk subsidized (B)	high risk subsidized (B)	total risky investment (A+B)	total risky investment (A+B)
Constant	16.500***	41.500***	47.180***	30.730***	63.680***	72.230***
	(0.926)	(4.818)	(1.587)	(8.156)	(1.417)	(7.570)
tax credit	0.549	0.225	5.345**	7.327***	5.894***	7.552***
	(1.310)	(1.475)	(2.244)	(2.496)	(2.005)	(2.317)
tax exemption	0.676	-1.189	-5.566**	-1.115	-4.889**	-2.304
	(1.325)	(1.442)	(2.270)	(2.441)	(2.027)	(2.266)
tax allowance	4.432***	4.393	-4.753**	-1.580	-0.321	2.813
	(1.325)	(1.488)	(2.270)	(2.519)	(2.027)	(2.338)
tax rate relief	2.935**	0.944	-2.875	1.029	0.060	1.973
	(1.325)	(1.547)	(2.270)	(2.619)	(2.027)	(2.431)
sub-rate		-48.900***		137.900***		88.970***
		(7.265)		(12.300)		(11.410)
risk-rate		1.014		-4.200***		-3.186***
		(0.620)		(1.050)		(0.975)
age		-0.501***		-0.383		-0.884***
		(0.176)		(0.299)		(0.277)
gender (male = 1)		-9.460***		14.790***		5.333***
		(0.864)		(1.462)		(1.357)
econ major (major in economics = 1)		1.259		-0.065		1.195
		(1.924)		(3.256)		(3.022)
decision time		-0.012*		0.016		0.005
		(0.006)		(0.011)		(0.010)
econ_inter_credit		-0.215		-4.180		-4.395
		(2.788)		(4.719)		(4.380)
econ_inter_exemption		7.736**		-18.960***		-11.230**
		(3.270)		(5.535)		(5.137)
econ_inter_allowance		-6.693**		-3.243		-9.936**
		(2.895)		(4.900)		(4.548)
econ_inter_rate relief		-4.472		3.848		-0.624
		(2.879)		(4.874)		(4.523)
Observations	1,792	1,792	1,792	1,792	1,792	1,792

Standard errors in parentheses; $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$

Table 24 Linear regression with interaction terms: economic major × sub-form

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	low risk (A)	low risk (A)	high risk subsidized (B)	high risk subsidized (B)	total risky investment (A+B)	total risky investment (A+B)
Constant	16.500***	44.760***	47.180***	25.500***	63.680***	70.260***
	(0.926)	(4.572)	(1.587)	(7.738)	(1.417)	(7.152)
tax credit	0.549	3.242	5.345**	-1.922	5.894***	1.320
	(1.310)	(2.401)	(2.244)	(4.063)	(2.005)	(3.756)
tax exemption	0.676	0.353	-5.566**	1.238	-4.889**	1.591
	(1.325)	(2.329)	(2.270)	(3.940)	(2.027)	(3.642)
tax allowance	4.432***	6.975***	-4.753**	-3.554	-0.321	3.421
	(1.325)	(2.273)	(2.270)	(3.846)	(2.027)	(3.555)
tax rate relief	2.935**	-1.757	-2.875	0.286	0.060	-1.471
	(1.325)	(2.122)	(2.270)	(3.591)	(2.027)	(3.319)
sub-rate		-48.900***		137.900***		88.950***
		(7.261)		(12.290)		(11.360)
risk-rate		1.003		-4.197***		-3.195***
		(0.620)		(1.049)		(0.970)
age		-0.666***		-0.066		-0.731***
		(0.173)		(0.293)		(0.271)
gender		-7.938***		13.010***		5.076
(male = 1)		(2.042)		(3.456)		(3.194)
econ major		0.125		-2.961*		-2.836*
(major in economics = 1)		(0.957)		(1.620)		(1.497)
decision time		-0.014**		0.017		0.003
		(0.006)		(0.011)		(0.010)
gender_inter_credit		-4.383		11.350**		6.972
		(2.838)		(4.802)		(4.438)
gender_inter_exemption		-0.812		-8.926*		-9.739**
		(2.781)		(4.706)		(4.349)
gender_inter_allowance		-6.814**		1.347		-5.467
		(2.793)		(4.726)		(4.368)
gender_inter_rate relief		4.680		2.810		7.490*
		(2.797)		(4.733)		(4.375)
Observations	1,792	1,792	1,792	1,792	1,792	1,792

Standard errors in parentheses; $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$

Table 25 Linear regression with interaction terms: gender × sub-form

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	low risk (A)	low risk (A)	high risk subsidized (B)	high risk subsidized (B)	total risky investment (A+B)	total risky investment (A+B)
Constant	16.500*** (0.926)	18.990** (9.178)	47.180*** (1.587)	84.160*** (15.510)	63.680*** (1.417)	103.200*** (14.380)
tax credit	0.549 (1.310)	44.020*** (11.260)	5.345** (2.244)	-75.140*** (19.020)	5.894*** (2.005)	-31.110* (17.630)
tax exemption	0.676 (1.325)	21.290* (12.280)	-5.566** (2.270)	-101.200*** (20.760)	-4.889** (2.027)	-79.940*** (19.240)
tax allowance	4.432*** (1.325)	-3.424 (15.780)	-4.753** (2.270)	-50.450* (26.670)	-0.321 (2.027)	-53.870** (24.720)
tax rate relief	2.935** (1.325)	46.700*** (14.110)	-2.875 (2.270)	-34.230 (23.850)	0.060 (2.027)	12.470 (22.100)
sub-rate		-48.950*** (7.252)		138.000*** (12.260)		89.050*** (11.360)
risk-rate		1.008 (0.619)		-4.174*** (1.047)		-3.166*** (0.970)
age		0.496 (0.387)		-2.672*** (0.654)		-2.177*** (0.606)
gender (male = 1)		-9.967*** (0.909)		15.010*** (1.536)		5.045*** (1.423)
econ major (major in economics = 1)		0.570 (1.020)		-2.557 (1.724)		-1.987 (1.598)
decision time		-0.012* (0.006)		0.019* (0.011)		0.007 (0.010)
age_inter_credit		-1.886*** (0.481)		3.496*** (0.813)		1.610** (0.754)
age_inter_exemption		-0.932* (0.524)		4.169*** (0.886)		3.237*** (0.821)
age_inter_allowance		0.271 (0.681)		2.070* (1.151)		2.341** (1.067)
age_inter_rate relief		-2.038*** (0.611)		1.563 (1.032)		-0.475 (0.956)
Observations	1,792	1,792	1,792	1,792	1,792	1,792

Standard errors in parentheses; $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$

Table 26 Linear regression with interaction terms: age × sub-form

	difficulty
Constant	1.652***
	(0.0265)
tax credit	0.348***
	(0.0374)
tax exemption	0.257***
	(0.0378)
tax allowance	0.121***
	(0.0378)
tax rate relief	0.121***
	(0.0378)
Observations	1,792

Standard errors in parentheses; ***$p \leq 0.01$, **$p \leq 0.05$, *$p \leq 0.1$

Table 27 Perceived difficulty (1 = easy, 2 = middle, 3 = difficult)

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Impressum:
Arbeitskreis Quantitative Steuerlehre, arqus, e.V.
Vorstand: Prof. Dr. Ralf Maiterth (Vorsitzender),
Prof. Dr. Kay Blaufus, Prof. Dr. Dr. Andreas Löffler
Sitz des Vereins: Berlin

Herausgeber: Kay Blaufus, Jochen Hundsdoerfer,
Martin Jacob, Dirk Kiesewetter, Rolf J. König,
Lutz Kruschwitz, Andreas Löffler, Ralf Maiterth,
Heiko Müller, Jens Müller, Rainer Niemann,
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ISSN 1861-8944