Discharge of residual debt Do private and institutional lenders differ?

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With the help of lab experiments we study the impact of discharging insolvent debtors of their residual debt. We investigate the impact of different participation rules, different types of lenders and the impact of debtor's own responsibility. We find that higher participation rates encourage risk taking behaviour of borrowers. Lower participation rates and lack of responsibility increase the amount of moonlighting. The difference between institutional and private lending is, however, only small and rarely significant.

JEL: C92; D14; D82; D86
Keywords: lab experiment, insolvency, moonlighting, institutional lenders

1. Introduction

A large part of private expenses is financed through credit. The credited amount ranges from small amounts of consumables which are paid with credit cards to entire family homes which are financed with the help of a mortgage. While many credits are paid back in time some are not. Here we ask what happens if a debtor finds it impossible to pay back, i.e. is insolvent. Locking up the debtor in a debtor's prison may serve as a deterrent ex-ante but effectively prevents the debtor from any further repayment. Discharging the debt increases the debtor's incentive to work, to contribute at least partially to some repayment of the debt and to be a useful member of the society. Ex-post, debt relief can be seen as a way to restore the debtors incentives to work. Ex-ante, debt relief can be seen as a way to incite irresponsible investments.

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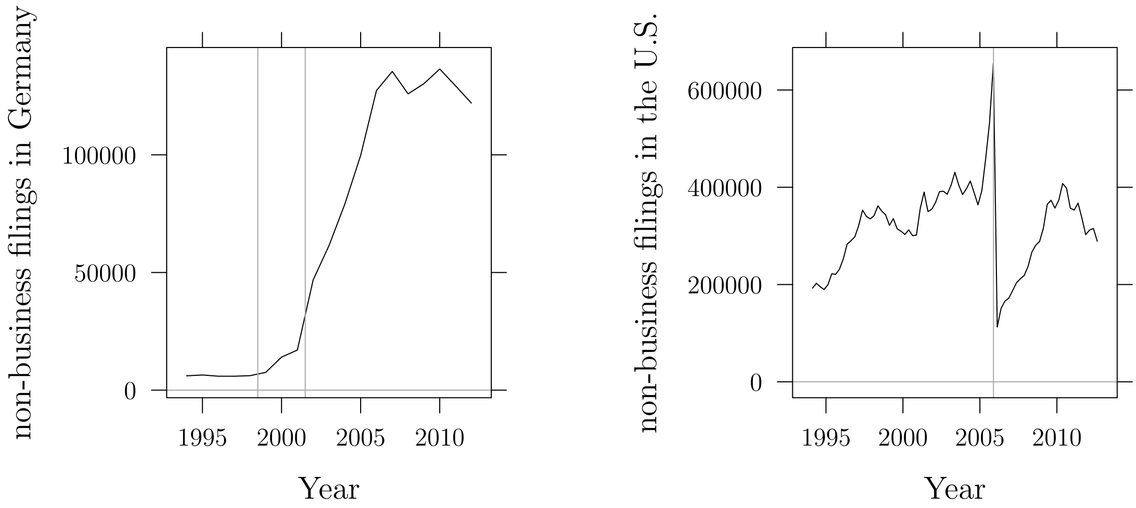
Figure 1 Number of insolvencies in Germany and in the U.S.A.

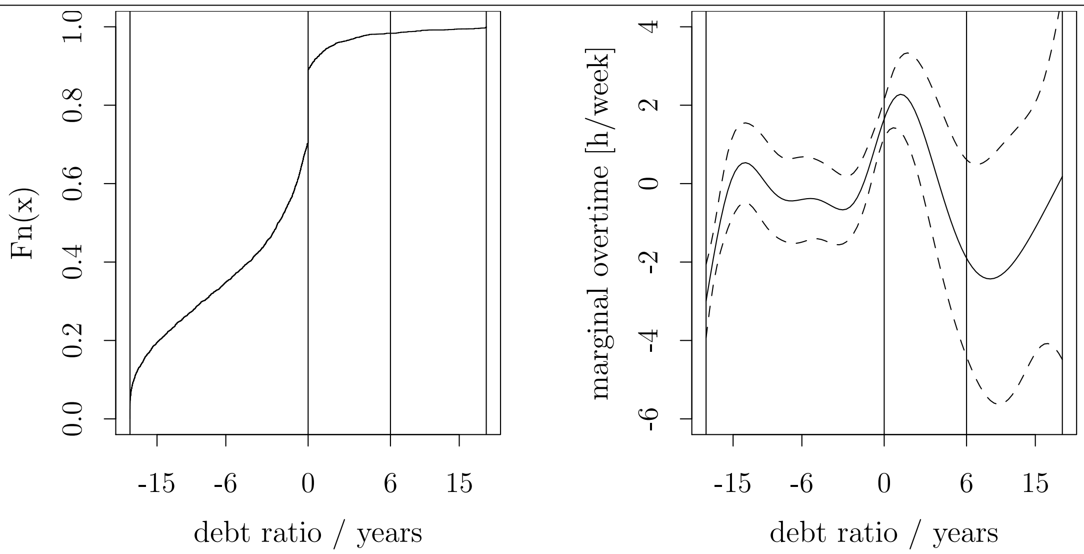


Source: Statistisches Bundesamt, Fachserie 2 Reihe 4.1, März 2013 and American Bankruptcy Institute, Quarterly Filings. The two vertical lines in the graph on the left denote 1. January 1999 when the *Insolvenzordnung* came into effect in Germany and 1. December 2001 when it became possible to defer the procedural cost. The vertical line in the graph on the right denotes 17. October 2005 when the Bankruptcy Abuse Prevention and Consumer Protection Act came into effect in the U.S.

It comes as no surprise that insolvency law is subject to active debate and to frequent change. In the U.S. the "Bankruptcy Abuse Prevention and Consumer Protection Act", enacted in April 2005, made it more difficult for consumers to file bankruptcy under chapter 7. In Germany, the "Insolvenzordnung" of January 1999 makes it easier for consumers to file for bankruptcy. To illustrate that a change in insolvency law can have a drastic impact on the behaviour of debtors, Figure 1 shows the development of the number of insolvencies in Germany and in the U.S.A. In Germany the Insolvenzordnung came into effect on 1. January 1999 (denoted by a vertical line in the left graph). In the U.S.A., the Bankruptcy Abuse Prevention and Consumer Protection Act came into effect on 17. October 2005. One can clearly see that both changes of the law lead to a dramatic change of the number of insolvencies.

Here we want to ask four questions: First, does a change in insolvency law also change the behaviour of the debtor ex-ante, i.e. is the debtor encouraged to take more risk since debt relief works as some sort of insurance? Second, how much is a change in insolvency law translated into a change in actual incentives? Third, is there a difference between private and institutional creditors? Fourth, does it matter if the debtor feels morally responsible for insolvency?

Figure 2 SOEP data: Debt ratio and paid overtime hours



Debt ratio denotes the number of years it would take to repay the dept if the entire income was used on repayment. Negative values denote wealth (i.e. the number of years the wealth would last as a substitute for the current income). The horizontal axis follows a logistic scale in both graphs. The left graphs shows the cumulative distribution of the debt ratio, the right graph shows the marginal overtime per week in hours as well as the range of plus/minus two standard deviations. Both graphs are based on weighted data from the SOEP and own calculations.
A vertical line at six years marks the level of debt ratio above which it pays off for the debtor to declare bankruptcy.

2. Evidence from the field

In the U.S. law most insolvent people have the choice between Chapter 7 (liquidation of debtors assets) and chapter 13 (garnishment of some further income). Under German law insolvent debtors have to give away their assets *and* future income over an exemption limit for six years to reach discharge of residual debt. As an incentive for working as much as before insolvent people are allowed to keep 50% of their overtime payment.

In this section we have a look at data from the German Socio-Economic Panel[1] (SOEP, Wagner et al., 2007). We can exploit that the waves of 2002 and 2007 provide detailed information about debt and wealth of 6451 people. From the SOEP data we calculate the total debt and we define

$$\text{debt.ratio} = \frac{\text{debt}}{(\text{net.labour.income} - 920€) \cdot 12} \tag{1}$$

The value of debt.ratio measures the number of years needed to repay the debt if the household keeps the non seizable income of 920 €[2] every month and uses the rest (the seizable income) to repay the debt. A negative value of debt.ratio denotes wealth. 650

[1]The SOEP data has been provided by the Deutsche Institut für Wirtschaftsforschung.
[2]For simplicity we made the assumption that all respondents are living in a single household.

of the households in the dataset are indebted, and 96 have a debt ratio larger than six, i.e. they could gain from declaring insolvency, provided they expect their income to stay the same during the next six years (unfortunately we have no information whether households actually did declare insolvency).

The left panel in Figure 2 show the cumulative distribution of the relative debt ratio in years. The right panel shows the result of estimating the following Generalised Additive Model:

$$\text{overtime} = \beta_0 + s(\text{debt.ratio}) + \beta_1 \text{hourly.wage} + \epsilon \tag{2}$$

Here, "overtime" is the number of paid overtime hours worked in the month before the interview, "debt.ratio" the ratio as defined above in equation 1, "hourly wage" is the hourly wage and ϵ the residual. We see in the figure that wealthy people (i.e. those with a negative debt ratio) work fewer paid overtime hours. Overtime peaks if the debt is positive and small (smaller than six years) and can be paid back in a reasonable time. Overtime decreases again if the debt becomes very large.

Evidence from the SOEP, hence, supports that debtors do increase their effort (measured as overtime) if they have a good chance to repay their debt. Effort is clearly smaller if the debt is so large that debtors are likely to be insolvent, and can, hence only access 50% of their income through overtime.

What we can not see is whether debtors would react to changes in the participation rate (which is a fixed 50% in the field), whether they behave differently towards institutional and private lenders and whether moral responsibility has an influence on behavior. In section 3 we present an experiment to answer these questions.

3. Experimental design

The experiment was implemented with z-Tree (Fischbacher, 2007) and run in the laboratory of the School of Economics at Jena University. Participants were recruited with ORSEE (Greiner, 2004) from a pool of students from all faculties.

Figure 3 illustrates the structure of the experiment. Initially, participants are divided into debtors and creditors. They keep these roles during the entire experiment.

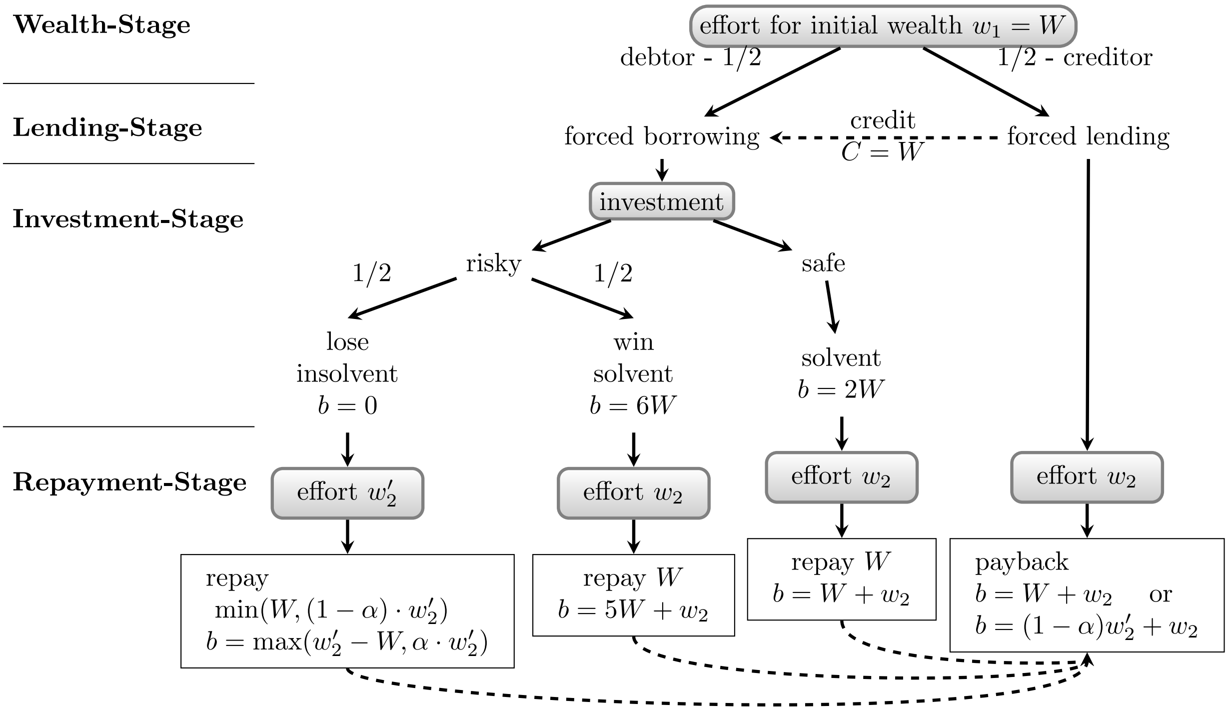
In a first "Wealth-Stage" players accumulate initial wealth in a real effort task. Participants work until they have obtained a fixed level of wealth W. The task is illustrated in appendix A and based on counting numbers[3]. This is a task which most participant find rather unpleasant. Once participants have earned their initial wealth W they can continue to solve more problems[4] or surf the internet.

In the next "Lending-Stage" each creditor lends the own wealth W to a debtor who has already accumulated a wealth of W and is, with the credit, now in the possession of $2W$. To simplify matters and to increase the number of interesting observations, creditors can not choose whether to lend or not to lend. Removing this discretion of the

[3] A related task has been discussed and used in Abeler et al. (2011).

[4] 40.6% of the participants solved at least one more problem without any payment and 27.9% solved at least 10 more problems during the whole session.

Figure 3 Structure of the experiment



creditor also means that the obligation of the debtor only refers to the monetary debt and can not be based on gratitude towards the creditor.

In the subsequent "Investment-Stage" debtors decide what to do with their wealth $2W$. They can invest everything in a risky project or they can keep the money safe. If debtors keep the money safe they will always be solvent and will always be able to repay their credit W (and will still own their initial wealth W). Debtors who choose the risky investment can be lucky or unlucky with equal probabilities. A lucky investor earns three times the investment, i.e. $6W$ and is solvent. After repaying W the investor still has a wealth of $5W$. An unlucky investor loses all the money and can not repay the credit, i.e. is insolvent. Since the risky project has a higher expected value it is socially efficient to always carry out the risky project.

In the "Repayment-Stage" participants can earn again money in a real effort task similar to the wealth-stage but only for a limited amount of time. Creditors and solvent debtors keep all the money from this task. Insolvent debtors have to pay back a certain percentage to their creditor and keep only the "participation rate" α. The length of this stage was deliberately kept shorter than the first stage so that the majority of the insolvent participants would find it impossible to repay their entire debt.[5]

During this fourth stage participants, in particular those who are insolvent and who

[5]For the one shot treatment 77.7% of the solvent and 87.3% of the insolvent participants earned less than W during this stage. For the repeated treatment 98% of the solvent and 98.2% of the insolvent participants earned less than W during this stage (see also 4).

Table 1 Parameters for repeated and one-shot treatments

treatment	no. of interactions	initial wealth W	time to repay	participation rate α
one shot	1	200	20 minutes	50%
repeated	12	25	1.5 minutes	{0%,10%,..,50%}
responsibility	8	25	1.5 minutes	{0%,20%,40%,50%}

have to give a fixed share of their income to their creditor, may not want to work as hard as they worked in the first stage. In some treatments ("no timeout") they can shirk and surf the internet as they could in the first stage[6], in other treatments ("timeout") they can moonlight, i.e. they can push a button which blocks their screen for 25 seconds and which gives them a fixed payoff of 1 for their private account which is not used to pay back their debt.[7] We should note that the moonlighting activity in the experiment is much less productive than the real effort task. For the participants who are in the control group the median time to produce one unit in the real effort task is 6 seconds, i.e. much less than 25 seconds in the moonlighting activity. Nobody in the control group needs on average 25 seconds or more to produce one unit.

Abbink et al. (2000) also look at moonlighting, however in a context where agents work in a "normal" work relationship. What we want to model here is the situation of a debtor who finds himself or herself insolvent as a result of the own choice to take a risk and who might feel morally obliged to repay the debt. Furthermore, principals can be active and reciprocal in the game of Abbink et al. (2000). In our game lenders do not take an active role.

Treatments: We compare five treatment variables:

- Participants can play the above situation one-shot or repeatedly. In the repeated treatment single interactions are shorter. Furthermore, in the repeated treatment all subjects experience different participation rates between 0% and 50% (see Table 1).

- The creditor can be an individual or a group (pooled risk). In treatments with individual creditors ("single") we divided 18 participants into 9 pairs of one debtor and one creditor each. In treatments with pooled creditors we divided 18 participants into 9 debtors and a group of 9 creditors who would share the risk of each loan jointly. In both cases we use a "partner-design": debtors face in all rounds the same group of creditors in the "pooled" case. They face in all rounds the same individual creditor in the individual case.

  In one shot treatments participants played either single or pooled while in the repated treatments they play single and pooled as independent parts in randomized

[6]The idea of surfing the internet as alternative option was used by Houser et al. (2010), too.
[7]The idea for such a button is inspired by Mohnen et al. (2008).

Table 2 Treatments

	session	participants	insolvent	control
not pooled	7	126	21	105
pooled	6	107	20	87
repeated no timeout	7	116	178	1199
repeated timeout	14	248	364	2612
responsibility	6	108	47	817

In the "repeated" treatments participants experience both "pooled" and "not pooled" creditors.

order.

Pooled creditors correspond to institutional lenders in contrast to individual lenders.

- After investments were made and (potentially) insolvency took place participants can again earn money which (in case of insolvency) is used to repay a part of their debt. Instead of earning money in this task, participants can also shirk or moonlight. In the "no-timeout" treatment participants can decide at any time whether they want to solve problems (and thus repay their debt) or whether they want to surf the internet. In the "timeout" treatment participants can similarly decide between solving problems and pushing a timeout button which earns them a small amount of money which they can keep for themselves.

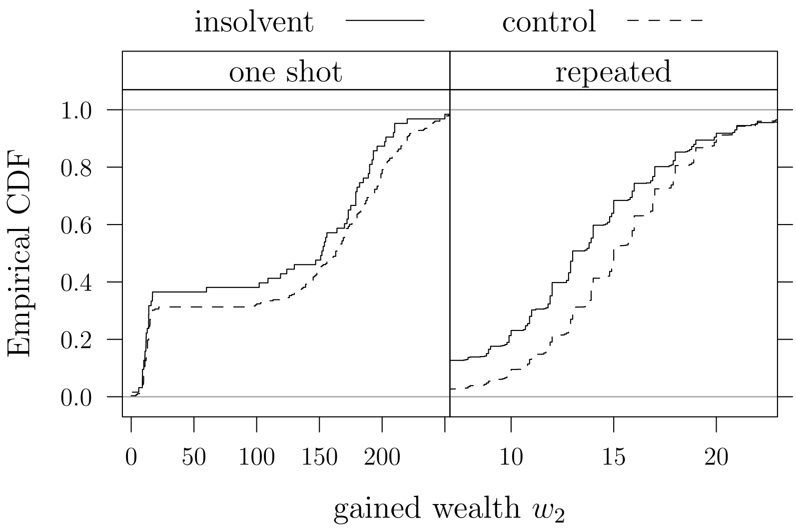
- In the treatments with repeated interaction we compare within-subject different participation rates α from 0% (debtor works only for the creditor) to 50% (debtor can keep half of the earnings).

- In the responsibility-treatment we compare behaviour with and without the opportunity of a safe investment. Without the opportunity of the safe investment ("no responsibility" condition), participants are forced into the risky investment, thus a potential insolvency is not their own fault. To keep the session time under two hours, we only investigated four participation rates instead of six.

Table 2 provides an overview of the treatments.

Theoretical predictions The number counting task in our experiment requires time and, for most participants, effort. Let us first look at those participants who can keep all their income from the real effort task in the fourth stage of the experiment, i.e. creditors or solvent debtors. For each additional problem these participants solve they increase their budget by one unit. We will use the performance of these participants as a benchmark or "control". Since most of the "control" participants provide effort $w_2 > 0$ in the fourth stage (see Figure 4) we can assume that the cost of providing one unit of effort is smaller than one for most participants.

Figure 4 Gained wealth w_2 during fourth stage



Participants in the baseline ("control") condition are either creditors or non-defaulting debtors.

Things are different for the insolvent participants who keep only a share of $\alpha \leq 1/2$. As a result they might either provide a smaller effort w_2' in the fourth stage or no effort at all if the cost for one unit is larger than α.

A debtor who decides whether to make the risky or the safe investment compares, hence, a utility of $u_{\text{safe}} = u(W + w_2)$ for the safe investment with $u_{\text{risky}} = (u(\alpha \cdot w_2') + u(5W + w_2))/2$.[8] The smaller α, the smaller possibly w_2' and, in particular, u_{risky}.

Hypothesis 1 (participation rate and risk): We hypothesise, hence, that with a larger participation rate α, debtors are more likely to take the risky investment.

Hypothesis 2 (type of lender and risk): We hypothesise that debtors are willing to take more risk if they face institutional lenders.

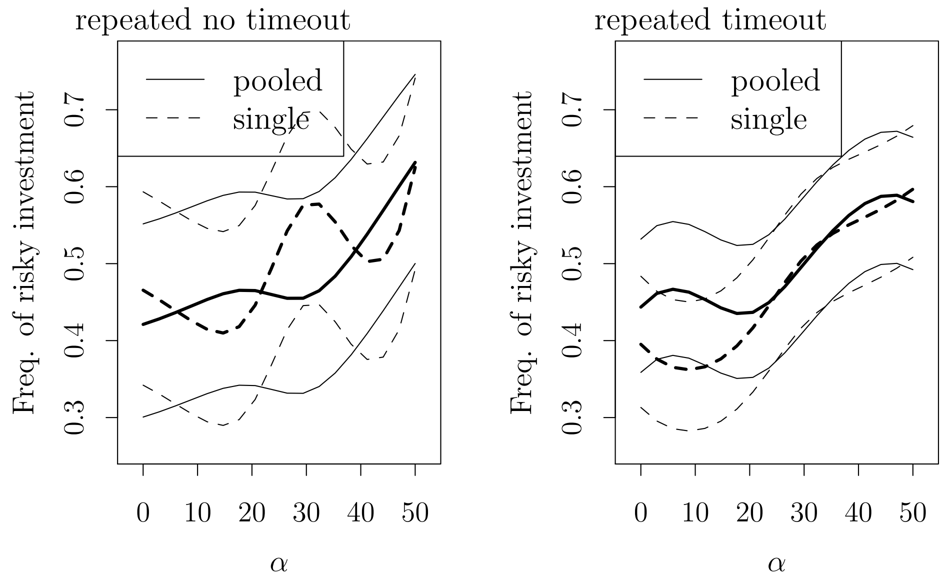
Hypothesis 3 (participation rate and repayment): With a larger participation rate α, debtors repay more.

Hypothesis 4 (type of lender and repayment): Participants might feel less obliged to repay institutional lenders (i.e. a group of lenders which shares the risk of several anonymous credits) and hence pay back less.

Hypothesis 5 (responsibility): If people become insolvent in the "no responsibility" condition they pay back less.

[8]For simplicity we consider here only the case of investors who do not expect to be able to pay back their entire debt.

Figure 5 Risky investments 95% confidence intervals



The participation rate α is the share of their income debtors may keep after their default. The figure shows that debtors tend to take more risk with larger participation rates, i.e. when they are allowed to keep a larger share of their income in case of a default. Confidence bands are based on a logistic model with dummies for the different levels of α.

4. Results

Taking risky decisions In our experiment we have 236 debtors who take all in all 2606 investment decisions with different participation rates, i.e. with different share of their income they are allowed to keep in case of a default. Figure 5 illustrates a clear relationship: The larger the amount participants are allowed to keep, the more likely they are to take a risky choice. We estimate the following logistic mixed effects model

$$P(\text{Risk}) = \mathcal{L}\left(\beta_0 + \beta_{\text{pooled}} d_{\text{pooled}} + \beta_\alpha \alpha + \epsilon_i\right) \quad (3)$$

where $P(\text{Risk})$ is the probability to take a risky decision, $\mathcal{L}$ is the logistic function, d_{pooled} is a dummy that is one in the case of a pool of lenders and zero otherwise, α is the participation rate and ϵ_i is a random effect for the participant. Table 3 shows the estimation results and confirms what we see in Figure 5: In line with hypothesis 1, the participation rate α clearly has an influence on the willingness to take a risky choice. The smaller the share insolvent participants are allowed to keep of their income, the less likely they are to make a risky investment. Regarding hypothesis 2, there is no significant effect of the lender's type (single or pooled) on risk taking behaviour.

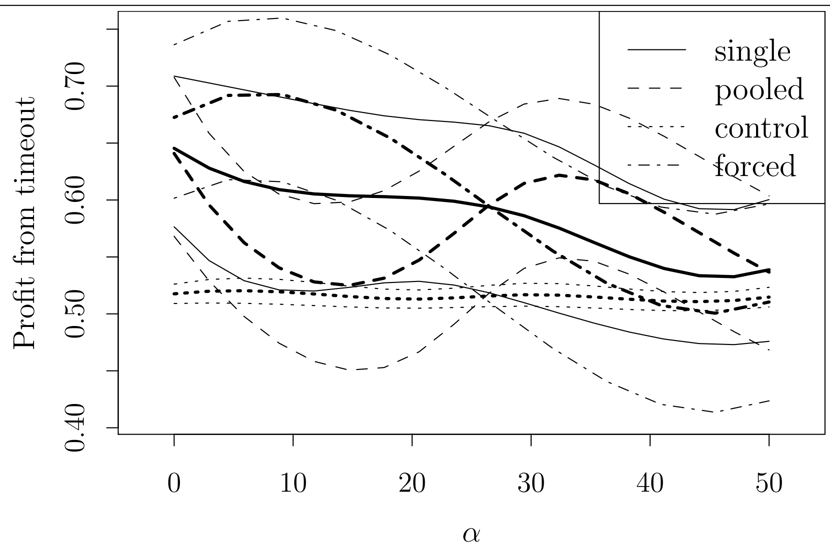
Moonlighting Figure 6 shows how much profit participants earn on average from using the timeout option, i.e. from moonlighting, for the different treatments and for different

Table 3 Risky investments: estimation of equation (3)

	one shot	repeated no-time-out	repeated time-out
(Intercept)	1.078***	−0.536	−0.953***
	[0.510; 1.645]	[−1.275; 0.203]	[−1.456; −0.449]
pooled	−0.122	−0.127	0.198
	[−0.944; 0.700]	[−0.520; 0.267]	[−0.070; 0.466]
part.rate. α		0.027***	0.029***
		[0.015; 0.039]	[0.021; 0.037]
var(ϵ_i)		5.540	5.420
		[;]	[;]
N	117	686	1488

Stars denote the following significance levels: ***=.001, **=.01, *=.05, +=.1. 95% HPD (highest posterior density) confidence intervals are given in brackets. Defaulting debtors in the "single" condition face an individual creditor. They face a pool of creditors (institutional lender) in the "pooled" condition. The model assumes a random effect for each participant in the repeated treatments.

Figure 6 Moonlighting: 95% confidence bands for profit from the timeout option



Participants in the baseline ("control") condition are either creditors or non-defaulting debtors. Defaulting debtors in the "single" condition face an individual creditor. They face a pool of creditors (institutional lender) in the "pooled" condition. Participants in the forced condition were insolvent and had no own choice to prevent opportunism through safe investment.. Confidence bands are based on a linear model with dummies for the different levels of α.

Table 4 Profit from the timeout option: estimation of equation (4)

	Estimate	HPD95lower	HPD95upper	pMCMC
(Intercept)	0.4049	0.3408	0.5224	0.001
control	-0.3291	-0.4569	-0.2699	0.001
pooled	-0.0586	-0.1977	0.0533	0.266
forced	0.3759	0.2022	0.4962	0.001
α	-0.0060	-0.0087	-0.0036	0.001
control $\times\alpha$	0.0058	0.0032	0.0086	0.001
pooled $\times\alpha$	0.0008	-0.0028	0.0048	0.450
forced $\times\alpha$	-0.0090	-0.0127	-0.0041	0.001

Participants in the baseline ("control") condition are either creditors or non-defaulting debtors. Defaulting debtors in the "single" condition face an individual creditor. They face a pool of creditors (institutional lender) in the "pooled" condition. Participants in the forced condition were insolvent and had no own choice to prevent opportunism through safe investment.The model assumes a random effect for each participant.

values of the participation rate. We can see that insolvent debtors choose the timeout option more frequently than the control group. However, we do not see a substantial difference between single and pooled creditors.

To confirm, we estimate the following mixed effects model:

$$\text{Profit}_{\text{Timeout}} = \beta_0 + \gamma_0\alpha + \sum_{T\in\text{Treatments}} (\beta_T + \gamma_T\alpha) + \epsilon_i + \epsilon_{it} \tag{4}$$

where $\text{Profit}_{\text{Timeout}}$ is the profit from the timeout option, α is the participation rate, ϵ_i is a random effect for the participant, and ϵ_{it} is the residual. Estimation results are shown in Table 4.

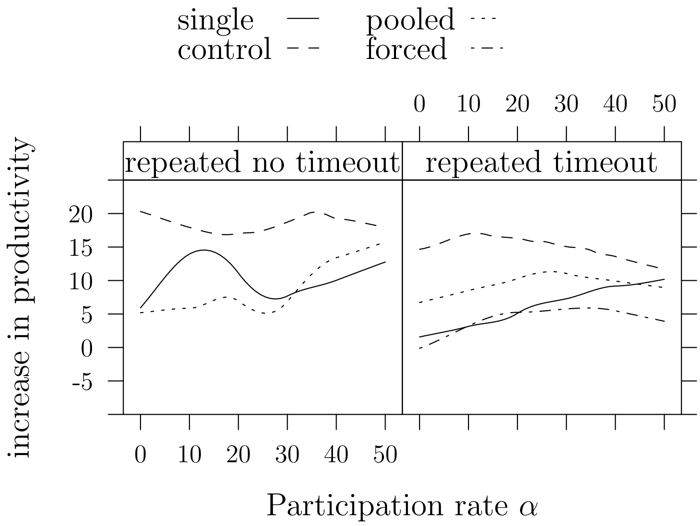
The reference treatment is "single". The coefficient of the participation rate α is negative for "single" lenders and significantly so. The larger the participation rate, the less insolvent debtors will use the timeout option (as predicted in Hypothesis 3).

The coefficient for "control" (i.e. those participants who are not insolvent) is negative and significantly so. Participants who do not have to repay a debt work clearly harder than participants who are insolvent. As we should expect, the interaction of "control" and α compensates the α from the single-reference treatment nearly perfectly. Since these participants do not have to pay back a credit, their behaviour is not affected by α.

In hypothesis 4 we had assumed that participants are less inclined to repay institutional lenders and thus expected more moonlighting. However, the coeffiecient for "pooled" is negative, i.e. debtors of institutional lenders spend less time moonlighting, but this effect is not significant. Also the interaction of pooled and α is nearly zero which means that participants reactions to α in both treatments are virtually the same.

With hypothesis 5 we had expected participants to moonlight more and thus repay less if they had no safe option and thereby are not responsible for their insolvency. The intercept of "forced" is positive and highly significant which supports our hypothesis.

Figure 7 Increase in productivity



Also the interaction of forced and α is negative and significant which means that the difference between forced and not forced ("single") declines with a larger share debtors may keep (both lines do not cross if $\alpha \in [0, 100]$).

Shirking During our experiment participants accumulate wealth in two different situations: At the beginning of the experiment where their solvency status is still open and during the experiment when they know their status. We use the difference in productivity to measure the amount of shirking. Figure 7 presents an overview. We see that the increase in productivity is highest for the control group, i.e. for either creditors or debtors who are solvent and who work for their own pocket. Insolvent debtors have a lower increase in productivity. This is specifically pronounced in the "repeated timeout" treatment.

For the two treatments, "repeated no timeout" and "repeated timeout", we estimate the following mixed effects model

$$\Delta\text{gained} = \beta_0 + \gamma_0\alpha + \sum_{T\in\text{Treatments}} (\beta_T + \gamma_T\alpha) + \epsilon_i + \epsilon_{it} \tag{5}$$

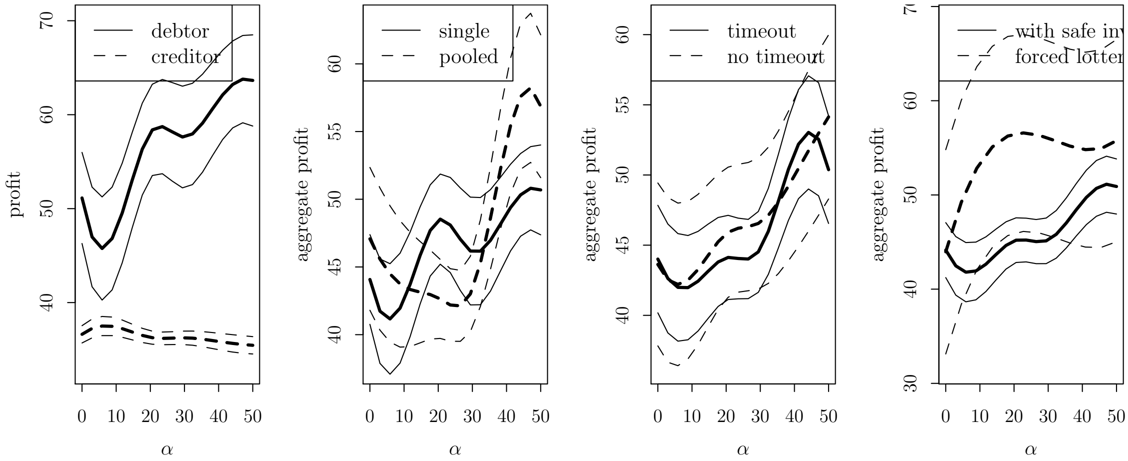
where Δgained is the increase in productivity (as compared to the first stage), α is the participation rate, ϵ_i is a random effect for the participant and ϵ_{it} is the residual. Results are shown in Table 5. The reference treatment is "single". We see that insolvent debtors do shirk: The coefficients for "control" (i.e. creditors or debtors who are not insolvent) is positive and significant. Also the participation rate has a positive and significant effect, i.e. participants shirk less if they can keep more. As above for moonlighting, the control- and alpha-interaction virtually compensates so that the participation rate in sum has no effect in the control group. Regarding hypothesis 4, that debtors work less when

Table 5 Increase in productivity: estimation of equation (5)

	repeated no timeout	repeated timeout / responsibility
(Intercept)	−14.761	−20.806***
	[−31.644; 2.122]	[−29.135; −12.477]
control	36.477***	33.831***
	[18.947; 54.006]	[25.428; 42.233]
pooled	−9.625	1.905
	[−33.143; 13.893]	[−9.508; 13.317]
forced		3.832
	[;]	[−9.500; 17.165]
α	0.705*	0.636***
	[0.121; 1.288]	[0.392; 0.880]
control × α	−0.761	−0.665***
	[−1.533; 0.010]	[−0.920; −0.411]
pooled × α	0.332	−0.074
	[−16.551; 17.215]	[−0.431; 0.284]
forced × α		−0.050
	[;]	[−0.448; 0.349]
var(ϵ_i)	215.000	339.000
	[;]	[;]
var(ϵ_{it})	1997.000	992.000
	[;]	[;]
N	1377	3840

Stars denote the following significance levels: ***=.001, **=.01, *=.05, $^{+}$=.1. 95% HPD (highest posterior density) confidence intervals are given in brackets. Participants in the baseline ("control") condition are either creditors or non-defaulting debtors. Defaulting debtors in the "single" condition face an individual creditor. They face a pool of creditors (institutional lender) in the "pooled" condition. Participants in the forced condition were insolvent and had no own choice to prevent opportunism through safe investment.The model assumes a random effect for each participant.

Figure 8 Total profits 95% confidence bands



The confidence bands are based on a ME estimation with dummies for the different levels of α and with a random effect for each participant. For the "pooled" treatment we round α to multiples of 10.

they have to repay an institutional ("pooled") creditor, we find that the coefficients of "pooled" are negative in the "no timeout" and positive in the "timeout" condition but not significant. The effect of "forced" in the responsibility-treatments is not significant.

Total profits To better understand the impact of our treatment variables on total profits the left panel in Figure 8 shows how total profits of debtors and creditors depend on the participation rate α. As we should expect debtors' profits increase with α while creditors' profits slightly decrease with α. In the other panels we show aggregate profits for debtors and creditors. We see that the aggregate profit increases in α. Debtors gain a lot from a large participation rate while creditors suffer only by a small amount. Since risk taking is socially efficient in our experiment and, as we have seen above, a larger participation rate increases risk taking it is no surprise to see that large participation rates come with larger aggregate profits.

We estimate the following mixed effects model for both types of players, "debtors" and "creditors" as well as for all players:

$$\text{Profit} = \beta_0 + \beta_\alpha \alpha + \beta_{\text{pooled}} d_{\text{pooled}} + \beta_{\text{forced}} d_{\text{forced}} + \epsilon_i + \epsilon_{it} \tag{6}$$

Profit is the total profit obtained in this round, α is the participation rate, d_{pooled} is a dummy which is one in the the case of pooled creditors and zero otherwise, d_{forced} is a dummy which is one in the the case of forced lottery and zero with safe investment option, ϵ_i is a random effect for the participant and ϵ_{it} is the residual. Results are shown in Table 6. Not too surprisingly debtor's profits increase significantly with the participation rate α. This goes in line with a decrease of creditor's profits, however this decrease is considerably less pronounced. We also see that profits for creditors are significantly larger in the case of single creditors[9]. The dummy for "forced" is always

[9] If we estimate separately by "timeout" and "no timeout", the significant result persists for the "no

Table 6 Total profits: estimation of Equation (6)

	creditor	debtor	all
(Intercept)	37.797***	48.471***	42.262***
	[37.032; 38.563]	[44.235; 52.708]	[39.807; 44.717]
part. rate α	−0.030***	0.280***	0.160***
	[−0.047; −0.012]	[0.169; 0.390]	[0.098; 0.222]
pooled	−0.667*	−0.381	−0.544
	[−1.188; −0.146]	[−4.426; 3.665]	[−2.604; 1.516]
forced	−4.841***	17.635***	6.396**
	[−6.007; −3.674]	[9.499; 25.770]	[2.037; 10.754]
$\mathrm{var}(\epsilon_i)$	16.200	157.000	200.000
	[;]	[;]	[;]
$\mathrm{var}(\epsilon_{it})$	39.600	2461.000	1259.000
	[;]	[;]	[;]
N	2557	2552	5109

Stars denote the following significance levels: ***=.001, **=.01, *=.05, +=.1. 95% HPD (highest posterior density) confidence intervals are given in brackets. Both estimations pool the "timeout" and the "no timeout" treatment. The model assumes a random effect for each participant.

highly significant, negative for creditors, positive for debtors and positive for the total profit – forcing creditors to take the risk redistributes wealth from creditor to the debtor but improve total profits overall. The increase in total profits is no surprise since the risk is socially efficient in our experiment. Since forced creditors do not feel responsible for their debt, there is more moonlighting which reduces debtors' and increases creditors' profits. However, we only compare profits as a monetary unit here. Risk aversion, justice or inequality aversion may lead to another results in utility units. We also did not model that rational creditors would demand an insurance premium for higher participation rates which would lead to increasing interest rates at higher participation rates. Indeed, this is only important for decisions if the investments is on the edge of individual efficiency - otherwise it is just a distributional issue.

5. Conclusion

We conducted a laboratory experiment to analyse the impact of different rules to discharge of residual debt. We studied in particular different participation rates and different types of creditors: private and institutional lenders. We also investigated if responsibility for the insolvency has an effect.

In line with our expectations, the participation rate has a substantial and significant influence on risk taking behaviour and on profits. The larger the fraction of the own income that an insolvent debtor is allowed to keep the more willing investors are to choose

timeout" but not for the "timeout" condition.

risky investments and the larger as debtors' as well as total profits. In comparison, the loss that creditors suffer as the result of a high participation rate is rather small.

Additionally, if people cannot escape insolvency by choosing a safe option, they feel less responsible and moonlight more. This effect is quite huge and significant. This actually shows that our treatment manipulation works. What we want to model is that creditors feel responsible for their situation since they could invest the money safely. When we remove the possibility of this safe investment, indeed, creditors behave less responsibly.

In contrast to our expectations we find few differences between institutional and private lenders. Single creditors do better than institutional creditors. All other effects of the creditor's type are not significant.

References

Abbink, Klaus, Bernd Irlenbusch, and Elke Renner (2000), "The moonlighting game: An experimental study on reciprocity and retribution." *Journal of Economic Behavior & Organization*, 42, 265–277, URL.

Abeler, Johannes, Armin Falk, Lorenz Goette, and David Huffman (2011), "Reference points and effort provision." *The American Economic Review*, 101, 470–492, URL.

Fischbacher, Urs (2007), "z-Tree: Zurich toolbox for ready-made economic experiments." *Experimental Economics*, 10, 171–178, URL.

Greiner, Ben (2004), "An online recruitment system for economic experiments." In *Forschung und wissenschaftliches Rechnen* (Kurt Kremer and Volker Macho, eds.), volume 63, of *GWDG Bericht*, 79–93, Ges. für Wiss. Datenverarbeitung, Göttingen.

Houser, Daniel, Daniel Schunk, Joachim Winter, and Erte Xiao (2010), "Temptation and commitment in the laboratory." IEW - Working Papers 488, Institute for Empirical Research in Economics - University of Zurich, URL.

Mohnen, A., K. Pokorny, and D. Sliwka (2008), "Transparency, inequity aversion, and the dynamics of peer pressure in teams: Theory and evidence." *Journal of Labor Economics*, 26, 693–720.

R Development Core Team (2012), *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, URL. ISBN 3-900051-07-0.

Wagner, Gert, Joachim Frick, and Jürgen Schupp (2007), "The german socio-economic panel study (soep)-evolution, scope and enhancements." *Schmollers Jahrbuch*, 127, 1, URL.

A. Real effort task

Period 1 of 1 Remaining time: 294

Please count the number of ones in the following 5×5 matrix and click the button with the corresponding number. You will then get a new problem with new numbers:

0	1	0	0	0
0	0	0	0	0
0	0	0	0	1
1	0	1	0	1
1	0	0	1	0

0	1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24	25

Problem No.	1
correct answers	0
incorrect answers	0

B. Statistical software

We used R for the statistical analysis and for the graphs (R Development Core Team, 2012).

- R version 3.0.2 (2013-09-25), `x86_64-pc-linux-gnu`
- Locale: `LC_CTYPE=en_GB.utf8`, `LC_NUMERIC=C`, `LC_TIME=en_GB.utf8`, `LC_COLLATE=en_GB.utf8`, `LC_MONETARY=en_GB.utf8`, `LC_MESSAGES=en_GB.utf8`, `LC_PAPER=en_GB.utf8`, `LC_NAME=C`, `LC_ADDRESS=C`, `LC_TELEPHONE=C`, `LC_MEASUREMENT=en_GB.utf8`, `LC_IDENTIFICATION=C`
- Base packages: base, datasets, graphics, grDevices, grid, methods, splines, stats, utils
- Other packages: filehash 2.2-1, Formula 1.1-1, gamm4 0.1-6, Hmisc 3.12-2, knitr 1.5, languageR 1.4, lattice 0.20-15, latticeExtra 0.6-24, lme4 0.999999-2, MASS 7.3-29, Matrix 1.0-14, memisc 0.96-4, mgcv 1.7-27, nlme 3.1-111, plyr 1.8, RColorBrewer 1.0-5, survival 2.37-4, tikzDevice 0.6.3, xtable 1.7-1
- Loaded via a namespace (and not attached): car 2.0-17, cluster 1.14.4, codetools 0.2-8, digest 0.6.3, evaluate 0.5.1, formatR 0.9, rpart 4.1-3, stats4 3.0.2, stringr 0.6.2, tools 3.0.2