Communication and Hidden Action: A Credit Market Experiment

Martin Brown, Jan Schmitz and Christian Zehnder

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Martin Brown† Jan Schmitz‡ Christian Zehnder§

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Abstract

We study the impact of pre-contractual communication on market outcomes when economic relationships are subject to hidden action. Our experiment is framed in a credit market context and borrowers (second movers) can communicate with lenders (first movers) prior to entering the credit relationship. Communication reduces moral hazard (strategic default) and increases trust (credit provision) in an environment where opportunistic behavior by borrowers is revealed ex-post to lenders. By contrast, in an environment where strategic defaults are hidden behind a veil of uncertainty, we find a substantially weaker impact of communication. Borrowers are more likely to renege on repayment promises when they can hide opportunistic behavior from lenders. As a consequence, lenders extend less credit to borrowers who promise to repay. Hidden action undermines the positive effect of communication on market outcomes. Our findings have implications for the design of contracts and how to structure relationships with a risk of hidden action: for pre-contractual communication to unfold its full potential it needs to go hand-in-hand with post-contractual monitoring.

Keywords: pre-contractual Communication, Hidden Action, Trust Game, Credit Market
JEL codes: G21, G41, C91

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†Study Center Gerzensee and University of St. Gallen, Dorfstrasse 2, CH-3115 Gerzensee, Mail: martin.brown@szgerzensee.ch.

‡Radboud University, Heyendaalseweg 141, NL-6525AJ Nijmegen, jan.schmitz@ru.nl.

§University of Lausanne, UNIL-Dorigny, Internef 612, CH-1015 Lausanne, Mail: christian.zehnder@unil.ch.

1 Introduction

Opportunistic behavior, i.e., post-contractual moral hazard, is a key risk to economic exchange in many contexts. Before entering into an exchange, economic agents do not know whether their counterparty will adhere to the agreed terms. Economic agents therefore need to trust that the counterparty behaves trustworthily and fulfils its obligations (Arrow, 1969; Falk & Fischbacher, 2006; Fehr *et al.* , 1993, 1998; Sapienza & Zingales, 2011). Research in behavioral economics documents that pre-contractual communication may be a powerful tool to increase trust and trustworthiness and to mitigate opportunistic behavior when behavior is perfectly observable ex-post (see, e.g., Balliet, 2009; Brandts *et al.* , 2015; Cooper & Kühn, 2014; Ellman & Pezanis-Christou, 2010; Lei *et al.* , 2014). In many relevant situations, however, observed outcomes do not perfectly reveal the behavior of the trading partner; i.e., economic relations are subject to hidden action.

In this paper, we provide empirical evidence from laboratory experiments showing that the impact of pre-contractual communication is undermined in relationships involving the possibility for hidden action. Our findings confirm existing evidence on communication under complete information: trust and trustworthiness increase when agents can communicate. This has beneficial effects on market outcomes. The positive effect of communication disappears, however, in situations where behavior is not perfectly revealed to the paired economic agent ex-post. Participants in our experiment are more likely to renege on promises when they can hide opportunistic behavior from their trading partner. We disentangle whether the positive effect of communication is impaired by market uncertainty or hidden action (which is only possible if there is uncertainty about market outcomes). Our results show that hidden action and not uncertainty about outcomes per-se undermines the effect of pre-contractual communication on market outcomes. Pre-contractual communication and post-contractual monitoring preventing hidden action are therefore important for communication to unfold its full potential and to increase economic outcomes.

Our experiment is framed in a credit market context because credit relationships are a prime example for asymmetric information with the potential for moral hazard. Borrowers may hide opportunistic behavior (strategic default) behind the veil of economic uncertainty and pretend to be incapable of repayment while they are actually solvent. Moreover, communication before entering credit relationships is a common practice in credit markets. In retail lending, for example, borrowers interact with loan officers collecting soft information about a borrower's ability and willingness to repay (Briceno Ortega *et al.* , 2008; Hertzberg *et al.* , 2010; Uchida *et al.* , 2012; Qian *et al.* , 2015). Peer-to-peer platforms likewise enable borrowers to communicate with prospective lenders (Gao *et al.* , 2018; Xu & Chau, 2018). In addition, several websites from the mortgage lending industry encourage their brokers to communicate with borrowers and find out more about their intentions and honesty (see, the website (LINK) of Expert Mortgage Assistance as just one of many examples).

In our experiment, we study a variation of the investment game introduced by Berg *et al.* (1995). In this game, the lender (first mover) can trust and extend credit to the borrower (second mover) who can decide whether to repay or not. Glaeser *et al.* (2000) and Karlan (2005) document that behavior in this game predicts behavior in real credit markets. We implement a "hidden action" condition in which the ability of the borrower

to repay the lender is stochastic and strategic defaults are not revealed to the lender. We compare the hidden action condition to a baseline condition in which borrowers can always repay if they want to and thus strategic defaults are automatically revealed to the lender. In the hidden action condition lender incomes are in expectation lower than in the baseline condition, because some borrowers are forced to default. To rule out that our main results are driven by a direct effect of uncertainty, we also implement a third condition. In this "revealed action" condition the ability of a borrower to repay is stochastic (as in the hidden action condition) but borrower income and thus the repayment decision is revealed to the paired lender after each period (as in the baseline condition). In all conditions we compare a treatment with pre-contractual communication to a treatment without communication. In the communication treatments borrowers can send free form text messages to the paired lender before the lender makes his decision on credit provision. The borrower thus has the opportunity to promise that she will repay.

We rely on data from laboratory experiments because causal effects of communication are hard to study with observational field data. In real-life credit markets, the decision to communicate is endogenous and may correlate with unobservable borrower characteristics that also affect post-contractual behavior. Moreover, repayment choices are hard to identify with field data as strategic defaults by solvent borrowers can rarely be perfectly disentangled from forced defaults by borrowers who do not have the means to repay.[1] In our laboratory experiment, we exogenously vary borrowers' (second movers') ability to communicate and we are able to perfectly disentangle opportunistic behavior (strategic defaults) from involuntary breach of contracts (forced defaults). Our laboratory experiment allows us to study (i) whether borrowers endogenously choose to make pre-contractual repayment promises to lenders, (ii) whether these repayment promises are kept or broken (iii) how repayment promises affect the credit provision by lenders and (iv) whether the ex-post revelation of strategic defaults to lenders plays a crucial role for credit provision and/or repayment.

We find that communication has a significantly positive effect on the average credit volume and repayment frequency in the baseline condition without hidden action. In this condition, communication leads to higher average payoffs for both lenders and borrowers. By contrast, in our hidden action condition the effect of communication is weak. In this environment, communication does not reduce strategic default, credit volumes are only slightly higher compared to the no-communication treatment, and borrower or lender payoffs do not increase. Difference-in-difference estimates confirm a weaker impact of communication on credit provision and payoffs in the hidden action condition as compared to the baseline condition. In the revealed action condition, where the repayment decision is revealed to the paired lender, we find that the positive impact of communication on credit provision, repayment behavior and payoffs is restored.

We add to the literature on communication and trust in behavioral economics (see, e.g., Cooper & Kühn, 2014; Balliet, 2009; Lei *et al.* , 2014) by providing novel evidence on the effect of communication when opportunistic behavior can be hidden behind surrounding economic uncertainty.[2] Most experimental studies on the effect of communication focus

[1] Demyanyk & Van Hemert (2011) and Ghent & Kudlyak (2011) for example, show that a large fraction of mortgage defaults during the financial crisis were presumably strategic in nature as borrowers were hiding behind surrounding defaults.

[2] Literature exploring behavior in the absence of communication in environments where subjects can

on strategic interaction in deterministic economic environments without stochastic risk that partners cannot behave trustworthily, even if they wanted to (see, e.g., Ben-Ner & Putterman, 2009). Charness & Dufwenberg (2006) provide first empirical evidence on the effect of communication in stochastic economic conditions. They find that communication increases trust and trustworthiness in situations with low levels of uncertainty.[3] Our experiment differs from Charness & Dufwenberg (2006) in two key dimensions. First, we expand their work by adding a revealed action condition which allows to study the differential impact of communication in an environment with and without hidden action. We can thus distinguish between the effect of communication when the trustor (lender) learns the trustee's (borrower's) action and when the actions are hidden and not perfectly revealed. Charness & Dufwenberg already discuss this interesting addition in their paper and speculate about the effect communication when opportunistic behavior is not revealed in this setting.[4] Second, our experiment features greater uncertainty about the ability of borrowers to repay. We conjecture that significant uncertainty about the second mover's income may undermine the beneficial effect of communication as it makes it easier for second movers to conceal opportunistic behavior.[5]

Our results reveal that the positive effect of communication is undermined when uncertainty is sufficiently large and opportunistic behavior can be well concealed. This finding indicates that the inclination of economic agents to keep their word is not fully driven by unconditional preferences for promise-keeping (Ellingsen & Johannesson, 2004; Vanberg, 2008), but is more in line with a preference for being seen as honest (Abeler *et al.* , 2019) or (expectation-based) guilt aversion (Di Bartolomeo *et al.* , 2019; Ederer & Stremitzer, 2017).[6] Our findings differ from recent findings by Hoppe & Schmitz (2018) who conduct a variant of the Charness & Dufwenberg experiment with multiple contract negotiation and communication phases and a hidden action condition.[7] Communication reduces the

hide their behavior shows that pro-social behavior may decrease (Brown *et al.* , 2016; Dana *et al.* , 2007; DellaVigna *et al.* , 2012; Exley, 2015; Guiso *et al.* , 2013; Xiao & Kunreuther, 2016). However, there are also exceptions where possibilities to hide opportunistic behavior do not increase selfishness (van der Weele *et al.* , 2014).

[3]Ederer & Schneider (2022) show that in situations with limited uncertainty, the effect of communication is robust when there is a time gap between the decision to trust and to behave trustworthily.

[4]Specifically, in Footnote 6 of their paper Charness & Dufwenberg state: "Independently of the contract-theoretic angle, we note that whether or not B's choice is observable by A may matter to the players' motivation (if they are not selfish). Perhaps B would feel worse choosing *Don't Roll* if he knew that A would know? We do not explore this interesting issue."

[5]In Charness & Dufwenberg subjects further only make one decision while our experiment gathers more observations on the individual level when subjects decide on credit sizes and repayment in several periods. Lastly, the strategy set is broader in our experiment (lenders can decide on a credit size from a set of four credits and borrowers decide on repayment for each credit size). Charness & Dufwenberg limit the decision space to binary choices (trust/do not trust and be trustworthy/not being trustworthy) in presence and absence of communication.

[6]This discussion also relates to the broader literature on lying aversion (see, e.g., Erat & Gneezy, 2012; Fischbacher & Föllmi-Heusi, 2013; Gneezy *et al.* , 2013; López-Pérez & Spiegelman, 2013; Vanberg, 2017) and truth telling (see, e.g., Ellingsen & Östling, 2010; Kartik *et al.* , 2007, 2014; Matsushima, 2008). Our findings are in line with recent experimental evidence by Gneezy *et al.* (2018) who show that people lie more often when their actions cannot be observed by an experimenter. The findings are also in line with Andreoni & Bernheim (2009) who show that giving in dictator games may be reduced if subjects can hide behind stochastic outcomes.

[7]Our design differs from Hoppe & Schmitz (2018) in several domains. Hoppe & Schmitz introduce lower levels of uncertainty (1/6) and have several negotiation stages in which first and second movers can

strategic uncertainty in their experiment and increases effort and payoffs. Our findings imply that the level of uncertainty (which is higher in our setting) and/or the possible to make counter-offers (which is not possible in our setting) play an important role for the effectiveness of communication.

Our findings also contribute to the literature on credit provision and loan repayment in financial economimcs. While a broad body of empirical studies in finance documents that lender and borrower behavior are systematically influenced by bankruptcy laws (Ghent & Kudlyak, 2011; Gropp *et al.* , 1997), credit information sharing (Brown & Zehnder, 2007; Liberman, 2016; Pagano & Jappelli, 1993), and collateral (Mian & Sufi, 2011; Stroebel, 2016), recent evidence also suggests an important role for moral constraints and social norms in reducing loan default and fostering credit provision in retail markets (Karlan, 2005; Guiso *et al.* , 2013; Fisman *et al.* , 2017). We contribute to this evidence by showing that soft factors such as pre-contractual communication can reduce credit risk. Our findings suggest, however, that pre-contractual communication is only effective when borrowers anticipate that moral hazard is likely to be revealed to the lender.

Bursztyn *et al.* (2019) and Karlan *et al.* (2016) show that *post-contractual* lender-to-borrower communication can improve repayment in consumer lending (Bursztyn *et al.* , 2019; Karlan *et al.* , 2016).[8] The findings of Bursztyn *et al.* and Karlan *et al.* inform on how to interact with borrowers in the post-contractual loan monitoring and loan recovery process. Our findings complement this literature by informing how to jointly design pre-contractual lender-borrower interaction with post-contractual loan monitoring.

The remainder of this paper is organized as follows: In Section 2 we present and discuss the experiment design. In Section 3 we provide testable hypothesis for our cross-treatment comparisons. In Section 4, we present our results and Section 5 discusses our findings.

2 Design of the Experiment

2.1 Trust Game

We implement a repeated trust game with a strangers matching protocol. Subjects are randomly assigned to be either a second mover borrower (she) or a first mover lender (he) in a matching group of 10 subjects (5 lenders and 5 borrowers) for 10 periods. In each period, each borrower (second mover) is randomly matched with one lender (first mover) out of the same matching group. Lenders and borrowers have the same endowment of 150 points. Lenders can issue a credit of 10, 40, 70 or 100 points from their endowment to

make proposals about the subsequently provided effort and pay. Moreover, Hoppe & Schmitz also have multiple rounds of free-form first and second mover communication.

[8] Bursztyn *et al.* (2019) report on a field experiment showing that text messages which emphasize the immorality of loan delinquencies are associated with higher subsequent repayment rates. Karlan *et al.* (2016) report on a similar experiment which randomized the content of text message reminders to microfinance clients prior to the due repayment date. Text messages which emphasize the personal relationship between the loan officer and the borrower are associated with higher repayment rates. Using observational data, Laudenbach *et al.* (2018) find support for the effectiveness of personal as opposed to impersonal communication in reducing delinquency. Ahlin & Townsend (2007) provide evidence that social sanctions encourage repayment of loans in rural Thailand. Breza (2012) shows that peer effects play an important role in fostering loan repayment.

the paired borrower. Borrowers yield an investment return which is four times the credit size. Hence, if a borrower receives a credit of 10 (40, 70, 100) points, she obtains a return of 40 (160, 280, 400) points, respectively.

Borrowers' decisions are elicited with the strategy method: Each borrower decides to repay or not for each of the possible credit sizes before she is informed about the credit choice of the paired lender. We fix repayments to 2.5 times the credit size. Thus, a borrower's repayment obligation for a credit of 10 (40, 70, 100) points is 25 (100, 175, 250) points. This parameter choice enables borrowers to implement an equal split of income between themselves and the paired lender for every credit size. The payoff of the lender is given by his endowment minus the credit size plus the repayment by the borrower. The payoff of the borrower is given by her endowment plus the investment return minus the repayment. Table 1 presents the lender and borrower payoffs for each credit size and repayment choice.

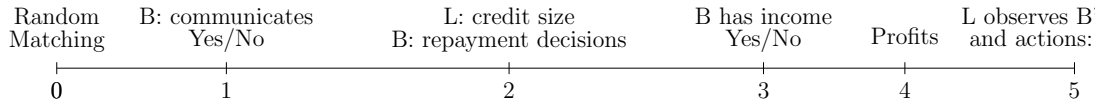
Table 1: Payoffs in the Baseline Trust Game

Credit size	Investment		Borrower's Income		Lender's Income	
	Return	Repayment due	repayment	no repayment	repayment	no repayment
10	40	25	165	190	165	140
40	160	100	210	310	210	110
70	280	175	255	430	255	80
100	400	250	300	550	300	50

Note: Trust game payoffs for borrowers and lenders for each credit size with repayment and without repayment.

After borrowers and lenders make their decisions, the period payoffs are realized. Borrowers and lenders are then randomly re-assigned to new pairs within their matching group for the next period. Borrowers and lenders only learn their own payoffs at the end of each period. However, given the deterministic nature of borrower income, both borrowers and lenders can calculate the payoff of their trading partner. Figure 1 illustrates the timeline of actions and decisions within each period in our different treatments (described in detail in Section 2.2 below).

To facilitate learning, we provide lenders in period six with the information about the total number of issued credits by size, the total number of repaid credits by credit size and the average earnings of lenders by credit size in period 1-5.[9] Furthermore, in period one, five and ten, lenders were asked to state their belief about how many borrowers in their matching group will repay their credits.[10] Lender beliefs were not incentivized.



Note: Timing (from Step 0-5) below horizontal line. Actions/decisions above the horizontal line. B=borrower; L=lender. 0: Random matching within a matching group in all treatments; 1: Communication possible in C-B, C-H, C-R; 2: All treatments; 3: Stochastic Income in: N-H, C-H, N-R, C-R; 4: Lender observes B's income: All treatments. Actions revealed in: N-B, C-B, N-R, C-R. Perid 6: Lenders receive info about behavior within matching group.

Figure 1: Timing of actions and decisions in each period

[9]Lenders and Borrowers were told in the instructions that they would receive this aggregate information.

[10]We discuss lender beliefs in Online Appendix A.4.

2.2 Treatments

Our aim is to study how the ability of borrowers (second movers) to hide opportunistic behavior affects the impact of communication in this trust game. To this end we study six treatments in a 2x3 design.

First, we vary the borrowers' ability to hide opportunistic behavior. In our "baseline" condition described above, the borrower's income is deterministic: She always yields a return which is four times the credit size. In this condition it is common knowledge that the borrower always has the ability to repay a loan. As a consequence any non-repayment of a loan is automatically identified as a strategic default. We compare this baseline condition to a "hidden action" condition in which the return of the borrower is stochastic. With probability $p = \frac{2}{3}$, the borrower's return is four times the credit size. With the complementary probability $1 - p = \frac{1}{3}$, the borrower's return is zero and the borrower is forced to default.[11] In this condition the income of a borrower is not revealed to the paired lender. As a consequence, lenders cannot disentangle whether the non-repayment of a loan is due to a strategic default or a forced default.

Second, we vary the ability of borrowers and lenders to communicate with each other. In the "no communication" condition borrowers cannot communicate with lenders. In the "communication" condition we allow for non-binding pre-contractual communication. Borrowers can send a text message with a maximum of 300 characters to the paired lender – before the lender makes his decision about the credit size. Lenders can read the message but cannot respond. Borrowers in the communication treatments thus have the possibility to promise that they will repay specific credit sizes (if they have the income to do so). Promises are, however, cheap talk because (i) they are non-binding for that period, and (ii) interaction is anonymous and lenders and borrowers are randomly rematched each period.

The hidden action condition allows borrowers to conceal strategic defaults because their income is stochastic and is not revealed to lenders. Our conjecture is that this condition undermines the effectiveness of communication as borrowers may be more likely to renege on promises to repay. However, compared to the baseline condition the hidden action condition is also characterized by stochastic borrower income and thus lower expected payoffs for borrowers and lenders. Thus any differential effect of communication between the two conditions could potentially be attributable to the greater uncertainty and/or an income effect, rather than to the ability of borrowers to hide opportunistic behavior.

In order to assess the role of hidden action as opposed to the effect of uncertainty and income effects, we study the effect of communication in a third condition. In the "revealed action" condition, borrower income is stochastic, however the realized borrower income and thus borrower repayment choice is revealed to the lender after each period. In this condition, it is common knowledge that lenders can disentangle whether a borrower defaulted strategically or was forced to do so due to lack of income. We again implement a treatment without communication and a treatment with communication.

Our treatment variations lead to six treatments (see Table 2 for a treatment overview): The ***Communication - Baseline (C-B)*** treatment, the ***No Communication - Baseline (N-B)*** treatment, the ***Communication - Hidden Action (C-H)*** treat-

[11] We assume that the borrower's endowment is illiquid and cannot be used to repay a loan.

Table 2: Treatment overview

Borrower income:		Deterministic	Stochastic	
Borrower choice:		Revealed	Hidden	Revealed
Communication	No	No Communication Baseline (N-B)	No Communication Hidden action (N-H)	No Communication Revealed action (N-R)
	Yes	Communication Baseline (C-B)	Communication Hidden action (C-H)	Communication Revealed action (C-R)

Note: Treatment overview. Row 1: Treatments without communication. Row 2: Treatments with communication. Column 1: Treatments with deterministic borrower income (No Communication Baseline (N-B) and Communication Baseline (C-B)). Repayment choice revealed to the lender. Column 2-3: Stochastic borrower income with hidden repayment action (No Communication and Hidden action (N-H) and Communication Hidden action (C-H)) in Column 2. Stochastic borrower income with revealed repayment decision (No Communication Revealed action (N-R) and Communication Revealed action (C-R)) in Column 3.

ment, the ***No Communication - Hidden Action (N-H)*** treatment, ***No Communication - Revealed Action (N-R)***, and the ***Communication - Revealed Action (C-R)*** treatment. These treatments allow us to compare the effect of communication on lender credit provision, borrower repayment behavior and payoffs under stochastic income and hidden action to stochastic income and revealed action to that in the baseline condition. We are interested in the differential effect of communication between these conditions.

2.3 Procedures

The experiment was conducted between March and May 2015 (main treatments) and between May and June 2017 (additional treatments) at the University of Hamburg Experimental Laboratory. The experiment was programmed in z-Tree (Fischbacher, 2007) and subjects were recruited using hroot (Bock *et al.* , 2014). 600 subjects participated in 30 sessions of the experiment.[12] There were 20 subjects in each session, so that we elicited 2 observations at the matching group level per session. At the end of each session, two periods (one period from period 1-5 and one period from period 6-10) were randomly chosen for payments. A session lasted about 80 minutes and subjects earned on average 13.66 Euro.[13] Roughly half of the subjects were female (55%) and subjects were on average 25 years old. Online Appendix A.5 shows that these key socio-demographics of subjects are balanced across treatments.

Upon arrival, subjects had to pick a number from a shuffled deck of cards (numbers 1-20). The number determined their computer cubical and whether they were a borrower or a lender. Subjects then had to read a set of instructions. While borrowers and lenders had individual instructions, both were informed about the action set, information set, and payoff consequences for the respective other role. Before the experiment started, subjects had to answer a set of computerized control questions. The experiment only started after all subjects answered the control questions correctly. After the experiment, we asked

[12]Note: The data for the NR and CR treatments were collected in 2017. Therefore, we ran two additional sessions also in the NB and NH treatment to highlight the consistency of subject behavior across years. Table 14 in Online Appendix A.6 presents 2015 and 2017 summary statistics for these treatments.

[13]At the time of the experiment, the average student salary in Germany was 10 Euro per hour.

subjects to fill in a questionnaire in which we elicited socio economic variables.

2.4 Discussion of the Design

Our experiment design was chosen to capture (in a stylized fashion) key features of economic interactions with hidden action. Hidden action is a threat to economic exchange in many situations (e.g., online retail where products are received after payment, one-off contracts in the gig economy where buyers have limited knowledge about quality, interactions involving the purchase of credence goods or insurance contracts in general). One specific context in which hidden action is arguably a particularly important issue is unsecured, non-repeated lending. Such credit relationship exist in a wide variety of contexts including personal lending, small-business lending, person-to person lending, and trade-credit. Our experiment is framed in the lending context as here, all features needed to study hidden action are present. Our framing is well suited to study communication with hidden action as in lending relationships the potential borrower may interact with the potential lender before they contract. The lender then decides upon how much to lend, knowing that the borrower may not be able to or may not be willing to repay. Our experiment mirrors the key factors of these interactions. A common challenge in laboratory experiments including morally charged behavior is that all possible choices are explicitly permitted by the experimental protocol. In our context, this might imply that strategic default is seen as more socially acceptable than in contexts outside of the laboratory. However, it is important to emphasize that this point holds for all our treatments. As we are only interested in between-treatment comparisons and not in the absolute frequencies with which certain behaviors occur, our results remain unaffected by these potential issues. Moreover, the credit market frame makes sure that all subjects understand the situation and prevents that some of the subjects associate the game with a different context which might affect their behavior.

There are four design choices in our experiment which warrant particular discussion: The first major design choice is the type of uncertainty we implement in the "hidden action" condition. In our experiment, the borrower's investment income is the only stochastic variable. Lenders must fear that a borrower may not be able to repay a loan, even if she wants to. The stochastic nature of borrowers' ability to repay is particularly interesting when studying the role of pre-contractual communication. In particular, borrowers may promise to repay loans, but then hide behind their potential solvency risk when breaking these promises and defaulting strategically. Our choice of uncertainty for the "hidden action" condition reflects the potential solvency or liquidity risk of debtors in a variety of credit contexts. Our choice also reflects of economic uncertainty in other market environments where participants can hide behind exogenous factors and engage in risky behavior (e.g., insurance markets). By contrast, our baseline-condition with deterministic borrower income hardly corresponds to real-life contexts. We implement the baseline-condition as one of two benchmark conditions (besides the revealed action condition) as it has been widely applied in experimental studies of communication in trust-games (see, e.g., Cooper & Kühn, 2014; Balliet, 2009; Lei *et al.* , 2014).

A second major design choice is the type of communication we implement. We study pre-contractual communication by borrowers to lenders. We choose one-sided communication by borrowers only, as previous evidence has shown that second-mover communication

can strongly influence the behavior of both second-mover and first-mover behavior in trust games (Charness & Dufwenberg, 2006; Ben-Ner & Putterman, 2009). pre-contractual communication allows second-movers to signal their type and intentions to first-movers. Thus this direction of communication is particularly important in a strategic situation where the first movers cannot enforce second-mover behavior and have imperfect information about the type and behavior of second movers.

Our design also differs from recent field experiments which study post-contractual (lender-to-borrower) communication (Bursztyn *et al.* , 2019; Karlan *et al.* , 2016). The difference in timing and communicating party reflects the difference in research questions between the studies. Karlan *et al.* (2016) and Bursztyn *et al.* (2019) are interested in how reminders and moral appeals from lenders (first movers) affect the propensity of borrowers (second movers) to repay outstanding loans. We are interested in how communication by borrowers about their intended repayment behavior can foster lending in the first place. As in Karlan *et al.* (2016) and Bursztyn *et al.* (2019) we allow for text-message communication only, rather than allowing borrowers to communicate face to face with lenders. We choose this type of communication in order to study the effect of communication in an anonymous, one-shot interaction and to be able to rule out any dynamic incentives from potential repeated interaction.[14] In contrast to Bursztyn *et al.* (2019) and Karlan *et al.* (2016), we do not exogenously vary the content of text-messages but communication is endogenous and borrowers can decide about the content of their messages. This is also different to (e.g., Bracht & Feltovich, 2009), who force second movers to communicate. We do not do this as it may undermine the intention of messages and the cost of lying. To account for the fact that the decision to communicate is endogenous we always benchmark the effect of communication in the different information conditions against treatments without communication in the same condition (i.e. revealed vs. hidden action with or without uncertainty about borrower actions). To assess the effectiveness of communication across information and economic conditions we use a difference-in-difference approach in our main analysis. We thereby capture differences in the propensity to communicate in different situations and measure the relative effectiveness of communication (see Section 3 below for hypotheses and Section A.1 in the Appendix for theoretical foundations for our predictions).

A third design choice concerns the strategy space of the lenders. In our experiment, lenders could choose between a loan of 10, 40, 70 or 100. They were thus not able to abstain from lending at all. We forced lenders to make a loan of at least 10 in order to circumvent "certainty" effects. Previous research has demonstrated that agents have a strong preference for certain rather than risky (or ambiguous) prospects (Kahneman & Tversky, 1979). In our experiment, lenders were exposed to the risk of non-repayment no matter what loan size they chose. On the other hand we limited the number of non-minimum loan sizes to three, i.e., a small loan (40), a medium loan (70) and a large loan (100). We chose to limit the strategy space of lenders to simplify the elicitation of borrower repayment choices. This design choice implies that we examine the intensive rather than the extensive margin of credit provision. Seminal papers of lending under information asymmetries highlight both margins (Stiglitz & Weiss, 1981; Jaffee & Russell,

[14] We are aware that face-to-face communication may enhance cooperation more than anonymous (see, e.g., Balliet, 2009, for a meta-analysis). However, assuming that treatment effects are constant across conditions, our results should hold.

1976). Kirschenmann (2016) provides evidence for the impact of information asymmetries on the intensive margin in small business lending.

Our fourth major design choice was to elicit repayment decisions in our trust game with the strategy method. In each period, a borrower had to state whether she would repay a loan size of 10, 40, 70 or 100 if (i) she received such a loan, and (ii) she was able to repay the loan (in the hidden and revealed action conditions). We chose to elicit borrower choices with the strategy method in order to get a complete picture of intended repayment behavior, no matter which loan size was actually offered to the borrower. Also, in the hidden action condition (and revealed action condition) we can elicit intended repayment behavior even for those borrowers who are forced to default. In a survey of the literature Brandts & Charness (2011) find no systematic difference in first-mover or second-mover behavior in trust / investment games which compare the strategy method to direct response elicitation.

3 Hypotheses

Our aim is to study the impact of pre-contractual communication on trust (credit provision) and trustworthiness (repayment behavior) when second movers (borrowers) can hide opportunistic behavior (strategic defaults) behind surrounding uncertainty in the market. The effect of interest in our study is thus a difference-in-difference effect: we will measure the difference in borrower repayment choice and lender credit offers between the C-H and N-H treatment and compare this to the difference in outcomes between the C-B and N-B and the C-R and N-R treatment. We present an intuitive signalling model with formal predictions in Appendix A.1. Our theory builds on the existing literature on social preferences (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999) and known behavior from second movers in the trust game (Karlan, 2005; Johnson & Mislin, 2011). In this section, we summarize the intuition and the assumptions of this model and present testable hypotheses which guide our analysis in Section 4 below.

We assume that at least some borrowers (second movers) face moral costs when not making a repayment (not behaving trustworthily) if they have an income and could do so (i.e., their utility is reduced if they strategically default and behave selfishly). Borrowers thus face a trade-off between the monetary benefit from strategic defaults and the negative (psychological) effect due to strategic default. We assume that these cost from strategic default are borrower specific and heterogeneous. Borrowers with high moral costs will always repay when they can, whereas borrowers with low moral costs will never repay. We further assume that borrowers' moral costs depend on two additional elements: i) moral costs increase if opportunistic behavior can be identified by the lender, i.e., borrowers feel worse if the paired lender knows that the borrower strategically defaulted, and ii) moral costs of strategic default increase if borrowers made a repayment promise, i.e. borrowers dislike breaking a promise. Consequently, borrowers with intermediate moral costs may make repayments in certain situations (e.g., when their actions are observable and/or when they made a repayment promise) and may strategically default in others (e.g., when their actions are not observable and/or when they did not make a repayment promise).

Our assumptions on borrower behavior are based on evidence suggesting that indi-

viduals experience *(expectation based) guilt aversion* (Di Bartolomeo *et al.* , 2019; Ederer & Stremitzer, 2017) or have a preference for *being seen* as honest (Abeler *et al.* , 2019). As a consequence, the effect of communication and promise keeping may be weakened if borrowers believe that lenders' expectations to receive payment are lower in the presence of uncertainty and hidden action or if their actions are not observable in these situations.

For simplicity, we assume in our model that lenders either extend the maximum credit (trust fully) or give no credit at all (do not trust). Thus, lenders face a trade-off between the monetary benefit a credit relationship with repayment may yield and the risk of (strategic or forced) credit default. Before entering in a credit relationship lenders hold a belief about the repayment probability of borrowers. This belief depends on the underlying economic situation (stochastic or deterministic income of borrowers) and the assumed moral costs for strategic default by borrowers. The assumed moral costs are influenced by whether or not borrowers communicated and made a repayment promise and whether or not borrower actions are observable.

Hypothesis 1 presents our hypotheses for the effect of communication in the baseline and hidden action conditions (the comparison follows intuitively from the descriptions about lender and borrower behavior above and is based on our predictions by treatment as summarized in Table 7 in Section A.1 in the appendix.).

Hypothesis 1 (The effect of communication in the baseline and hidden action conditions)**.**

1.A In the C-B treatment, borrowers are more likely to choose to repay large credits and lenders are more likely to offer large credits than in the N-B treatment.

1.B In the C-H treatment, borrowers are more likely to choose to repay large credits and lenders are more likely to offer large credits than in the N-H treatment.

1.C The impact of communication on borrower behavior is weaker in the hidden action condition (C-H vs. N-H) compared to the baseline condition (C-B vs. N-B). The impact of communication on lender behavior may be weaker or stronger in the hidden action condition (C-H vs. N-H) compared to the baseline condition (C-B vs. N-B).

In the C-B and C-H, two possible equilibria may arise: there is a no-communication equilibrium in which borrower and lender behavior is identical to that in the N-B treatment. In addition, there is a communication equilibrium in which all borrowers promise to repay large loans. In the communication equilibrium of the C-B treatment (C-H treatment) more borrowers will choose to repay large loans compared to the N-B treatment (N-H treatment). As a consequence, lenders are more likely to offer large loans in the communication equilibria of the C-B and C-H treatment compared to the N-B and N-H treatment. However, because borrowers can hide opportunistic behavior in the C-H treatments, the treatment effect of communication on borrower behavior should be weaker in the hidden action condition (C-H vs. N-H) compared to the baseline condition (C-B vs. N-B).

The treatment effect of communication on lender behavior can be weaker or stronger in the hidden action condition (C-H vs. N-H) compared to the baseline condition (C-B vs. N-B). There are two countervailing effects at play: on the one hand communication has a weaker impact on borrower repayment choices in the hidden action condition (see above).

On the other hand, due to stochastic borrower income the threshold belief required for lenders to offer credit is higher cet. par. in the hidden action condition compared to the baseline condition. This implies that for a given increase in the share of borrowers who repay the decrease in the threshold belief that borrowers do not repay is larger in the hidden action than in the baseline condition.

In our model, the mechanism driving this effects underlying Hypothesis 1 is that when strategic defaults are not revealed to lenders, less borrowers feel compelled to honor their promises to repay. In our empirical analysis we will compare borrower promises and subsequent repayment behavior in the C-B and C-H treatment. Hypothesis 2 summarizes our predictions for this comparison.

Hypothesis 2 (Promises, repayment behavior and credit in the communication treatments)**.**

- *Borrowers are equally likely to promise to repay (large) loans in the C-H and C-B treatments.*
- *In the C-H treatment, borrowers are more likely to break a promise to repay than in the C-B treatment.*
- *Lenders are less likely to offer large loans to borrowers who promise to repay in the C-H treatment than in the C-B treatment.*

To disentangle the role of hidden action from the role of stochastic income per se, we examine the effect of communication in our revealed action condition. This condition is identical to the hidden action condition except that the realized borrower income is revealed ex-post to the lender. This allows the lender to distinguish strategic defaults from forced defaults. If the effect of communication in the hidden action condition is weakened due to the increased uncertainty and lower expected income of lenders then we would expect a similar weak effect of communication in the revealed action condition. By contrast, if the ability to hide opportunistic behavior is responsible for the weak effect of communication in the hidden action condition, then we should see stronger effects of communication in the revealed action condition. Hypothesis 3 summarizes our conjecture that hidden action rather than uncertainty and income effects drive the weak effect of communication in the hidden action condition:

Hypothesis 3 (The effect of communication in the revealed action condition)**.**

- *In the C-R treatment, borrowers are more likely to choose to repay large credits and lenders are more likely to offer large credits than in the N-R treatment.*
- *The differential impact of communication between the baseline condition (C-B vs. N-B) and the revealed action condition (C-R vs. N-R) is smaller than between the baseline condition and the hidden action condition (C-H vs. N-H)*

To derive alternative hypotheses for our cross-treatment comparisons we relax the assumption that borrowers incur higher moral costs if they default strategically after they have promised to repay. We also relax the assumption that moral costs of strategic default are even higher if promise-breaking behavior is revealed to the lender. Consider

first that promise-breaking does not affect the individual costs of strategic default at all. It is apparent that under this assumption lender and borrower behavior is independent of the ability to communicate. We would thus predict no difference in strategic default (or lender credit provision) between the C-B and N-B treatments or the C-H and N-H treatments. Now consider that promise-breaking does affect the moral costs of strategic default, but these costs are independent of whether promise-breaking is revealed to the lender or not. Under this assumption we predict less strategic default in the C-B compared to the N-B treatment and in the C-H compared to the N-H treatment. However, in contrast to Hypothesis 1.C above, there should be no differential effect in the impact of communication on borrower behavior between the baseline and hidden action conditions. Moreover, under this condition, we expect a stronger impact of communication on credit provision in the hidden action compared to the baseline condition.

4 Results

We report our findings in two subsections. In Section 4.1, we test Hypothesis 1 by comparing the effect of communication across our two main conditions: the hidden action condition and the baseline condition. We confirm a significant weaker treatment effect of communication on market outcomes in the hidden action condition. In Section 4.2 we examine the mechanism behind this differential treatment effect. Here, we first confirm Hypothesis 2 by documenting that borrowers are more likely to break promises to repay in the hidden action than in the baseline condition. We then confirm Hypothesis 3 by showing that in our revealed action treatment (as opposed to the hidden action treatment) communication has a significant impact on borrower and lender behavior.

Table 3: Realized Outcome Variables by Treatment

Borrower income:	Deterministic		Stochastic			
Borrower choice:			Hidden		Revealed	
Communication	No	Yes	No	Yes	No	Yes
Treatment:	N-B	C-B	N-H	C-H	N-R	C-R
Credit Size	46.30 [27.4; 75.4]	75.04 [67; 92.8]	45.10 [28.6; 68.2]	58.24 [41.8; 78.4]	41.32 [29.2; 71.8]	63.10 [53.2; 71.2]
Strategic Default (cond. on income)	0.65 [0.26; 0.84]	0.44 [0.18; 0.78]	0.547 [0.26; 0.73]	0.52 [0.33; 0.70]	0.60 [0.47; 0.75]	0.46 [0.33; 0.61]
Borrower Profit	290.5 [245.1; 356.6]	329.4 [297.3; 370.2]	233.7 [193.1; 291]	249.8 [193.6; 296.1]	227.5 [195.4; 281.4]	251.9 [236.1; 281.3]
Lender Profit	148.4 [120.2; 202.9]	195.7 [136.2; 242.7]	139.5 [128.5; 154.2]	142.7 [122.7; 167.1]	135.4 [131; 145.2]	148.3 [130.5; 176.3]

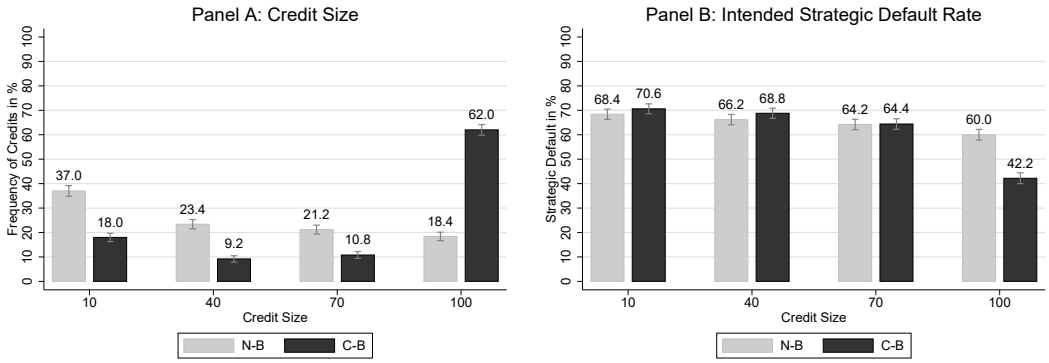
Note: The table reports the mean of matching group averages for each variable. The range of matching group averages is shown in brackets [min; max]. We implemented 10 matching groups for each treatment.

Table 3 presents descriptive statistics for realized outcome variables by treatment. We report the average credit size (*Credit Size*), the frequency of strategic default among those borrowers who can repay (*Strategic Default*) as well as the resulting profits for borrowers (*Borrower Profit*) and for lenders (*Lender Profit*) by treatment.

4.1 The Effect of Communication: Hidden action vs. Baseline condition

We first report the effect of communication in our baseline condition. Table 3 documents a 62% increase in the average credit size in the C-B treatment compared to the N-B treatment (75.0 vs. 46.3). A two sided rank-sum test at the matching group level confirms that this increase is statistically significant (N=20, p<0.01).[15] Panel A of Figure 2 confirms that communication impacts on lender behavior in the baseline condition. Lenders offer the maximum credit size (credit of size 100) more than three times as often in the C-B treatment compared to the N-B treatment (62% vs. 18.4%; N=20, p<0.01).

Communication also has an impact on repayment behavior in the baseline condition. Table 3 reveals a substantial and statistically significant decrease in the realized strategic default rate in the C-B treatment compared to the N-B treatment (44.2% vs. 65%; N=20, p=0.015). This improvement in loan repayment may be driven by two effects: First, borrowers may be less likely to default on a loan of a given size in the C-B compared to the N-B treatment. Second, borrowers in both treatments may be less likely to default on larger loans. As a result, the higher average credit size in the C-B compared to the N-B treatment would go hand in hand with a higher loan repayment rate. Our data reveals that both effects are at play. Panel B of Figure 2 shows that the intended strategic default (ISD) rate is decreasing in loan size in both treatments. The higher intended strategic default rates on lower loan sizes may be because these loan sizes may be associated with lower trust by the lender and are hence reciprocated less frequently compared with high loans. But this decline is stronger in the C-B than in the N-B treatment. The figure shows that the ISD rate for credits of size 10 is similar in both treatments. By contrast, the ISD for credits of size 100 is significantly lower in the C-B treatment than in the N-B treatment (42.2 % vs. 60 %; N=20, p=0.044).[16]



Notes: Panel A shows the mean frequency with which lenders give credits of the different size (10, 40, 70, and 100) in the C-B and N-B treatments. Panel B shows the mean intended strategic default rate for each credit size (10, 40, 70, and 100) in the C-B and N-B treatments. Error bars show +/- one standard deviation of the mean.

Figure 2: Credit Offers and Intended Strategic Default: Baseline Condition

In our baseline condition, communication leads to a substantial increase in the provi-

[15] If not explicitly stated, we always use two-sided tests with matching group averages as unique observations to determine statistically significant differences between our treatments.

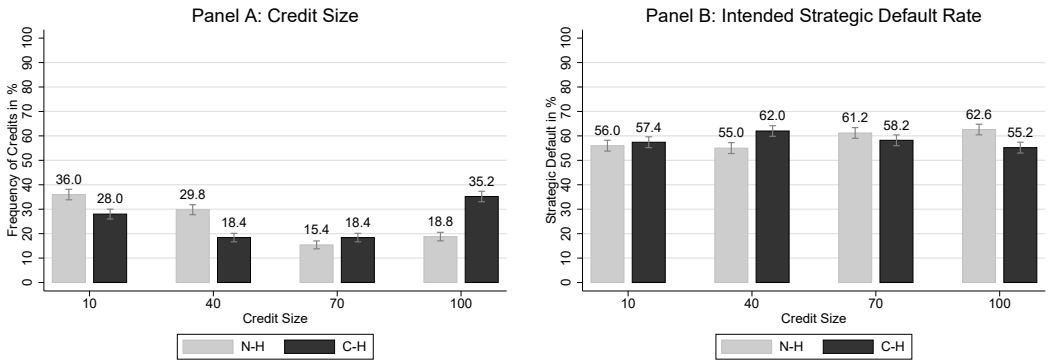
[16] We do not find a significant effect of communication on borrower repayment behavior for other credit sizes.

sion of credit and a substantial reduction in the strategic default rate. As a consequence, both lenders and borrowers yield higher payoffs in the treatment with communication. Borrowers earn on average 13% more in the C-B treatment compared to the N-B treatment (329 vs. 291 points; N=20, p=0.012). Lenders earn on average 32% more in the C-B treatment compared to the N-B treatment (196 vs. 148 points; N=20, p<0.01).

Result 1.A (The effect of communication in the baseline condition)**.** *In the C-B treatment, borrowers are more likely to repay large loans and lenders are more likely to offer large loans than in the N-B treatment. Communication leads to a pareto improvement: Borrowers and lenders yield higher average payoffs in the C-B compared to the N-B treatment.*

We next examine the effect of communication in the hidden action condition. The summary statistics in Table 3 show that the average credit size offered by lenders is 30% higher in the C-H treatment compared to the N-H treatment (58.2 vs. 45.10; N=20, p=0.05). Figure 3 (Panel A) shows that the frequency of credits of size 100 is almost twice as high in the C-H treatment compared to the N-H treatment (35% vs. 19%; N=20, p=0.03).

Table 3 reveals that there is no difference in the realized strategic default rate between the C-H and the N-H treatment (54.7% vs 51.5%; N=20, p=0.4). Figure 3 shows that intended strategic default is hardly related to loan size in the C-H treatment or the N-H treatment. Moreover, there is no statistically significant difference in borrower behavior between the C-H and N-H treatments for any loan size.[17]



Notes: Panel A shows the mean frequency with which lenders give credits of the different size (10, 40, 70, and 100) in the N-H and C-H treatments. Panel B shows the mean intended strategic default rate for each credit size (10, 40, 70, and 100) in the N-H and C-H treatments. Error bars show +/- one standard deviation of the mean.

Figure 3: Credit Offers and Intended Strategic Default: Hidden Action Condition

Table 3 shows that there is only a small, statistically insignificant increase in borrower profits from the N-H treatment to the C-H treatment (233.7 vs. 249.8; N=20, p=0.19). The average profit of lenders hardly differs between the two treatments (N=20, p=0.65).

Result 1.B (The effect of communication in the hidden action condition)**.** *Lenders offer larger credit volumes in the C-H compared to the N-H treatment but borrowers are not more likely to repay loans. Communication does not lead to a significant increase in average lender or borrower profits.*

[17]ISD 10: N=20, p=0.93; ISD 40: N=20, p=0.13; ISD 70: N=20, p=0.49; ISD 100: N=20, p=0.36

Our analysis so far suggests that communication has a significant positive effect on credit provision, repayment behavior, and payoffs in the baseline condition. By contrast, the effect of communication is much weaker in the hidden action condition. To formally test for differential treatment effects of communication across the two conditions, we present results from difference–in–difference regressions with matching group averages as observations. Table 4 presents results for six dependent variables: Average credit size (CS – Column 1), the realized strategic default rate contingent on repayment ability (Strategic Default – Column 2), borrower profit (Borrower Profit – Column 3) and lender profit (Lender Profit – Column 4), the frequency of credit size 100 (Credit Size 100 – Column 5) and the intended strategic default rate for credits of 100 (ISD 100 – Column 6). The explanatory variables are *Hidden Action*, a dummy variable indicating the hidden action condition, *Communication* which is a dummy variable indicating the communication treatments. The interaction between the two *Hidden Action* × *Communication* is our variable of interest.

Table 4: Difference in Difference Regressions: Hidden Action vs. Baseline

	Outcome				**Behavior**	
Dependent variable:	Credit Size	Strategic Default	Borrower Profit	Lender Profit	Credit Size 100	ISD 100
	(1)	(2)	(3)	(4)	(5)	(6)
Hidden Action	-1.200	-0.103	-56.73***	-8.950	0.00400	0.0260
	(5.708)	(0.0697)	(13.59)	(9.870)	(0.0617)	(0.0830)
Communication	28.74***	-0.208***	38.96***	47.26***	0.436***	-0.178**
	(5.708)	(0.0697)	(13.59)	(9.870)	(0.0617)	(0.0830)
Hidden Action × *Comm.*	-15.60*	0.176*	-22.86	-44.10***	-0.272***	0.104
	(8.073)	(0.0985)	(19.21)	(13.96)	(0.0872)	(0.117)
Constant	46.30***	0.650***	290.5***	148.4***	0.184***	0.600***
	(4.036)	(0.0493)	(9.607)	(6.979)	(0.0436)	(0.0587)
Observations	40	40	40	40	40	40
F	11.87	3.071	19.99	14.25	22.09	2.387
R^2	0.497	0.204	0.625	0.543	0.648	0.166

Note: Difference–in–difference (OLS) regressions with matching group averages as observations. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Columns (1-4) present regressions with market outcomes as dependent variables. Columns (5-6) present regressions with lender and borrower behavior as dependent variables. In all regressions, the no communication baseline treatment (N-B) is the benchmark condition. *Hidden Action* is a variable indicating the treatments with forced default. Communication is a dummy variable which is equal to one in the treatments with communication and zero otherwise. *Hidden Action* × *Comm.* captures the interaction effect between the hidden action and communication treatment.

The results presented in Table 4 confirm that there is a significant weaker impact of communication on realized outcome variables in the hidden action condition. The interaction term *Hidden Action* ×*Communication* is large and statistically significant for the average credit size (Column 1), the realized strategic default rate (Column 2) and lender profits (Column 4). The differential impact of communication across conditions is smaller and weaker for borrower profits (Column 3). The results in columns (5-6) of Table 4 suggest that the differential treatment effect of communication on the above outcome variables can be attributed more to lender rather borrower behavior. The column (5) estimates show a significant differential effect of communication on lender credit offers. By

contrast, the column (6) estimates suggest a weaker differential impact of communication on borrower repayment behavior.

Result 1.C (Differential effect of communication in hidden action vs. baseline condition)**.** *The positive effect of communication on credit volume and lender profits is significantly weaker in the hidden action condition compared to the baseline condition.*

4.2 Mechanism: Hidden action and promise breaking

In this section we provide evidence which supports our conjecture that the ability of borrowers to hide opportunistic behavior reduces the effectiveness of communication in the C-H compared to the C-B treatment.

4.2.1 Borrower promises and behavior

We first report on borrower-lender communication in our C-H and C-B treatments as well as the subsequent behavior by borrowers and lenders. We show that borrowers are much more likely to break their promises to repay loans in the C-H compared to the C-B treatment. As a consequence lenders offer less credit to borrowers who promise repayment in the C-H than the C-B treatment.

First, we explore how borrowers communicate to their paired lender.

Table 5 presents summary statistics for coded chat variables.[18] The table first reports the frequency of borrower-lender communication (*Messaging*).

We explore how borrowers communicated with the paired lender in Table 5. The table presents summary statistics for coded chat variables.[19] The table first reports the frequency of borrower-lender communication (*Messaging*). Second, we report the content of messages communicated by borrowers to the paired lender. *Promise* captures any promise by a borrower to repay a credit, i.e. any promise to repay a specific credit size or any promise unrelated to a specific credit size. *Promise 100* captures specific promises

[18]Note: Messages (983) of borrowers were coded by three research assistants independently. Research assistants were unaware of the research question and at least two coders had to agree that a message falls into a certain category for a variable to be included in the analysis. A borrower's message could fall in multiple categories. We use Krippendorff's α as a measure for inter-coder reliability (Hayes & Krippendorff, 2007). Most categories included in the analysis are above (*Threat*=0.883; *Threat 100*=0.872; *Request 100*=0.753; *Request*=0.786; *Promise*=0.90; *Promise 100*=0.77; *Friendly*=0.12) the cut-off value proposed by Krippendorff ($\alpha = 0.667$). Furthermore, our values are in and above the values reported in other economic experiments (see, e.g., Bartling *et al.* , 2017; Brandts *et al.* , 2014; Cason *et al.* , 2017; Eisenkopf, 2014; Leibbrandt & Sääksvuori, 2012). Coder instructions are available in Online Appendix B.

[19]Note: Messages (983) of borrowers were coded by three research assistants independently. Research assistants were unaware of the research question and at least two coders had to agree that a message falls into a certain category for a variable to be included in the analysis. A borrower's message could fall in multiple categories. We use Krippendorff's α as a measure for inter-coder reliability (Hayes & Krippendorff, 2007). Most categories included in the analysis are above (*Threat*=0.883; *Threat 100*=0.872; *Request 100*=0.753; *Request*=0.786; *Promise*=0.90; *Promise 100*=0.77; *Friendly*=0.12) the cut-off value proposed by Krippendorff ($\alpha = 0.667$). Furthermore, our values are in and above the values reported in other economic experiments (see, e.g., Bartling *et al.* , 2017; Brandts *et al.* , 2014; Cason *et al.* , 2017; Eisenkopf, 2014; Leibbrandt & Sääksvuori, 2012). Coder instructions are available in Online Appendix B.

to repay a credit of size 100. *Request* is a variable describing a request of a borrower for credit of any specific size as well as any request for a loan without mentioning a specific credit size. *Request 100* captures the requests for credits of size 100. *Threat* is a variable which captures all threats to only repay a specific credit size. *Threat 100* captures threats to only repay credits of 100. Finally, the table reports whether there are general differences in the way that borrowers communicate with lenders in the different treatments. *N-grams* reports the average length with respect to the number of n-grams (or words with meaning) of a message.[20] *Mistake* reports the average number of spelling and grammar mistakes detected by Microsoft Word's German spell checker for messages within a matching group. The table also summarizes the share of messages which had been identified to use a friendly 'tone' (*Friendly*).

Table 5 shows that borrowers send messages 71% of the time in the C-H treatment, compared to 66.4% of the time in the C-B treatment. This treatment difference is not statistically significant (N= 20, p=0.47). The treatments did not affect the most common massages that borrowers send to the paired lender.[21] The most common message in both treatments involves a repayment promise and a request for credits of any (unspecific) size (*Promise+Request*: 54.2% vs. 53%; N=20, p=0.62). The second most frequent message contains a repayment promise and a requests for a credit size of 100 (*Promise+Request 100*: 48.4% vs. 41.6%; N=20, p=0.22).[22] The treatment conditions further do not influence the number of n-grams, (*N-grams*: 14.94 vs. 13.78; N=20,p=0.65), the likelihood of making mistakes (*Mistakes*: 0.522 vs. 0.384; N=20, p=0.79), the general friendliness or 'tone' of the messages (*Friendly*: 0.38% vs. 0.41% ; N=20, p=0.82).

Consistent with our assumption about borrower behavior, borrowers mostly promise to repay large loans as these are most profitable. For example in the C-B treatment, 49.4% of all messages are promises and 46.6% of all the messages are repayment promises for credits of 100. In the C-H and C-R treatment the fraction of promises for large loans is equally large. That credits of 100 are most relevant for borrowers is also reflected in the fraction of threats that are related to repayments of the highest credit size. Borrowers only infrequently threat lenders to only make repayments for certain credits. If they do, however, it is for credits of 100. The way borrowers communicate also supports the interpretation that the somewhat higher intended strategic default rates on small credit sizes (smaller than a credit 100) in all treatments can be a direct consequence of lower borrower reciprocity for low levels of trust by the lender which has the additional intention of shifting lenders' credit decision towards the highest and most profitable credits.

In Panel A of Figure 4, we report the intended strategic default rate for loans of 100 (ISD 100) conditional on borrower communication. The first bar (light grey) reports

[20]We follow common practice in text-analysis (Gentzkow *et al.* , 2019) and report n-grams related to words which carry a meaning. We follow Schonlau *et al.* (2017) to generate n-grams and when excluding the most common stop words (like, e.g., the, but, a, and, etc., see LINK).

[21]Note that also for general aspects of communication like, e.g., whether or not borrowers reveal information about themselves, whether messages have non-topic related content, are written in a fuzzy or somewhat weird manner or the coders identify and aggressive tone, we do not find differences in communication between treatments (all p-values from pairwise comparisons >0.1).

[22]Borrowers in the C-B treatment more often promise to repay credits of 100 compared with borrowers in the C-H treatment. The difference between treatments, although substantial is only marginally significant (*Promise 100*: 46.6% vs. 35.6%; N=20, p=0.10). Moreover, there is only a marginally significant difference in the frequency that borrowers send promises for any credit size between the C-B and the C-H treatment (*Promise*: 49.4% vs. 40.4%; N=20, p=0.09).

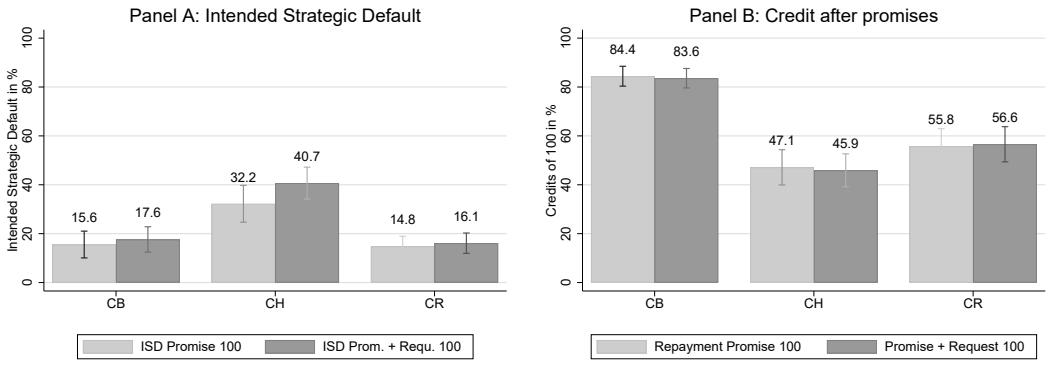
Table 5: Borrower Communication

	C-B	C-H	C-R
Messaging	0.664 [0.4; 0.88]	0.710 [0.4; 0.88]	0.592 [0.2; 0.94]
Promise	0.494 [0.12; 0.62]	0.404 [0.18; 0.78]	0.532 [0.12; 0.84]
Promise 100	0.466 [0.12; 0.6]	0.356 [0.12; 0.68]	0.486 [0.02; 0.82]
Promise+Request	0.542 [0.12; 0.7]	0.53 [0.18; 0.78]	0.556 [0.18; 0.9]
Promise+Request 100	0.484 [0.12; 0.7]	0.416 [0.18; 0.68]	0.498 [0.2; 0.82]
Threat	0.102 [0; 0.2]	0.0240 [0; 0.16]	0.0340 [0; 0.22]
Threat 100	0.0800 [0; 0.2]	0.0220 [0; 0.16]	0.0340 [0; 0.22]
N-grams	14.94 [5; 23.38]	13.78 [4.92; 21.08]	13.53 [3.9; 28.9]
Mistakes	0.522 [0.06; 1.26]	0.384 [0.1; 0.84]	0.48 [0; 1.96]
Friendly	0.38 [0.12; 0.74]	0.41 [0.2; 0.78]	0.31 [0; 0.8]

Note: Summary statistics for coded chat variables. Variables describe mean of matching group averages. The range of matching group averages is shown in brackets [min; max]. *Messaging* captures any incidence of borrower communication with the paired lender. *Promise* captures specific (for a certain credit size) and unspecific (for any credit size or credits in general) promises to repay credit. *Promise 100* captures promises to repay credits of 100. *Promise+Request* is a variables capturing any specific request or repayment promise (for a specific credit size) or unspecific request or repayment promise for credit. *Promise + Request 100* captures requests or promises for credits of size 100. *Threat* is a variable describing a threat to only repay certain credit sizes. *Threat 100* captures threats to only repay credits of size 100. Note that borrowers can make multiple threats, promises or requests within one message. *N-grams* captures the average number of n-grams (or words with meaning) of a message. *Mistake* shows the average number of spelling and grammar mistakes detected by Microsoft Word's German spell checker. *Friendly* summarizes the share of messages which were written using friendly language.

ISD 100 for those borrowers who promise to repay such a loan (ISD 100 Promise 100). The second bar (dark grey) reports ISD 100 for those borrowers who promise to repay a credit of 100 or request such a credit (ISD Prom. + Requ. 100). The results show that borrowers are much more likely to break their repayment promises when their actual repayment behavior is hidden. In the C-B borrowers break their promises about 15.6% of the time compared to 32.2% in the C-H treatment (N=20, p=0.07). Likewise, borrowers who combine repayment promises and repayment requests for credit of 100 are much more likely to default in the C-H treatment (40.7%) compared with borrowers in the C-B treatment (17.6%), (N=20, p=0.01).[23]

[23]Borrowers were also more likely to default on credits of 100 if they communicated in a friendly tone in the C-H compared with the C-B treatment (55.9% vs. 18.2%; N=20, p< 0.01). For the other



Notes: Panel A of the figure shows the mean intended strategic default rate for borrowers who promise to repay credits of 100 (light grey bars) and borrowers who also include requests for credits of 100 in their repayment promise (dark grey bars) in the C-B, C-H, and C-R treatment. Panel B of the figure presents the mean frequency with which lenders give credits of 100 in the C-B, C-H, and C-R treatment conditional on receiving a promise to repay a credit of 100 (light grey bars) or a repayment promise for a credit of 100 which also explicitly included a request for such a credit (dark grey bars). Error bars represent +/- one standard deviation of the mean.

Figure 4: Borrower and Lender behavior after communication

Lenders anticipate that borrowers are more likely to renege on their promises in the hidden action condition. Panel B of Figure 4 reveals that lenders give credits of 100 84.4% of the time after receiving a message containing a repayment promise for this credit size in the C-B treatment (light grey bar - Repayment Promise 100). If borrower include requests for such credits in the message, the credits are granted with equal frequency (83.6%) as the variable Promise + Request 100 (dark grey bar) shows. In the C-H treatment, lenders are less likely to respond to promises (47.1%; N=20, p<0.01) and promises combined with requests (45.9%; N=20, p<0.01) of borrowers.[24]

Result 2 (Borrower promises, repayment and credit in the C-B and C-H treatments)**.** *In the C-H treatment, borrowers are more likely to break promises to repay than in the C-B treatment. Lenders are less likely to offer large loans to borrowers who request and promise to repay such loans in the C-H treatment than in the C-B treatment.*

4.2.2 Hidden action vs. uncertainty

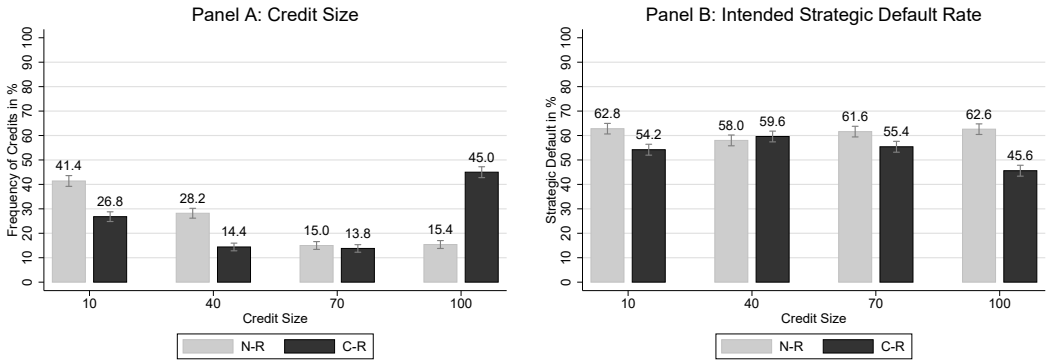
In this section we report on lender behavior, borrower behavior and payoffs in the revealed action condition. As discussed in Section 2.2 this condition is identical to the hidden action condition except that the borrowers income is revealed ex-post to the lender. This

communication variables (*N-grams*, *Mistakes*, or aggressiveness of language, personal information, or fuzzy language, which – because of minor relevance and very low incidence – are not reported in the table) we do not find differences between treatments (all p-values >0.1) or events were too infrequent to make meaningful comparisons (occurrences in only a few matching groups).

[24]Lenders were also less likely to provide a credit of 100 in response to friendly messages sent by borrowers in the C-H compared with the C-B treatment (46% vs. 80%; N=20, p< 0.01). They were also less likely to extent credit if borrowers had mistakes in their messages in the C-H compared with the C-B treatment (42% vs. 75%; N=20, p< 0.01) which indicates that the hidden action condition undermined also soft aspects of communication like the effect of friendliness of messages or the extent to which mistakes are forgiven. We do not find any differences between treatments with regard to the other communication variables (*N-grams*, aggressiveness of language, personal information, or fuzzy language. P-values >0.1 or events were too infrequent to make meaningful inferences (occurrences in only a few matching groups)).

allows the lender to distinguish strategic defaults from forced defaults. If the effect of communication in the hidden action condition was weakened due to the increased uncertainty and lower expected income of lenders then we would expect a similar weak effect of communication in the revealed action condition. By contrast, if the ability to hide opportunistic behavior is responsible for the weak effect of communication in the hidden action condition, then we should see stronger effects of communication in the revealed action condition.

Table 3 shows that the average credit size is 52% higher in the C-R treatment compared to the N-R treatment (63.1 vs. 41.3; N=20, p<0.01). Panel A of Figure 5 further shows that this increase in average credit size is driven by a higher frequency of maximum credit offers (100) in the C-R treatment compared to N-R treatment (45% vs. 15.4%; N=20, p<0.01).



Notes: Panel A shows the mean frequency with which lenders give credits of the different size (10, 40, 70, and 100) in the N-R and C-R treatment (Panel A). Panel B shows the mean intended strategic default rate for each credit size (10, 40, 70, and 100) in the N-R and C-R treatment.

Figure 5: Credit Offers and Intended Strategic Default: Revealed Action Condition

Table 3 shows that the strategic default rate is significantly lower in the C-R treatment compared to the N-R treatment (46.2% vs. 60.4%; N=20, p<0.01). Panel B of Figure 5 reveals that, in particular, the intended strategic default rate for credits of 100 is higher in the N-R treatment compared to the C-R treatment (62.6% vs. 45.6%; N=20, p<0.01).

In the revealed action condition communication leads to a pareto improvement. Table 3 shows that lenders' profits increase by 9.5% from 135 points in the N-R treatment to 148 points in the C-R treatment (N=20, p=0.04). Borrower profits increase by 10.5% from 227.5 in the N-R treatment to 251.9 in the C-R treatment (N=20, p=0.02).

Table 6 provides a formal test for differential treatment effects of communication between the revealed action condition and the baseline condition. Again, we present results from difference–in–difference regressions with matching group averages as observations. And again we present results for six dependent variables: Average credit size (CS – Column 1), the realized strategic default rate contingent on repayment ability (Strategic Default – Column 2), borrower profit (Borrower Profit – Column 3) and lender profit (Lender Profit – Column 4), the frequency of credit size 100 (Credit Size 100 – Column 5) and the intended strategic default rate for credits of 100 (ISD 100 – Column 6). The explanatory variables are *Revealed Action*, a dummy variable indicating the revealed action condition, *Communication* which is a dummy variable indicating the communication treatments. The interaction between the two *Revealed Action* × *Communication* is our

variable of interest.

The results presented in Table 6 suggest small and statistically insignificant differences in the impact of communication on realized outcome variables in the hidden action condition compared to the baseline condition. Moreover, comparing the Table 6 results to those in Table 4 we find a much more similar impact of communication in the revealed action and the baseline conditions as when comparing the revealed action condition to the baseline condition. In particular, the magnitude and statistical significance of the difference-in-difference estimates for credit extension by lenders is smaller in Table 6 than in Table 4.

Table 6: Difference in Difference Regressions: Revealed Action vs. Baseline

	Outcome				**Behavior**	
Dependent variable:	Credit Size	Strategic Default	Borrower Profit	Lender Profit	Credit Size 100	ISD 100
	(1)	(2)	(3)	(4)	(5)	(6)
Revealed Action	-4.980	-0.0464	-62.91***	-13.07	-0.0300	0.0260
	(4.987)	(0.0647)	(11.67)	(9.786)	(0.0539)	(0.0747)
Communication	28.74***	-0.208***	38.96***	47.26***	0.436***	-0.178**
	(4.987)	(0.0647)	(11.67)	(9.786)	(0.0539)	(0.0747)
Revealed Action × *Comm.*	-6.960	0.0665	-14.62	-34.34**	-0.140*	0.00800
	(7.052)	(0.0914)	(16.50)	(13.84)	(0.0763)	(0.106)
Constant	46.30***	0.650***	290.5***	148.4***	0.184***	0.600***
	(3.526)	(0.0457)	(8.252)	(6.920)	(0.0381)	(0.0528)
Observations	40	40	40	40	40	40
F	19.35	5.074	29.30	14.72	34.14	3.724
R^2	0.617	0.297	0.709	0.551	0.740	0.237

Note: Difference–in–difference (OLS) regressions with matching group averages as observations. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Columns (1-4) present regressions with market outcomes as dependent variables. Columns (5-6) present regressions with lender and borrower behavior as dependent variables. In all regressions, the no communication baseline treatment (N-B) is the benchmark condition. *Revealed Action* is a variable indicating the treatments with forced default and revealed borrower behavior. Communication is a dummy variable which is equal to one in the treatments with communication and zero otherwise. *Revealed Action* × *Comm.* captures the interaction effect between the hidden action and communication treatment.

Result 3 (The effect of communication in the revealed action condition)**.** *In the revealed action condition, communication improves credit provision, repayment behavior and the average payoffs for both borrowers and lenders. The impact of communication in the revealed action condition is more similar to that in the baseline condition, than the impact of communication in the hidden action treatment.*

To support our finding that the positive impact of communication is restored in the revealed action condition, we conclude with a discussion of communication behavior in this condition. Table 5 and Figure 4 document borrower communication and subsequent behavior by lenders and borrowers in the C-R treatment. Table 5 documents that borrowers communicate very similar in all treatments (all pairwise comparisons p> 0.1).

The Figure 4, Panel A results, however, show that borrowers break promises to repay credits of 100 only 14.8% of the time in the C-R treatment. This is significantly less often

than the 32% in the C-H treatment (N=20, p=0.06). Similarly, the intended strategic default rate when including requests for credits of 100 in the message is significantly lower in the C-R than in the C-H (16.1% vs. 40.7%; N=20, p=0.01).[25]

Panel B of Figure 4 shows that lenders, respond different to borrower communication in the C-R compared with the C-H treatment. Following a borrower repayment promise for credits of 100, lenders are more likely to provide this credit in the C-R treatment (55.8%) and in the C-H treatment (47.1%). Similarly, combinations of repayment promises with credit request for high credits of 100 are are more likely to to trigger a corresponding loan in the C-R treatment (56.6%) than in the C-H treatment (45.9%). These substantial differences are, however, not statistically significant.[26]

The results presented above support our conjecture that the ability to hide strategic defaults undermines the effectiveness of communication in our hidden action condition. Once borrower behavior is revealed to lenders - as in our revealed action condition - communication leads to a substantial increase in gains from trade - even if borrower income is stochastic.

5 Discussion and Conclusion

We implement a communication experiment in a trust game framed in the credit market context. We exogenously vary (i) whether borrowers (second movers) can communicate with lenders (first movers) prior to contracting and (ii) whether strategic defaults (opportunistic behavior) are revealed to lenders. Our results show that borrowers are more likely to renege on promises to repay when their strategic default is not subsequently revealed to lenders. As a consequence, communication has a weaker impact on credit provision and loan repayment in an environment with hidden action compared to an environment without hidden action.

Our results add to existing findings from behavioral economics showing that communication is a tool to increase trust and trustworthiness (see, Charness & Dufwenberg, 2006; Hoppe & Schmitz, 2018, for evidence on situations with hidden action). We show that this may not always be the case. In our experiment, uncertainty in the surrounding economic environment offers the possibility to hide opportunistic behavior which significantly undermines the effect of communication. Adding to this literature, we show that ex-post monitoring is a necessary complement to pre-contractual communication in supporting trustworthy behavior. In our experiment, the full benefit of pre-contractual communication can only be unfolded if behavior can be identified ex-post.

The findings from our experiment further complement recent field experiments in credit markets which document that lender-borrower communication can harness moral

[25]Confirming the differences between the C-B and C-H treatment borrower ISD for credits of 100 after communicating in a friendly manner is different between the C-H and C-R (55.9% vs. 9%; N=20, $p< 0.01$). There are no differences between the treatments with regards to other aspects affecting communication.

[26]Repayment Promise 100: C-H vs. CR: N=20, p=0.4; Promise+ Request 100: C-H vs. CR: N=20, p=0.22. Moreover, there are no significant differences in lender behavior with regard to other communication variables (*N-grams*, *Friendly*, *Mistakes* aggressiveness of language, personal information, or fuzzy language in messages between the C-H and C-R treatments (all pairwise comparisons $p> 0.01$). These results suggest that lender responses to borrower communication are at least partially influenced by the underlying uncertainty between the C-B and the C-H and C-R treatments.

incentives and increase the willingness of borrowers to repay loans (Bursztyn *et al.* , 2019; Karlan *et al.* , 2016). The findings of these studies show that post-contractual loan reminders can mitigate credit default. However, the effectiveness of loan reminders hinges on harnessing the moral or personal obligation of borrowers to repay. Our results document that pre-contractual communication can also mitigate credit risk, especially if borrowers personally commit to repay loans. However, the effectiveness of pre-contractual promises in encouraging loan repayment depends strongly on whether promise-breaking by borrowers is revealed to lenders ex-post. This finding implies that borrower behavior is not primarily caused by an (unconditional) preference for promise-keeping (Ellingsen & Johannesson, 2004), but may actually be more strongly driven by a preference for being seen as honest (Abeler *et al.* , 2019) or (expectation-based) guilt aversion. Our findings therefore suggest that preferences for promise keeping and lying aversion may be more fragile than previously thought of.

Our findings suggest that lenders—be it traditionally brick and mortar banks or their novel online competitors—can employ pre-contractual communication as a tool of credit risk management. However, pre-contractual communication will be most effective in encouraging loan repayment, when borrowers anticipate that subsequent strategic defaults can be identified by the lender. Promise making reduces credit risk when promise breaking is likely to be revealed. If pre-contractual communication is accompanied by intensive post-contractual monitoring the positive benefits of communication set in which improve outcomes beyond monitoring in isolation.

This finding is important as strategic defaults are usually hard to identify in the field. Relying on communication in settings with economic uncertainty (like credit markets) is not a viable tool to substantially reduce credit risk. Our results suggest that lenders should combine pre-contractual communication with a credible post-contractual loan monitoring process. This seems natural to traditional retail banks whose loan officers interact with clients face-to-face throughout the loan cycle. For fintech lenders relying on online environments our results suggest that if communication with prospective borrowers is to be used as a credit risk management tool—rather than just as a sales instrument—then personal interaction needs to be followed up on consequently after the loan is disbursed.

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A Internal Appendix

A.1 Modell

In this section we derive predictions for our treatments which are the basis for the testable hypotheses for cross-treatment comparisons presented in the main body of the paper. Recent evidence suggests that repayment behavior in personal loan markets is influenced by social norms and moral constraints (Guiso *et al.* , 2013; Bursztyn *et al.* , 2019). Previous studies in the field and the lab have also documented that second mover behavior in the trust game is influenced by moral concerns and that first movers anticipate such prosocial behavior (Karlan, 2005; Johnson & Mislin, 2011). In the context of our experiment, we therefore expect that some lenders will offer loans which exceed the minimum credit size and some borrowers will choose to repay loans.

In the following we derive predictions for our treatments and establish testable hypotheses for cross-treatment effects. We build on a model in which borrowers differ in their personal (moral) costs of strategic default. Lenders cannot identify borrower types and have heterogeneous beliefs about the distribution of borrowers' costs of strategic default.

A.1.1 Borrower and Lender Behavior

We assume that the utility of a borrower i can be modeled as

$$U_i = e_i + \theta \cdot c - r_i(c) \cdot \beta \cdot c - (1 - r_i(c)) \cdot k_i(c), \tag{1}$$

where c is the loan amount received and $r_i(c) = \{0, 1\}$ is the repayment decision of the borrower for a loan of size c. The parameter e_i is the borrowers endowment, θ is the investment return per unit of credit and β is the required repayment per unit of credit. Each borrower suffers a personal cost $k_i(c)$ if she defaults strategically on a loan of size c.

To simplify our analysis we assume that lenders can either offer no credit or a credit of size $c_{max} > 0$. From equation (1) it follows that a borrower who has received a loan c_{max} will repay this loan, i.e. $r(c_{max}) = 1$, if

$$k_i(c_{max}) \geq \beta \cdot c_{max}. \tag{2}$$

We impose three assumptions on borrowers' personal costs of strategic default $k_i(c_{max})$. First, we assume that personal costs of strategic default are heterogeneous across borrowers. Second, we assume that for each borrower the cost of strategic default is higher if she had previously promised to repay that loan. Third, we assume that the personal cost due to a broken promise is higher if the strategic default is revealed to the lender than if it is hidden from the lender. To be specific, we assume that the personal cost of strategic default in the case of no prior promise to repay k_i is distributed uniformly across borrowers on the range $[0, k_{max}]$, where $k_{max} > \beta \cdot c_{max}$ to ensure that some borrowers are always willing to repay. We further assume that for each borrower i the personal cost of default after promising to repay is $(1+\alpha_H) \cdot k_i$ if the strategic default is not revealed to the lender and $(1 + \alpha_R) \cdot k_i$ if the strategic default is revealed to the lender, where $\alpha_R > \alpha_H > 0$.

In line with (Guiso *et al.* , 2013) our behavioral assumptions for borrowers imply that moral constraints affect the decision to default strategically. Our specific assumptions are consistent with evidence which suggests that individuals experience (expectation based) guilt aversion (Di Bartolomeo *et al.* , 2019; Ederer & Stremitzer, 2017). or have a preference for being seen as honest (Abeler *et al.* , 2019). As a consequence, their behavior largely depends on the lenders' expectations about the likelihood of repayment and on the likelihood that their actions are revealed to the lender.

Based on the assumptions above we can define four main types of borrowers (see Figure 1):

- Type "A" borrowers repay a loan of c_{max} even if they have not promised to do so. These are the borrowers for which: $k_i \geq \beta \cdot c_{max}$.
- Type "B" borrowers always repay a loan of c_{max} if they have promised to repay that loan. However, they will not repay if they did not promise to do so. These are the borrowers for which: $(1 + \alpha_H) \cdot k_i \geq \beta \cdot c_{max} > k_i$.
- Type "C" borrowers repay a loan of c_{max} only if they have promised to repay that loan and strategic defaults are revealed to lenders. These are the borrowers for which: $(1 + \alpha_R) \cdot k_i \geq \beta \cdot c_{max} > (1 + \alpha_H) \cdot k_i$.

- Type "D" borrowers never repay a loan of c_{max}. These are the borrowers for which: $(1 + \alpha_R) \cdot k_i < \beta \cdot c_{max}$.

We define k^* as the threshold of moral costs above which borrowers will repay a loan of c_{max}, i.e. all borrowers with with $k_i \geq k^*$ will choose to repay. From Figure 1 it follows that the threshold k^* depends on (i) whether borrowers promised to repay a loan, and (ii) whether strategic defaults will be revealed to lenders. If no borrower has promised to repay we have $k^* = \beta \cdot c_{max}$. If borrowers have promised to repay and strategic defaults are revealed we have $k^* = \frac{\beta \cdot c_{max}}{1+\alpha_R}$. If borrowers have promised to repay and strategic defaults are not revealed we have $k^* = \frac{\beta \cdot c_{max}}{1+\alpha_H}$.

For each lender j the expected payoff L_j is given by

$$L_j = e_j - c + p \cdot \lambda_j(c) \cdot \beta \cdot c, \tag{3}$$

where p is the probability that the borrower can repay the loan and $\lambda_j(c)$ is the belief of lender j about the repayment choice of the borrower.

From equation (3) it follows that a lender j will prefer to offer c_{max} rather than no credit if:

$$\lambda_j(c_{max}) \geq \frac{1}{\beta \cdot p}. \tag{4}$$

We assume that lenders have heterogeneous beliefs about the repayment choice of borrowers $\lambda_j(c_{max})$ arising from individual beliefs about the distribution of the personal costs of default k_i. Each lender j believes that these costs are distributed uniformly across borrowers on the range $[0, k_j]$, with $k_j = k_{max} * b_j$. We assume that b_j is distributed uniformly across lenders with $E[b_j] = 1$ so that some lenders are overoptimistic about the repayment behavior of borrowers $b_j > 1$, while others are pessimistic $b_j < 1$. On average, lenders' beliefs are consistent with the actual distribution of borrowers' personal costs of strategic default.

Suppose a lender with belief b_j expects all borrowers with $k_i \geq k^*$ to repay a loan c_{max}. The lenders belief about the repayment choice of any borrower is thus:

$$\lambda_j(c_{max}) = 1 - \frac{k^*}{b_j \cdot k_{max}}. \tag{5}$$

From equation (2) and (3) it follows that - conditional on k^* - all lenders will offer the loan c_{max} for which b_j is at least:

$$b^*(k^*) = \frac{\beta \cdot p \cdot k^*}{(\beta \cdot p - 1) \cdot k_{max}}. \tag{6}$$

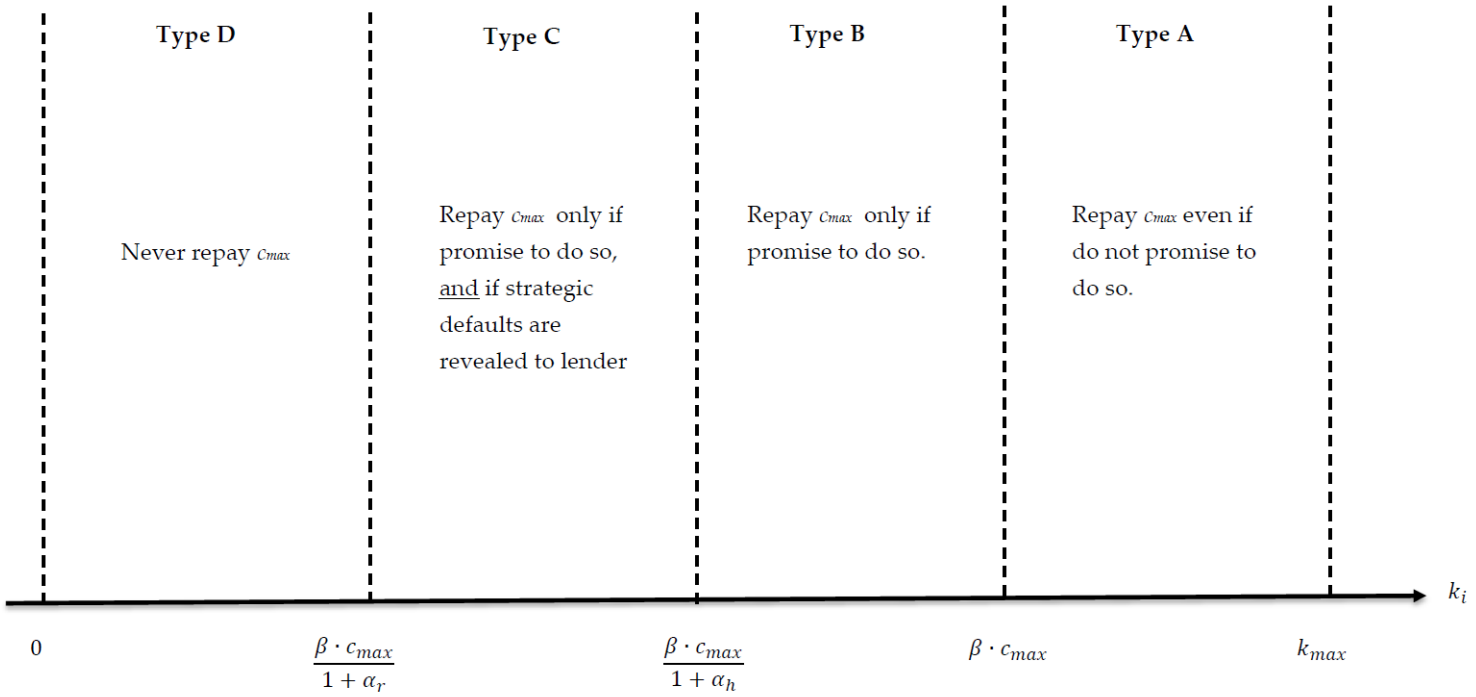


Figure 6: Borrower types

Table 7: Equilibrium Predictions

	No Communication Equilibria			Communication Equilibria		
Treatments	N-B	N-H	N-R	C-B	C-H	C-R
k^*	$\beta \cdot c_{max}$	$\beta \cdot c_{max}$	$\beta \cdot c_{max}$	$\frac{\beta \cdot c_{max}}{1+\alpha_R}$	$\frac{\beta \cdot c_{max}}{1+\alpha_H}$	$\frac{\beta \cdot c_{max}}{1+\alpha_R}$
b^*	$\frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta - 1)}$	$\frac{\frac{2}{3}\beta^2 \cdot c_{max}}{k_{max} \cdot (\frac{2}{3}\beta - 1)}$	$\frac{\beta^2 \cdot \frac{2}{3} \cdot c_{max}}{k_{max} \cdot (\frac{2}{3}\beta - 1)}$	$\frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta - 1) \cdot (1+\alpha_R)}$	$\frac{\frac{2}{3}\beta^2 \cdot c_{max}}{k_{max} \cdot (\frac{2}{3}\beta - 1) \cdot (1+\alpha_H)}$	$\frac{\frac{2}{3}\beta^2 \cdot c_{max}}{k_{max} \cdot (\frac{2}{3}\beta - 1) \cdot (1+\alpha_R)}$

Note: Overview of equilibrium predictions without communication (Columns 1-3) and with communication (Columns 4-6). k^* defines the threshold of moral costs above which borrowers repay credits. b^* represents the threshold of beliefs about maximum moral costs of default above which lenders offer credits. Note that for all three communication treatments (C-B, C-H, C-R) an equilibrium without and with communication exist.

A.1.2 Predictions by Treatment

Propositions 1-4 provide equilibrium predictions by treatment. Table 3 summarizes the resulting equilibrium conditions for the threshold of moral costs k^* above which borrowers choose to repay and the threshold of beliefs b^* above which lenders will offer c_{max}.

Proposition 1 presents our equilibrium predictions for the no communication treatments (N-B, N-H, N-R). As borrowers cannot make promises to lenders, the personal cost of strategic default for any borrower is identical in all three treatments. As a consequence, the prediction for borrower behavior (k^*) is identical in all three treatments: only Type A borrowers choose to repay. The difference in predictions between treatments arises from the fact that the probability that borrowers will be able to repay is higher in the N-B ($p = 1$) than in the N-H or N-R treatments ($p = 2/3$). As a consequence, the threshold belief b^* above which a lender will offer the maximum credit is lower in the N-B than in the N-H or N-R treatments.

Proposition 1 (Equilibria in N-B, N-H and N-R treatments)**.**

- *In the no communication treatments, only type A borrowers choose to repay the maximum loan size. The threshold of personal default costs above which loans are repaid is:* $k^*_{N-B} = k^*_{N-H} = k^*_{N-R} = \beta \cdot c_{max}$.
- *In the N-B treatment, the threshold belief above which lenders choose to offer* c_{max} *is:* $b^*_{N-B} = \frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta - 1)}$.
- *In the N-H and N-R treatments, the threshold belief above which lenders choose to offer* c_{max} *is:* $b^*_{N-H} = b^*_{N-R} = \frac{\beta^2 \cdot \frac{2}{3} \cdot c_{max}}{k_{max} \cdot (\beta \cdot \frac{2}{3} - 1)}$.

Proof of Proposition 1.

Borrower behavior:

In the no communication treatments borrowers cannot make promises to lenders. Thus for each borrower we have $k_i(c_{max}) = k_i$. From Equation (1) therefore only the borrowers for which $k_i \geq \beta \cdot c_{max}$ will repay a loan c_{max}. These are (by definition) the Type "A" borrowers. For the no communication treatments we therefore have $k^*_{N-B} = k^*_{N-H} = k^*_{N-R} = \beta \cdot c_{max}$.

Lender behavior in the N-B Treatment:

In the N-B treatment borrowers can always repay a loan ($p = 1$). From Equation (4) we therefore have:

$$b^*(k^*) = \frac{\beta \cdot k^*}{(\beta - 1) \cdot k_{max}}. \tag{7}$$

From above we know that $k^*_{N-B} = \beta \cdot c_{max}$. Therefore we have $b^*_{N-B} = \frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta - 1)}$.

Lender behavior in the N-H and N-R Treatments:

In the N-H and N-R treatments we have $p = \frac{2}{3}$. From Equation (4) we therefore have:

$$b^*(k^*) = \frac{\beta \cdot \frac{2}{3} \cdot k^*}{(\beta \cdot \frac{2}{3} - 1) \cdot k_{max}}. \tag{8}$$

From above we know that $k^*_{N-H} = k^*_{N-R} = \beta \cdot c_{max}$. Therefore we have: $b^*_{N-H} = b^*_{N-R} = \frac{\beta^2 \cdot \frac{2}{3} \cdot c_{max}}{k_{max} \cdot (\beta \cdot \frac{2}{3} - 1)}$.

□

In the treatments with communication (C-B, C-H, C-R) borrowers can send messages to lenders before the lenders make their decisions. In particular, borrowers can promise to repay loans. As borrowers are heterogeneous in their personal cost of strategic default k_i and lenders cannot distinguish borrowers by type, the ability to send non-binding messages implies that interaction in the communication treatments resembles a signalling game. Proposition 2 shows that in this signalling game a pooling equilibrium without communication, i.e., an equilibrium in which no borrower promises to repay c_{max}, exists for all three treatments. In such an equilibrium the behavior of borrowers and lenders is identical to that in the corresponding no communication treatments.

Proposition 2 (No communication outcome equilibrium in the C-B, C-H and C-R treatments)**.** *In each of the three communication treatments C-B, C-H, C-R there exists a pooling equilbrium with no communication. In such an equilibrium no borrower promises to repay a loan of c_{max} and behavior of borrowers and lenders is identical to that in the equilibrium of the corresponding no communication treatment (see Proposition 1).*

Proof of Proposition 2 .

Borrower behavior:
Consider a pooling equilibrium without communication in the C-B, C-H or C-R Treatment. If no borrower promises to repay then for each borrower we have $k_i(c_{max}) = k_i$. Borrower behavior is identical to that in the no communication treatments (see proof of Proposition 1): $k^*_{C-B,nocom} = k^*_{C-H,nocom} = k^*_{C-R,nocom} = \beta \cdot c_{max}$.

Lender behavior:

Borrower behavior in the no communication equilibirum of the C-B, C-H and C-R treatments is identical to that in the N-B, N-H and N-R treatments. Consequently lenders' threshold beliefs in equilibrium must also be identical to those in the respective no communication treatment: In the no cmmunication treatment of the C-B treatment we have $b^*_{C-B,nocom} = \frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta - 1)}$. In the C-H and C-R treatments we have $b^*_{C-H,nocom} = b^*_{C-R,nocom} = \frac{\beta^2 \cdot \frac{2}{3} \cdot c_{max}}{k_{max} \cdot (\beta \cdot \frac{2}{3} - 1)}$.

For a pooling equilibrium without communication to exist, no borrower must have an incentive to deviate and promise to repay c_{max}. This is the case if lenders have off-equilibrium beliefs that any borrower who does promise to repay c_{max} will actually default.

□

Proposition 3 shows that a pooling equilibrium with communication, i.e., an equilibrium in which all borrowers promise to repay c_{max}, also exists for all three communication treatments. In this equilibrium a higher share of borrowers repay loans than in the equilibrium without communication for the same treatment. The reason is that for each borrower i the personal cost of strategic default k_i is higher after promising to repay. The proposition further clarifies that in any equilibrium with communication some borrowers renege on their promises: Those borrowers with low personal costs of strategic default promise to repay, but choose to default.

Proposition 3 (Communication equilibria in the C-B, C-H and C-R treatments)**.**

- *In all communication treatments, a pooling equilibrium exists in which all borrowers promise to repay a loan of c_{max}.*
- *In the C-B and C-R treatments, all borrowers of Type A, B and C choose to repay the maximum loan size, while Type D borrowers choose to default. The threshold of personal default costs above which loans are repaid is: $k^*_{C-B,com} = k^*_{C-R,com} = \frac{\beta \cdot c_{max}}{1+\alpha_R}$.*
- *In the C-H treatment, borrowers of Type A and B choose to repay the maximum loan size, while Type C and D borrowers choose to default. The threshold of personal default costs above which loans are repaid is: $k^*_{C-H,com} = \frac{\beta \cdot c_{max}}{1+\alpha_H}$.*
- *In the C-B treatment, the threshold belief above which lenders choose to offer c_{max} is: $b^*_{C-B,com} = \frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta - 1) \cdot (1+\alpha_R)}$.*
- *In the C-H treatment, the threshold belief above which lenders choose to offer c_{max} is: $b^*_{C-H,com} = \frac{\frac{2}{3}\beta^2 \cdot c_{max}}{k_{max} \cdot (\frac{2}{3}\beta - 1) \cdot (1+\alpha_H)}$.*
- *In the C-R treatment, the threshold belief above which lenders choose to offer c_{max} is: $b^*_{C-R,com} = \frac{\frac{2}{3}\beta^2 \cdot c_{max}}{k_{max} \cdot (\frac{2}{3}\beta - 1) \cdot (1+\alpha_R)}$.*

Proof of Proposition 3.

Borrower behavior in the C-B and C-R treatments:

Consider a pooling equilibrium with communication in the C-B and C-R treatments. In these treatments strategic defaults are revealed to lenders. Thus if a borrower promises to repay, her costs of strategic default are: $k_i(c_{max}) = k_i \cdot (1 + \alpha_R)$. In communication equilibria where all borrowers promise to pay, all borrowers with $k_i \cdot (1 + \alpha_R) \geq \beta \cdot c_{max}$ will thus choose to repay. These are (by definition) the Type "A", Type "B" and Type "C" borrowers. We therefore have $k^*_{C-B,com} = k^*_{C-R,com} = \frac{\beta \cdot c_{max}}{1+\alpha_R}$.

Borrower behavior in the C-H treatment:

In the C-H treatment strategic defaults are not revealed to lenders. Thus if a borrower promises t, repay her costs of strategic default are: $k_i(c_{max}) = k_i \cdot (1 + \alpha_H)$. In a communication equilibrium where all borrowers promise to pay, all borrowers with $k_i \cdot (1 + \alpha_H) \geq \beta \cdot c_{max}$ will thus choose to repay. These are (by definition) the Type "A",

and Type "B" borrowers. We therefore have $k^*_{C-H,com} = \frac{\beta \cdot c_{max}}{1+\alpha_H}$.

Lender behavior in the C-B Treatment:

In the C-B treatment borrowers can always repay a loan ($p = 1$). From Equation (4) we therefore have:

$$b^*(k^*) = \frac{\beta \cdot k^*}{(\beta - 1) \cdot k_{max}}. \tag{9}$$

From above we know that: $k^*_{C-B,com} = \frac{\beta \cdot c_{max}}{1+\alpha_R}$. Therefore we have $b^*_{C-B,com} = \frac{\beta^2 \cdot c_{max}}{k_{max} \cdot (\beta-1) \cdot (1+\alpha_R)}$.

Lender behavior in the C-H Treatment:

In the C-H treatments we have $p = \frac{2}{3}$. From equation [4] we therefore have:

$$b^*(k^*) = \frac{\beta \cdot \frac{2}{3} \cdot k^*}{(\beta \cdot 2\frac{2}{3} - 1) \cdot k_{max}}. \tag{10}$$

From above we know that: $k^*_{C-H,com} = \frac{\beta \cdot c_{max}}{1+\alpha_H}$. Therefore we have: $b^*_{C-H,com} = \frac{\beta^2 \cdot p \cdot c_{max}}{k_{max} \cdot (\beta \cdot p - 1) * (1+\alpha_H)}$.

Lender behavior in the C-R Treatment:

In the C-R treatments we have $p = \frac{2}{3}$. From Equation (4) we therefore have:

$$b^*(k^*) = \frac{\beta \cdot \frac{2}{3} \cdot k^*}{(\beta \cdot 2\frac{2}{3} - 1) \cdot k_{max}}. \tag{11}$$

From above we know that: $k^*_{C-R,com} = \frac{\beta \cdot c_{max}}{1+\alpha_R}$. Therefore we have: $b^*_{C-H,com} = \frac{\beta^2 \cdot p \cdot c_{max}}{k_{max} \cdot (\beta \cdot p - 1) \cdot (1+\alpha_R)}$.

For a pooling equilibrium with communication to be sustained, no borrower must have an incentive to deviate and remain silent. This is the case if lenders have off-equilibrium beliefs that any borrower who does not promise to repay c_{max} will actually default. □

Finally, Proposition 4 shows that none of our communication treatments features a separating equilibrium in which only some borrowers promise to repay c_{max} and lenders only offer a loan c_{max} to those borrowers.

Proposition 4 (Separating equilibria in the C-B, C-H and C-R treatments)**.** *In the three communication treatments C-B, C-H, C-R there is no separating equilibrium in which some borrowers promise to repay c_{max} while other borrowers remain silent and lenders only offer a loan c_{max} to those borrowers who promise to repay.*

Proof of Proposition 4.

In a separating equilibrium a silent borrower would receive a loan of $c_{min} = 0$ and thus yield a payoff of: e_i. Now consider a borrower with $k_i(c_{max}) = 0$. This borrower would prefer to deviate and promise to repay c_{max}. The borrower would receive c_{max} and default on that loan, yielding a payoff of $e_i + \theta * c_{max}$. Thus the presence of selfish borrowers for whom imitation is costless rules out a separating equilibrium in all treatments with communication.

□

A.2 Borrower behavior over time

Figure 7 depicts the average strategic default rate for each credit size over time. Panels A-D show strategic default rates in the N-B, C-B, N-H and C-H treatments, repectively. The figure shows that there is an upward trend in strategic default for all credit sizes over time in all treatments. The regressions presented in Table 8 and Table 9 confirm the graphical results presented in Figure 7. The tables present linear GLS regressions with individual borrower fixed effects. The dependent variables are a borrower's decision to strategic default on the different credit sizes. In all regressions, standard errors are clustered at the matching group level and explanatory variables are period dummies to capture the time trends. From the tables it is apparent that the strategic default rate for all credit sizes increases over time in all treatments.

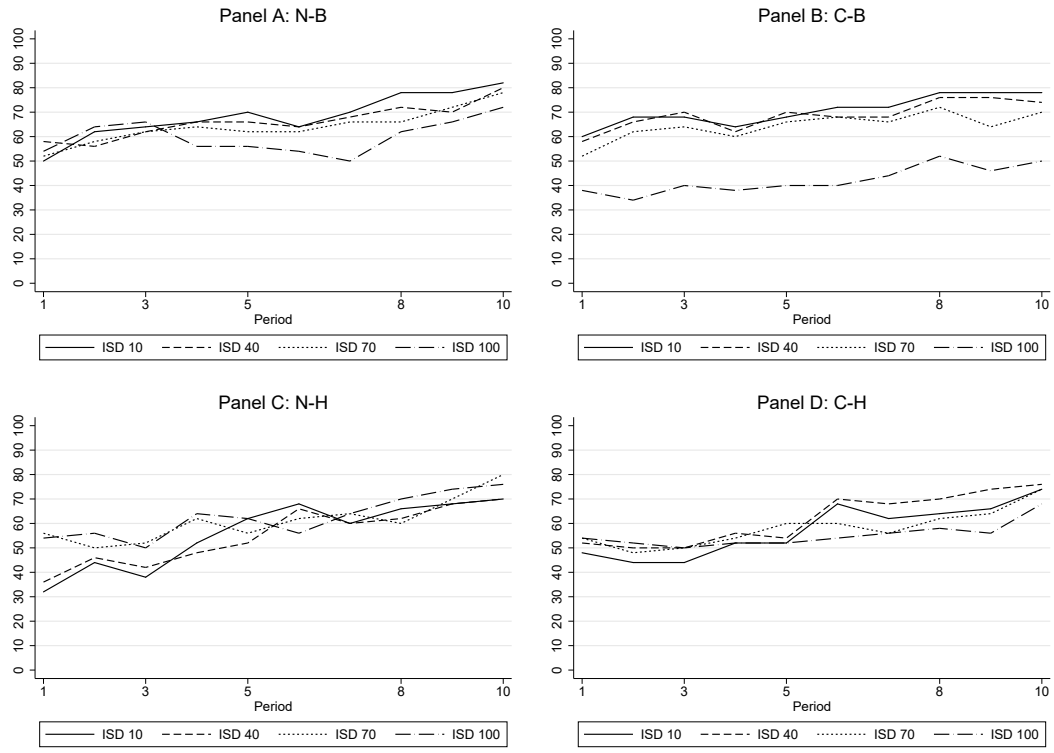


Figure 7: Intended Strategic Default Rate over Time by Treatment

Notes: The figure highlights the intended strategic default rate for each credit size (10, 40, 70, and 100) in all treatments over time. Panel A presents time trends in the N-B treatment. Panel B shows the intended strategic default rate in the C-B treatment. Panel C presents time trends in the N-H treatment and Panel D in the C-H.

Table 8: Linear GLS Regressions: Strategic Default over time (N-B and C-B treatment)

Panel A: N-B	Credit Size			
DV: Strategic Default	10	40	70	100
	(1)	(2)	(3)	(4)
Period 2	0.120*	-0.0200	0.0600	0.100*
	(0.0617)	(0.0559)	(0.0525)	(0.0451)
Period 3	0.140	0.0400	0.100*	0.120*
	(0.0854)	(0.0840)	(0.0542)	(0.0538)
Period 4	0.160*	0.0800	0.120*	0.0200
	(0.0725)	(0.0862)	(0.0617)	(0.0559)
Period 5	0.200**	0.0800	0.100	0.0200
	(0.0851)	(0.0807)	(0.0752)	(0.0471)
Period 6	0.140**	0.0600	0.100	4.94e-15
	(0.0605)	(0.0905)	(0.0752)	(0.0737)
Period 7	0.200**	0.100	0.140*	-0.0400
	(0.0673)	(0.0864)	(0.0740)	(0.0586)
Period 8	0.280***	0.140	0.140**	0.0800**
	(0.0617)	(0.109)	(0.0605)	(0.0330)
Period 9	0.280***	0.120	0.200**	0.120*
	(0.0749)	(0.0913)	(0.0673)	(0.0617)
Period 10	0.320**	0.220**	0.260***	0.180**
	(0.101)	(0.0925)	(0.0525)	(0.0559)
Constant	0.500***	0.580***	0.520***	0.540***
	(0.0538)	(0.0676)	(0.0488)	(0.0384)
Observations	500	500	500	500
Cluster	10	10	10	10
Individual FE	Yes	Yes	Yes	Yes
F	5.476	232.4	60.69	23.57
R^2	0.0705	0.0391	0.0436	0.0449
Panel B: C-B				
Period 2	0.0800	0.0800	0.100*	-0.0400
	(0.0862)	(0.0913)	(0.0451)	(0.0586)
Period 3	0.0800	0.120	0.120**	0.0200
	(0.0446)	(0.0749)	(0.0446)	(0.0925)
Period 4	0.0400	0.0400	0.0800	2.62e-15
	(0.0840)	(0.0840)	(0.0617)	(0.0602)
Period 5	0.0800	0.120	0.140***	0.0200
	(0.0686)	(0.0862)	(0.0431)	(0.0635)
Period 6	0.120*	0.100	0.160**	0.0200
	(0.0617)	(0.0810)	(0.0503)	(0.0821)
Period 7	0.120	0.100	0.140**	0.0600
	(0.0749)	(0.0963)	(0.0605)	(0.0905)
Period 8	0.180**	0.180**	0.200***	0.140**
	(0.0702)	(0.0635)	(0.0602)	(0.0605)
Period 9	0.180**	0.180**	0.120*	0.0800
	(0.0702)	(0.0635)	(0.0538)	(0.0749)
Period 10	0.180**	0.160*	0.180**	0.120*
	(0.0702)	(0.0785)	(0.0559)	(0.0617)
Constant	0.600***	0.580***	0.520***	0.380***
	(0.0591)	(0.0657)	(0.0386)	(0.0536)
Observations	500	500	500	500
Cluster	10	10	10	10
Individual FE	Yes	Yes	Yes	Yes
F	.	8.838	8.838	8.437
R^2	0.0600	0.0434	0.0405	0.0304

Note: Cluster Robust Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the unique matching group level. The DV in all regressions is a borrower's decision to strategic default (Column 1: 10, Column 2: 40, Column 3: 70, Column 4: 100). All regressions include individual fixed effects. Explanatory variables are period dummies (Period 1- Period 10) to capture effects over time. Panel A: N-B treatment. Panel B: C-B treatment.

Table 9: Linear GLS Regressions: Strategic Default over time (N-H and C-H treatment)

Panel A: N-H	Credit Size			
DV: Strategic Default	10	40	70	100
	(1)	(2)	(3)	(4)
Period 2	0.120**	0.100*	-0.0600	0.0200
	(0.0446)	(0.0451)	(0.0676)	(0.0635)
Period 3	0.0600	0.0600	-0.0400	-0.0400
	(0.0676)	(0.0854)	(0.0840)	(0.0785)
Period 4	0.200*	0.120	0.0600	0.100
	(0.0998)	(0.0686)	(0.0740)	(0.0689)
Period 5	0.300**	0.160	4.08e-15	0.0800
	(0.114)	(0.108)	(0.0673)	(0.0617)
Period 6	0.360***	0.300**	0.0600	0.0200
	(0.0942)	(0.0963)	(0.0799)	(0.0702)
Period 7	0.280***	0.240**	0.0800	0.100
	(0.0862)	(0.0840)	(0.0913)	(0.0915)
Period 8	0.340***	0.260***	0.0400	0.160**
	(0.0854)	(0.0799)	(0.0785)	(0.0659)
Period 9	0.360***	0.320***	0.140*	0.200*
	(0.0785)	(0.0862)	(0.0740)	(0.0903)
Period 10	0.380***	0.340***	0.240**	0.220**
	(0.0875)	(0.0431)	(0.0840)	(0.0875)
Constant	0.320***	0.360***	0.560***	0.540***
	(0.0606)	(0.0608)	(0.0614)	(0.0590)
Observations	500	500	500	500
Cluster	10	10	10	10
Individual FE	Yes	Yes	Yes	Yes
F	144.9	382.9	370.8	907.8
R^2	0.108	0.0856	0.0637	0.0625
Panel B: C-H				
Period 2	-0.0400	-0.0200	-0.0600	-0.0200
	(0.0404)	(0.0635)	(0.0605)	(0.0362)
Period 3	-0.0400	-0.0200	-0.0400	-0.0400
	(0.0586)	(0.0764)	(0.0503)	(0.0503)
Period 4	0.0400	0.0400	3.53e-15	-0.0200
	(0.0586)	(0.0840)	(0.0737)	(0.0635)
Period 5	0.0400	0.0200	0.0600	-0.0200
	(0.0404)	(0.0559)	(0.0740)	(0.0559)
Period 6	0.200***	0.180**	0.0600	1.09e-15
	(0.0602)	(0.0702)	(0.0676)	(0.0602)
Period 7	0.140	0.160*	0.0200	0.0200
	(0.0799)	(0.0725)	(0.0821)	(0.0764)
Period 8	0.160**	0.180***	0.0800	0.0400
	(0.0659)	(0.0471)	(0.0807)	(0.0586)
Period 9	0.180***	0.220***	0.100	0.0200
	(0.0471)	(0.0635)	(0.0689)	(0.0635)
Period 10	0.260***	0.240***	0.200**	0.140**
	(0.0605)	(0.0586)	(0.0673)	(0.0605)
Constant	0.480***	0.520***	0.540***	0.540***
	(0.0414)	(0.0469)	(0.0503)	(0.0388)
Observations	500	500	500	500
Cluster	10	10	10	10
Individual FE	Yes	Yes	Yes	Yes
F	1414.8	1150.3	68807.4	12.79
R^2	0.0933	0.0996	0.0529	0.0275

Note: Cluster Robust Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the unique matching group level. The DV in all regressions is a borrower's decision to strategic default (Column 1: 10, Column 2: 40, Column 3: 70, Column 4: 100). All regressions include individual fixed effects. Explanatory variables are period dummies (Period 1- Period 10) to capture effects over time. Panel A: N-H treatment. Panel B: C-H treatment.

A.3 Lender behavior over time

Figure 8 displays lender behavior over time. Panel A of the figure shows the average credit size over time in the N-B and the C-B treatment. Panel B highlights the average credit size over time in the N-H and the C-H treatment. The figure documents two important features of our communication effects: First, from the outset lenders issue higher credits in the communication treatments. Second, there is a decline in credit size over time in the treatments without communication. In the treatments with communication however, credit sizes are more stable over time.

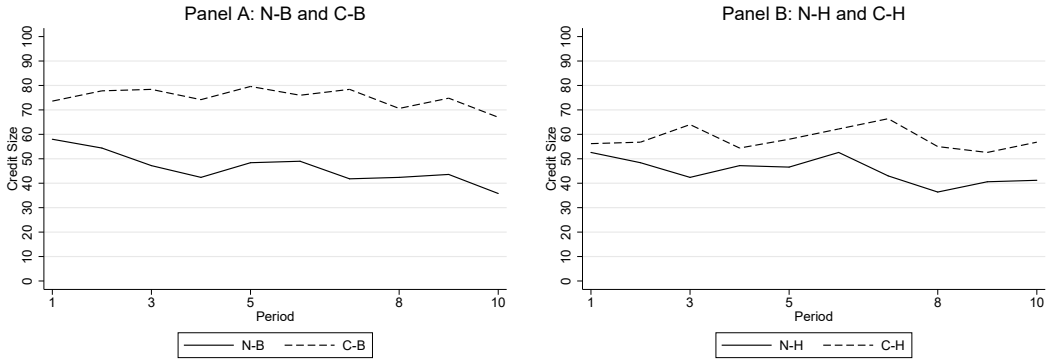


Figure 8: Average Credit Size over Time

Notes: The figure highlights the average credit size in all treatments over time. Panel A presents time trends in the N-B an C-B treatment. Panel B shows the average credit size in the N-H and C-H treatments.

Table 10 complements Figure 8 by presenting linear fixed effect GLS regressions for lender behavior over all ten periods of the experiment. The dependent variable in all regression is a lender's decision to issue a credit of different size. We include individual fixed effects and cluster standard errors at the unique matching group level in all regressions. The results confirm the time trends depicted in figure 8. Credit sizes significantly decline in the treatments without communication (N-B, N-H) but are stable over time in the respective communication treatments (C-B, C-H).

A.4 Lender beliefs

In period 1, 6, and 10 we elicited lenders' beliefs concerning the share of borrowers who would repay a loan of each loan size in that period. Prior to this elicitation in periods 6 and 10 we presented the lenders with information on aggregate repamyent behavior of the five borrowers in their matching group for all previous periods. In this appendix we provide evidence that lenders update their beliefs correctly over time.

Table 10, Panel A presents lender beliefs in period one of the experiment. Before borrowers make their first repayment decision and before lenders first decide which credit to give to the paired borrower beliefs about strategic default for high credits are very similar across all treatments. Panel B and Panel C demonstrate a shift in beliefs in the C-B treatment. By period six, lenders expect that 48% of the borrowers strategic default on their credits in the C-B treatment. By contrast, the beliefs about borrower defaults in the other treatments increase over time.

Table 10: Linear GLS Regressions: Credit size over time

DV: Credit Size	N-B (1)	C-B (2)	N-H (3)	C-H (4)
Period 2	-3.600	4.200	-4.200	0.600
	(4.156)	(3.133)	(4.607)	(3.548)
Period 3	-10.80**	4.800	-10.20***	7.800*
	(3.700)	(5.401)	(3.133)	(3.727)
Period 4	-15.60**	0.600	-5.400	-1.800
	(5.355)	(3.431)	(3.185)	(5.712)
Period 5	-9.600	6.000	-6.000*	1.800
	(7.775)	(4.944)	(3.254)	(5.712)
Period 6	-9.000	2.400	-4.49e-13	6.000
	(7.565)	(6.201)	(4.329)	(6.122)
Period 7	-16.20**	4.800	-9.600*	10.20
	(5.853)	(7.210)	(4.960)	(6.257)
Period 8	-15.60*	-3.000	-16.20***	-1.200
	(7.288)	(6.524)	(3.727)	(6.980)
Period 9	-14.40	1.200	-12.00***	-3.600
	(7.879)	(7.648)	(2.854)	(7.616)
Period 10	-22.20***	-6.600	-11.40**	0.600
	(4.694)	(7.190)	(4.642)	(6.599)
Constant	58.00***	73.60***	52.60***	56.20***
	(4.595)	(3.773)	(2.268)	(3.979)
Observations	500	500	500	500
Cluster	10	10	10	10
Individual FE	Yes	Yes	Yes	Yes
F	22.37	9.991	393.5	300.6
R^2	0.0578	0.0146	0.0472	0.0247

Note: Cluster Robust Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the unique matching group level. The dependent variable in all regressions is the lenders decision about the credit size (10, 40, 70, 100). All regressions include individual fixed effects. Explanatory variables are period dummies (Period 1-Period 10) to capture effects over time. Column 1: Regressions restricted to lenders in the N-B treatment. Column 2: Regressions restricted to lenders in the C-B treatment. Column 3: Regressions restricted to lenders in the N-H treatment. Column 4: Regressions restricted to lenders in the C-H treatment.

Table 12 provides statistical evidence for the differences in lender beliefs over time. The table presents within treatment GLS regressions with individual fixed effects for lender beliefs over time. In all regressions, standard errors are clustered at the matching group level. The table confirms the descriptive statistic results from table 11. The regressions highlight that within all treatments lenders adjust their beliefs about the strategic default rate in their matching group upwards. An exception are the beliefs about strategic defaults of credits 100 in the C-B treatment (Column 4 in Panel B). In this treatments, lenders adjust their beliefs downwards.

We present Figure 9 as an example of how well lenders adjust their beliefs (and lending decisions) to the borrowers repayment behavior. The figure graphically highlights a lenders' belief about borrower strategic default rate for credits of 100 (light grey bar), the average percentage of credits 100 issued by the lenders (dark grey bar) and the average strategic default rate of credits 100 (black bar). Panel A-D describes the behavior in the N-B, C-B, N-H and C-H treatments respectively. The figure shows that lenders initially overestimate the strategic default rate within their matching group but adjust their beliefs over time. Beliefs about strategic default and actual strategic default rates become more and more aligned as the experiment proceeds. The figure also shows that high beliefs about strategic default also directly translate into low credit volumes. It is apparent form Figure 9 that communication only impacts on beliefs and credit sizes in the communication treatments where borrower behavior is revealed (C-B treatment). In fact, it is in these treatment where lenders adjust their overestimated beliefs about strategic default rates downwards and increase the frequency with which they give credits of 100.

Table 11: Summary of Lender Beliefs over Time by Treatment

Prob. of Fundamental Default:	$p = 0$		$p = \frac{1}{3}$	
Borrower behavior:	Revealed		Hidden	
Panel A: Period 1 Beliefs	N-B	C-B	N-H	C-H
	(1)	(2)	(3)	(4)
Strategic Default 10	0.320	0.336	0.384	0.384
	(0.212)	(0.140)	(0.172)	(0.171)
Strategic Default 40	0.468	0.428	0.472	0.464
	(0.166)	(0.0885)	(0.129)	(0.140)
Strategic Default 70	0.640	0.596	0.592	0.604
	(0.116)	(0.0610)	(0.123)	(0.111)
Strategic Default 100	0.736	0.704	0.700	0.704
	(0.155)	(0.0826)	(0.139)	(0.107)

Prob. of Fundamental Default:	$p = 0$		$p = \frac{1}{3}$	
Borrower behavior:	Revealed		Hidden	
Panel B: Period 5 Beliefs	N-B	C-B	N-H	C-H
Strategic Default 10	0.468	0.580	0.436	0.560
	(0.213)	(0.250)	(0.181)	(0.0980)
Strategic Default 40	0.576	0.548	0.568	0.600
	(0.214)	(0.190)	(0.125)	(0.112)
Strategic Default 70	0.720	0.524	0.684	0.668
	(0.208)	(0.201)	(0.112)	(0.113)
Strategic Default 100	0.864	0.480	0.748	0.752
	(0.0888)	(0.208)	(0.136)	(0.141)

Prob. of Fundamental Default:	$p = 0$		$p = \frac{1}{3}$	
Borrower behavior:	Revealed		Hidden	
Panel C: Period 10 Beliefs	N-B	C-B	N-H	C-H
Strategic Default 10	0.636	0.724	0.624	0.636
	(0.228)	(0.167)	(0.213)	(0.101)
Strategic Default 40	0.700	0.672	0.680	0.716
	(0.200)	(0.177)	(0.147)	(0.0832)
Strategic Default 70	0.752	0.612	0.792	0.704
	(0.218)	(0.198)	(0.108)	(0.174)
Strategic Default 100	0.876	0.480	0.812	0.732
	(0.124)	(0.203)	(0.125)	(0.218)

Note: Mean of matching group averages with standard deviation in parentheses. Panel A: Mean beliefs about strategic default rates for all credit sizes in the first round of belief elicitation (Period 1). Panel B: Mean beliefs about strategic default rates for all credit sizes in the second round of belief elicitation (Period 5). Panel C: Mean beliefs about strategic default rates for all credit sizes in the third round of belief elicitation (Period 10). *Strategic Default 10*, *Strategic Default 40*, *Strategic Default 70* and, *Strategic Default 100* indicate the belief that borrowers strategic default on the different credit sizes.

Table 12: Linear GLS Regressions: Lender Beliefs over time

Panel A: N-B		Credit Size		
DV: Beliefs	10	40	70	100
Period 5	0.148	0.108	0.0800	0.128**
	(0.0962)	(0.0810)	(0.0630)	(0.0415)
Period 10	0.316**	0.232**	0.112	0.140**
	(0.113)	(0.0844)	(0.0679)	(0.0541)
Constant	0.320***	0.468***	0.640***	0.736***
	(0.0685)	(0.0532)	(0.0428)	(0.0308)
Observations	150	150	150	150
Cluster	10	10	10	10
F	7.095	5.877	1.605	4.770
R^2	0.209	0.181	0.0657	0.140
Panel B: C-B				
Period 5	0.244**	0.120*	-0.0720	-0.224***
	(0.0869)	(0.0609)	(0.0681)	(0.0598)
Period 10	0.388***	0.244***	0.0160	-0.224***
	(0.0721)	(0.0631)	(0.0688)	(0.0616)
Constant	0.336***	0.428***	0.596***	0.704***
	(0.0504)	(0.0398)	(0.0426)	(0.0380)
Observations	150	150	150	150
Cluster	10	10	10	10
F	17.88	10.92	1.740	7.734
R^2	0.342	0.267	0.0488	0.202
Panel C: N-H				
Period 5	0.0520	0.0960**	0.0920***	0.0480
	(0.0350)	(0.0335)	(0.0282)	(0.0293)
Period 10	0.240***	0.208***	0.200***	0.112***
	(0.0355)	(0.0267)	(0.0345)	(0.0311)
Constant	0.384***	0.472***	0.592***	0.700***
	(0.0226)	(0.0171)	(0.0186)	(0.0182)
Observations	150	150	150	150
Cluster	10	10	10	10
F	52.69	30.55	16.82	6.878
R^2	0.236	0.282	0.308	0.104
Panel D: C-H				
Period 5	0.176***	0.136***	0.0640*	0.0480
	(0.0381)	(0.0295)	(0.0324)	(0.0411)
Period 10	0.252***	0.252***	0.1000*	0.0280
	(0.0649)	(0.0425)	(0.0541)	(0.0695)
Constant	0.384***	0.464***	0.604***	0.704***
	(0.0320)	(0.0231)	(0.0262)	(0.0349)
Observations	150	150	150	150
Cluster	10	10	10	10
F	11.00	17.89	2.255	0.997
R^2	0.210	0.331	0.0633	0.0120

Note: Cluster Robust Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the unique matching group level. The dependent variable in all regressions is the lenders belief about strategic default (10, 40, 70, 100). All regressions include individual fixed effects. Explanatory variables are period dummies (Period 5 and Period 10) to capture effects over time.

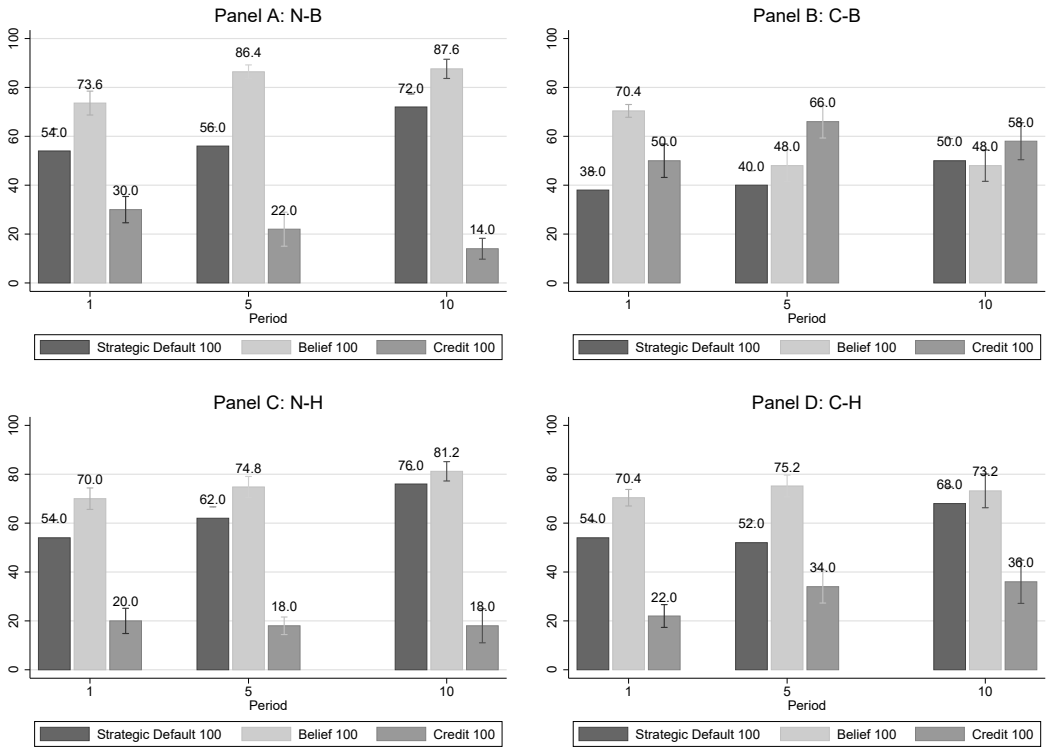


Figure 9: Lender Beliefs for Strategic Default 100, Mean frequency of Credits of 100, Strategic Default Rate for Credits of 100

Notes: Notes: The figure shows the lender beliefs about borrower strategic default for credits of 100, the frequency with which lenders give credits of 100 and the strategic default rate for credits of 100. Panel A: N-B treatment. Panel B: C-B treatment. Panel C: N-H treatment. Panel D: C-H treatment.

A.5 Socio demographic characteristics by treatment

Table 13: Socio Demographics by Treatment

Borrower income:	Deterministic		Stochastic			
Borrower repayment choice:			Hidden		Revealed	
Communication	No	Yes	No	Yes	No	Yes
Treatment:	N-B	C-B	N-H	C-H	N-R	C-R
Age	24.51	25.94	25.94	25.14	24.53	25.20
	(3.914)	(6.553)	(5.756)	(5.187)	(4.547)	(4.782)
Female	0.560	0.590	0.520	0.460	0.570	0.640
	(0.499)	(0.494)	(0.502)	(0.501)	(0.498)	(0.482)
Student	0.930	0.990	0.940	0.960	0.980	0.980
	(0.256)	(0.100)	(0.239)	(0.197)	(0.141)	(0.141)
Income after expenses	328.8	357.8	329.7	373.1	352.4	325.9
	(239.0)	(502.6)	(254.9)	(513.6)	(261.8)	(192.7)

Note: The table reports averages of socio demographic variables by treatment. Standard deviations are shown in parentheses. *Age Female* is a variable which is equal to one if a subject is female and zero if a subject is male. *Student* is a variable which is equal to one if a subject is enrolled as a student and zero otherwise (note that occasionally none students may participate in experiments). *Income after expenses* shows self reported income after all expenses (e.g., housing cost etc.).

A.6 Summary statistics N-B and N-H 2015 and 2017

Table 14: Summary Statistics by Treatment - N-B and N-H: 2015 and 2017

	N-B – 2015	N-B – 2017	N-H– 2015	N-H – 2017
Credit	46.30	37.75	45.10	28
	(15.23)	(10.15)	(14.26)	(9.749)
ISD	0.650	0.62	0.587	0.615
	(0.157)	(0.078)	(0.112)	(0.113)
Borrower Profit	290.5	270.0	233.7	206.0
	(37.56)	(22.52)	(32.16)	(20.62)
Lender Profit	148.4	143.3	139.5	136
	(24.31)	(8.007)	(8.379)	(5.860)

Note: Mean of matching group averages with standard deviation in parentheses. Mean credit size (*Credit Size*, mean of realized strategic defaults over all credits (*RSD*), the mean of borrower profits (*Borrower Profit*) and the mean of lender profits (*Lender Profit*).

B Online Appendix - Instructions

Coding Instructions for classification of borrower communication in the C-B, C-H and C-R treatments:

Coding:

While coding, please mark all corresponding categories as 1. If a statement does not fall into a certain category, either please mark this with 0 or leave the category empty. More than one category may apply for the same statement.

What you see is the chat message of a borrower to a lender. Borrowers were able to send a free form message to a lender and lenders were able to decide to give a credit of size 10, 40, 70 or 100.

"uid" represents an individual identifier variable in the dataset which allows sorting of messages.

Multiple categories apply in which a message may fall. These categories are: promise, request, lie, threat, personal info weird/crazy, fuzzy (unclear), promise 10 (promise to repay a credit of 10), promise 40 (promise to repay a credit of 40), promise 70 (promise to repay a credit of 70), promise 100 (promise to repay a credit of 100), request 10 (request a credit of 10), request 40 (request a credit of 40), request 70 (request a credit of 70), request 100 (request a credit of 100), threat 10 (threat to only repay credits of 10), threat 40 (threat to only repay credits of 40), threat 70 (threat to only repay credits of 70), threat 100 (threat to only repay credits of 100), and message with personal info (name etc.), language_ neutral_ language_friendly_language _aggressive

Every coder has a personalized ending of variable names. Either _1, _2, or _3. This allows us to identify consensus and disagreements.

If the message field is empty, you do not need to code anything.

Here are a few examples of messages:

Promise: "I promise to pay my credit"

Request: "I request a credit of 100. Thank you!"

Promise and request and promise 100: "if I get a credit of 100, I will repay the credit"

Promise/promise 100/threat:

"If you give me the highest credit, I will repay. Then we both have 11€ and I will be happy with it. For any credit below that, it does not pay for me to repay because I get less than 300 anyway."

"Hello, for credits of 10 or 40, I will keep the money. I will happily repay credits of 70 or 100"

Weird: " I believe Birdman was actually better than Boyhood and rightfully deserved the best Picture Oscar"

Personal/promise/request: "Hello lender! I am Vivien and am in cabin 12. I want a credit of 100 points. I guarantee to repay my credit. This way, we will both have 300 points. Thanks"

General Instructions for Lenders

Welcome to the experimental laboratory!

Today, you will participate in an economics experiment. By participating, you can earn money. The amount of money you make depends on your own decisions and the decisions of other participants. Therefore, it is important that you carefully read the following instructions.

The instructions you have received from us are for your private information. **During the experiment, communication is absolutely prohibited.** If you have any questions, please contact us by raising your hands. An experimenter will come to you and answer your questions. Failure to comply with the rules will result in exclusion from the experiment and all payments. The decisions you make during the experiment are **anonymous**. Only the experimenter knows your identity but your decisions cannot be assigned to your identity.

For your participation in the experiment, you will receive a show up fee of **5 Euros**. The additional payment depends on your decisions and the decisions of other participants.

The experiment is divided into different periods. In each period, you have to make decisions that you enter in the computer. In total, there are 10 periods. At the end of the experiment, 2 periods are randomly selected for your payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. Your payment during the experiment will be calculated in **points**. The total number of points obtained in the two selected periods will be converted into Euros and then paid to you in cash. For the conversion, the following exchange rate applies:

100 Points = 2 Euro.

In total, you receive your earnings from the 2 payment periods plus the show up fee of 5 Euros in cash.

Please wait in your cabin during the payout phase until you are summoned by us to collect your payment. Please bring all the documents you have received from us when you receive your payment.

Before the experiment, all 20 participants were divided into two groups of 10 who independently participate in the experiment. In each group, there are 5 borrowers and 5 lenders.

Throughout the experiment, you are a lender in your group of 10.

Brief overview about the experimental procedure

Throughout the experiment, your group consists of the same 10 persons: you (as a lender), 4 other lenders and 5 borrowers.

The experiment consists of 10 periods. In each period, you will be randomly paired with on of the 5 borrowers of your group of 10.

At the beginning of each period, each borrower and lender has an endowment of 150 point.

Treatment Communication: In each period, there is a communication phase, in which borrowers can decide to write a message to the lender they were paired with. Only borrowers can write a message and lenders can read it.

In each period, you have to decide on the amount of the loan for the borrower you have been paired with. The granted loan has to be between 10 points and 100 points and can be either 10, 40, 70 or 100 points. The loan will be automatically invested in a project.

By granting a loan to a borrower, the borrower will incur a loan debt, which will be two and a half times larger than the granted loan.

The borrower will get a project revenue, which will be four times larger than the granted loan. The borrower has to decide whether he wants to settle the outstanding loan debt.

At the end of each period, your income and the income of the borrower are calculated. You and the borrower will be informed about your income.

After five periods, you will receive a one-time summary on the amount of granted loans for the different loan amounts, how many of these loans have been repaid and the average income for the respective loan amount.

The experiment consists of 10 periods. At the end of the experiment, your income from each period is calculated and converted in Euros and 2 periods are randomly selected for payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. The points of these two periods will be converted into Euros and paid out in cash together with the 5 Euros show up fee.

Detailed information about the experimental procedure

Throughout the experiment, you are in a group of 10 people. The 9 others in your group are the same people during the whole experiment. Your group of 10 consists of 5 borrowers and 5 lenders. You are a lender during the entire experiment.

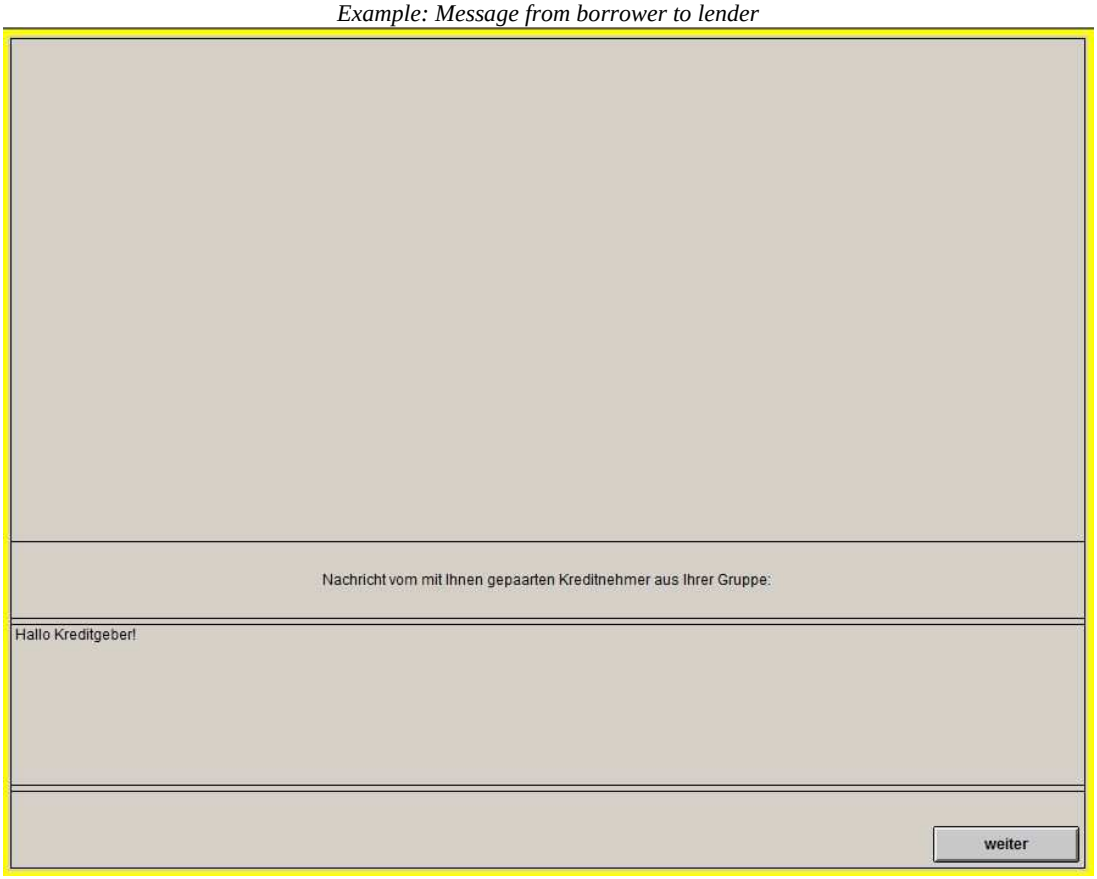
In each period, you will be paired with a borrower from your group of 10. In each period, a new pairing will be randomly selected. Thus, in course of the experiment you will be paired with different borrowers from your group of 10.

0. Communication *(only for communication treatment)*

Borrowers can decide in each period whether they want to send a message to the lender they were paired with. This message can contain up to 300 signs. Borrowers can also decide not to write a message to the lender. Only borrowers can send a message. You as a lender can read it but you cannot reply to it.

If the borrower you were paired with decides to write you a message, you will see the following screen:

Example: Message from borrower to lender



Translation:

Line 1: Message from borrower of your group you were paired with.
Line 2: Hello lender!

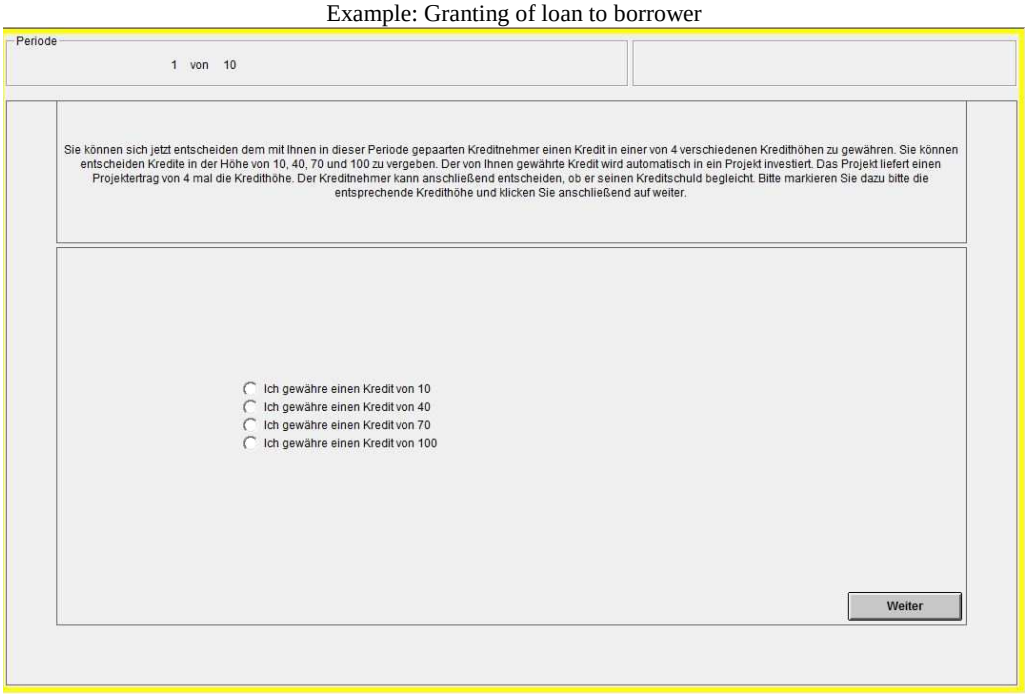
In the example above, the borrower has written «Hello lender!». After you have read the message, you can proceed with the experiment by clicking the "next"-button.

1. Granting of loan

At the beginning of each period, you and all the other lenders have an endowment of 150 points. Each borrower has also an endowment of 150 points.

You have to decide on the size of the loan for the borrower you have been paired with. You can grant a loan between 10 points and 100 points. There are 4 different loan amounts that can be granted. The amount of the loan is either 10, 40, 70 or 100 points.
You can only grant one loan and you see the following screen:

Example: Granting of loan to borrower



Translation
Line 1, 2, 3 and 4: You have to decide on the size of the loan for the borrower you have been paired with. You can grant a loan between 10 points and 100 points. There are 4 different loan amounts that can be granted. The amount of the loan is either 10, 40, 70 or 100 points. The loan is automatically invested in a project. The borrower will get a project revenue, which is four times as large as the granted loan. The borrower can decide whether he wants to settle the loan debt. Please indicate the corresponding loan amount and then click next.
Line 5: I grant a loan of 10
Line 6: I grant a loan of 40
Line 7: I grant a loan of 70
Line 8: I grant a loan of 100

2. Project revenue and loan debt

The loan is automatically invested in a project. The borrower will get a project revenue, which is four times as high as the granted loan (e.g. 280 in case of a loan amount of 70). The loan debt owed to you as the lender is two and a half times as large as the loan amount (e.g. 175 in case of a loan amount of 70).

Table: Project revenue and loan debt

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250

3. Repayment of loan debt

The borrower has to decide whether he wants to settle the loan debt. If the borrower decides to repay the loan debt, the repayment is equal the loan debt amount, otherwise the repayment is 0.

4. Your income

In each period, your income will depend on:

- the size of the loan to the borrower,
- the repayment decision of the borrower.

Your income is determined by your endowment from the beginning of a period minus the loan plus the repayment of the borrower.

Your income = 150 - loan + repayment

Thus, your income depends largely on the repayment of the borrower. If the borrower decides to settle his loan debt, your income is higher if you grant a large loan (because the repayment is larger than the loan in case of a project success). If the borrower does not repay his loan debt, your income is higher if you grant the smallest possible loan amount.

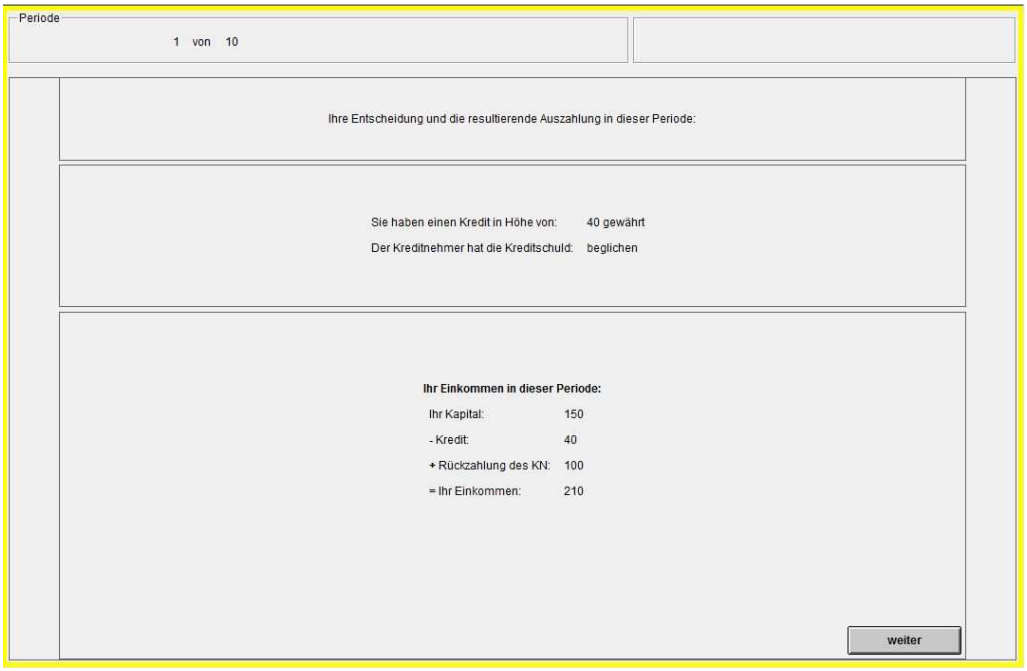
In the following table, you can see your income as lender for each possible loan amount:

Table: Income of the lender

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250
Your income				
in case of repayment	165	210	255	300
in case of no repayment	140	110	80	50

5. Information about your income

At the end of each period, you will get information about your income on your screen, which will look as follows:



Translation
Line 1: Your decision and the resulting payment in this period:
Line 2: You have granted a loan amount of 40
Line 3: The borrower has settled the loan debt
Line 4: Your income in this period:
Line 5: Your endowment: 150
Line 6: - Loan: 40
Line 7: + Repayment of the borrower: 100
Line 8: = Your income: 210

You will see your chosen loan amount, whether you get a repayment and your income.

6. Income of the borrower

In each period, the income of the borrower depends on:

- the size of the loan to the borrower,
- and whether the borrower settles his loan debt.

The income of the borrower is determined by the endowment at the beginning of a period plus the project revenue minus the repayment.

Income = 150 + project revenue - repayment

The income of the borrower is therefore the higher the larger the loan you granted. Additionally, borrowers can increase their income by deciding not to settle their loan debt and not making a repayment.

In the following table, you can see the possible incomes of a borrower for each loan amount.

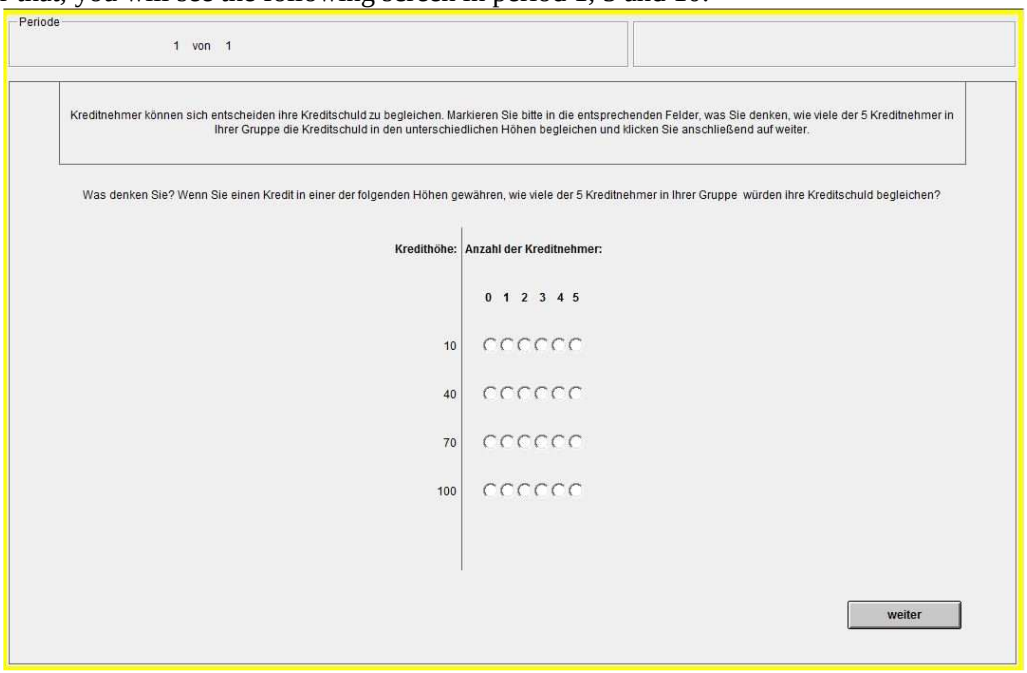
Table: Income of the borrower

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250
Income of borrower				
In case of repayment	165	210	255	300
In case of no repayment	190	310	430	550

7. Your beliefs about the repayment behavior of the borrower

In period 1, 5 and 10, you as a borrower will be asked to indicate your belief about how many borrowers in your group will repay their loan debt for the different loan amounts.

For that, you will see the following screen in period 1, 5 and 10:

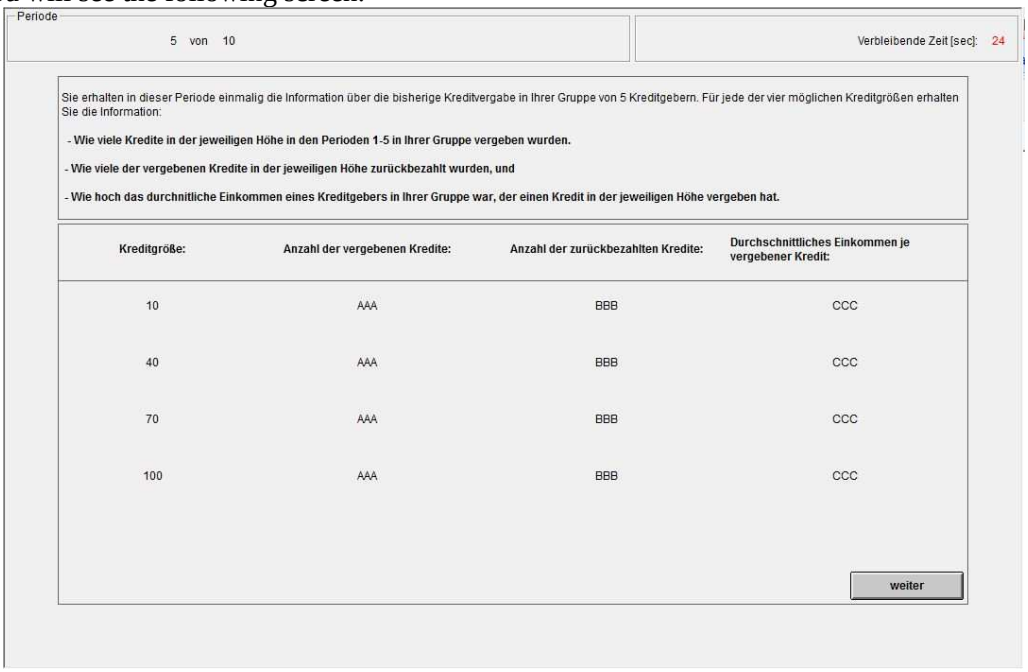


Translation:
Line 1 and 2: Borrowers can decide to settle their loan debt. Pleas mark in the corresponding box, how many of the 5 borrowers you believe to settle their debt for the different loan amounts. Subsequently, klick next.
Line 3: What do you think? If you grant a loan of the following amount, how many of the 5 borrowers in your group will settle their loan debt?
Left column: Loan amount
Right column: Number of borrowers

8. Information about the loan granting in the periods 1-5

In period five, you will receive a one-time summary about the loan granting in the periods one to five. In total, there are 25 granted loans in the first five periods in your group. You learn how many of the 25 loans in your group were granted of the different loan sizes (10, 40, 70, and 100). Besides that, you receive the information haw many of the granted loans of the different sizes have been repaid by the borrowers. Finally, you will learn the average incomes, which have been earned with the granting of loans of the different loan sizes (10, 40, 70, and 100).

You will see the following screen:



Translation:
Line 1 and 2: In this period, you receive a one-time information about the past loan granting in your group of 5 lenders. For each of the four possible loan amounts you will get the following information:
Line 3: - How many loans of the respective site have been granted in periods 1-5.
Line 4: - How many of the granted loans of the respective size were repaid.
Line 5: - How high was the average income of a lender in your group, who granted a loan of the respective size.
First column: Loan amount.
Second column: Number of granted loans
Third column: Number of repaid loans
Fourth column: Average income per granted loan

Please not that this figure is an example in which all loan amounts, repayments and incomes have been replaced by the letters AAA, BBB and CCC! During the experiment you see the actual values depending on your loan granting behavior and the behavior of your group members.

9. Examples for possible incomes

Example 1: You decide to grant a loan of 100 points. The borrower decides to settle the loan debt of 250 points for a loan size of 100 points.

- Your income: 150 - 100 + 250 = 300 Points
- The income of the borrower: 150 + 400 - 250= 300 Points

Example 2: You decide to grant a loan of 100 points. The borrower decides not to repay the loan debt of 250 points for a loan size of 100 points.

- Your income: 150 - 100 = 50 Points
- The income of the borrower: 150 + 400 = 550 Points

Example 3: You decide to grant a loan of 10 points. The borrower decides to settle the loan debt of 25 points for a loan size of 10 points.

- Your income: 150 - 10 + 25 = 165 Points
- The income of the borrower: 150 + 40 - 25= 165 Points

Example 4: You decide to grant a loan of 10 points. The borrower decides not to repay the loan debt of 25 points for a loan size of 10 points.

- Your income: 150 - 10 = 140 Points
- The income of the borrower: 150 + 40 = 190 Points

Payment:

After the 10 periods, a participant is selected at random to come to the experimenter and draw 2 distinct numbers, one between 1 and 5 and one between 6 and 10. The numbers will be publicly announced and will determine the payment periods for all participants. Therefore, 2 different periods will be randomly selected for payment, one from the first 5 periods and one from the second 5 periods. The selected periods will be entered into the computer program by the experimenter. Your earnings will then be reported on the screen.

Your payoff is computed as follows:

Your payoff for pay period 1 in points
+ Your payoff for pay period 2 in points
= Your overall payoff in points

Your final payoff in Euro (100 points = 2 Euro)
+ The show up fee = 5 Euro
= Your payoff in Euro

After completion of the experiment and before we start with the payouts, please fill in the questionnaire that follows the experiment. When you have completed the questionnaire, please remain seated at your place before we start paying the participants. Please wait in your cabin until you are called by us to collect your payment. Please bring all documents you have received from us when you receive your payment.

The experiment begins when all participants are fully familiar with the procedure of the experiment and understand the consequences of their decisions and the decisions of others for their earnings. To ensure this, we ask you to solve some control questions. Your solutions to the control questions have no effect on the income you can earn in the experiment.

You receive the control questions below in paper form and on the computer screen. Please solve them on paper first. In order to verify the accuracy of your answers you are asked to answer the questions again on the computer screen.

The experiment begins once you have correctly solved all the control questions. After completion of the experiment, please fill in a questionnaire on the screen. Then the payout commences.

If you have any questions, please raise your hand. An experimenter will come to you and answer your question.

Control Questions

Question:

a) What is your endowment at the beginning of each period?

Answer:

b) What is the endowment of a borrower at the beginning of each period?

Answer:

c) What is the maximum loan amount?

Answer:

d) What is the minimum loan amount?

Answer:

e) Do borrowers have to settle the loan debt?

Answer:

f) You decide to grant a loan of 40. The borrower has decided to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the borrower?

Answer:

g) You decide to grant a loan of 40. The borrower has decided not to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the borrower?

Answer:

General Instructions for Borrowers

Welcome to the experimental laboratory!

Today, you will participate in an economics experiment. By participating, you can earn money. The amount of money you make depends on your own decisions and the decisions of other participants. Therefore, it is important that you carefully read the following instructions.

The instructions you have received from us are for your private information. **During the experiment, communication is absolutely prohibited.** If you have any questions, please contact us by raising your hands. An experimenter will come to you and answer your questions. Failure to comply with the rules will result in exclusion from the experiment and all payments. The decisions you make during the experiment are **anonymous**. Only the experimenter knows your identity but your decisions cannot be assigned to your identity.

For your participation in the experiment, you will receive a show up fee of **5 Euros**. The additional payment depends on your decisions and the decisions of other participants.

The experiment is divided into different periods. In each period, you have to make decisions that you enter in the computer. In total, there are 10 periods. At the end of the experiment, 2 periods are randomly selected for your payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. Your payment during the experiment will be calculated in **points**. The total number of points obtained in the two selected periods will be converted into Euros and then paid to you in cash. For the conversion, the following exchange rate applies:

100 Points = 2 Euro.

In total, you receive your earnings from the 2 payment periods plus the show up fee of 5 Euros in cash.

Please wait in your cabin during the payout phase until you are summoned by us to collect your payment. Please bring all the documents you have received from us when you receive your payment.

Before the experiment, all 20 participants were divided into two groups of 10 who independently participate in the experiment. In each group, there are 5 borrowers and 5 lenders.

Throughout the experiment, you are a borrower in your group of 10.

Brief overview about the experimental procedure

Throughout the experiment, your group consists of the same 10 persons: you (as a borrower), 4 other borrowers and 5 lenders.

The experiment consists of 10 periods. In each period, you will be randomly paired with one of the 5 lenders of your group of 10.

At the beginning of each period, each borrower and lender has an endowment of 150 point.

[Treatment Communication:] In each period, there is a communication phase, in which you as a borrower can decide to write a message to the lender you were paired with. Only borrowers can write a message and lenders can read it.

In each period, the lender you have been paired with has to decide on the loan amount he wants to grant. The granted loan has to be between 10 points and 100 points and can be either 10, 40, 70 or 100 points. The loan will be automatically invested in a project.

You will earn a project revenue, which is 4 times as high as the granted loan. Your loan debt is always two and a half times as high as the granted loan.

As a borrower, you have to decide whether you want to repay the loan debt or not.

At the end of each period, your income and the income of the lender are calculated. You and the lender will be informed about your income.

The experiment consists of 10 periods. At the end of the experiment, your income from each period is calculated and converted in Euros and 2 periods are randomly selected for payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. The points of these two periods will be converted into Euros and paid out in cash together with the 5 Euros show up fee.

Detailed information about the experimental procedure

Throughout the experiment, you are in a group of 10 people. The 9 others in your group are the same people during the whole experiment. Your group of 10 consists of 5 borrowers and 5 lenders. You are a borrower during the entire experiment.

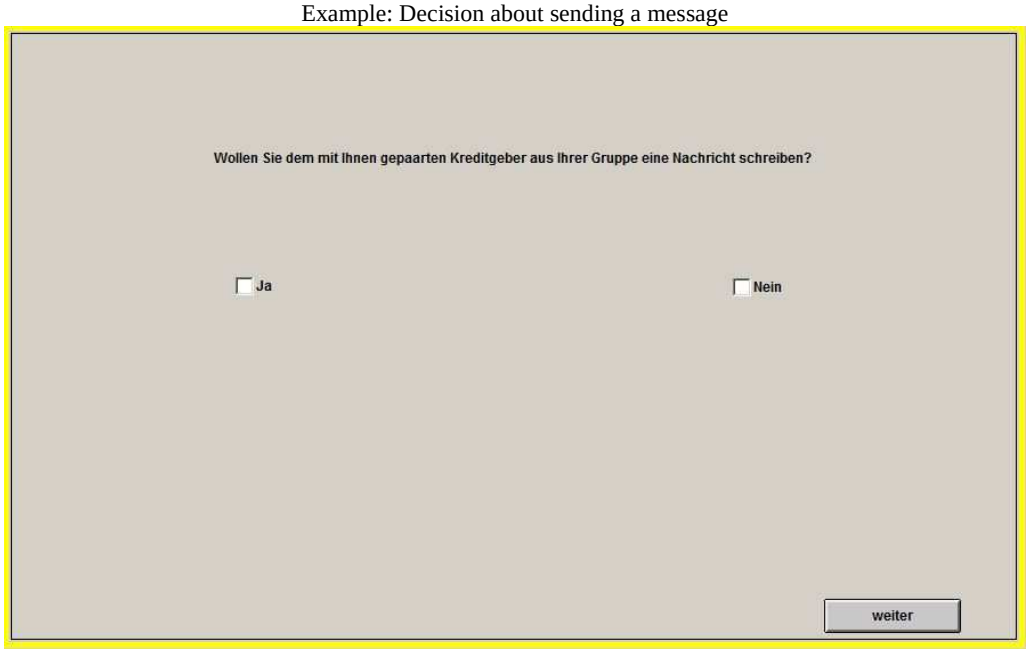
In each period, you will be paired with a lender from your group of 10. In each period, a new pairing will be randomly selected. Thus, in course of the experiment you will be paired with different lenders from your group of 10.

0. Communication *(only for communication treatment)*

At the beginning of each period, you can decide whether you want to send a message to the lender you were paired with. This message can contain up to 300 signs and you have to enter the message into the system. You can also decide not to write a message to the lender. Only you as a borrower can send a message. The lender can read it but he cannot reply to it.

You will see the following screen and can decide whether you want to write e message or not. If you decide not to send a message, go directly to the decision phase of the corresponding period:

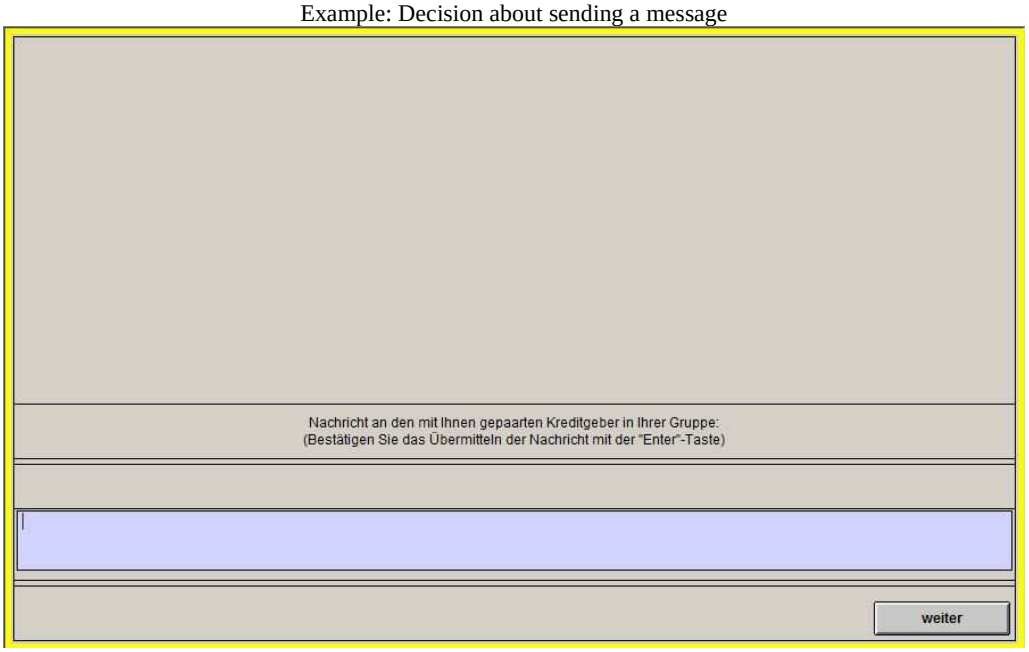
Example: Decision about sending a message



Translation:
Line 1: Do you want to send a message to the lender you were paired with?
Line 2: Yes No

Click "yes", if you decide to write a message to the lender you were paired with and then click next. After that, you will see the following screen:

Example: Decision about sending a message



Translation
Line 1: Message to the lender you were paired with:
Line 2: (Please confirm the transmission of the message by clicking "Enter")

Enter your message in the field highlighted in blue and confirm your entry by clicking "Enter". Following, click "next". Please note that you have to type the complete message and only click "Enter" at the end of the message. Please use the "Enter"-key only to send your message and not to make a line break.

1. Loan, project revenue and loan debt

At the beginning of each period, you and all the other borrowers have an endowment of 150 points. Each lender has also an endowment of 150 points.

The lender you have been paired with has to decide on the amount of the loan he grants you. There are 4 different loan amounts that can be granted. The amount of the loan is either 10, 40, 70 or 100 points.

The loan is automatically invested in a project. You will get a project revenue, which is four times as large as the granted loan (e.g. 280 in case of a loan amount of 70). Your loan debt is two and a half times as large as the loan amount (e.g. 175 in case of a loan amount of 70).

Table: Project revenue and loan debt

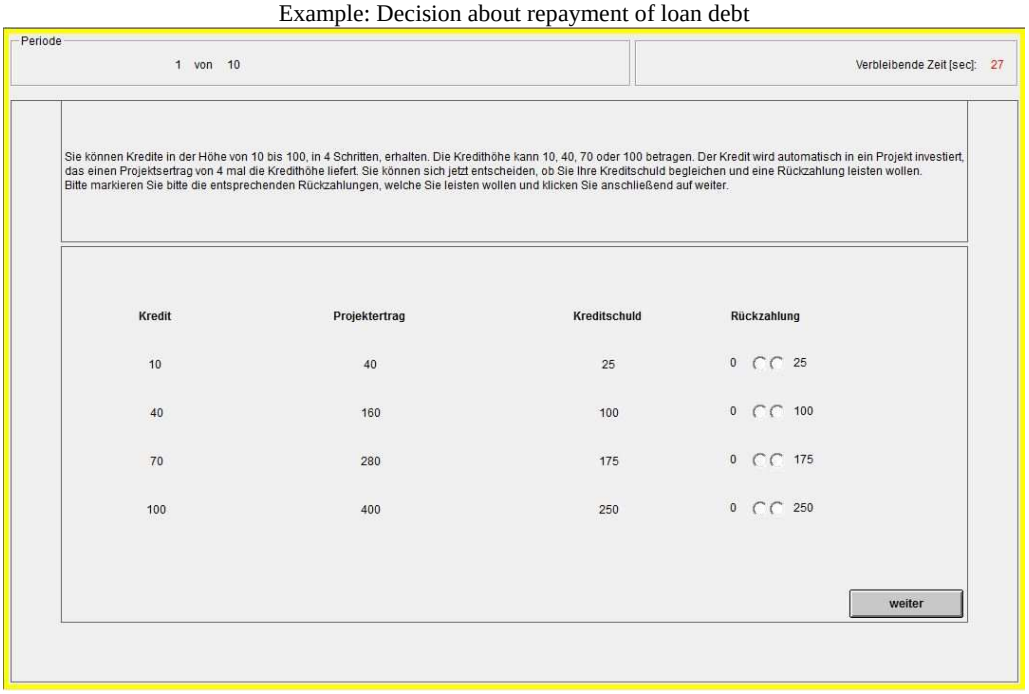
Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250

2. Repayment of loan debt

You have to decide whether you want to settle the loan debt. You make your repayment decision in each period, before you get to know which loan amount the lender has granted you. Therefore, you have to decide for each of the four loan amounts whether you repay your loan debt.

Below, you can see the corresponding decision screen:

Example: Decision about repayment of loan debt



Translation
Line 1, 2 and 3: You can get a loan between 10 points and 100 points. There are 4 different loan amounts that can be granted to you. The amount of the loan is either 10, 40, 70 or 100 points. The loan is automatically invested in a project. The project revenue is four times as large as the granted loan. You can now decide whether you settle your loan debt and make a repayment. Please indicate the corresponding repayment, which you want to make and then click next.

1. Column: Loan
2. Column: Project revenue
3. Column: Loan debt
4. Column: Repayment

If you decide to settle your loan debt, the repayment will be equal to the loan debt.

3. Your income

In each period, your income will depend on:

- the size of the loan of the lender,
- your repayment decision.

Your income is determined by your endowment from the beginning of a period plus the project revenue minus the repayment.

Your income = 150 + project revenue - repayment

Thus, your income depends largely on the loan the lender grants you. Further, you can increase your income by deciding not to settle your loan debt and not to make a repayment.

In the following table, you can see your income for each possible loan amount:

Table: Income of the borrower

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250
Your income				
in case of repayment	165	210	255	300
in case of no repayment	190	310	430	550

4. Income of lender

In each period, the income of the lender will depend on:

- the size of the loan of the lender,
- your repayment decision.

The income of the lender is determined by the endowment at the beginning of a period minus the loan plus your repayment.

Income = 150 - loan + repayment

Thus, the income of the lender depends largely on your repayment. If you decide to settle your loan debt, the income of the lender is higher in case of a larger loan (because the repayment is larger than the loan in case of a project success). If you do not repay your loan debt, the income of the lender is higher if he grants the smallest possible loan amount.

In the following table, you can see the income of the lender for each possible loan amount:

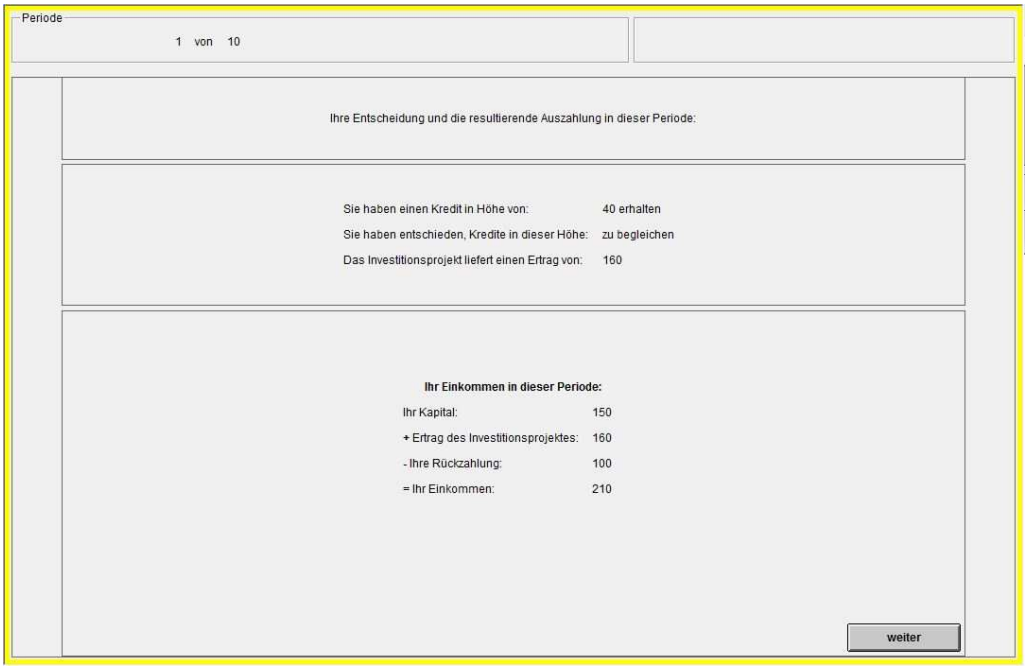
Table: Income of the lender

Loan amount	10	40	70	100
Project revenue	40	160	280	400

Loan debt	25	100	175	250
Income of the lender				
in case of repayment	165	210	255	300
in case of no repayment	140	110	80	50

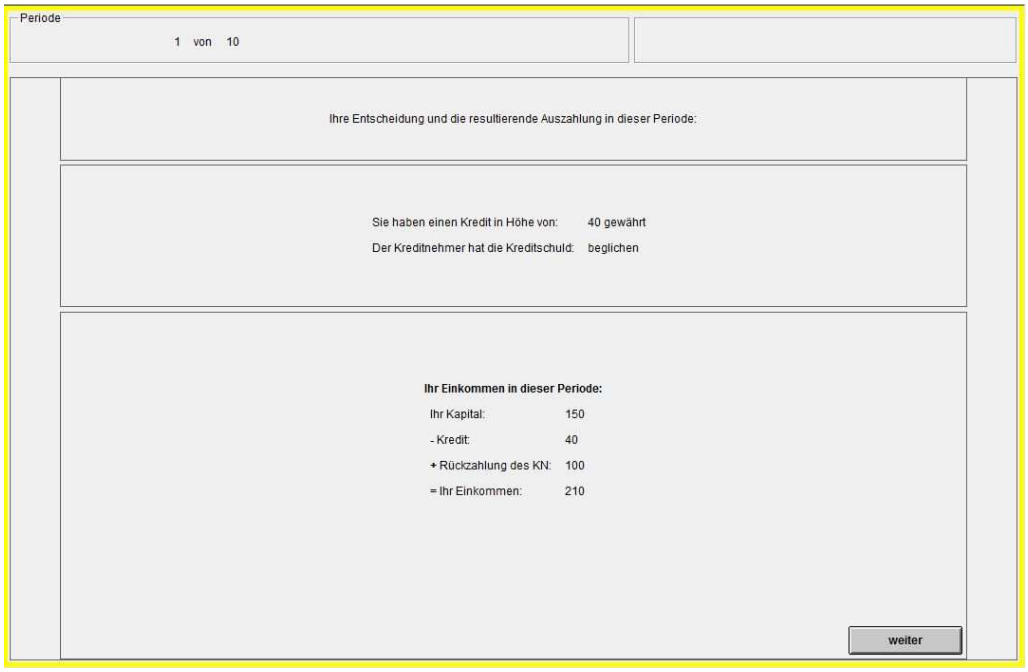
5. Information about your income

At the end of each period, you will get information about your income on your screen, which will look as follows:



Translation
Line 1: Your decision and the resulting payment in this period:
Line 2: You got a loan of 40
Line 3: You have decided to settle the loan debt
Line 4: The investment project yields a revenue of 160
Line 5: Your income in this period:
Line 6: Your endowment: 150
Line 7: + Project revenue 160
Line 8: - Your repayment 100
Line 9: = Your income: 210

At the end of each period, the lender will get information about his income on his screen, which will look as follows:



Translation
Line 1: Your decision and the resulting payment in this period:
Line 2: You have granted a loan amount of 40
Line 3: The borrower has settled the loan debt
Line 4: Your income in this period:
Line 5: Your endowment: 150
Line 6: - Loan: 40
Line 7: + Repayment of the borrower: 100
Line 8: = Your income: 210

The lender will see his chosen loan amount, whether he gets a repayment and his income.

6. Examples for possible incomes

Example 1: The lender decides to grant a loan of 100 points. You decide to settle the loan debt of 250 points for a loan size of 100 points.

- The income of the lender: 150 - 100 + 250 = 300 Points
- Your income: 150 + 400 - 250= 300 Points

Example 2: The lender decides to grant a loan of 100 points. You decide not to repay the loan debt of 250 points for a loan size of 100 points.

- The income of the lender: 150 - 100 = 50 Points
- Your income: 150 + 400 = 550 Points

Example 3: The lender decides to grant a loan of 10 points. You decide to settle the loan debt of 25 points for a loan size of 10 points.

- The income of the lender: 150 - 10 + 25 = 165 Points
- Your income: 150 + 40 - 25= 165 Points

Example 4: The lender decides to grant a loan of 10 points. You decide not to repay the loan debt of 25 points for a loan size of 10 points.

- The income of the lender: 150 - 10 = 140 Points
- Your income: 150 + 40 = 190 Points

Payment:

After the 10 periods, a participant is selected at random to come to the experimenter and draw 2 distinct numbers, one between 1 and 5 and one between 6 and 10. The numbers will be publicly announced and will determine the payment periods for all participants. Therefore, 2 different periods will be randomly selected for payment, one from the first 5 periods and one from the second 5 periods. The selected periods will be entered into the computer program by the experimenter. Your earnings will then be reported on the screen.

Your payoff is computed as follows:

Your payoff for pay period 1 in points
+ Your payoff for pay period 2 in points
= Your overall payoff in points

Your final payoff in Euro (100 points = 2 Euro)
+ The show up fee = 5 Euro
= Your payoff in Euro

After completion of the experiment and before we start with the payouts, please fill in the questionnaire that follows the experiment. When you have completed the questionnaire, please remain seated at your place before we start paying the participants. Please wait in your cabin until you are called by us to collect your payment. Please bring all documents you have received from us when you receive your payment.

The experiment begins when all participants are fully familiar with the procedure of the experiment and understand the consequences of their decisions and the decisions of others for their earnings. To ensure this, we ask you to solve some control questions. Your solutions to the control questions have no effect on the income you can earn in the experiment.

You receive the control questions below in paper form and on the computer screen. Please solve them on paper first. In order to verify the accuracy of your answers you are asked to answer the questions again on the computer screen.

The experiment begins once you have correctly solved all the control questions. After completion of the experiment, please fill in a questionnaire on the screen. Then the payout commences.

If you have any questions, please raise your hand. An experimenter will come to you and answer your question.

Control Questions

Question:

a) What is your endowment at the beginning of each period?

Answer:

b) What is the endowment of a lender at the beginning of each period?

Answer:

c) What is the maximum loan amount?

Answer:

d) What is the minimum loan amount?

Answer:

e) Do you have to settle the loan debt?

Answer:

f) The lender has decided to grant a loan of 40. You have decided to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the lender?

Answer:

g) The lender has decided to grant a loan of 40. You have decided not to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the lender?

Answer:

General Instructions for Lenders

Welcome to the experimental laboratory!

Today, you will participate in an economics experiment. By participating, you can earn money. The amount of money you make depends on your own decisions and the decisions of other participants. Therefore, it is important that you carefully read the following instructions.

The instructions you have received from us are for your private information. **During the experiment, communication is absolutely prohibited.** If you have any questions, please contact us by raising your hands. An experimenter will come to you and answer your questions. Failure to comply with the rules will result in exclusion from the experiment and all payments. The decisions you make during the experiment are **anonymous**. Only the experimenter knows your identity but your decisions cannot be assigned to your identity.

For your participation in the experiment, you will receive a show up fee of **5 Euros**. The additional payment depends on your decisions and the decisions of other participants.

The experiment is divided into different periods. In each period, you have to make decisions that you enter in the computer. In total there are 10 periods. At the end of the experiment, 2 periods are randomly selected for your payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. Your payment during the experiment will be calculated in **points**. The total number of points obtained in the two selected periods will be converted into Euros and then paid to you in cash. For the conversion, the following exchange rate applies:

100 Points = 2 Euro.

In total, you receive your earnings from the 2 payment periods plus the show up fee of 5 Euros in cash.

Please wait in your cabin during the payout phase until you are summoned by us to collect your payment. Please bring all the documents you have received from us when you receive your payment.

Before the experiment, all 20 participants were divided into two groups of 10 who independently participate in the experiment. In each group, there are 5 borrowers and 5 lenders.

Throughout the experiment, you are a lender in your group of 10.

Brief overview about the experimental procedure

Throughout the experiment, your group consists of the same 10 persons: you (as a lender), 4 other lenders and 5 borrowers.

The experiment consists of 10 periods. In each period, you will be randomly paired with on of the 5 borrowers of your group of 10.

At the beginning of each period, each borrower and lender has an endowment of 150 point.

[Treatments with communication:] In each period, there is a communication phase, in which borrowers can decide to write a message to the lender they were paired with. Only borrowers can write a message and lenders can read it.

In each period, you have to decide on the amount of the loan for the borrower you have been paired with. The granted loan has to be between 10 points and 100 points and can be either 10, 40, 70 or 100 points. The loan will be automatically invested in a project. Whether the project is a success is determined randomly.

By granting a loan to a borrower, the borrower will incur a loan debt, which will be two and a half times larger than the granted loan.

The probability that a project is a success is 66%. Therefore, a project is on average in two out of three cases a success. In case of a project success the borrower earns a project revenue, which is four times larger than the granted loan. After the project success, the borrower has to decide whether he wants to settle the outstanding loan debt.

The probability that the project is not a success is 33%. Therefore, a project is on average in one out of three cases not successful. In case of an unsuccessful project, the borrower does not get a project revenue and cannot settle his loan debt.

[Treatment N-R and C-R:] At the end of each period, you will get information on whether the project was a success and you will learn the repayment decision of the borrower.

[Not displayed in N-R and C-R (N-H and C-H only):]You do not get instantaneous information about whether the project was a success or not and you do not get to know the repayment decision of the borrower. If you do not get a repayment, you therefore do not know whether the project was not a success and the borrower could not make a repayment or whether the project was a success but the borrower did not want to make a repayment. After five periods, you will receive a one-time summary on the amount of granted loans for the different loan amounts, how many of these loans have been repaid and the average income for the respective loan amount.

At the end of each period, your income and the income of the borrower are calculated. You and the borrower will be informed about your income.

The experiment consists of 10 periods. At the end of the experiment, your income from each period is calculated and converted in Euros and 2 periods are randomly selected for payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. The points of these two periods will be converted into Euros and paid out in cash together with the 5 Euros show up fee.

Detailed information about the experimental procedure

Throughout the experiment, you are in a group of 10 people. The 9 others in your group are the same people during the whole experiment. Your group of 10 consists of 5 borrowers and 5 lenders. You are a lender during the entire experiment.

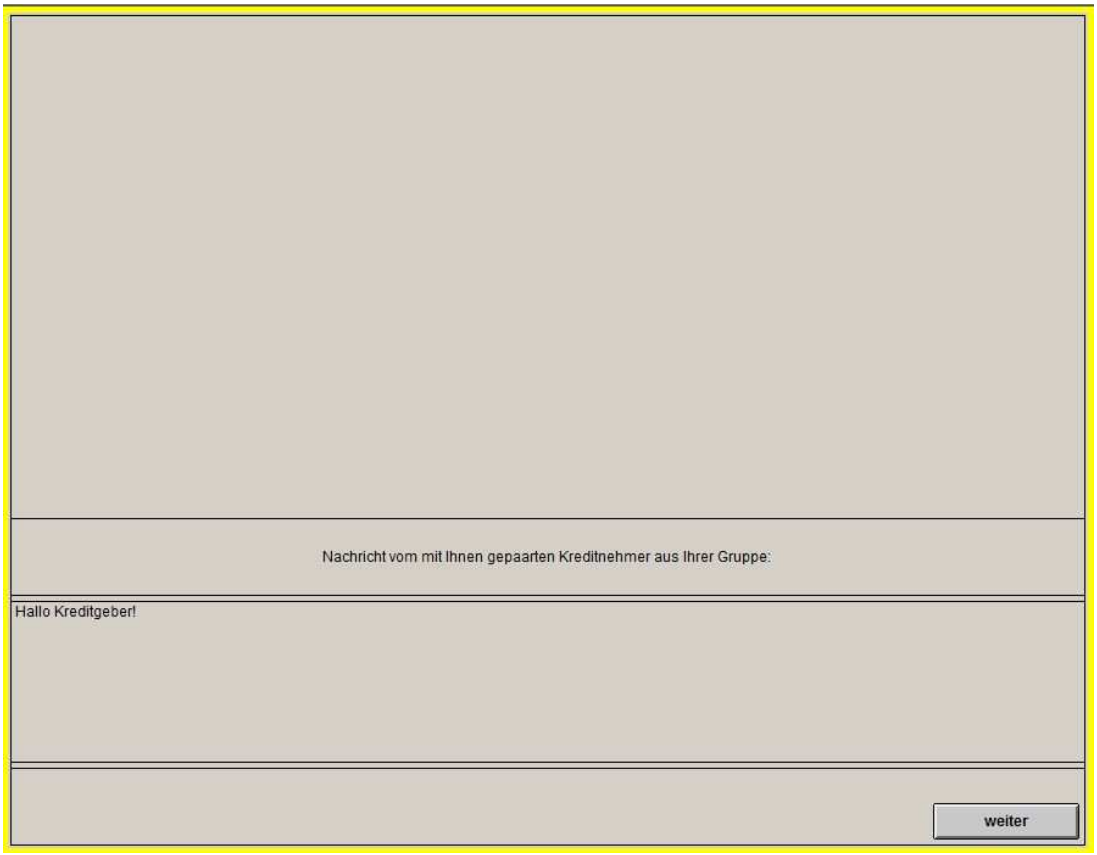
In each period, you will be paired with a borrower from your group of 10. In each period, a new pairing will be randomly selected. Thus, in course of the experiment you will be paired with different borrowers from your group of 10.

0. Communication *(only for communication treatment)*

Borrowers can decide in each period whether they want to send a message to the lender they were paired with. This message can contain up to 300 signs. Borrowers can also decide not to write a message to the lender. Only borrowers can send a message. You as a lender can read it but you cannot reply to it.

If the borrower you were paired with decides to write you a message, you will see the following screen:

Example: Message from borrower to lender



Translation:
Line 1: Message from borrower of your group you were paired with.
Line 2: Hello lender!

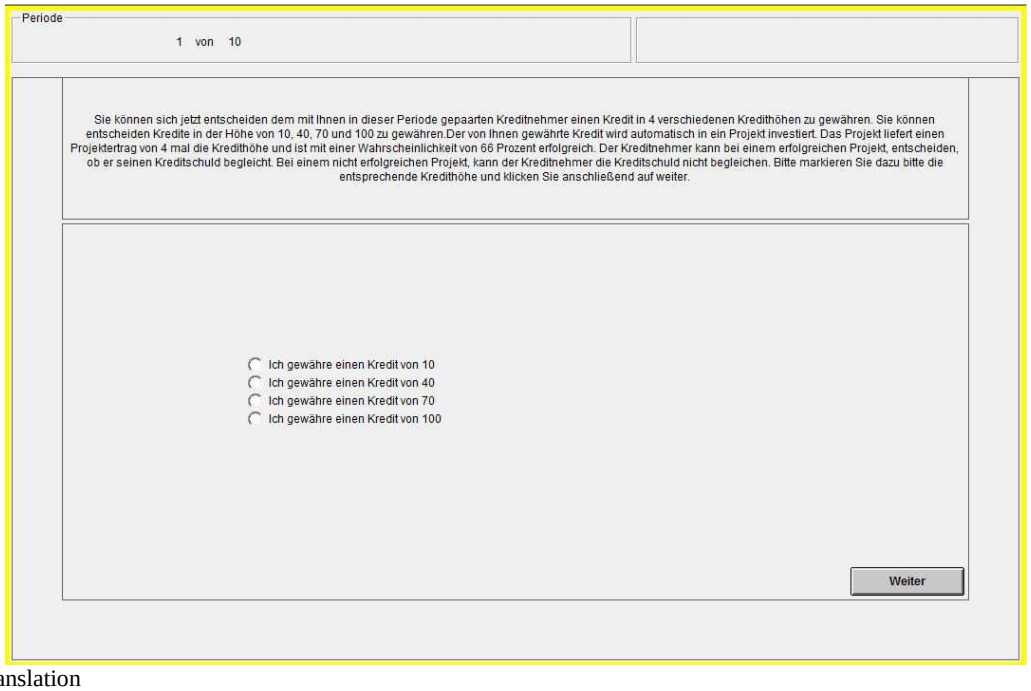
In the example above, the borrower has written «Hello lender!». After you have read the message, you can proceed with the experiment by clicking the "next"-button.

1. Granting of loan

At the beginning of each period, you and all the other lenders have an endowment of 150 points. Each borrower has also an endowment of 150 points.

You have to decide on the size of the loan for the borrower you have been paired with. You can grant a loan between 10 points and 100 points. There are 4 different loan amounts that can be granted. The amount of the loan is either 10, 40, 70 or 100 points.
You can only grant one loan and you see the following screen:

Example: Granting of loan to borrower



Translation
Line 1, 2, 3, 4 and 5: You can now decide to grant a loan to the borrower you were paired with. There are 4 different loan amounts that can be granted. The amount of the loan is either 10, 40, 70 or 100 points. The loan is automatically invested in a project. The project yields a revenue, which is four times as large as the granted loan and will be successful with a probability of 66%. In case of a project success, the borrower can decide whether he wants to settle the loan debt. In case of an unsuccessful project, the borrower is not able to repay the loan debt. Please indicate the corresponding loan amount and then click next.
Line 6: I grant a loan of 10
Line 7: I grant a loan of 40
Line 8: I grant a loan of 70
Line 9: I grant a loan of 100

2. Project revenue and loan debt

The loan is automatically invested in a project. The project is a success with a probability of 66%, with a probability of 33% the project is no success. Thus, a project is on average successful in two out of three cases and unsuccessful in one out of three cases. Whether the project is a success is randomly determined by a computer program. The probability that a project is a success is the same for all borrowers in your group.

If the project is a success, borrowers earn a project revenue, which is four times as high as the granted loan (e.g. 280 in case of a loan amount of 70). The loan debt owed to you as the lender is two and a half times as large as the loan amount (e.g. 175 in case of a loan amount of 70).

Table: Project revenue and loan debt

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250

If the project is not a success, borrowers earn a project revenue of 0.

3. Repayment of loan debt

In case of a project success, the borrower has to decide whether he wants to settle the loan debt. If the borrower decides to repay the loan debt, the repayment is equal the loan debt amount, otherwise the repayment is 0.

If the project is not a success, the borrower cannot repay is loan debt and the repayment is 0.

4. Your income

In each period, your income will depend on:

- the size of the loan to the borrower,
- whether the project is a success,
- the repayment decision of the borrower.

Your income is determined by your endowment from the beginning of a period minus the loan plus the repayment of the borrower.

Your income = 150 - loan + repayment

In case of a project success, your income thus depends largely on the repayment of the borrower. If the borrower decides to settle his loan debt, your income is higher if you grant a large loan (because the repayment is larger than the loan in case of a project success). If the borrower does not repay his loan debt, your income is higher if you grant the smallest possible loan amount.

If the project is not a success, borrowers cannot repay the loan debt. Your income as lender is determined by your endowment from the beginning of a period minus the loan.

Your income = 150 – loan

In the following table, you can see your income as lender for each possible loan amount:

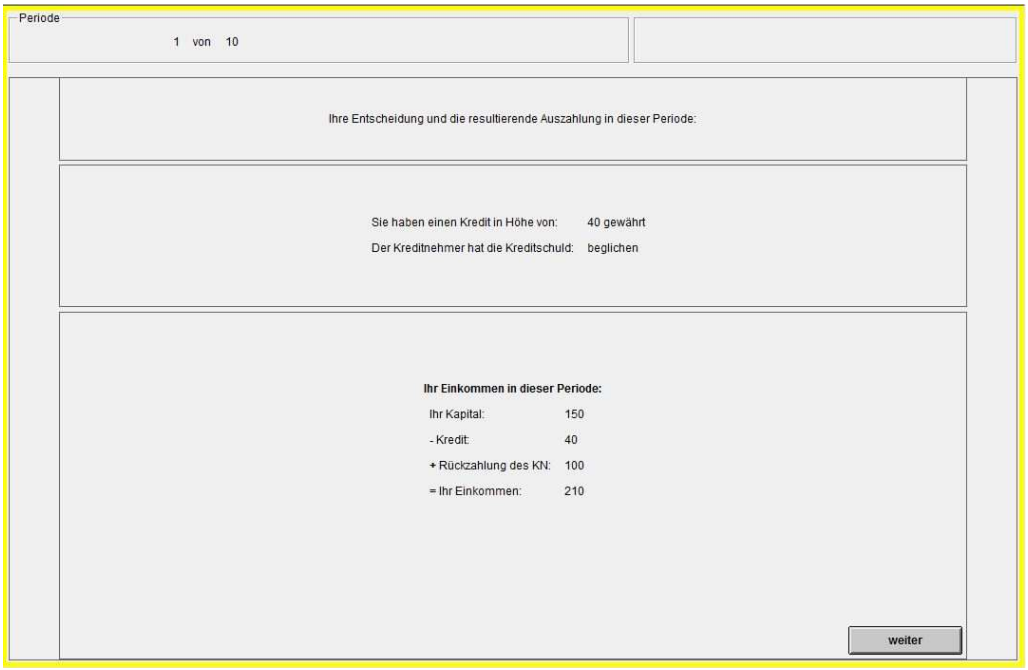
Table: Income of the lender

Loan amount	10	40	70	100
Project revenue in case of success	40	160	280	400
Loan debt	25	100	175	250
Your income				
In case of success and repayment	165	210	255	300
In case of success and no repayment	140	110	80	50
In case of no success	140	110	80	50

[Not displayed in N-R and C-R (N-H and C-H only):] As you can see in the table above, you cannot distinguish whether a loan debt is not settled because the repayment was not made even if the project was a success or because the project was not a success and the repayment could not be made.

5. Information about your income

At the end of each period, you will get information about your income on your screen, which will look as follows:



Translation
Line 1: Your decision and the resulting payment in this period:
Line 2: You have granted a loan amount of 40
Line 3: The borrower has settled the loan debt
Line 4: Your income in this period:
Line 5: Your endowment: 150
Line 6: - Loan: 40
Line 7: + Repayment of the borrower: 100
Line 8: = Your income: 210

Note the following: You *[only]* get to know your chosen loan amount, whether you receive a repayment and your income. *[Not displayed in N-R and C-R (N-H and C-H only):] If a loan debt is not settled you will not know whether the project was not a success or whether the borrower has decided not to repay his loan debt.*

[N-R and C-R]: If a loan debt is not settled you will learn whether this is because the project was not a success or because a borrower decided not to repay his loan.

6. Income of the borrower

In each period, the income of the borrower depends on:

- the size of the loan to the borrower,
- whether the project is a success,
- and whether the borrower settles his loan debt.

In case of a project success, the income of the borrower is determined by the endowment at the beginning of a period plus the project revenue minus the repayment.

Income = 150 + project revenue - repayment

In case of a project success, the income of the borrower is therefore the higher the larger the loan you granted. Additionally, borrowers can increase their income by deciding not to settle their loan debt and not making a repayment.

In case the project is not a success, the income of the borrower is determined by the endowment at the beginning of a period.

Income = 150

In the following table, you can see the possible incomes of a borrower for each loan amount.

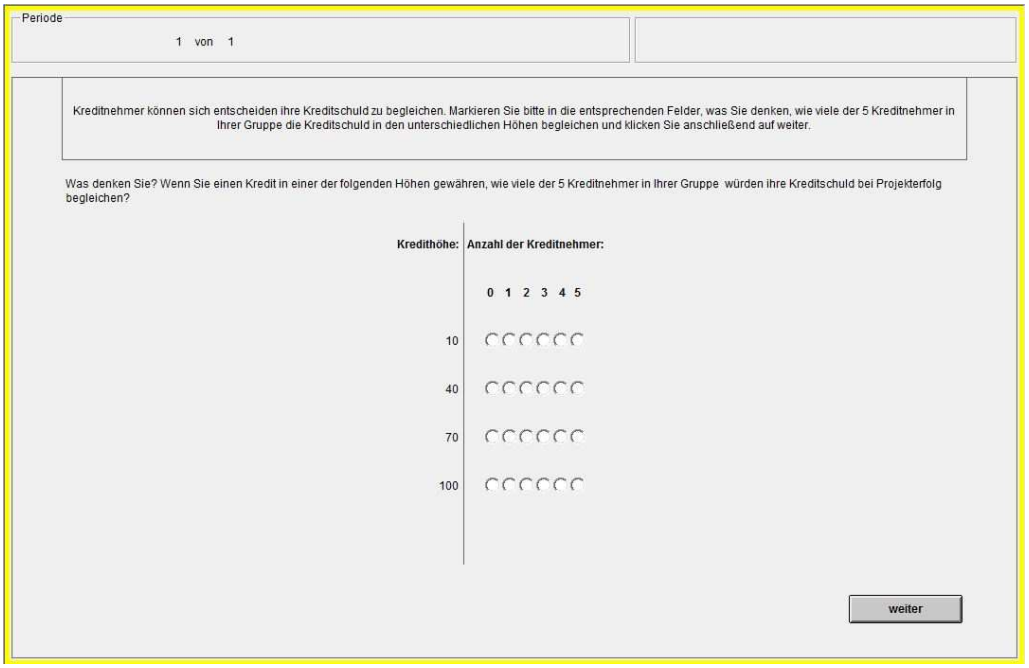
Table: Income of the borrower

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250
Income of borrower				
In case of success and repayment	165	210	255	300
In case of success and no repayment	190	310	430	550
In case of no success	150	150	150	150

7. Your beliefs about the repayment behavior of the borrower

In period 1, 5 and 10, you as a borrower will be asked to indicate your belief about how many borrowers in your group will repay their loan debt for the different loan amounts.

For that, you will see the following screen in period 1, 5 and 10:

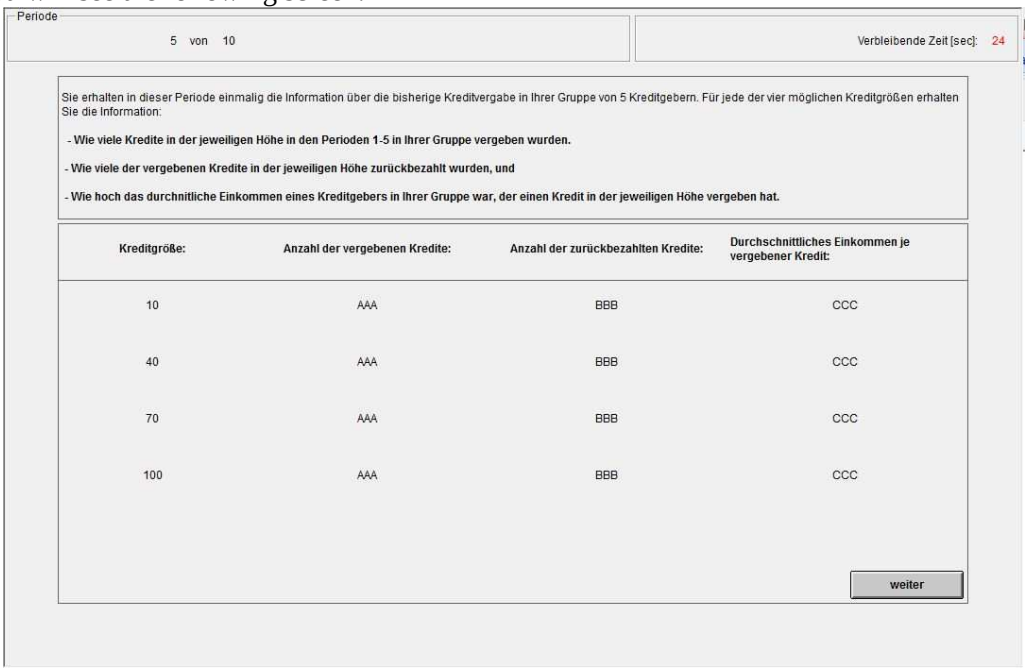


Translation:
Line 1 and 2: Borrowers can decide to settle their loan debt. Pleas mark in the corresponding box, how many of the 5 borrowers you believe to settle their debt for the different loan amounts. Subsequently, klick next.
Line 3: What do you think? If you grant a loan of the following amount, how many of the 5 borrowers in your group will settle their loan debt?
Left column: Loan amount
Right column: Number of borrowers

8. Information about the loan granting in the periods 1-5

In period five, you will receive a one-time summary about the loan granting in the periods one to five. In total, there are 25 granted loans in the first five periods in your group. You learn how many of the 25 loans in your group were granted of the different loan sizes (10, 40, 70, and 100). Besides that, you receive the information haw many of the granted loans of the different sizes have been repaid by the borrowers. Finally, you will learn the average incomes, which have been earned with the granting of loans of the different loan sizes (10, 40, 70, and 100).

You will see the following screen:



Translation:
Line 1 and 2: In this period, you receive a one-time information about the past loan granting in your group of 5 lenders. For each of the four possible loan amounts you will get the following information:
Line 3: - How many loans of the respective site have been granted in periods 1-5.
Line 4: - How many of the granted loans of the respective size were repaid.
Line 5: - How high was the average income of a lender in your group, who granted a loan of the respective size.
First column: Loan amount.
Second column: Number of granted loans
Third column: Number of repaid loans
Fourth column: Average income per granted loan

Please not that this figure is an example in which all loan amounts, repayments and incomes have been replaced by the letters AAA, BBB and CCC! During the experiment, you see the actual values depending on your loan granting behavior and the behavior of your group members.

9. Examples for possible incomes

Example 1: You decide to grant a loan of 100 points. The project is a success. The borrower decides to settle the loan debt of 250 points for a loan size of 100 points.

- Your income: 150 - 100 + 250 = 300 Points
- The income of the borrower: 150 + 400 - 250= 300 Points

Example 2: You decide to grant a loan of 100 points. The project is a success. The borrower decides not to repay the loan debt of 250 points for a loan size of 100 points.

- Your income: 150 - 100 = 50 Points
- The income of the borrower: 150 + 400 = 550 Points

Example 3: You decide to grant a loan of 100 points. The project is not a success.

- Your income: 150 - 100 = 50 Points
- The income of the borrower: 150 Points

Example 4: You decide to grant a loan of 10 points. The project is a success. The borrower decides to settle the loan debt of 25 points for a loan size of 10 points.

- Your income: 150 - 10 + 25 = 165 Points
- The income of the borrower: 150 + 40 - 25= 165 Points

Example 5: You decide to grant a loan of 10 points. The project is a success. The borrower decides not to repay the loan debt of 25 points for a loan size of 10 points.

- Your income: 150 - 10 = 140 Points
- The income of the borrower: 150 + 40 = 190 Points

Example 6: You decide to grant a loan of 10 points. The project is not a success.

- Your income: 150 - 10 = 140 Points
- The income of the borrower: 150 Points

Payment:

After the 10 periods, a participant is selected at random to come to the experimenter and draw 2 distinct numbers, one between 1 and 5 and one between 6 and 10. The numbers will be publicly announced and will determine the payment periods for all participants. Therefore, 2 different periods will be randomly selected for payment, one from the first 5 periods and one from the second 5 periods. The selected periods will be entered into the computer program by the experimenter. Your earnings will then be reported on the screen.

Your payoff is computed as follows:

Your payoff for pay period 1 in points
+ Your payoff for pay period 2 in points
= Your overall payoff in points

Your final payoff in Euro (100 points = 2 Euro)
+ The show up fee = 5 Euro
= Your payoff in Euro

After completion of the experiment and before we start with the payouts, please fill in the questionnaire that follows the experiment. When you have completed the questionnaire, please remain seated at your place before we start paying the participants. Please wait in your cabin until you are called by us to collect your payment. Please bring all documents you have received from us when you receive your payment.

The experiment begins when all participants are fully familiar with the procedure of the experiment and understand the consequences of their decisions and the decisions of others for their earnings. To ensure this, we ask you to solve some control questions. Your solutions to the control questions have no effect on the income you can earn in the experiment.

You receive the control questions below in paper form and on the computer screen. Please solve them on paper first. In order to verify the accuracy of your answers you are asked to answer the questions again on the computer screen.

The experiment begins once you have correctly solved all the control questions. After completion of the experiment, please fill in a questionnaire on the screen. Then the payout commences.

If you have any questions, please raise your hand. An experimenter will come to you and answer your question.

Control Questions

Question:

a) What is your endowment at the beginning of each period?

Answer:

b) What is the endowment of a borrower at the beginning of each period?

Answer:

c) What is the maximum loan amount?

Answer:

d) What is the minimum loan amount?

Answer:

e) What is the probability of a project success?

Answer:

f) Do borrowers have to settle the loan debt?

Answer:

g) You decide to grant a loan of 40. The project is a success. The borrower has decided to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the borrower?

Answer:

h) You decide to grant a loan of 40. The project is a success. The borrower has decided not to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the borrower?

Answer:

i) You decide to grant a loan of 40. The project is not a success.

- What is your income?
- What is the income of the borrower?

Answer:

General Instructions for Lenders

Welcome to the experimental laboratory!

Today, you will participate in an economics experiment. By participating, you can earn money. The amount of money you make depends on your own decisions and the decisions of other participants. Therefore, it is important that you carefully read the following instructions.

The instructions you have received from us are for your private information. **During the experiment, communication is absolutely prohibited.** If you have any questions, please contact us by raising your hands. An experimenter will come to you and answer your questions. Failure to comply with the rules will result in exclusion from the experiment and all payments. The decisions you make during the experiment are **anonymous**. Only the experimenter knows your identity but your decisions cannot be assigned to your identity.

For your participation in the experiment, you will receive a show up fee of **5 Euros**. The additional payment depends on your decisions and the decisions of other participants.

The experiment is divided into different periods. In each period, you have to make decisions that you enter in the computer. In total, there are 10 periods. At the end of the experiment, 2 periods are randomly selected for your payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. Your payment during the experiment will be calculated in **points**. The total number of points obtained in the two selected periods will be converted into Euros and then paid to you in cash. For the conversion, the following exchange rate applies:

100 Points = 2 Euro.

In total, you receive your earnings from the 2 payment periods plus the show up fee of 5 Euros in cash.

Please wait in your cabin during the payout phase until you are summoned by us to collect your payment. Please bring all the documents you have received from us when you receive your payment.

Before the experiment, all 20 participants were divided into two groups of 10 who independently participate in the experiment. In each group, there are 5 borrowers and 5 lenders.

Throughout the experiment, you are a lender in your group of 10.

Brief overview about the experimental procedure

Throughout the experiment, your group consists of the same 10 persons: you (as a borrower), 4 other borrowers and 5 lenders.

The experiment consists of 10 periods. In each period, you will be randomly paired with one of the 5 lenders of your group of 10.

At the beginning of each period, each borrower and lender has an endowment of 150 point.

[Treatment Communication:] In each period, there is a communication phase, in which you as a borrower can decide to write a message to the lender you were paired with. Only borrowers can write a message and lenders can read it.

In each period, the lender you have been paired with has to decide on the loan amount he wants to grant. The granted loan has to be between 10 points and 100 points and can be either 10, 40, 70 or 100 points. The loan will be automatically invested in a project. Whether the project is a success is determined randomly.

Your loan debt is always two and a half times as high as the granted loan.

The probability that a project is a success is 66%. Therefore, a project is on average in two out of three cases a success. In case of a project success, you earn a project revenue, which is four times larger than the granted loan. After the project success, you have to decide whether you want to settle the outstanding loan debt.

The probability that the project is not a success is 33%. Therefore, a project is on average in one out of three cases not successful. In case of an unsuccessful project, you do not get a project revenue and cannot settle your loan debt.

[Treatment N-R and C-R:] At the end of each period, your lender will get information on whether the project was a success and he will learn your repayment decision.

[Not displayed in N-R and C-R (N-H and C-H only):]Your lender does not get information about whether the project was a success or not and he also does not learn your repayment decision. If the lender does not get a repayment, he therefore does not know whether the project was not a success and you could not make a repayment or whether the project was a success but you did not want to make a repayment.

At the end of each period, your income and the income of the lender are calculated. You and the lender will be informed about your income.

The experiment consists of 10 periods. At the end of the experiment, your income from each period is calculated and converted in Euros and 2 periods are randomly selected for payment. For that, one period from period 1 to 5 and one period from period 6 to 10 will be randomly selected. The points of these two periods will be converted into Euros and paid out in cash together with the 5 Euros show up fee.

Detailed information about the experimental procedure

Throughout the experiment, you are in a group of 10 people. The 9 others in your group are the same people during the whole experiment. Your group of 10 consists of 5 borrowers and 5 lenders. You are a borrower during the entire experiment.

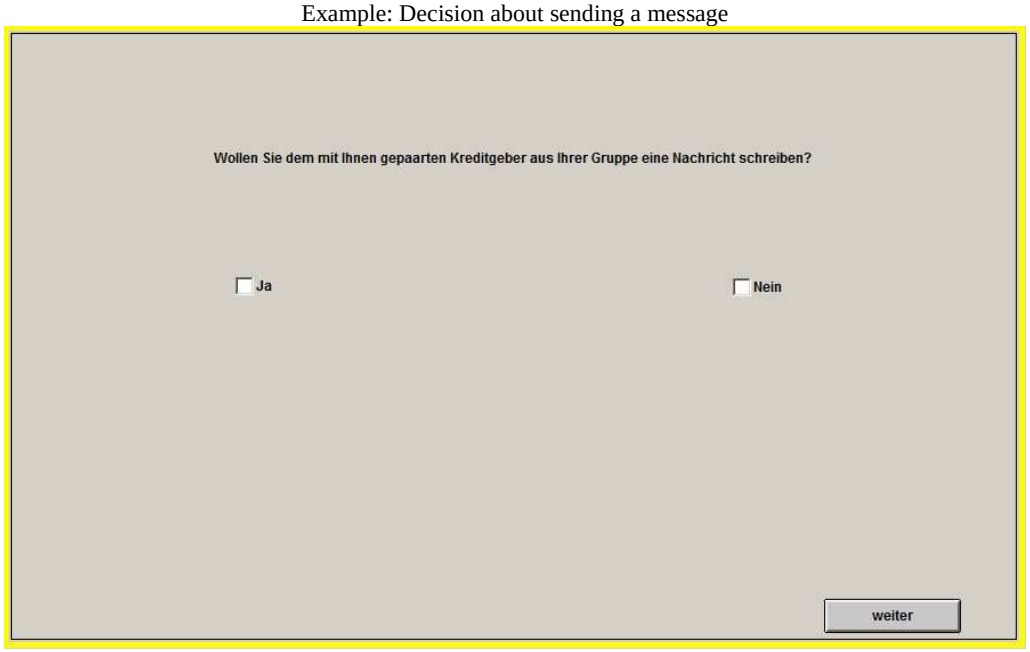
In each period, you will be paired with a lender from your group of 10. In each period, a new pairing will be randomly selected. Thus, in course of the experiment you will be paired with different lenders from your group of 10.

0. Communication *(only for communication treatments)*

At the beginning of each period, you can decide whether you want to send a message to the lender you were paired with. This message can contain up to 300 signs and you have to enter the message into the system. You can also decide not to write a message to the lender. Only you as a borrower can send a message. The lender can read it but he cannot reply to it.

You will see the following screen and can decide whether you want to write e message or not. If you decide not to send a message, go directly to the decision phase of the corresponding period.

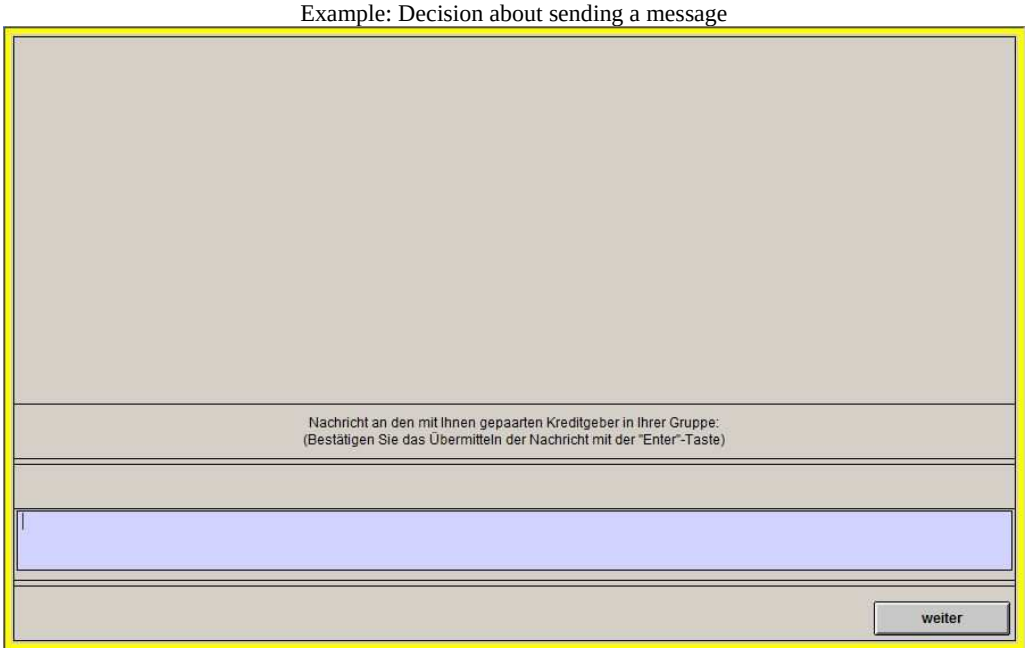
Example: Decision about sending a message



Translation:
Line 1: Do you want to send a message to the lender you were paired with?
Line 2: Yes No

Click "yes", if you decide to write a message to the lender you were paired with and then click next. After that, you will see the following screen:

Example: Decision about sending a message



Translation
Line 1: Message to the lender you were paired with:
Line 2: (Please confirm the transmission of the message by clicking "Enter")

Enter your message in the field highlighted in blue and confirm your entry by clicking "Enter". Following, click "next". Please note that you have to type the complete message and only click "Enter" at the end of the message. Please use the "Enter"-key only to send your message and not to make a line break.

1. Loan, project revenue and loan debt

At the beginning of each period, you and all the other borrowers have an endowment of 150 points. Each lender has also an endowment of 150 points.

The lender you have been paired with has to decide on the amount of the loan he grants you. There are 4 different loan amounts that can be granted. The amount of the loan is either 10, 40, 70 or 100 points.

The loan is automatically invested in a project. The project is a success with a probability of 66%, with a probability of 33% the project is no success. Thus, a project is on average successful in two out of three cases and unsuccessful in one out of three cases. Whether the project is a success is randomly determined by a computer program. The probability that a project is a success is the same for all borrowers in your group and public information to all the lenders.

If the project is a success, you earn a project revenue, which is four times as high as the granted loan (e.g. 280 in case of a loan amount of 70). Your loan debt owed to the lender is two and a half times as large as the loan amount (e.g. 175 in case of a loan amount of 70).

Table: Project revenue and loan debt

Loan amount	10	40	70	100
Project revenue	40	160	280	400
Loan debt	25	100	175	250

If the project is not a success, you earn a project revenue of 0.

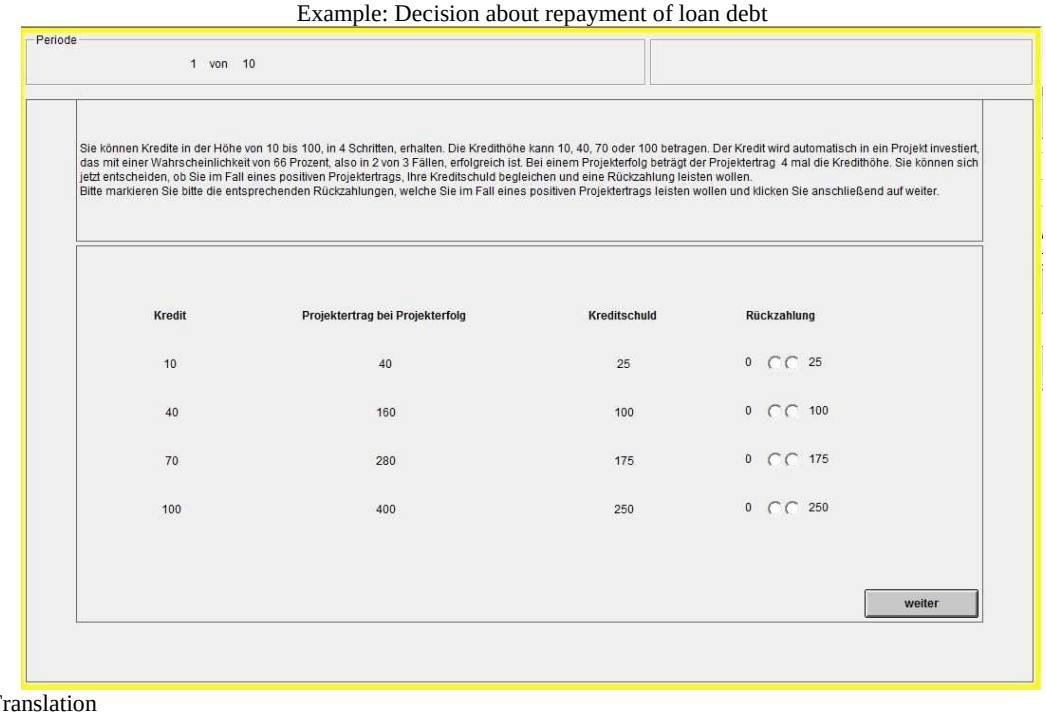
2. Repayment of loan debt

In case of a project success, you have to decide whether you want to settle your loan debt.

You have to decide whether or not you want to settle the loan debt. You make your repayment decision in each period, before you get to know which loan amount the lender has granted you. Therefore, you have to decide for each of the four loan amounts whether you repay your loan debt.

Below, you can see the corresponding decision screen:

Example: Decision about repayment of loan debt



Translation
Line 1, 2 and 3: You can get a loan between 10 points and 100 points. There are 4 different loan amounts that can be granted to you. The amount of the loan is either 10, 40, 70 or 100 points. The loan is automatically invested in a project. The project revenue is four times as large as the granted loan. You can now decide whether you settle your loan debt and make a repayment. Please indicate the corresponding repayment, which you want to make and then click next.

1. Column: Loan
2. Column: Project revenue
3. Column: Loan debt
4. Column: Repayment

If you decide to settle your loan debt, the repayment will be equal to the loan debt.

3. Your income

In each period, your income will depend on:

- the size of the loan of the lender,
- whether the project was a success,
- your repayment decision.

If the project is a success, your income is determined by your endowment from the beginning of a period plus the project revenue minus the repayment.

Your income = 150 + project revenue - repayment

If the project is In case of a project success, your income thus depends largely on the loan the lender grants you. Further, you can increase your income by deciding not to settle your loan debt and not to make a repayment.

If the project is not a success, your income is determined by your endowment from the beginning of a period.

Your income = 150

In the following table, you can see your income for each possible loan amount:

Table: Income of the borrower

Loan amount	10	40	70	100
Project revenue in case of success	40	160	280	400
Loan debt	25	100	175	250
Your income				
In case of success and repayment	165	210	255	300
In case of success and no repayment	190	310	430	550
In case of no success	150	150	150	150

4. Income of lender

In each period, the income of the lender will depend on:

- the size of the loan of the lender,
- whether the project is a success

- your repayment decision.

If the project is a success, the income of the lender is determined by the endowment at the beginning of a period minus the loan plus your repayment.

Income = 150 - loan + repayment

Thus, the income of the lender depends largely on your repayment. If you decide to settle your loan debt, the income of the lender is higher in case of a larger loan (because the repayment is larger than the loan in case of a project success). If you do not repay your loan debt, the income of the lender is higher if he grants the smallest possible loan amount.

If the project is not a success, the income of the lender is determined by his endowment from the beginning of a period minus the loan.

Your income = 150 – loan

In the following table, you can see the income of the lender for each possible loan amount:

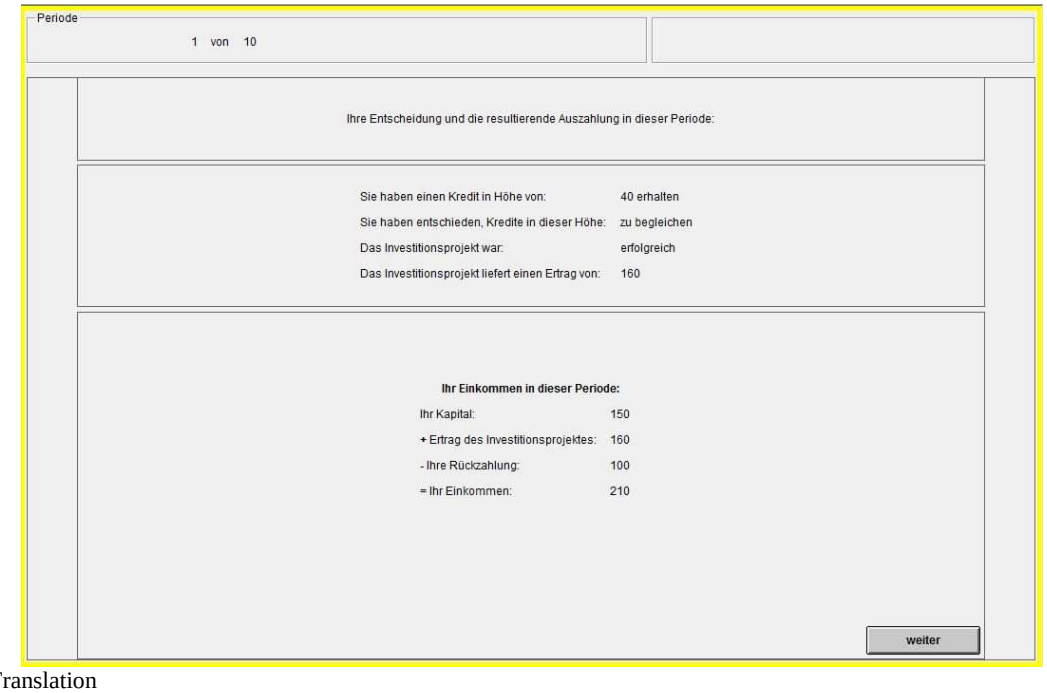
Table: Income of the lender

Loan amount	10	40	70	100
Project revenue in case of success	40	160	280	400
Loan debt	25	100	175	250
Income of lender				
In case of success and repayment	165	210	255	300
In case of success and no repayment	140	110	80	50
In case of no success	140	110	80	50

[Not displayed in N-R and C-R (only N-H and C-H):] As you can see in the table above, the lender cannot distinguish whether a loan debt is not settled because the repayment was not made even if the project was a success or because the project was not a success and the repayment could not be made.

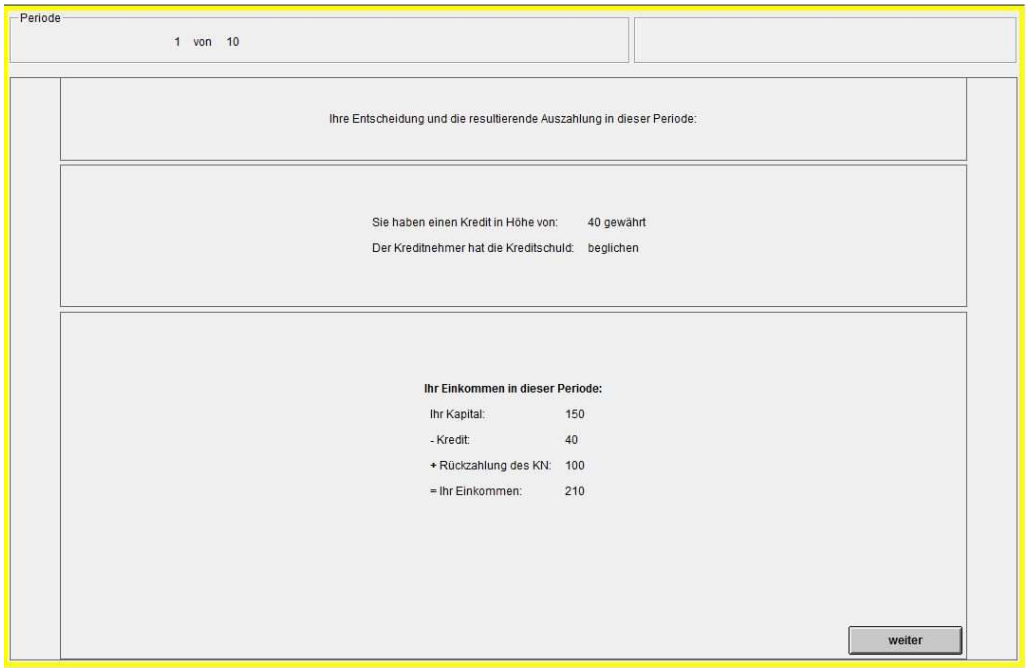
5. Information about your income

At the end of each period, you will get information about your income on your screen, which will look as follows:



Translation
Line 1: Your decision and the resulting payment in this period:
Line 2: You got a loan of 40
Line 3: You have decided to settle the loan debt
Line 4: The investment project yields a revenue of 160
Line 5: Your income in this period:
Line 6: Your endowment: 150
Line 7: + Project revenue 160
Line 8: - Your repayment 100
Line 9: = Your income: 210

At the end of each period, the lender will get information about his income on his screen, which will look as follows:



Translation
Line 1: Your decision and the resulting payment in this period:
Line 2: You have granted a loan amount of 40
Line 3: The borrower has settled the loan debt
Line 4: Your income in this period:
Line 5: Your endowment: 150
Line 6: - Loan: 40
Line 7: + Repayment of the borrower: 100
Line 8: = Your income: 210

Note the following: The lender *[only]* gets to know his chosen loan amount and his income. *[Not displayed in N-R and C-R (only N-H and C-H):] If a loan debt is not settled the lender will not know whether the project was not a success or whether you have decided not to repay your loan debt.*

[N-R and C-R]: If a loan debt is not settled the lender will learn whether this is because the project was not a success or because you decided not to repay your loan.

6. Examples of possible incomes

Example 1: The lender decides to grant a loan of 100 points. The project is a success. You decide to settle the loan debt of 250 points for a loan size of 100 points.

- The income of the lender: 150 - 100 + 250 = 300 Points
- Your income: 150 + 400 - 250= 300 Points

Example 2: The lender decides to grant a loan of 100 points. The project is a success. You decide not to repay the loan debt of 250 points for a loan size of 100 points.

- The income of the lender: 150 - 100 = 50 Points
- Your income: 150 + 400 = 550 Points

Example 3: The lender decides to grant a loan of 100 points. The project is not a success.

- Your income: 150 Points
- The income of the lender: 150 - 100 = 50 Points

Example 4: The lender decides to grant a loan of 10 points. The project is a success. You decide to settle the loan debt of 25 points for a loan size of 10 points.

- The income of the lender: 150 - 10 + 25 = 165 Points
- Your income: 150 + 40 - 25= 165 Points

Example 5: The lender decides to grant a loan of 10 points. You decide not to repay the loan debt of 25 points for a loan size of 10 points.

- Income of the lender: 150 - 10 = 140 Points
- Your income: 150 + 40 = 190 Points

Example 6: The lender decides to grant a loan of 10 points. The project is not a success.

- The income of the lender: 150 - 10 = 140 Points
- Your income: 150 Points

Payment:

After the 10 periods, a participant is selected at random to come to the experimenter and draw 2 distinct numbers, one between 1 and 5 and one between 6 and 10. The numbers will be publicly announced and will determine the payment periods for all participants. Therefore, 2 different periods will be randomly selected for payment, one from the first 5 periods and one from the second 5 periods. The selected periods will be entered into the computer program by the experimenter. Your earnings will then be reported on the screen.

Your payoff is computed as follows:

Your payoff for pay period 1 in points
+ Your payoff for pay period 2 in points
= Your overall payoff in points

Your final payoff in Euro (100 points = 2 Euro)
+ The show up fee = 5 Euro
= Your payoff in Euro

After completion of the experiment and before we start with the payouts, please fill in the questionnaire that follows the experiment. When you have completed the questionnaire, please remain seated at your place before we start paying the participants. Please wait in your cabin until you are called by us to collect your payment. Please bring all documents you have received from us when you receive your payment.

The experiment begins when all participants are fully familiar with the procedure of the experiment and understand the consequences of their decisions and the decisions of others for their earnings. To ensure this, we ask you to solve some control questions. Your solutions to the control questions have no effect on the income you can earn in the experiment.

You receive the control questions below in paper form and on the computer screen. Please solve them on paper first. In order to verify the accuracy of your answers you are asked to answer the questions again on the computer screen.

The experiment begins once you have correctly solved all the control questions. After completion of the experiment, please fill in a questionnaire on the screen. Then the payout commences.

If you have any questions, please raise your hand. An experimenter will come to you and answer your question.

Control Questions

Question:

a) What is your endowment at the beginning of each period?

Answer:

b) What is the endowment of a lender at the beginning of each period?

Answer:

c) What is the maximum loan amount?

Answer:

d) What is the minimum loan amount?

Answer:

e) What is the probability of a project success?

Answer:

f) Do you have to settle your loan debt?

Answer:

g) The lender decides to grant a loan of 40. The project is a success. You have decided to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the lender?

Answer:

h) The lender decides to grant a loan of 40. The project is a success. You have decided not to repay the loan debt for a loan amount of 40.

- What is your income?
- What is the income of the lender?

Answer:

i) The lender decides to grant a loan of 40. The project is not a success.

- What is your income?
- What is the income of the lender?

Answer: