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ABSTRACT

This paper reports a study on decision-making by borrowers regarding take-up of different loan types in a laboratory microfinance experiment setting. I hypothesize that when borrowers are offered a flexible choice of different loan types (here, individual liability (IL) and joint liability (JL)), then they are able to self-select their desirable loan and this could lead to higher overall take-up of loans. I find evidence that loan take-up rate is significantly higher when the choice-set becomes more flexible with additional provision of a second loan type. Further evidence shows that in a setting where moral hazard and free-riding can be eliminated, JL type is more popular among borrowers when both loans are available in the choice-set; this indicates that when borrowers can make sure that partners would not be able to cheat, then JL type could excel in take-up rate. On controlling for risk and selfishness, results suggest that highly risk-averse borrowers mostly stay away from any loan type and prefer safer and unprofitable outside income options. Less selfish borrowers show signs of higher inclination in taking up JL loan, compared to others. Investigating the interaction between discount rate and selfishness, I find that JL is either desirable by those who are selfish yet patient enough to reap the long run benefits of JL loan through its dynamic incentives that reduces the risk of repayment, or by those who are impatient but are less selfish. The results collectively imply that microloan types need to be customized according to the heterogeneous preferences of the borrowers; also, there needs to be enough flexibility in the offered choice-set for better self-selection.

JEL Classification: C90, D81, G21, I38, O21

Keywords: Microloan, Laboratory experiment, Loan take-up, Development policy

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1. Introduction

One of the most popular instruments to which microcredit owes its success is the joint liability (JL) mechanism of loan repayment. Through its peer-monitoring strategy it has the potential of solving the disadvantages of asymmetric information between lenders and borrowers, and thus enforces better repayment. Thus it has been deemed as a superior method in microloan contracts all over the world.[1] However, over the years, individual liability (IL) loan contracts have also been used in parallel. With their varied repayment liability schemes, it is not unlikely that these two loan types could appeal to the borrowers differently. This is due to prevalence of heterogeneous preferences among the borrowers; hence not every borrower would prefer both the loan types equivalently. In this paper, I attempt to study the puzzles in decision-making of the borrowers while taking up such loan types. Through a laboratory microfinance setting, I try to understand whether being able to self-select into different loan types can increase take-up of these microloans. And, together with that I also try to uncover how heterogeneous preferences among borrowers can play a role in take-up of these two different loan types.

The motivation for this paper arises from the mediocre performance of microcredit as a poverty alleviation tool; large-scale field experiments throughout the last decade (in India by Banerjee et al. (2015a), in Morocco by Crépon et al. (2015), in Bosnia Herzegovina by Augsburg et al. (2015), in Mexico by Angelucci et al. (2015), in Mongolia by Attanasio et al. (2015), and in Ethiopia by Tarozzi et al. (2015)) fail to find any outstanding effect of microcredit in poverty alleviation, as had been projected initially based on performances of the Grameen Bank and other frontrunners. One critical and unanticipated puzzle that all these studies stumble upon is extremely low take-up of the microloans by those poor for whom these are specifically designed.[2] Summarizing the above field experiments, Banerjee et al. (2015b) points out: - *"all these six settings are undoubtedly a fair representative of the distribution of lenders, loan types, borrowers and markets of the microcredit world"*. Therefore, indeed the consistent finding of low take-up rate in these experiments calls for an investigation. And, I think that one possible way of addressing the gap in take-up is to enquire the issue via the channel of borrowers' preferences.

I start by arguing that although the studies mentioned above as well as many others in this thread[3], have focused on making the loans profitable for the mass of prospective borrowers, they have not incorporated borrowers' heterogeneous preferences into the equation. Therefore, in this study, I focus on borrowers' heterogeneity in preferences and thereby try to understand if that could play a role in selection of loan type.

[1] The mechanism got popularized through its exceptionally successful implementation by the Grameen Bank in Bangladesh in the 80's. Later the mechanism was heavily used by several microcredit organizations in many developing countries. Theoretical models by Stiglitz (1990), Besley and Coate (1995), Armendáriz de Aghion (1999), Ghatak and Guinnane (1999) bear testimony to the endurance of the JL mechanism in better enforceability of repayment.

[2] Furthermore, the unpredicted low take-up of loans in all these studies has weakened the statistical power of the sample and therefore hinders impact evaluation of microcredit.

[3] Giné and Karlan (2014)

And if indeed heterogeneous preferences drive take-up of different types, then offering a flexible choice-set to borrowers should increase take-up. So, I take a simple hypothesis to the lab to test: i.e., if take-up rate of loans increases when borrowers are offered a flexible choice-set with both JL and IL loans compared to when they are offered only one loan type. The argument for having flexible choice-set is: in order to better understand the true desirability of a loan type, we need to let the borrowers decide; and for that, borrowers need some freedom of selection.

This set-up is distinctly different from what had been used in the above mentioned field experiments; there the study-borrowers did not have the scope to choose between different loan types[4]- either they took the loan offered or they did not. Most laboratory and framed field experiments till date in the context of microcredit (Abbink et al. (2006), Cason et al. (2012), Kono (2014)), with their aim of studying superior enforceability of repayment through JL compared to IL, have also followed similar design of allowing one loan type at a time.

To further consolidate my hypothesis, I argue that heterogeneous preferences can play a big role in what loan a borrower might want to choose. This is because, there are a handful of features of JL and IL loan types and those could be advantageous or disadvantageous to the borrowers conditional on their individual preferences. One of the main features of microcredit loans is the dynamic incentive that comes with them i.e. the promise of further loans from the lender in case of full repayment. While considering the dynamic incentive, JL excels over IL because the former increases the probability of loan repayment through a jointly liable peer-group and this in turn increases the chances of getting further loans; JL thus decreases the risk of non-repayment after every period of loan. Thus for a borrower who is risk-averse regarding repayment, JL would be more preferable. On the other hand, when the timeline is being considered, the immediate or short-run expected payoff from JL is lower than that from IL, because the borrower has to also take into account the possibility of repaying on behalf of an unsuccessful partner; but, when considering the possibility of getting loan conditional on successful repayment in future periods, the discounted expected payoff from JL excels over IL type. As the future time horizon for availability of the loans is unknown, it is ideal that the choice might be driven by the discount rate of the borrowers; the borrower, who discounts future less and values the long run benefit of receiving further loans, would have higher willingness to choose JL type. Therefore, given these features[5], the ex-ante optimization by the borrowers should be influenced by their individual time preferences[6] along with risk preferences. In addition to these, the taker of JL might also

[4]The studies in Ethiopia, India, Mexico and Morocco offered only JL; in Bosnia-Herzegovina IL was offered, whereas in Mongolia both types were offered, but to separate groups - each being offered to one group.

[5]Note that these are the set of differences between the two loan types when we are assuming that peer-monitoring is fully implemented i.e. there is information symmetry among the JL group members about their investment outcomes. However, when it is not, JL brings along the possibility of free-riding; and depending on the borrower's motives she might or might not choose JL type.

[6]Frederick et al. (2002), Lengwiler (2005), Gollier and Zeckhauser (2005) discuss about heterogeneity of time preferences over utility streams. Here, my aim is to check if there is an association between the subjects' time preferences and the choice

prefer to bear the cost of a partner's burden (and hence a lower short run expected payoff than IL) in order to enjoy higher utility from the expected gains of both.[7] This possibility originates from the behavioural foundations of preferences, which validates that it is not uncommon that an individual derives additional (positive/negative) utility from other's outcome i.e. *social* or *other-regarding preferences* (Rabin (1993), Levine (1998), Fehr and Schmidt (1999), Bolton and Ockenfels (2000)). In sum, these possible differences in risk, time and other-regarding preferences incite my hypothesis that when the choice-set of loan types is constricted, there might not be as many takers as would be otherwise.

Another key feature of my design is the outside income option. When analyzing take-up, one needs to pay careful attention to modelling the outside option of the prospective borrowers. Considering what goes on in the real field, I assume that the prospective borrowers do not have a constant source of income; therefore, when they reject a loan they merely leave themselves to chances of getting some temporary job that would lead to much lower earnings than what a successful investment outcome of the microloan could do. Therefore, this aspect has also been incorporated in this design in the form of an uncertain outside income, i.e. an employment opportunity; the probability of getting employed is higher than the success probability of the investment project with the loan, but the wage is much lower than the returns from a successful investment. To my knowledge, no previous study considers the issue of outside income option in the context of microloans.

In a laboratory experiment conducted on 220 university student subjects in the decision-making lab in Turku, Finland, I find significant evidence in favour of the hypothesis which claims that when offered a choice-set with the two loan types, take-up proportion is higher than an offer of just one loan type. I also find a few interesting effects due to heterogeneous preferences confirming that they are instrumental in the choice-making by the borrower: willingness to take up IL loan decreases significantly with increases in risk-aversion; but on the whole, willingness to take up any loan significantly decreases with increase in risk-aversion. I further test the effects of altruistic attitude and discount rate on take-up of the loans; I do find evidence that the subjects who took JL loan tended to donate more in a one-shot dictator game (DG). Looking at the interaction between discount rate and altruistic giving, I find that JL is either desirable by those who are patient yet 'selfish' in terms of altruistic giving; or it is desirable by those who show less patience in time discounting game but are 'fair' givers in DG. And, the demand of IL loan works in exactly the opposite way. Therefore, I do get some evidence in expected direction: demand for JL loan requires patience to reap higher profit in long run, and if one is not patient enough, the demand for JL loan ha to be

of loan; theoretically, with an uncertain time horizon, if one discounts future heavily (other parameters remaining fixed) then she would want to take IL and if not then JL would be more preferred.

[7]For example, Dreber et al. (2014) study the association between altruistic giving and cooperation in indefinitely repeated PD game. They find evidence of correlation between generosity (in terms of dictator game giving) and cooperation in infinitely repeated PD when no cooperative equilibria exist; this implies that it is not unlikely that individuals with *'other' or 'social' regarding preferences* sometimes go out of the standard way to cooperate. However, the authors do not find similar correlation when cooperative equilibria exist. Such varied results motivate to check if there is any role of altruistic giving in this study.

driven by non-selfish cooperative nature.

This paper makes a contribution to the literature on borrower's strategic investment behaviour in the frame work of microcredit. Previous literature in this area includes framed field experiments by Giné et al. (2010), Fischer (2013), Janssens and Kramer (2016) and Barboni (2017). Barboni's framed field experiment with Indian microentrepreneurs also deals with take-up of microloans; but she focusses on the variability of repayment schedule by offering a menu of rigid and flexible repayment contracts. She finds evidence that the high-revenue borrowers prefer flexible schedule and risk-averse borrowers stick to rigid repayment schedule, the second result providing some strength to my hypothesis that choice of contract types could differ according to borrowers' risk preferences. Janssens and Kramer's work is close to my work in the sense that they also study demand among microfinance clients- but, for micro-insurance under different contract types with joint liability. Giné et al. and Fischer study risk-taking choices by borrowers under different microfinance contracts; the former studies the choice between risky and certain projects by borrowers under different contract types and the latter gives the borrowers a choice-set containing several levels of risk. While these two studies try to learn optimal risk-taking attitude given the contract type, my study tries to approach the issue in a different way by studying which contract type is optimal for the borrower given the risk and other costs. Additionally, this paper also makes a contribution to a very small literature till date which deals with various issues of microfinance in a laboratory setting: of them, Abbink et al. (2006) and Cason et al. (2012), as mentioned earlier, are studies on loan repayment and monitoring decisions, whereas Baland et al. (2017) explore mechanisms for improved cooperation in social dilemmas.

The remainder of the paper is structured as follows. Section 2 describes the theoretical modelling of the loan types and the borrower's decision-making conditions for taking up a given loan type. In Section 3 I move on to describe the experimental design and the lab procedure. This is followed by discussion on results in Section 4. Finally, in Section 5, I conclude.

2. Theoretical framework

In this section, with help of a standard economic model, I deduce how a borrower makes her decision when offered with a certain loan type.

2.1. Features of IL and JL loan types

The loan features used in this model are the basic ones used in the framework of microcredit and in addition, I put some simplifying restrictions for better tractability. The restrictions are similar to those considered in literature (Besley and Coate (1995), Armendáriz de Aghion (1999) and Ghatak and Guinnane (1999), etc.)

I assume, the features common to both loan/contract types are: **1.** each borrower, if she chooses any loan type, gets loan b to invest in a one-period risky project; **2.** Repayment fee for each borrower is $(1+r).b$, where $r > 0$ is the rate of interest; **3.** Probability of success in the risky project is p, which yields return π;

if the investment fails with probability $(1-p)$, then b is lost and return is 0. In case of failure, the borrower cannot return her own loan. I assume discrete possibilities, i.e., if one is successful, she repays the entire loan otherwise zero in case of failure; **4.** Borrowers have no other source of income when they borrow loan. And, they cannot use return of one period to repay in the next period; **5.** $\alpha = \frac{(1+r).b}{\pi}$ is the repayment ratio.

The additional features of JL loan are: **1.** the loans are available in a group of two borrowers (assuming the simplest group formation); **2.** risk across the projects is uncorrelated; **3.** Success probability p in the investment is common knowledge to all; **4.** if one member is successful in her own project while her partner is not, the former repays on behalf of the latter. Therefore, for JL to be feasible, $(\pi - 2\alpha\pi) \geq 0 \Rightarrow \alpha < \frac{1}{2}$; **5.** the most important feature in this model is that there is symmetric information between the borrowers in a group on their respective investment outcome: hence, no possibility of freeriding[8] by false-reporting own investment outcome.

2.2. Features of the outside income option

Since the aim is to study take-up of loan types in the experimental set-up, I also need to consider the situation when the subjects do not take up the offered loan. The easiest way to model an outside option would have been to offer a safer flat income to the subjects. However, there is evidence that availability of safe and sure options in experimental tasks could bias the subjects towards those (Andreoni and Sprenger (2012)). To avoid such certainty effects, I model the outside option to be safer than loan investment, yet with some uncertainty attached. I believe this is appropriate in the context of microcredit: in the field when the prospective borrowers reject a loan, it is not because they have a sure fallback income option; usually they have some temporary job (or merely the prospect of getting one) which brings an income much lesser than return from a successful investment with a microloan. In the same context, it is realistic to assume that getting such temporary employment is easier than yielding successful return from loan investment. Thus I model the outside option as close as possible to real life scenario; I design it as an employment opportunity for the subject if she does not choose any loan. I assume that the probability of obtaining employment is $q(> p)$ and income/wage is $s < (\pi - 2\alpha\pi)$. Further assumptions are: if one obtains an employment is a certain period, then she receives the wage s for sure; also, whether one is successful to obtain employment in the next period or not is independent of whether she obtains it in the present period.

2.3. Theoretical predictions

Laying down the assumptions of the three different income types in the setting, I move on to discussing the discounted expected utility of an individual under the three income structures. In order to concentrate on the take-up decisions of borrowers, I abstract from the lender's problem and instead take the set of loan types offered as given.[9]

[8] In order to concentrate on the differences in features of the loan types that are already present (see Section 1), I abstract from the possibility of free-riding, as it would further complicate the set-up.

[9] Giné et al. (2010) and Kono (2014) too have their models without the lender's function.

The expected discounted utility of individual i if she selects IL loan, is:

$$EU_{i,IL} = \frac{1}{1-\delta p}.p.U_i(\gamma; \pi - \alpha\pi), \tag{1}$$

where γ is the parameter for risk-aversion. The expected discounted utility of individual i if she selects employment opportunity (henceforth EMPL), is:

$$EU_{i,EMPL} = \frac{1}{1-\delta}.q.U_i(\gamma; s) \tag{2}$$

Now, it is optimal to choose IL loan over EMPL *iff* (1) > (2)

$$\Rightarrow \frac{p(1-\delta)}{q(1-\delta p)} \geq \frac{U_i(\gamma; s)}{U_i(\gamma; \pi - \alpha\pi)} \tag{3}$$

Assuming a *CRRA* utility function, 3 can be re-written as,

$$\Rightarrow \frac{p(1-\delta)}{q(1-\delta p)} \geq [\frac{s}{\pi - \alpha\pi}]^{(1-\gamma)} \tag{3'}$$

By assumption, $s < (\pi - \alpha\pi)$; therefore the *RHS* in (3') increases with γ. This implies that with increase in γ beyond a certain level (say γ^*), the *RHS* exceeds the *LHS* and it is not optimal to choose IL over EMPL anymore when $\gamma > \gamma^*$.

For the general risk-pooling advantage of JL, it allows a higher probability of loan repayment and obtaining of future loans than IL. With IL loan, the probability of getting the next period of loan is p. With JL loan, the probability of getting the next period of loan is $p^2 + p.(1-p) + (1-p).p$ in case of a two-person group. The first term stands for when both the group members are individually successful in their respective projects, second and third terms stand for when one is successful in her project but the other is not and the former is liable to repay on behalf of the latter (Armendáriz de Aghion (1999), Giné et al. (2010)).

Therefore, with JL under information symmetry, an individual i's discounted expected utility is:

$$EU_{i,JL} = \frac{1}{1-\delta(2p-p^2)}[p^2 U_i(\gamma; \pi - \alpha\pi) + p.(1-p)U_i(\gamma; \pi - 2\alpha\pi)] \tag{4}$$

Therefore, JL is better than IL *iff* $EU_{i,JL} \geq EU_{i,IL}$

$$\Rightarrow \frac{U_i(\gamma; \pi - 2\alpha\pi)}{U_i(\gamma; \pi - \alpha\pi)} \geq \frac{1-2\delta p}{1-\delta p} \tag{5}$$

Again, by using a *CRRA* utility function (5) becomes,

$$[\frac{\pi - 2\alpha\pi}{\pi - \alpha\pi}]^{(1-\gamma)} \geq \frac{1-2\delta p}{1-\delta p} \tag{5'}$$

Since $(\pi - 2\alpha\pi) < (\pi - \alpha\pi)$, with decrease in value of γ the *LHS* becomes smaller. With declining value of γ, at a certain value, say γ^{**}, the *LHS* no longer exceeds the *RHS* and the inequality in (5') does not hold anymore.

Proposition 1. *Combining the inequalities from* (3) *and* (5)*, we can obtain the lower threshold of risk-aversion above which JL is preferred over IL, and the higher threshold of risk aversion until which IL is preferred over EMPL. For example, using a CRRA utility function (in* (3') *and* (5')*), we can see that JL is preferred over IL which in turn is preferred over EMPL in the range* $\gamma^{**} < \gamma < \gamma^{*}$ *(given the discount factor* δ*).*

Note, in order to have EMPL preferred to JL when JL has a higher expected discounted utility than IL (i.e. when $\gamma > \gamma^{**}$), a borrower has to have an even higher level of risk-aversion than level γ^{*} which is already the switching point from IL to EMPL.

Now, I focus on some comparative statics on discount factor δ:- Since in this setting, the future time horizon for which the loan is available, is unknown to the borrower, it is possible that the borrower's decision of the choice she makes is affected by her belief of how many periods the loan offerings would last for or for how many periods she is willing to wait to see the gains. The *RHS* in (5) is a decreasing function of δ. The lower the value of δ (i.e. the higher the discounting of future), the *RHS* in (5) is higher and this is turn requires a higher γ to satisfy the inequality. This confirms that as the discount factor decreases, the risk-aversion level needs to increase in order to keep JL loan more preferable than IL loan.

Proposition 2. *With discount factor decreasing from 1 to 0, a borrower's risk aversion parameter needs to keep increasing from* $\gamma|_{\delta=1}$ *to* $\gamma|_{\delta=0}$ *in order to prefer JL loan over IL.*

In the model so far, we see that if discount factor is 0 or low (i.e. the borrower draws utility only from immediate period/s), then the borrower prefers JL loan over IL only if the degree of risk aversion is high enough. However, one could argue that this set-up is not completely explained by means of risk and time preferences. An interesting line of inquiry is to also include utility from other's (here, the partner) income as a component in the utility function of the JL loan borrower. In line with models that incorporate *"social preferences"* (e.g. Levine (1998), Charness and Rabin (2002)), if the borrower puts some positive weight on the partner's payoff in her own utility function, then even with low level of risk-aversion and low discount factor it is possible to have the utility from JL to surpass that from IL.

Here, I focus on the altruism aspect of social preferences only. Following the pure altruism modelling by Levine (1998), let us try to understand how the utility function of individual i looks like when it includes distributed weights on two components:- one being the standard expected utility from her own payoffs and the other being the non-standard component that comprises her utility from the expected value of partner j's income. Let i put a positive weight $\beta(0 < \beta < 1)$ on her utility from j's expected income, and the remaining weight on her standard expected utility. In this regard, i's discounting is not affected and remains as discussed before (in 4). Now (4) can be written as,

$$U_{i,JL,\beta} = \frac{1}{1-\delta(2p-p^2)}[(1-\beta)(p^2 U_i(\gamma;\pi-\alpha\pi) + p.(1-p)U_i(\gamma;\pi-2\alpha\pi)) + \beta U_i(EV_j)], \qquad (6)$$

where $EV_j = p^2(\pi - \alpha\pi) + p(1-p)(\pi - 2\alpha\pi)$. This term is devoid of any risk parameter since irrespective of the level of i's risk aversion, the expected income of j will remain as a constant term in the utility function of i.

Now, when β is positive, i would prefer *JL* over *IL iff* $U_{i,JL,\beta} \geq EU_{i,IL}$, i.e.

$$\frac{(1-\beta)p}{1-\delta(2p-p^2)}[pU_i(\gamma;\pi-\alpha\pi)+(1-p)U_i(\gamma;\pi-2\alpha\pi)]+\frac{\beta}{1-\delta(2p-p^2)}U_i(EV_j) \geq \frac{1}{1-\delta p}.p.U_i(\gamma;\pi-\alpha\pi) \quad (7)$$

Note, $EU_{i,IL}$ remains the same; since their is no partner involved in IL, I keep the utility function free from β.

By simplifying (7) and using a *CRRA* utility function, *JL* is preferred to *IL* as long as the following holds

$$\frac{\beta(1-\delta p)EV_j}{p(1-p)(1-2\delta p)(\pi-\alpha\pi)^{(1-\gamma)}} - \frac{\beta p(1-\delta p)}{(1-p)(1-2\delta p)} \geq 1 - \frac{(1-\beta)(1-\delta p)}{(1-2\delta p)}[\frac{\pi-2\alpha\pi}{\pi-\alpha\pi}]^{(1-\gamma)} \quad (8)$$

Of course, when $\beta = 0$, (8) simplifies to (5').

Now, rewriting the condition for JL $\succeq$ IL in (5') as $\frac{(1-\delta p)}{(1-2\delta p)}[\frac{\pi-2\alpha\pi}{\pi-\alpha\pi}]^{(1-\gamma)} \geq 1$, we can say: as δ decreases and crosses a lower threshold δ^* (say), the inequality does not hold anymore (given γ does not change). Therefore when $\beta = 0$: for any δ, (say, δ') $< \delta^*$, $\frac{(1-\delta' p)}{(1-2\delta' p)}[\frac{\pi-2\alpha\pi}{\pi-\alpha\pi}]^{(1-\gamma)} < 1$ always holds and IL is preferred more. But using δ' back in (8), JL can be still preferred to IL as long as

$$\frac{\beta(1-\delta' p)}{(1-p)(1-2\delta' p)}[\frac{EV_j}{p(\pi-\alpha\pi)^{(1-\gamma)}} - p] \geq 1 - \frac{(1-\beta)(1-\delta' p)}{(1-2\delta' p)}[\frac{\pi-2\alpha\pi}{\pi-\alpha\pi}]^{(1-\gamma)} \quad (9)$$

Let's look at an example where IL $\succ$ JL when we consider a β-free model but when β is positive, it is not necessarily true:

The simplest case is with $\gamma = 0$ and $\delta = 0$ *(a risk neutral individual who discounts future totally)*, where (9) boils down to the following condition so that JL can yield higher utility than IL,

$$\frac{\beta}{(1-p)}[\frac{EV_j}{p(\pi-\alpha\pi)} - p] \geq 1 - (1-\beta)[\frac{\pi-2\alpha\pi}{\pi-\alpha\pi}] \quad (10)$$

However, when $\beta = 0$, JL $\not\succ$ IL as inequality in (10) never holds ($1 - \frac{\pi-2\alpha\pi}{\pi-\alpha\pi} \not\leq 0$).

Proposition 3. *If the incidence of "other-regarding preferences" is considered, and thus if the borrower of JL loan derives additional positive utility from partner's payoff, then Proposition 2 could be updated as follows:*

As the borrower's discount factor decreases, the risk aversion level does not necessarily have to rise in order to prefer JL over IL. If her expected utility incorporates a positive weight on partner's expected payoff, then she could prefer JL even with a lower risk aversion level given her low discount factor.

Now, we move on to the experiment to check if the discussed parameters and their relationships are sufficient to conclude on the borrower's take-up decision-making.

3. Experimental design & lab procedure

As discussed in Section 2, when all other parameters (loan size (b), individual success probability of loan investment (p), investment outcome (π), rate of interest on loan (r)) of IL loan and JL loan remain the same, the probability of being able to repay the loan and thus be eligible to get another loan in the next period differs between the two loan types; with a two-person JL contract, the joint probability for repayment is $2p - p^2$ in contrast to the repayment probability of IL, which a lesser value p. And due to this higher probability of repayment after every period, JL yields a higher discounted expected income when one considers a sizeable number of periods of loan availability for the future. Therefore, JL is more worthy of take-up in presence of dynamic incentive. But without the dynamic incentive, IL is more profitable. The underlying question of our hypothesis is: under dynamic incentive, is JL more desirable by all equally? If not, then possibly a flexible choice-set would help. And, thereby from their decision-makings over such choice-sets, I intend to elicit their motives of taking up or not taking up of a certain loan type.

3.1. Details of the treatment designs

This experimental design had three treatment variations: one group was offered a choice-set of IL, JL and EMPL, another group was offered a choice-set of IL and EMPL and the last group was offered choice-set with JL and EMPL. I henceforth address these groups as IL-JL-EMPL, IL-EMPL and JL-EMPL respectively. Comparison between IL-JL-EMPL with the other two groups enables evaluating the hypothesis i.e. if the flexibility of being able to self-select from a bigger choice-set increases overall take-up or not.

3.1.1. Design details of the three different income choices

Individual liability loan (IL). If the subject chose this income type at the beginning of a round, then she received a loan of 100 ECU (Experimental Currency Unit) in the first period. She invested that loan in a business which yields 500 ECU with 50% chance and 0 ECU with 50% chance. At the end of the first period, she had to pay back the loan of 100 ECU plus an interest rate of 20% as a fee for the loan. If the business investment was successful, then the loan could be repaid. As long as 120 ECs could be repaid by the subject, she received another loan of 100 ECU in the next period, which would be invested in the same way. If the business investment failed, then the earning was 0 ECU; and in that case, the repayment could not be done. Hence she was not eligible to get any further loan.

Joint liability loan (JL) . If the participant chose this income type at the beginning of a round, then she was matched with another participant *(Participant B)*[10] with whom the former took the joint loan[11] and then made a business investment. *Participant B* was randomly selected from among all those participants who also

[10]The language was kept as neutral possible by avoiding terms like 'partner', 'pair', 'peer', etc. I stressed on avoiding such words in the verbal/written instructions, as well as in the main experiment.

[11]I also avoided using the strong word 'liability' while instructing the subjects; instead, I let them figure out by themselves from the features of the loan. In the instructions and in the experiment, I termed the loans as 'Individual loan' and 'Joint loan'.

had chosen joint loan in the same round[12]. In all periods of the same round, the 'pairs' remained constant. Once the round was be over (and should the subject choose JL again), she was randomly re-matched. No communication was possible with *Participant B*.

In the first period, they received a loan of 100 ECU each. Each invested this loan in a business of their own which yields 500 ECU with 50% chance and 0 ECU with 50% chance. The repayment fee was same for each of them, i.e. 120 ECs. If both the business investments were successful, each could repay their own loan. If one investment was successful and the other was not, the subject with the successful investment repaid both loans plus both fees, i.e. altogether 240 ECs. As long as in total 2*120 ECs was repaid by one or both of them, both could receive another loan of 100 ECU each in the next period, which they invested in the same way. If both business investments failed in the same period, each earned 0 ECU. In that case, no further loan could be obtained by either of them in the same round.[13]

Employment opportunity (EMPL). If the participant chose this income type at the beginning of a round, then she had 67% chance of finding employment in each period. If employment was obtained in a given period, the wage was 50 ECs, otherwise 0 ECs. Unlike the case with the loans, the chance of finding employment in any given period was not dependent on whether the subject had found employment in the previous period.

3.1.2. Design details of the experimental procedure

To determine the success or failure in loan investment or employment seeking, the subjects were supposed to click on the screen to obtain a random number (between 0 and 1, where all values are equally likely). If the subject had chosen EMPL and if the random number was ≤ 0.33, that would imply that she could not obtain employment in that period; if the random number was > 0.33, it would imply she could obtain employment in that period. If the subject had chosen IL or JL and if the random number was ≤ 0.50, that would imply that her own investment was unsuccessful in that period; if the random number was > 0.50, it would imply that her own investment was successful in that period.

I deliberately avoided any effort-involving task to determine the success of investment and employment-seeking because that could have motivated the subjects in not revealing their true effort due to intrinsic moral hazard and freeriding incentives; and in this paper I would simply like to focus more precisely on issues that are already there even after omitting moral hazard and freeriding incentives. Also, no transaction (e.g. disbursal of loan, repayment, etc.) was done physically during the experiment. Instructions were such that each subject would have an account maintained under her name during the entire session; for example,

[12]If the total number of JL takers in a round was odd, then the unmatched subject was instructed on the screen that she could not be matched with a participant in that round; therefore the computer would act as *Participant B* for her and select random numbers to decide *B*'s investment outcome.

[13]Also, I never specified the collective probability of repayment (i.e. 0.75) under JL to the subjects; instead I let them figure out by keeping the instructions as vivid as possible.

if she would choose loan, then in the beginning of each period her account would be credited with 100 ECs; the loan repayment amount would be debited from the account, etc.

I maintained some further restrictions in the design in order to keep it comparable to the assumptions in the theoretical setting: **1.** The subjects were not able to report falsely about their investment outcome either to us or *Participant B* in case of JL. This was restricted by directly showing them the outcome of their investment or employment-seeking on their screens, and also their net incomes after each period. In case of JL, information on *Participant B*'s investment outcome also appeared on the subject's screen and necessary repayment amounts were deducted directly from their accounts. **2.** By allowing no communication between the JL group-members, I precluded the possibility of collusion against the lender (experimenter in this case). The aim was to see that when no communication is allowed, what the subjects would instinctively choose in the strictest condition, that is, with no communication, randomly chosen partner, etc. **3.** The subjects were told that they would play several rounds of the game during the session. Each round would have a few periods and after every period there would be a 10% chance that the next period would not occur. I never mentioned how many rounds would there be or how long the periods in a round would last.

3.2. Elicitation of heterogeneous preferences

I controlled for discount rates and generosity[14] of the subjects to check if that affects take-up of JL loan. As a measure of generosity in sharing income, I used the standard one-shot DG (Forsythe et al. (1994)) where the subjects were asked to share a reward of 3 Euros with an anonymous participant.[15]

As mentioned above, the benefits of JL loan cannot be reaped right away; besides being non-selfish, one has to discount future low enough to see the profit out of such a loan; therefore I also controlled for discount rate of the subjects to see if it has any correlation with take-up type. To measure short term discount rates, I used the measure by Reuben et al. (2010) with monetary rewards.[16]

I also elicited the subjects' risk attitude by Holt and Laury (2002) test. In spite of certain disadvantages of this test pointed out in recent literature on risk elicitation[17], I prefer the state-of-the-art H&L test because

[14] In my opinion: since there is neither any communication between the JL group-members nor they have a say in whether they would like to contribute for the group member, the JL takers do not necessarily have to show reciprocity to each other for future cooperation; hence I do not measure that; rather I am more interested in the pure giving attitude.

[15] According to Dreber et al. (2014), DG is better than ultimatum game/ one-shot PD/PG games in measuring social preferences, because it is the least sensitive to priming and framing effects.

[16] In this test, subjects are given a set of 9 decisions- each decision consists of choosing between an amount 50 Euros today and a larger amount $(1+r)$*50 Euros in 1 week. For the set of decisions, the values of r used are: 0.00, 0.01, 0.03, 0.05, 0.07, 0.09, 0.10, 0.15, and 0.20. With gradual increase in r over the 9 decisions, at some value of r the subject switches from 50 Euros today to $(1+r)$*50 Euros in a week; the r at switching point serves as the subject's discount rate.

[17] Crosetto and Filippin (2016) in their study on comparison of the popular risk elicitation tests, point out that H&L test is often difficult to comprehend by subjects due to its complicated probabilities, and thus wrong understanding can lead to multiple switching points. But then again, they agree that not a single test is perfect; and once the observations with inconsistent choices (multiple switching points) are removed, H&L test performs well enough.

it is easier to point out the observations that have made inconsistent choices and drop them.[18]

3.3. Laboratory procedure

3.3.1. Recruitment

The experiment was conducted in the Public Choice Research Centre (PCRC) decision-making laboratory of University of Turku, Finland. The subjects were recruited using the ORSEE software (Greiner (2004)) and the computerized decision-making task was programmed and conducted on the z-tree software (Fischbacher (2007)). The experiments were conducted in January - March, 2017. Invitations were sent out to 1716 participants registered until that time. 91% of the registered subject pool of the lab is university students (Uni. Turku, Turku University of Applied Sciences); the rest constitute of PhDs, post-docs of the university, employees in/outside of the university, unemployed, self-employed individuals, etc. All participants are Finnish nationals and/or are fluent in the language. The experiments were entirely conducted in Finnish language.

3.3.2. Implementation

13 sessions were allotted for the main experiment- 5 for IL-JL-EMPL, 4 for IL-EMPL and JL-EMPL each. Since the laboratory accommodates at most 20 subjects at a time, I invited that many (additional 3 for reserve) for each session. In total 65, 63 and 94 invitees turned up to participate in IL-EMPL, JL-EMPL and IL-JL-EMPL respectively. Upon arrival for the session for which they had enrolled, the participants were randomly allocated to a computer according to the number (between 1 and 20) which they picked from a box. The computers are located in visually isolated cubicles in the lab. When all subjects had been seated, the instruction pages were handed to them and the associate[19] read it aloud to them. After that, the subjects were given an additional 5 minutes to go through the instructions by themselves and instructed to raise hand if they needed any clarification. Once that was assured, the experiment was initiated on the computers. Before Round 1 started, three 'test' questions along with multiple-choice answer options appeared on the subjects' screens; the questions were to control for their understanding of the crucial points of the instructions. In case they marked the wrong answer, a *prompt* appeared on the screen asking to 'check the answer'; this was meant to provide a soft indication to re-read/re-think in case they have misunderstood the crucial parts.

Each session consisted of 10 rounds of choice-making. Each round started simultaneously for every subject. At the beginning of each round, the subjects were able to select an income type IL, JL or EMPL depending on what was available in the choice-set in that session. Each round continued for a few periods

[18] In the tests for individual-level control measures, only H&L test and the DG were economically incentivized; whereas the discount game was not.

[19] Two female student associates helped out with all the 13 sessions; the sessions with different treatment types were equivalently distributed between the two of them. Furthermore, they were given similar set of instructions on how to communicate with the subjects.

(it was programmed such that the number of periods never exceeded 3, if not already interrupted by a 10% chance of not occurring).

At the end of Round 10, further instructions appeared on the screen indicating that a few more questions would be asked which would allow them to add to their earnings from the main experiment. These questions were the one-shot DG and the H&L risk aversion test. This was followed by an on-screen summary of their choices and earnings in the ten rounds. Then they clicked to randomly select one round; the experimental earnings of the chosen round was converted into Euros and shown on screen. They were also asked a few more questions - these were the test for discount rate; the 10- point-scale standardized survey questions on risk and trust as used in the lab version module on preference elicitation by Falk et al. (2016); and finally, difficulty level of the experiment.

On way out, the subjects were paid in cash a total sum of the 3 Euros participation fees, the earnings from the main experiment and the additional earnings from the one-shot DG and the H&L test. An entire session lasted for about 50 minutes on average.

4. Results

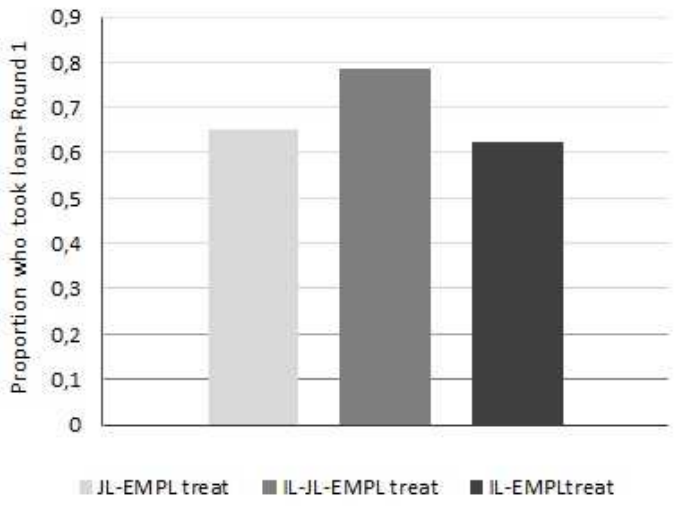
4.1. Pilot studies, sample size and statistical power

Prior to the main experiment, I also carried out pilot sessions with all the three treatment types. The three pilot sessions, each consisting of one of the three treatment types, were conducted on December 16th, 2016 in the same lab. The subjects of the pilot were also recruited using the ORSEE software Greiner (2004). However, the subjects in the pilot were never invited back to the main experimental sessions. Since there is no similar previous study to get advice on effect size, I had to rely on the observed outcomes of the pilot treatments. In the pilot, the take-up proportions of the loans were 0.50, 0.70 and 0.84 with sample sizes 20, 19 and 20 in the IL-EMPL, JL-EMPL and IL-JL-EMPL treatments respectively. The difference in proportion in terms of *Cohen's h*[20] (Cohen (1988)) is 0.75 between treatments IL-EMPL and IL-JL-EMPL and 0.34 between JL-EMPL and IL-JL-EMPL. The former is a medium-to-large effect while the latter is a small-to medium effect as per *Cohen's h* standard. Even though drawing inference on effect sizes observed in such small samples would be very risky, still I had to base my sample size and power calculations on that. I wanted to have enough sample size to be well-powered to detect similar effects in the main experiment. Thus I decided on having around 100 subjects in IL-JL-EMPL group and around 80 each in IL-EMPL and JL-EMPL groups. For a medium-sized effect (absolute difference in effect 0.8-0.6=.20 (in *Cohen's h* it is 0.44)) this would give a power of 83%.[21]

[20] In statistics, *Cohen's h* is a popular measure of difference between two independent proportions. *'h'* is the difference in the arc-sine transformation of the two proportion values. The rule of thumb allows h=0.20 as small, h=0.50 as medium and h=0.80 as large differences.

[21] If the effect sizes would be the same in the main experiment as in the pilot versions, then the decided sample size would give a power of 99% while testing between IL-EMPL and IL-JL-EMPL and a power of 61% in case of JL-EMPL and IL-JL-EMPL.

Figure 1: Take-up of loans in the three treatments- Round 1



4.2. Main experimental findings

This section presents the experimental findings. The first and foremost objective of the paper is to study if flexibility in choice options can lead to higher take-up rate. For this part of the analysis, I focus only on the take-up rates in Round 1 of the different treatment groups. Concentrating on the first round data will protect from potential threats against statistical independency of observations on decision-making by subjects across the rounds. In Section 4.2.3, I include the study of any learning effect among the subjects over the rounds.

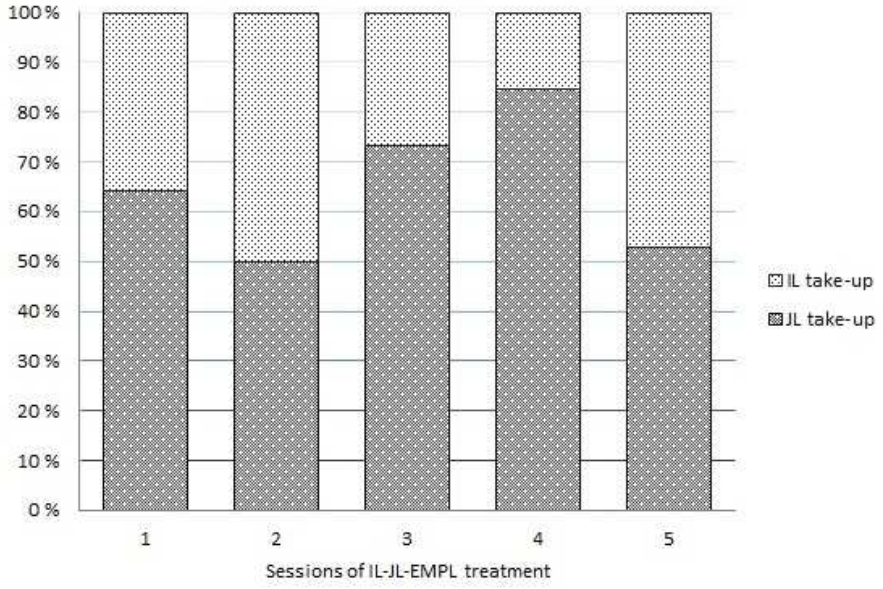
Figure 1 gives an overview of the take-up proportions in Round 1 across the three different groups. The percentage of take-up was 78.5% in IL-JL-EMPL, whereas in IL-EMPL and JL-EMPL the percentages of take-up were 62.5% and 65.1% respectively. With non-parametric analysis with Chi-square test for independence between the three treatment types and take-up preference (binary: yes/no), I reject the hypothesis of independence ($p < .10$) ; this allows to conclude that take-up behaviour significantly varies across the three groups.

Figure 2 gives a closer look at the distribution of JL and IL take-up among the loan takers in Round 1 in the IL-JL-EMPL treatment. A binomial test confirms that JL loan take up is significantly higher ($p < 0.01$). This indicates that when borrowers can make sure that partners would not be able to cheat, then JL could excel in take-up rate.

4.2.1. Determinants of loan take-up

In addition to non-parametric test, I regress take-up of loan on the 3 different treatment categories for in Round 1. I then add the individual-level control variables in the regression. I use the linear probability

Figure 2: Distribution of JL and IL take-up among the loan takers in Round 1 of Treatment IL-JL-EMPL



model specification for each case:

$$Y_i = \alpha + \sum \beta_t * Trt_t + \boldsymbol{X_i'}\gamma + \epsilon_i, \tag{11}$$

where, Y_i is the take-up of loan (any type) by individual i. Trt_t is the dummy variable that takes value 1 if individual i was in treatment t, otherwise 0; with β_t being the treatment effect. $\boldsymbol{X_i'}$ is the vector of individual-level control variables.

Table 1 summarizes the regression results of the treatment effects on take-up of any loan type in Round 1. In Column (a), we see that with respect to IL-JL-EMPL, take-up is lower by 15.99 percentage points ($p = 0.03$) and 13.41 percentage points ($p = 0.07$) in IL-EMPL and JL-EMPL respectively. When the individual-level control variables are included, the treatment effects more or less remain in the same direction and level, however the coefficient of JL-EMPL is not significant anymore (as shown in Column (b)). This could be due to the reason that in the regressions that involve controlling for the individual preferences, I drop the inconsistent observations.[22] I further find a statistically significant decline in probability to take loan as the level of risk-aversion[23] increases; however, no significant effect of altruism or discount rate found.

[22]For the regressions including the individual-specific control variables, I drop 57 observations whose measure of risk is inconsistent, i.e. who switched among the lotteries more than once in the H&L test. I further drop the 10 observations who shared more than half in the dictator game, 5 of them sharing the entire of 3 Euros. There was no way to verify if these subjects had mistaken the amount to be shared for the amount that they wanted to keep for themselves.Therefore, I drop those observations as I would like to avoid predicting the effects based on any confusion. Furthermore I also follow the 'trimming rule' *à la* Horrace and Oaxaca (2006) which suggests that as long as the number of observations with predicted values outside the unit range is small and as long as they are dropped, the estimates from LPM are consistent.

[23]I include the number of safe lotteries chosen from a set of 10 paired H&L lotteries as the measure of risk-aversion; the

4.2.2. Determinants of choice between loan types

4.2.2.1. Results of OLS regressions on take-up of the two loan types in Round 1. I separately study the take-up of the two different loan options in Round 1. To estimate the impact on the take-up of each of the two loan types, I again use a linear probability model. Table 2 Columns (1) and (2) respectively report the effects on take-up of JL loan and IL loan across the treatment variations.

For JL take-up. I find that only altruistic attitude has a statistically significant effect in group IL-JL-EMPL; a unit increase in DG-giving increases probability to take up of JL by 22.62 ($p = 0.02$) percentage points. The interaction coefficient -.2034 gives the difference in the slopes of DG-giving in group JL-EMPL and IL-JL-EMPL, but the difference in not statistically significant. Even in case of the other preference measures I do not find significant difference in slopes across the treatments.

For IL take-up. The measure of risk aversion has a statistically significant effect in group IL-JL-EMPL implying that with unit increase in risk aversion, probability to take up IL loan decreases by 5.77 percentage points ($p = 0.06$). The interaction coefficient indicates that the difference in the slopes of risk aversion in group IL-EMPL and IL-JL-EMPL is not statistically significant. The other preference measures have neither significant main effects nor interaction effects.

Therefore, combining the effects of the individual-level control variables for preferences across the treatment types, I can conclude that altruistic attitude has a positive effect on probability to take JL loan and risk aversion has a negative effect on probability to take IL loan. And since these average marginal effects do not differ significantly across the treatment types, we cannot deny that similar effects persist across the comparing treatments.

4.2.2.2. Interaction effects. I further analyze the Round 1 data by including additional interaction terms between the different preference measures to the LPM regressions. Since I found no significant difference in slopes of these measures across the different treatment types, therefore in the following analysis I do not distinguish between the treatment types.

In Section 2, Proposition 2 suggests that for low discount factor, an individual prefers to have IL over JL if she is not highly risk-averse; this is when we do not include any additional utility gain from partner's outcome. I test if such a relation holds with my data, by adding interaction between risk-aversion and discount rate. I categorize risk-aversion into three levels (if number of safe lotteries chosen ≤ 4, 'not risk-averse'; if $4 <$ no. of safe lotteries < 7, 'risk-averse'; ≥ 7, 'highly risk-averse')[24]. I further categorize discount

higher the number of safe lotteries chosen from the list the higher is the risk-aversion.

[24]The categorization is more or less is in line with H&L original test. I separate the 'risk-averse' from 'highly risk-averse' in order to check if there is any difference in the choices of the two kinds when discount factor is low (as per suggestions by Proposition 2).

rate by breaking it down into two levels ('patient'- those with discount rate < 0.05; 'less patient' those with discount rate ≥ 0.05). However I do not find any significant interaction effect. I do find plausible patterns such as: among the 'patient' subjects, with increase in risk aversion, probability of taking up JL increases (statistically insignificant) and probability to take up IL decreases (statistically significant) (Table 3 Columns (1) & (2)). Among the 'risk-averse' and 'highly risk-averse' subjects, moving from 'patient' to 'less patient' category increases probability to take up IL and decreases that for JL. As per suggestions of theory, we do see that probability to take IL rises with fall in patience among 'risk-averse' ($0.169 - .054 = 0.115$ in Column (2)), but we do not find any exception in action of the 'highly risk-averse' as compared to 'risk-averse'($.065 - .054 = .011$). However, these findings are only suggestive and cannot be stressed upon.

According to Section 2 Proposition 3, individuals who discount future heavily yet have high *other-regarding preferences* may prefer JL over IL even without being highly risk-averse. Therefore, I investigate how the two-way interaction of social and time preference measures of the subjects affects the take-up of JL and IL loans. For easiness of interpretation, I categorize 'shared amount in DG' into three levels ('selfish'- shared from nothing up to 1 Euro; 'fair' - shared between 1 Euro up to 1.5 Euros; 'more than fair'- shared more than 1.5 Euros)[25]. I find that among the 'selfish' ones, as patience decreases to 'less patient', probability to take up JL decreases (coefficient -.1473 in Table 4 Column (1)) and probability to take up IL increases (coefficient .1035 in Table 4 Column (2)). Although there is no statistical significance to claim anything strongly, we do see a pattern here: among the subjects who show self-interest maximizing preferences by sharing very low/no amount in the DG, probability to take up JL decreases as patience decreases; and we see the opposite effect for IL. But the 'fair' subjects do not necessarily show the same behaviour as patience decreases; and this effect change from 'patient' to 'less patient' in case of the 'fair' subjects is significantly different by 35.63 percentage points ($p = 0.03$) from a similar effect change in case of the 'selfish' ones while JL take-up (the sum of the interaction and main coefficient shows that with decrease in patience JL take-up increases among 'fair' subjects). Similarly, the effect change from 'patient' to 'less patient' in case of the 'fair' subjects is significantly different by 34.5 percentage points ($p = 0.03$) from a similar effect change in case of the 'selfish' while IL take-up (the sum of the interaction and main coefficient shows that with decrease in patience IL take-up decreases among 'fair' subjects). Summarizing these findings from the two-way interaction terms, we can see that either one has to be patient or if not patient then non-selfish/cooperative enough to boost her desire for JL loan.

Now I summarize the results obtained from the two sets of interaction effects: I do find substantial evidence that JL take-up is driven by *other-regarding preferences*; while it is not the most profitable for self to take up JL as a 'less patient' subject, yet the 'fair' ones have higher willingness to take up JL. From the interaction between risk and time preference, I do not find any evidence that 'less patient' subjects would

[25]I already discussed before that I drop the 'more than fair' category from analysis.

incline more toward JL if they have high level of risk aversion. Therefore, as per the collective evidence obtained here: JL preference seems to be driven by altruistic attitude and not by high risk-aversion among less patient borrowers.

4.2.3. Impact of treatment on take-ups of the different loan types over the rounds

I now move on to analysis with all rounds' data. Each session continued for 10 rounds. In the beginning of each round, subjects could make a new choice of the income type which they wanted in that particular round. In this section I look for any learning effect in the subjects over the rounds. I separately study the effect on take-up of the different loan types. I use the two-way interaction between lagged take-up (binary: 1 if the choice type in question was taken in past round, 0 otherwise) and lagged earning result (binary: 1 if earned more than zero in past round, 0 otherwise). The lags in take-up and earning result are by one round.

Using LPM with fixed effects I do not find any interesting outcome as such.[26] According to the panel regression results of both JL and IL (given in Tables 5 and 6), there is statistically significant evidence that if earnings in the last round was zero, then willingness to take IL (JL) in current round by those who had taken it in the last round is 12.7 (17.4) percentage points less than those who had not taken it in the last round. This implies that if earned nothing with a certain loan type in the last round, subjects do not repeat take-up of the same loan type in the current round. While comparing the interaction effect outcomes, we can infer the following: in case of IL take-up, regardless of earning zero or positive income with IL in the last round, subjects are equally less likely to take it again than those who had not taken it in last round. But in case of JL take-up there is a significant positive difference in probability for JL re-take-up between those who earned non-zero income and those who earned zero income with JL in the last round; this implies that when earned a positive income with JL in the last round, the subjects were less willing to turn away from JL re-take-up compared to when they earned a zero income with JL in the last round. In sum, it is safe to conclude that the subjects did not stick to only one choice type; even though they earned some positive income from their chosen type in one round, they showed less willingness to choose the same option again in the next round.

5. Conclusion

The inspiration for this study comes from the gradual decline in faith over the past decade in microcredit loans as a global poverty alleviation tool. We see from large-scale field experiments that were implemented in the core developing countries, that the short and long run welfare effects from microcredit are miles behind what had been projected two decades ago. And one of the key instruments for this bad performance could be the low demand or take-up of these loans by those poor who were the very target group. This outcome of

[26] I do not drop the H&L risk-inconsistent observations nor the observations that share more than half the amount in DG, because here I am only interested in their choices.

low take-up is common to many field experiments conducted in the last decade. Such unanticipated findings from big studies give rise to a new interest into the post-analysis of what could have gone wrong. This study attempts to find some answer to that. I start with a very controlled set-up in the lab where I simply try to dissect the advantageous and disadvantageous sides of IL and JL loan types and study if individuals with different preferences are inspired by the loan features differently; and I argue that if that is so, then borrowers should be able to better self-select their desirable loan type from a flexible choice-set of different loan types. And, this in turn would be able to lead to the final aim of increasing overall take-up.

Using the standard features of JL and IL loans in the framework of microcredit, I argue that although JL loan with dynamic incentive would yield higher expected payoff than IL loan in long run, its immediate expected payoff is lower than that of IL loan. Therefore, a borrower has to go through a complicated cost-benefit analysis before making a choice between the two; and, in that decision-making, her risk preference, time preference and social preference might come into play. I keep the loan features free from moral hazard and free-riding possibilities in JL, because my aim is to be able to study the effects of the different features that are already there.

In a lab experiment with student subjects, I study a group who are offered a broader choice-set of both loan types *vis-à-vis* two other groups who are offered only one type each. I do find significant evidence that take-up rate is higher in the former group. Additionally, I also find that take-up of loan types is driven by varied preferences of the subjects, thus giving strength to my arguments. I find that risk-averse subjects totally stay away from any loan type; takers of JL type have more than 'self-regarding' preferences. With a closer look, I find that two types of subjects have higher probability to take up JL: **1.** the subjects who are rather 'self-regarding' yet 'patient'; they are the standard economic agents who behave as the theoretical model predicts; **2.** the subjects who are not patient enough, but show signs of having more than just 'self-regarding' preferences.

One limitation of this lab setting could be that here the JL loan type only provides for partnering up with someone anonymous, which is unlike the case in the real setting. I defend my framework by arguing that if already JL is well in demand in a framework which only allows random anonymous partners, then its demand would be more pronounced in the real situation where the borrowers are willing to partner up with friends and acquaintances. If we think of the real situation, JL loan is actually a safer choice if and when borrowers are fully assured that their partners cannot cheat on them and will help them in case of genuine investment failure. If such an assurance is there by means of information symmetry on investment outcomes in a group, then it is justified that borrowers would be convinced to opt for it.

Nevertheless, we cannot completely ignore the need of IL type, as here we see evidence that demand for JL is more among those who show more generous attitude in sharing income. Therefore, for those who are not so generous and yet have less risk-averse preferences, could be more interested in IL type loan. Therefore, as a lender it would be fruitful to elicit the preferences of the prospective borrower and then offer a suitable loan type; or, if preference elicitation is not feasible, it is better to offer bigger choice-set of loans so that the

borrower has room for self-selection.

I agree that the level of the effects that I find in my experiment may not be entirely replicated in a framed-field/field experiment, but nevertheless the directions of the effects that I find are sufficiently fruitful. We could all agree that if the loan offerings are customized according to the heterogeneous preferences of the borrowers, it could lead to a better take-up rate.

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Appendix

Table 1: Dependent variable - Take-up of loan in Round 1

Variable	Coefficient (a)	Coefficient (b)
Treatment Category		
IL-JL-EMPL	(*base*)	(*base*)
IL-EMPL	$-.1599^{**}$	$-.1914^{**}$
	(.0745)	(.0894)
JL-EMPL	$-.1341^{*}$	$-.1061$
	(.0741)	(.0875)
Individual specific controls:		
Nr. of safe lotteries chosen		$-.0381^{**}$
		(.0180)
Shared amount in DG		.0540
		(.0575)
Discount rate		.6867
		(.7978)
Constant	$.7850^{***}$	$.9904^{***}$
	(.0429)	(.1432)
Observations	220	149
R^2	0.0256	0.0621

***, **, *Significance: $p < 0.01$, $p < 0.05$ and $p < 0.10$ respectively; 1. Heteroscedasticity-robust errors in parentheses; 2. Dropped for Column (b), the H&L risk inconsistent obs. and obs. which share more than half amount in DG ; 3. 4 obs. dropped due to Horrace & Oaxaca trimming for Column (b).

Table 2: Effect of heterogeneous preferences on take-up of JL & IL loans across the different treatment groups in Rd.1

	Take-up of JL	Take-up of IL
	(1)	(2)
Treatment Category:		
IL-JL-EMPL	(*base*)	(*base*)
JL-EMPL	.4771	
	(.3866)	
IL-EMPL		.2391
		(.3086)
Nr. of safe lotteries chosen (in IL-JL-EMPL)	.0210	$-.0577^{*}$
	(.0324)	(.0303)
Treatment category X Nr. of safe lotteries chosen	$-.0228$	$-.0126$
	(.0565)	(.0417)
Shared amount in DG (in IL-JL-EMPL)	$.2262^{**}$	$-.1107$
	(.0978)	(.0864)
Treatment category X Shared amount in DG	$-.2034$	.1108
	(.1479)	(.1505)
Discount rate (in IL-JL-EMPL)	.3019	$-.5979$
	(1.3543)	(1.111)
Treatment category X Discount rate	.4660	2.4202
	(1.900)	(1.831)
Observations	107	111
R^2	0.0947	0.2417

**, *Significance: $p < 0.05$ and $p < 0.10$ respectively; 1.in Column (1) only treatments JL-EMPL and IL-JL-EMPL considered, whereas in Column (2) only treatments IL-EMPL and IL-JL-EMPL considered; 2. Het-robust errors in parentheses; 3. Dropped H&L risk inconsistent obs. and obs. which share more than half amount in DG; 4. 5 obs.dropped due to Horrace & Oaxaca trimming in Column (1); 3 obs.dropped due to Horrace & Oaxaca trimming in Column (2).

Table 3: Interaction effect of time and risk preference on JL & IL take-up in Round 1

	Take-up of JL	Take-up of IL
	(1)	(2)
Risk-aversion_category (when disc.rate_category='patient')		
'not risk-averse'	(*base*)	(*base*)
'risk-averse'	.2132	$-.2843^{*}$
	(.1621)	(.1544)
'highly risk-averse'	.2802	$-.4316^{***}$
	(.1723)	(.1507)
Discount rate _category (when risk-aversion_category='not risk-averse')		
'patient'	(*base*)	(*base*)
'less patient'	.1878	−.0544
	(.1824)	(.2071)
Disc.rate_category X risk-aversion_category		
'less patient' * 'risk-averse'	−.2111	.1684
	(.2543)	(.2841)
'less patient' * 'highly risk-averse'	−.3805	.0654
	(.2306)	(.2338)
Observations	109	112
R^2	0.1115	0.2616

$^{***},^{*}$Significance: $p < 0.01, p < 0.10$; 1.in Column (1) only treatments JL-EMPL and IL-JL-EMPL considered, whereas in Column (2) only treatments IL-EMPL and IL-JL-EMPL considered; 2. Het-robust errors in parentheses; 3. Dropped H&L risk inconsistent obs. and obs. which share more than half amount in DG; 4. the coefficients of the interaction term report the difference in effect of discount rate for 'risk-averse' and 'highly risk-averse' as compared with effect of discount rate for 'non risk-averse'.

Table 4: Interaction effect of time and social preference on JL & IL take-up in Round 1

	Take-up of JL	Take-up of IL
	(1)	(2)
DG sharing_category (when disc.rate_category='patient')		
'selfish'	(*base*)	(*base*)
'fair'	.1584	.0302
	(.1213)	(.1005)
Discount rate _category (when DG sharing_category='selfish')		
'patient'	(*base*)	(*base*)
'less patient'	−.1473	.1035
	(.1161)	(.1080)
Disc.rate_category X DG sharing_category		
'less patient' * 'fair'	.3563**	−.3447**
	(.1583)	(.1563)
Observations	109	112
R^2	0.1470	0.2482

**Significance: $p < 0.05$; 1.in Column (1) only treatments JL-EMPL and IL-JL-EMPL considered, whereas in Column (2) only treatments IL-EMPL and IL-JL-EMPL considered; 2. Het-robust errors in parentheses; 3. Dropped H&L risk inconsistent obs. and obs. which share more than half amount in DG; 4. the coefficients of the interaction term report the difference in effect of discount rate for 'fair' as compared with effect of discount rate for 'selfish'.

Table 5: Dependent variable - JL take-up in 10 rounds

	Coefficient
Lagged JL takeup (at Lagged _earnings outcome=0)	
Lagged JL takeup= 0	(*base*)
Lagged JL takeup= 1	$-.1741^{***}$
	(.0552)
Lagged earnings outcome (at Lagged JL takeup=0)	
Lagged earnings outcome= 0	(*base*)
Lagged earnings outcome= 1	$-.0365$
	(.0501)
Lagged JL takeup X Lagged earnings outcome	$.1391^{**}$
	(.0607)
Observations	1404
R^2	
overall	.0289
within	.0179
between	.6797

***, **Significance: $p < 0.01, p < 0.05$; 1.only treatments JL-EMPL and IL-JL-EMPL considered; 2. Het-robust errors in parentheses; 3. the coefficients of the interaction term report the difference in effect of lagged take-up of JL for 'L.earnings outcome=1' as compared with effect of lagged take-up of JL for 'L.earnings outcome=0'.

Table 6: Dependent variable - IL take-up in 10 rounds

	Coefficient
Lagged IL takeup (at Lagged earnings outcome=0)	
Lagged IL takeup= 0	(*base*)
Lagged IL takeup= 1	$-.1266^{***}$
	(.0470)
Lagged earnings outcome (at Lagged IL takeup=0)	
Lagged earnings outcome= 0	(*base*)
Lagged earnings outcome= 1	−.0264
	(.0308)
Lagged IL takeup X Lagged earnings outcome	.0150
	(.0461)
Observations	1413
R^2	
overall	.1776
within	.0138
between	.9672

***Significance: $p < 0.01$; 1.only treatments IL-EMPL and IL-JL-EMPL considered; 2. Het-robust errors in parentheses; 3. the coefficients of the interaction term report the difference in effect of lagged take-up of IL for 'L.earnings outcome=1' as compared with effect of lagged take-up of IL for 'L.earnings outcome=0'.

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