The Endowment Effect and Collateralized Loans

Kevin Carney, Michael Kremer, Xinyue Lin, and Gautam Rao

Harvard University

This version: January 2019

Somewhat Preliminary Draft

Abstract

This paper studies how the endowment effect influences the demand for collateralized loans. Using a field experiment with dairy farmers in Kenya, we show that borrowers dislike loans that place endowed (already-owned) assets at risk of loss by providing them as collateral. They are willing to pay 9% per month higher interest to instead collateralize using the asset being financed by the loan itself. This occurs despite borrowers valuing the new and endowed assets similarly before owning either. Despite higher take-up, same-asset collateralized loans do not have higher default rates. We provide evidence that borrowers systematically under-predict their future attachment to assets before they own them. Thus, borrowers may initially perceive that they have little to lose when providing the new asset as collateral, but subsequently come to develop an endowment effect over it, resulting in high repayment effort. Barriers to collateralization using new assets, which are common in developing countries, may play an important role in driving down demand for collateralized loans. The welfare consequences of such loans are ambiguous, and depend on how quickly reference points adjust after losing an asset.

1 Introduction

Low take-up of seemingly profitable investments is a common puzzle in development. Credit constraints are thought to be part of the explanation, yet take-up of credit for risky investments is often low in poor countries (Banerjee et al. 2015). Previous research has sought to identify forms of financing that lead to high demand and successful completion of contracts. One under-explored approach is to offer loans where the very asset being financed is used as collateral, as in mortgages and car loans in many developed countries. A recent study in Kenya (Jack et al. 2018) finds that relaxing collateral requirements may be an effective way to increase demand for credit. In this paper, we highlight one reason why the typical collateral requirements in developing countries might deter borrowers: the endowment effect.

The endowment effect is a phenomenon — well documented in experimental economics — where owning a good increases one's valuation of that good, and reduces one's willingness to lose it. Borrowers who are subject to an endowment effect may thus dislike placing assets they already own at risk by offering them as collateral. We hypothesize that they may instead be more willing to take up loans collateralized by the new asset being financed, over which they may not (yet) have developed an endowment effect. A key question is how soon borrowers come to feel "endowed" with the new financed asset, and whether they correctly anticipate this at the time of loan take-up.[1] If an endowment effect over the new asset develops before the loan is paid off, then repayment incentives will remain high when collateralizing using the new asset. If borrowers additionally fail to anticipate this effect, then lenders can achieve both higher demand (since borrowers ex-ante perceive that they will have little to lose) and high repayment effort (since borrowers will come to feel a sense of loss in case of default).

We conducted a randomized experiment to test this theory. First, we compared take-up of Same-Asset Collateralized Loans (SACLs), which use the asset being financed as collateral, and Other-Asset Collateralized Loans (OACLs), which require existing assets as collateral. The assets used in the experiment were chosen from a list of common household and agricultural durables, with market prices of around 15 days of per capita daily income, and loan repayment terms of two months. To isolate the role of the endowment effect in determining the take-up rates of these loans, we first endowed participants with a randomly-selected durable asset as compensation for their participation and then, one week later, offered them a loan to finance the purchase of a different randomly-assigned asset. We measured borrowers' willingness to pay (WTP) for new assets using OACLs (with the initially-endowed asset used as collateral) and SACLs (with the same asset being financed used as collateral). By randomly assigning assets, we ensure that in expectation, the baseline valuation for the assets being financed is the same in the SACL and the OACL, such that any difference in take-up between the two loans can be attributed to the endowment effect over the collateral.

We find that borrowers have a substantial preference for loans that use the item being purchased as collateral. The average willingness to pay for a new item is 13.3% higher when it is financed using a SACL rather than an OACL. This is equivalent to borrowers being willing to pay an 8.8 percentage point higher monthly interest rate. The only difference between the two loans we offered was the collateral: the SACL required the new item being purchased as collateral, while the OACL required an item the respondent had owned for a week as collateral. Due to the random assignment of the items, the collateral items used for the two loans should be valued similarly on average, which we

[1] In the language of reference dependence, the question is how quickly the reference point updates to include the new asset, and whether borrowers have accurate beliefs about this process.

verify using baseline measures of WTP for each item. We attribute the difference in WTP for the two loans to an endowment effect over the OACL collateral item. We consider various potential confounds, including learning about the endowed asset, complementary investments, hedging motives, and a lack of comprehension, and argue that none of them are likely to explain the full set of results.

Next, we explore whether borrowers anticipate this endowment effect, which has important implications for consumer welfare and policy-making. To test for such misperceptions, we measured borrowers' predictions about their future take-up decisions for SACLs and OACLs before we endowed them with any item. By comparing predicted take-up (before the OACL collateral item was endowed) to actual take-up (after the OACL collateral item was owned for one week), we can determine whether consumers anticipate that the first item will enter their reference point, creating an endowment effect. Our results suggest that people underestimate the strength of their future endowment effect. Because ownership of the collateral does not change between the times of prediction and actual take-up decisions in case of the SACL, there is no reason to expect misprediction. We find that subjects indeed accurately predict on average their future willingness to pay for an item using a SACL. For the OACL, however, actual willingness to pay using the loan is significantly lower than what subjects predicted before being endowed with the collateral. This is consistent with subjects being at least partially unaware that they will become attached to the endowed item over the course of a week, making them less willing to take up a loan that uses it as collateral.

To directly measure the strength of subjects' endowment effect and their level of awareness about it, we also elicited willingness to accept (WTA) for the endowed item after a week of ownership and predictions of their WTA prior to endowment of the item, following Loewenstein and Adler (1995). Comparing WTA to baseline WTP for the item provides a direct test of the endowment effect, and comparing WTA to predicted WTA gives us a second way of measuring subjects' awareness of this endowment effect. Consistent with our results from the loan offers, we find evidence of a strong endowment effect over the initially-endowed item: WTA is more than four times higher than WTP, on average. Consistent with the loan predictions, predicted WTA falls between actual WTA and initial WTP for the item. This suggests that people anticipate some attachment to the item, but do not fully understand the strength of the endowment effect they will come to experience.

To map these results to behavioral parameters and to better understand welfare implications, we estimate a structural model of loan take-up decisions. In our model, borrowers experience an endowment effect due to loss aversion, which we model following Kahneman and Tversky (1979) and Kőszegi and Rabin (2006). We designed the experiment with this model in mind, and the treatments provide transparent identification of the parameters. We estimate levels of loss aversion ($\lambda = 4.57$) that are higher than those typically found in laboratory experiments, but within the range of recent field estimates. We estimate the projection bias parameter $\alpha = 0.58$, indicating that borrowers under-estimate their future endowment effect by 42%. The benchmark estimates also imply that individual act as if they perceive a default probability of 5%, even though observed default rates in our experiment are under 1%. While it is possible that individuals systematically over-estimate or over-weight the probability of default, we note that individuals face correlated shocks to income in our context and the experiment was conducted over the course of a few months, and therefore we cannot rule out that ex-ante beliefs about default rates were rational.

The welfare implications of SACLS are ambiguous. One the one hand, borrowers underpredict their future endowment effect and thus may be signing up for SACLs which ex-post open them up to

(stronger than anticipated) painful losses in the case of defaults. However, the overall welfare impacts of introducing SACLs to an environment that previously only had OACLs will depend on whether people under-adopt OACLs (for any reason) and whether SACLs move loan take-up toward or away from the optimal level. The take-up of OACLs is likely to be too little for many reasons. For example, borowers with projection bias may overestimate how long they will feel a sense of loss if they lose the existing assets which serve as collateral in OACLs. SACLs can help offset this bias and encourage the take-up because people under-appreciate their future attachment to items they do not yet own and predict that they would feel less sense of loss in the case of default. Further, if borrowers overestimate the probability of default, as our estimates provide suggestive evidence of,[2] then they may generally overestimate the risk they take of losing their collateral by taking up loans. In this case, borrower's underestimation of their future attachment to the SACL new item may offset their overestimation of the risk of default and therefore move take-up towards the optimal level. Furthermore, lacking assets that could serve as collateral will also obviously deter people from taking up OACLs. By extending financing to individuals who need credit but cannot accumulate assets to use as collateral, SACLs could improve welfare. However, while SACLs are effective in encouraging loan take-up, it is entirely possible that they lead to too much take-up.

On the other hand, SACLs may have perverse welfare consequences during loan repayment. For example, in the United States, consumers and firms use SACLs for a wide range of assets, from homes to business equipment. While SACLs for productive assets or affordable consumer durables may be innocuous, firms may take advantage of borrowers' preference for SACLs to sell temptation goods or luxury items that are beyond the financial reach of their customers. A customer who does not anticipate becoming attached to the new item might approach such an offer thinking "What do I have to lose?" since in the case of default, they would lose something they never had to begin with. Yet if the consumer is subject to the endowment effect, the new item will eventually enter their reference point. This unanticipated endowment effect will make default hurt more than the borrower initially anticipated and could drive them to go to greater lengths than they expected in order to repay the loan.

One contribution of this paper is to the behavioral economics literature on the endowment effect.[3] While the endowment effect is considered a foundational result of behavioral economics, and a canonical example of the consequences of loss aversion, we have relatively little evidence on the endowment effect in the field, with a prominent exception being List (2003; 2004; 2011), a path-breaking series of papers which show that the endowment effect in trading goods reduces with market experience, but is prominently found in inexperienced traders and consumers. In their review of the literature, Ericson and Fuster (2014) conclude, "Although this is difficult to do, it would be very desirable to get more evidence from field settings with goods or entitlements of substantial value. Relatedly, more research is needed in the field that examines how decisions in important domains such as...savings/investment...are affected by changes in ownership." This paper provides precisely such evidence.

[2]Overweighting of small probabilities is also one feature of Kahneman and Tversky's cumulative prospect theory.

[3]Existing literature, going back to Knetsch (1989) and Kahneman et al. (1990), establishes the endowment effect in the lab. Indeed, the endowment effect has been described as "one of the most robust findings in the psychology of decision making" (Knetsch et al. 2001). More recently, there have been several studies about the endowment effect in a developing country context. Apicella et al. (2014) conduct experimental tests of the endowment effect among hunter-gatherers in Northern Tanzania. They find that subjects living in the most isolated part of the study region did not display an endowment effect, while those who were more exposed to modern society and the market economy did exhibit an endowment effect. This suggests that the endowment effect may not be a fundamental or immutable element of human psychology.

A second contribution of this paper is to provide new explanations and evidence on an important question in development economics. First, evidence from multiple settings suggests that farmers, small-scale entrepreneurs, and households in developing countries sometimes leave high expected-return investments unexploited (Banerjee and Duflo, 2007; 2012). In theory, provision of credit could allow these investments to be made, but uptake of credit is often limited (Banerjee et al., 2015). This project proposes that loss aversion — through generating an endowment effect — can drive down take-up of collateralized credit for making productive investments embodied in physical capital. More broadly, we will evaluate different financing contracts to increase such investments.

A final contribution is to the literature on collateralized credit in finance, where the role of collateral has been widely studied, e.g. in influential papers by Hart and Moore (1994) and Kiyotaki and Moore (1997). To this literature, we point to a psychological factor which might affect demand for, and repayment of, collateralized credit.

The rest of the paper proceeds as follows. Section 2 describes the setting and lays out the experimental design. Section 3 presents our main reduced form results. Section 4 explores projection bias and subjects' awareness of their endowment effect. In Section 5 we develop a theoretical model of loan take-up decisions. Section 6 presents structural estimates of the model's key parameters. Section 7 discuss the welfare implications of the loans we study and presents numerical estimates of the welfare effects. Section 8 concludes.

2 Setting and Experimental Design

We conducted an experiment to test whether borrowers prefer loans collateralized with the new asset being financed. There are several reasons a borrower might prefer to use new assets rather than existing assets as collateral. We designed the experiment to isolate the role of the endowment effect.

Setting

Our study took place near the boundary of Kenya's Nyandarua and Laikipia counties, in the former Central Province. We partnered with a local savings and credit cooperative association (SACCO), the Nyala Vision SACCO. SACCOs are common financial institutions in Kenya, and approximately five percent of Kenya's population are members of a SACCO. There are several SACCOs in the area where we conducted our study. The Nyala Vision SACCO has five branches and provides deposit accounts and loans. It primarily serves dairy farmers, and has an associated dairy cooperative to whom members can sell milk. The cooperative makes payments through the SACCO, and borrowers can have loan payments directly deducted from their milk revenues. The SACCO offers loans for a variety of purposes, including farm equipment, school fees, and emergency loans.

We recruited subjects from the SACCO's list of members. Table 1 describes our sample. Our sample is relatively old, with a mean age of 51, and is approximately balanced on gender. The average subject has 9.8 years of education, the mean income in the month prior was KES 23,900 (USD 236). 62% of subjects report that dairy farming is their most important source of income, while 26% report farming other livestock or crops is their most important farm of income. Most subjects are smallholder farmers: subjects reported that on average they had 1.8 cows producing milk at the time they were surveyed.

Identification Challenge

The key identification challenge is to offer loans that are identical but for one feature: whether their collateral is already owned by the borrower, and therefore a part of their endowment. To illuminate this challenge, suppose borrowers were randomly offered one of two loans to purchase a new asset: one loan that required the borrower to provide an existing asset as collateral (an OACL), and another loan that used the new asset itself as collateral (a SACL). While borrowers might prefer the SACL because it does not put their endowment at risk, they might also be more inclined towards SACLs for other reasons. Perhaps the borrower simply lacks an asset to provide as collateral. Or perhaps the assets they could use as collateral are more valuable than the new asset, irrespective of an endowment effect. These confounds make it difficult to attribute a preference for SACLs to the endowment effect.

To overcome this challenge, we first endowed subjects with a durable household or farm asset. One week later, so that the asset entered their endowment, we elicited each subject's willingness to pay for new assets using an OACL and a SACL. The OACL uses the initially-endowed item as collateral, while the SACL uses the new item being purchased as collateral. By endowing each subject with the initial item for free, we overcome the challenge that borrowers with limited assets may not be able to take up an OACL. By randomly assigning which items serve as the endowed item and new items we ensure that the new items and items for sale have the same expected value in both loans. In this way, any difference in willingness to pay between OACL and SACL can be attributed to an endowment effect over their collateral.

Experimental Protocol

We invited members of the SACCO to participate in two sessions scheduled one week apart. If a subject was not available exactly one week after the first session, their return was scheduled as close as possible to the one-week target. 84% of subjects returned for the second session exactly one week after the first. 95% of subjects completed the second session within two days from the one-week target. Nine people (1% of the sample) attrited between the first and second sessions.

Figure 1 illustrates the experimental design. We began by eliciting subjects' valuations of four household and agricultural items that are commonly sold in the area. We measured willingness to pay for each item using a Becker-DeGroot-Marschak (BDM) multiple price list methodology (Becker, DeGroot and Marschak, 1964). Subjects were presented with a list of possible prices and asked whether they would be willing to purchase the item at that price. We informed subjects that after they stated their preferences, one of the four items would be randomly selected using a computer lottery and one price from the list would be randomly chosen. That price would then be the sale price, and they would purchase the item if they had previously agreed to the randomly selected sale price. Although all subjects completed the price lists for all four items, we only actually implemented the random draws with a 1/100 probability, and we informed subjects that there was a chance that the computer would not select any item for sale. This allowed us to elicit incentivized measures of willingness to pay for the items without actually selling any item to most people, which might have influenced their demand for the items in subsequent exercises. Ultimately, only three subjects actually purchased an item in this exercise. The entire process was explained extensively using multiple examples, and subjects could not proceed to the price lists until they correctly answered a series of comprehension questions. Responses to comprehension questions show that all subjects understood that for each price they were asked about

there was some probability that their choice would be implemented. As further evidence that subjects understood the incentive-compatible nature of the exercise, there were no reports of subjects expressing regret or a desire to change their responses after a price was randomly drawn in this exercise or any of the other BDM exercises we conducted.

This exercise gave us each subject's willingness to pay for each of the four items. For each subject, we identified the three items that were the closest in valuation. We then randomized which of these three items would be the endowed item, the item financed using an OACL, and the item financed using a SACL. This randomization ensured that in expectation, the ex-ante valuation of the endowed item was the same as that of the item financed using a SACL and the item financed using an OACL, even though the four items used have different average valuations. At the end of the first session, we gave subjects the randomly selected endowed item to take home with them. They were told that they would have the opportunity to purchase additional items using loans in the second session, but were not informed of the terms of the loans or which items would be offered.

Participants returned to the study site to complete a second session after a delay of approximately one week. We used a one-week delay to give sufficient time for the endowed item to enter into subjects' reference points and to minimize attrition and scheduling conflicts. In the second session, we told subjects they would be offered a loan to purchase one of the two items that were not endowed to them. We explained that one of the items would be financed using a loan with the endowed item as collateral (an OACL), and that the other item would be financed using a loan with the new item itself as collateral (a SACL). The loans were to be paid in two monthly installments with one percent monthly interest. Subjects had to correctly answer comprehension questions about the terms of the loan and its collateral before proceeding to willingness to pay questions.

We measured willingness to pay for each loan, rather than take-up at a fixed price, to increase power. Again we used a Becker-DeGroot-Marschak price list to elicit willingness to pay for each loan. At this point, subjects were very familiar with the procedure. Alongside each price we displayed what the monthly installment payment would be for that price. We randomly varied the order in which the two loans were presented. We also explained the first loan and elicited its willingness to pay before mentioning the terms of the second loan. This allows us to account out comparison effects that could have influenced how subjects evaluated the second loan that was presented to them. We find no evidence of ordering effects. After subjects completed the price lists, the computer randomly selected one of the loans, and then randomly selected the price for that loan. If the subject agreed to that price for that loan, they entered into a loan contract at the drawn price and went home with the new item.

After the main portion of the experiment were complete, subjects participated in an experimental exercise to measure loss aversion, where they could choose to accept or reject a series of small gain-loss lotteries. Previously in the experiment, subjects were endowed with 100 Kenyan shillings to cover any losses they might incur during in these lotteries, so that liquidity constraints were not a concern. However, we did not draw a direct connection between this payment and the lotteries, and responses in qualitative piloting indicated that people considered these lotteries in isolation. The experiment concluded with a brief questionnaire about sociodemographics and farming.

3 Reduced Form Results

Table 2 shows summary statistics about the baseline valuations from the initial BDM exercise for each of the four items used in the survey. Due to delays in procurement from the supplier, some subjects completed the experiment without either the milk can or the cooking pot. While this makes it less likely that the three experimental items are similarly valued ex-ante by any one individual, it does not jeopardize our identification strategy. Using four items in total ensured that we could still randomize which item served as the endowed item, new item for sale using a SACL, and new item for sale using an OACL, even when one item was out of stock. The table shows that subjects valued the items similarly, though the thermos was evaluated as slightly less valuable on average. For all items, mean valuations were below the market price, which was approximately KES 2,500 for each of the items.

To test our main hypothesis, we compare willingness to pay for an item using a SACL relative to an OACL. Figure 2 shows the raw differences in mean willingness to pay. Subjects are willing to pay KES 1348 on average for an item when financed using a SACL, compared to KES 1195 on average when financed with an OACL. This difference of KES 153 is statistically significant at the 0.0001 level.

Because we elicited baseline valuations for each of the items used in the experiment, we can control for ex-ante differences in how subjects valued the loans' new items and collateral items. To do so, we estimate the following pre-specified regression equation:

$$\Delta\text{Loan}_i = \beta_0 + \beta_1 \Delta\text{New Item}_i + \beta_2 \Delta\text{Collateral}_i + \varepsilon_i \tag{1}$$

Here, deltas represent differences in valuation between the components of the SACL and the OACL for individual i. On the left-hand side is the difference between individual i's willingness to pay for a new item using a SACL versus an OACL. On the right-hand side we include a constant, the difference between i's baseline valuations of the new items using a SACL and an OACL ($\Delta\text{New Item}_i$), the difference between i's baseline valuations of the collateral items for the SACL and the OACL ($\Delta\text{Collateral}_i$), and an individual-specific error term. Thus, the coefficient of interest is the constant, which represents the difference between individuals' willingness to pay for a SACL and an OACL, controlling for differences in their baseline valuation of the new items as well as the collateral items for the two loans.[4]

Table 3 reports estimates of our pre-specified regression. The coefficient of interest, the constant, shows that people are willing to pay KES 159 more on average when they can use the asset they are purchasing, rather than the endowed asset, as collateral. This represents a 13.3% increase in WTP over the mean OACL WTP of KES 1195. In terms of the total amount being paid, this is equivalent to people being willing to pay an 8.8% higher monthly interest rate in order to be able to collateralize using the item they are purchasing. Because we randomized which items were for sale using the loans and which item was the endowed item, the only systematic difference between the SACL and the OACL is that in the OACL, subjects had owned the collateral item for a week. Therefore, we attribute this difference in WTP for the two loans to an endowment effect. Subjects exhibit a preference to collateralize loans using the item being purchased, and they are willing to pay more to do so.

[4]In an appendix, we report results of regressions with an indicator for SACL as robustness checks (an observation is individual × loan). Results look similar.

Possible confounds

There are several possible reasons other than an endowment effect that people might be willing to pay more for a SACL than an OACL. We designed the experiment to rule out these confounds, and our data suggest that they are not a concern.

One possible confound is learning about the endowed item. If subjects learned over the course of the week about the item we endowed them with, they may have been more or less inclined to put this item at risk than a new item, which they did not have the opportunity to learn about. To avoid this, we selected the set of items used in the experiment in order to minimize the scope for learning. In the local context, cooking pots, milk cans, cow sprayers, and metal thermoses are all common items, which people were likely to already own at least one of, but could possibly use another. These items are all relatively straightforward to evaluate, and we gave subjects the opportunity to inspect each of the four items in-person before beginning the initial BDM exercise. Because the items are commonplace and uncomplicated, we believe there was limited scope for learning about them beyond this first inspection. Moreover, in order for learning to explain our result, people would need to systematically update positively about the endowed item.

To test for this confound empirically, we exploit variation in past experience with the items, as measured by the number of the endowed items that the subject previously owned. If our results are driven by learning about the endowed item over the course of the week, we would expect to see a larger gap between WTP for SACL and WTP for OACL for those who previously owned the item they were endowed with, therefore having less of an opportunity to learn from an additional one. In column (2) of table 4, we add a dummy variable indicating whether the borrower owned the endowed item before. In column (3) of table 4, we add a control variable for the number of endowed items previously owned to our main regression specification. That both the coefficients are statistically insignificant at conventional levels suggests our result is not driven by positive updating about the endowed item between the first and second sessions.

Further, the scope for learning should vary across different items. For example, one is more likely to learn about the usefulness of a cow sprayer than a milk can. Thus, we test whether the effect differs across four items. Figure 3 shows the gaps between WTP for SACL and WTP for OACL by endowed item. We can see that there are no statistically significant differences across four items, providing another piece of evidence against the channel of learning. In addition, learning cannot explain the pattern of beliefs, which we will elaborate more in section 4.

Furthermore, we chose items that should have little to no fixed costs of using. If an asset had a fixed cost that a borrower had already sunk, then the borrower may be less inclined to put that asset at risk than a new asset for which the costs had not yet been sunk. This is unlikely in the case of our items. Similarly, it is unlikely that our result is driven by a correlation between financial shocks and the returns to using the new item. The items we use are durable goods, so short-run fluctuations should not matter. This explanation seems implausible for our set of items.

We explore whether a preference for SACLs could be driven by intra-household frictions. For example, a subject was endowed with an item and then gave it to their spouse between the first and second session, then they could be less willing to put it at risk as collateral. While this could still be thought of as an expanded version of an endowment effect that includes social preferences, we find no evidence in favor of this channel. In column (8) of table 4, we add a control variable indicating whether

the endowed item is more likely to be used by the respondent than by their spouse according to local gender norms. Our point estimate suggests that subjects have a stronger preference for SACLs when they are likely to be the ones using the endowed item. This is contrary to what one would expect if intra-household frictions were driving our main result, though the coefficient is not significant at conventional levels.

Finally, it is unlikely that the result in table 3 is driven by confusion about the experiment or the loans. Comprehension checks showed that subjects had an excellent grasp of the loans and the price elicitation method. Subjects were required to correctly explain the terms of two loans back to the enumerator before stating their willingness to pay. In column (6) of table 4 we show that there is no significant difference in our result by education level.

4 Projection Bias

To shed light on the welfare implications of our results, we measured whether people anticipate an endowment effect prior to owning an item. If borrowers fully anticipate that a new item will they purchase will enter into their endowment, it is difficult to rationalize why they would prefer using new items as collateral. Conversely, borrowers who underpredict their future attachment a new item will be more likely to accept a loan that puts the new item at risk as collateral. We interpret this underprediction as an instance of projection bias (Loewenstein, O'Donoghue, and Rabin 2003), where people overestimate the extent to which their future preferences will be similar to their current preferences. The findings described in the previous section — that people prefer loans that use the new item as collateral — are consistent with at least some degree of projection bias. We designed our experiment to be able to measure the extent to which borrowers suffer from projection bias when making take-up decisions about loans.

Understanding the extent to which borrowers anticipate their attachment to new items is not only intellectually interesting; it can help us study the welfare consequences of SACLs, which we will cover in greater detail in section 7.

Experimental Protocol

To test for projection bias, we measure whether people predict that they will become attached to an item after they receive it. To do this, we compare subjects' willingness to accept (WTA) for an item they own to their predicted WTA prior to being given the item, as in Loewenstein and Adler (1995). Ideally, we would be able to elicit these predictions for SACLs, measuring at the time of take-up whether people anticipate that they will become attached to the new item (which also serves as the loan's collateral) in the future. However, this is not possible in our setting, because not all individuals were offered a SACL. Instead, we use two other sets of predictions to test for projection bias. First, we ask subjects in the first session to predict their WTA for the endowed item after owning it for one week. Then, in the second session, we elicit WTA for the endowed item using the BDM method, allowing us to compare predicted WTA pre-endowment to actual WTA after one week of ownership. Second, we elicit subjects' predictions of their WTP for the two loans before being endowed with any item. We compare these predictions from the first session to subjects' actual WTP for the loans one week later in the second session. If subjects anticipate that they will become attached to the endowed item over the course of

one week, these loan predictions will determine whether they translate this attachment into a future preference against using the endowed item as collateral.

We elicited WTA and predicted WTA for the endowed item for all subjects. Only a randomly-selected one third of subjects participated in the loan take-up predictions. We limited participation in these predictions out of concern that making predictions would induce anchoring of subjects' actual loan take-up decisions to their previous take-up predictions. Randomization of participation in the predictions allows us to measure whether such anchoring effects occurred. In practice, we find no evidence that making predictions affected eventual WTP for the loans. Additionally, we randomized half of participants to receive small payments of up to KES 50 (USD 0.50) for correct predictions. We offered these payments to increase subjects' incentives to think seriously about how they thought they would respond in the future, yet kept them small so that they would not give subjects strong reasons to match their actual responses to their previous predictions. Ultimately, we find no evidence that the incentives influenced subjects' responses.

Results

WTP, WTA, and predicted WTA. Figure 4 compares initial WTP for the endowed item, WTA for the endowed item after one week of ownership, and predicted future WTA for the item prior to its endowment. Figure 4a shows the results of the full sample: willingness to accept is much higher than willingness to pay — KES 5,508 vs KES 1,205 (USD 55 vs USD 12), suggesting a remarkably strong endowment effect. In fact, this is likely an underestimate of the difference between WTA and WTP; our data are top coded, as 62% of respondents said they would not accept any price on our price list and declined to state a higher amount that they would accept in exchange for the item. At the baseline, subjects do predict that their WTA after one week will be substantially higher than their WTP for the endowed item, but they underpredict the full extent to which they will become attached to the endowed item. Predicted WTA for the endowed item falls between actual WTP and WTA, and is significantly different from both. This suggests that subjects have partial projection bias with regard to their endowment effect over the item, understanding that they will become attached over the course of a week but not recognizing the full extent of their eventual attachment. To check whether this pattern also holds for individuals who are not top coded, we present results for this subsample in figure 4b. We can see that the pattern (WTA $>$ predicted WTA $>$ WTP) still holds, but the gaps between the three become smaller.

Figure 5 presents the heterogeneity in WTP, WTA, and predicted WTA. We can see in figure 5a that most individuals who are not top coded under-predict their future WTA. In the right upper corner, there are some people who predict correctly that they will not be willing to sell the endowed item back at any price. The fitted line shows a mildly positive correlation between WTA and predicted WTA. Figure 5b shows the relationship between WTA and WTP. Almost everyone displays an endowment effect over the endowed item, and there is a lot of heterogeneity across individuals. The fitted line shows a mildly positive correlation between WTA and WTP. Figure 5c shows the relationship between predicted WTA and WTP. There are more circles that are close to the 45 degree reference line, but most individuals still have a higher predicted WTA than WTP. The fitted line shows a positive correlation between predicted WTA and WTP.

What can explain the striking difference between subjects' WTA and WTP for the endowed item?

We conducted qualitative debriefing questions to investigate why subjects were so unwilling to part with their items after one week of ownership. One possibility is that subjects could have sold or bartered the item in between the first and the second session. Our debriefing questions suggest that this was uncommon: only one person reported having bartered the item during the week between sessions. We also emphasized that the endowed item was compensation for the subjects' participation rather than a gift, in order to circumvent norms against selling gifts. In debriefing questions, only 8 out of 162 individuals mentioned regarding the item as a gift. Most subjects rationalized their unwillingness to forfeit the item by describing the "importance" or "value" of the item to them. Many even cited an attachment they had developed as a reason not to sell the item back to us in the WTA exercise. Others cited a preference for illiquid assets due, for example, to fears of squandering cash or preferences for a durable good.

Further, the confound of learning that we mentioned in section 3 cannot explain the fact that on average, the predicted WTA is larger than the baseline WTP, because both responses are elicited in session 1 and there is no scope for learning.

Loan predictions. Figure 6 shows the predicted and actual loan WTP for the one third of subjects who were randomly selected to completed these predictions. On average, subjects in the first session correctly predict their willingness to pay for the SACL in the second session. This is intuitive — because the SACL does not involve the endowed item at all, there are no obvious reasons that subjects' evaluations of this loan would change during the week between sessions. In contrast, there is a significant difference of KES 166 (USD 1.66) between the means of the predicted and actual WTP for the OACL. The point estimate for the mean predicted OACL WTP (column 3) falls between the predicted SACL WTP (column 1) and the actual OACL WTP (column 4), though the difference between predicted WTP for SACL and OACL is not statistically significant at conventional levels. This is consistent with the WTA prediction results, suggesting that subjects have a substantial amount of projection bias and do not fully anticipate the extent to which they will become attached to the endowed item after a week. Here, we see that this leads them to underestimate their aversion to using that item as collateral for a loan in the future.

An alternative explanation for why people may prefer a SACL to an OACL is that borrowers understand the new asset does not fully enter their reference points until loans are fully paid off and they have the legal ownership of the asset. Because our experimental design does not allow us to test if people have projection bias over the new asset, we were unable to rule out this explanation.

5 A Simple Model

We designed our field experiment to allow us to structurally estimate parameters from canonical models of reference-dependent preferences. In this section, we extend these models to describe subjects' decisions in our experimental exercises. In the following section, we use the model to obtain structural estimates of these key parameters, which allows us to estimate the welfare effects of the loans.

5.1 Set-up

Following Kahneman and Tversky (1979) and Koszegi and Rabin (2006), we assume that agents have reference-dependent preferences that can be represented by the utility function $U_t = U(c_t|r_t) = m(c_t) +$

$n(c_t|r_t)$, where $m(\cdot)$ is standard consumption utility, r_t is the reference point at time t, and $n(\cdot)$ is the gain-loss component of the agent's utility. In our setting, the agent's consumption utility is defined over two dimensions: the endowed item and the item financed by loans. We write their consumption bundle c_t as (c_t^1, c_t^2), where $c_t^1 \in \{0,1\}$ indicates whether the agent owns the endowed item at time t and $c_t^2 \in \{0,1\}$ indicates whether the agent owns the item offered using a loan at time t. And we assume additive separability across consumption dimensions. We denote the agent's consumption values of the endowed item, the new item offered using a SACL, and the new item offered using an OACL as V_E, V_S, and V_O, respectively. The gain-loss component of utility is tied directly to consumption utility $n(c_t|r_t) = \mu(m(c_t) - m(r_t))$, where μ has the properties of the Kahneman-Tversky (1979) value function. For simplicity, we follow Koszegi and Rabin (2006) and assume μ to be a piece-wise linear function. It is clear that all of our results are driven by the sense of loss. To make the model predictions easier to interpret, we make a further simplification by suppressing the sense of gain, so that $\mu(x) = 0$ if $x \geq 0$ and $\mu(x) = \lambda x$ if $x < 0$.[5] $\lambda > 0$ is used to parameterize the additional weight the agent places on losses relative to gains and to consumption utility

We consider status-quo reference points (Kahneman and Tversky, 1979; 1992). Our simplified model has three periods. An agent's initial reference point in period zero, before they are endowed with any item, is $r_0 = (0,0)$. After being endowed, her reference point becomes $r_1 = (1,0)$ in period 1. If she takes up a loan, then the reference point will be $r_2 = (1,1)$ in period 2.

When she is making the loan take-up decision, the agent may not fully anticipate that the new asset will enter reference point fully once purchased, due to projection bias (Loewenstein et al., 2003). She may project her present preferences, including her present reference point, onto her future state. Let $\hat{U_t^\tau}$ denotes self t's prediction of her future self τ's utility ($t \in \{0,1\}$, $\tau > t$). Following Loewenstein et al. (2003), we incorporate projection bias into our model by assuming the utility function $\hat{U_t^\tau} = (1-\alpha)U(c_\tau|r_t) + \alpha U(c_\tau|r_\tau)$. With this formulation, α parameterizes the agent's degree of projection bias; if $\alpha = 1$, the person has no projection bias. In our setting, it can be proven that $\hat{U_t^\tau} = (1-\alpha)U(c_\tau|r_t) + \alpha U(c_\tau|r_\tau) = U(c_\tau|(1-\alpha)r_t + \alpha r_\tau)$, [6] so that an agent who suffers from projection bias expects their reference point to be $r_t^\tau = (1-\alpha)r_t + \alpha r_\tau$, which falls somewhere between the truth (r_τ) and their current reference point (r_t). This allows us to represent the agent's preferences using the simplified expression $\hat{U_t^\tau} = U(c_\tau|r_t^\tau)$.

The agent faces a probability of defaulting on the SACL and OACL of d_S and d_O, respectively. These parameters represent the individual's true ex-ante probability of default of each type of loan. However, at the stage of making loan take-up decisions, what matters is not the true default probability but rather the agent's *beliefs* about their probability of defaulting about, which we denote by $\widehat{d_S}$ for the SACL and $\widehat{d_O}$ for the OACL. These parameters can differ in value from d_S and d_O, as borrowers may underestimate or overestimate their likelihood of defaulting.[7] For simplicity, we leave the perceived default probability as exogenous (say, determined entirely by income shocks), and assume that $\widehat{d_S} = \widehat{d_O} = \widehat{d}$.

[5] It can be shown that suppressing the sense of gain is essentially redefining the consumption utility. In an appendix, we establish a mapping between parameters in our model with parameters in a standard Koszegi and Rabin (2006) model.

[6] This is not universally true, but in our case, this equation holds because goods are discrete.

[7] In fact, one prediction of Kahneman and Tversky's prospect theory is that borrowers may overestimate small probabilities.

5.2 Model Predictions

The model allows us to derive expressions as follows for each of the valuations and predictions we elicited in the experiment.

WTP for four items. We elicited the baseline willingness to pay for each item. This gives us the initial valuations for each of the endowed item, the SACL new item, and the OACL new item, $WTP_i^{item} = V_i - c,\ \ i \in \{E, S, O\}$. We add the parameter c based on the consideration that participants may be liquidity constrained or not familiar with the BDM procedure yet and therefore under-report their valuation of items. c captures liquidity costs in the baseline WTP for items.

Actual and predicted WTA for the endowed item. We elicited the actual willingness to accept in period 1, when the endowed goods had fully entered the reference point. At this point, the agent's valuation of the item includes their consumption value and the amount they would pay to avoid losses from losing the item, so that $WTA = U(1|1) - U(0|1) = (1 + \lambda)V_E$.

We also elicit subjects' predicted WTA at period 0, before they are endowed with the item. This predicted WTA will depend on the agent's perceived reference point, which under projection bias is $r_0^1 = (1 - \alpha) \cdot 0 + \alpha \cdot 1 = \alpha$. So the agent's predicted WTA prior to being endowed with the item is $\widehat{WTA} = U(1|\alpha) - U(0|\alpha) = (1 + \alpha\lambda)V_E$.[8]

Combining these two expressions, we write the difference between predicted and actual WTA as $WTA - \widehat{WTA} = (1 - \alpha)\lambda V_E$. This shows that if the agent is loss averse ($\lambda > 0$) and subject to projection bias ($\alpha < 1$), she will underpredict her future WTA for the endowed item.

Demand for SACL and OACL. A borrower who takes up a SACL will own both the endowed item and the new item if they repay the loan, but if they default, the new item is be repossessed. In contrast, under OACLs, if borrowers fail to repay the loan, the endowed item is repossessed instead.

Borrowers who suffer from projection bias under-estimate their future attachment to the new item, and therefore under-value the sense of loss upon losing the new item, which drives up their demand for SACLs. When a borrower considers taking up such a loan, their perceived equivalent reference point is $r_1^2 = (1 - \alpha)(1, 0) + \alpha(1, 1) = (1, \alpha)$. A greater α implies that the borrower is more aware that the new item will enter their reference point. Then, a borrower's expected utility from taking up a SACL is $(1 - \widehat{d})\Big(U(1, 1|1, \alpha) - Price_S\Big) + \widehat{d}U(1, 0|1, \alpha)$. This represents the sum of borrower's utility if they do not default and if they do default, weighted by their perceived probability of each scenario. Similarly, the predicted expected utility from OACL take-up is $(1 - \widehat{d})\Big(U(1, 1|1, \alpha) - Price_O\Big) + \widehat{d}U(0, 1|1, \alpha)$. If the agent does not take up a loan, she still keeps the endowed item but does not receive a new item, and her utility is simply $U(1, 0|1, 0)$. As the loan price increases, taking up loans becomes less attractive. When the price reaches people's willingness to pay, the utility from loan take-up is equal to the reservation utility, and they are indifferent between taking the loan or not: $(1 - \widehat{d})\Big(U(1, 1|1, \alpha) - WTP_S\Big) + \widehat{d}U(1, 0|1, \alpha) = U(1, 0|1, 0)$ and $(1 - \widehat{d})\Big(U(1, 1|1, \alpha) - WTP_O\Big) + \widehat{d}U(0, 1|1, \alpha) = U(1, 0|1, 0)$.

Using the utility function described in Section 5.1, we can solve these inequalities to yield expressions

[8] For simplicity, we assume the predicted utility is equal to the decision utility that agents maximize if they are asked to commit to their predictions. We also assume that people are naive about their projection bias.

for the agent's WTP for each loan in terms of the model's parameters:

$$WTP_S = \underbrace{-\frac{\widehat{d}}{1-\widehat{d}}(1+\alpha\lambda)V_S}_{\text{Utility penalty from losing collateral}} + \underbrace{\frac{1}{1-\widehat{d}}V_S}_{\text{Utility gain from getting new item}}$$

$$WTP_O = \underbrace{-\frac{\widehat{d}}{1-\widehat{d}}(1+\lambda)V_E}_{\text{Utility penalty from losing collateral}} + \underbrace{\frac{1}{1-\widehat{d}}V_O}_{\text{Utility gain from getting new item}}$$

Here, we can see the agent's willingness to pay for a SACL (i) is independent of V_E, the value placed on the endowed item; (ii) increases in V_S,the value placed on the new item financed by the SACL[9]; (iii) decreases in λ, loss aversion; (iv) decreases in α, the extent to which the agent understands how his reference point would update. The willingness to pay for an OACL (i) decreases in V_E, the value placed on the endowed goods; (ii)increases in V_O, the value placed on the new item financed by the OACL; (iii) decreases in λ, loss aversion; (iv) decreases in α, the extent to which the agent understands how her reference point would update (i.e. increases with projection bias).

The difference between willingness to pay for SACL and OACL, which is our primary object of interest, is due to the different utility penalties in the case of default. She prefers SACL to OACL because she believes it will feel less painful to lose the new item being purchased, which has not fully entered her reference point. Suppose, for simplicity, that her initial valuation of all three items is the same ($V_E = V_O = V_S = V$). In this case, it is easy to see that $WTP_S - WTP_O = \frac{\widehat{d}}{1-\widehat{d}}(1-\alpha)\lambda V > 0$, meaning the agent will pay more for an item when she can finance it using a SACL rather than an OACL. This preference for SACL compared to OACL (i) increases in λ, loss aversion; (ii) decreases in α (increases in projection bias); (iii) increases in $\widehat{d}$, perceived default rates.

(Mis)prediction of Future Demand for SACL and OACL. As described in Section 4, we elicit subjects' predictions of their future willingness to take up loans at period 0, before they were given the endowed item to take home with them. As before, we assume that the predicted utility is equal to the decision utility and that the agent is naive about her projection bias. From the standpoint of period 0, the agent's perceived equivalent reference point is $r_0^2 = (1-\alpha)(0,0) + \alpha(1,1) = (\alpha,\alpha)$ if she takes up either of the loans, and is $r_0^2 = (1-\alpha)(0,0)+\alpha(1,0) = (\alpha,0)$ if not. Then, the agent's predicted expected utility from taking up a SACL is $(1-\widehat{d})\Big(U(1,1|\alpha,\alpha) - Price_S\Big) + \widehat{d}U(1,0|\alpha,\alpha)$. Similarly, the period-0 agent predicts that the expected utility from taking-up an OACL is $(1-\widehat{d})\Big(U(1,1|\alpha,\alpha) - Price_O\Big) + \widehat{d}U(0,1|\alpha,\alpha)$. If they do not take up loans, they predict that their utility would be $U(1,0|\alpha,0)$. As previously, we can solve for the predicted SACL and OACL WTP by setting the expected utility from the loans equal to the agent's reservation utility and solving for the price, which gives:

$$\widehat{WTP_S} = -\frac{\widehat{d}}{1-\widehat{d}}(1+\alpha\lambda)V_S + \frac{1}{1-\widehat{d}}V_S$$

$$\widehat{WTP_O} = -\frac{\widehat{d}}{1-\widehat{d}}(1+\alpha\lambda)V_E + \frac{1}{1-\widehat{d}}V_O$$

[9]But if λ or α is relatively big, willingness to pay for a SACL may decrease in V_S.

$\widehat{WTP_S} = \widehat{WTP_O}$, given $V_E = V_O = V_S$. That is, as long as the items for sale using the loans are valued equally, then the agent predicts that they will be willing to pay the same amount using each loan. At period 0, people have not been endowed with any item, so they underestimate their future attachment to both items equally. This makes period-0 self indifferent between a SACL and an OACL, and no willing to pay more for one than the other.

Comparing an agent's predicted loan WTP with the actual WTP for that loan, we have $\widehat{WTP_S} - WTP_S = 0$, $\widehat{WTP_O} - WTP_O = \frac{\hat{d}}{1-\hat{d}}(1-\alpha)\lambda V_E > 0$. Agents who are loss averse and projection biased will predict their willingness to take up a SACL correctly because the new item would not fully entered the reference point until period 2, after both decisions are made. However, the agent will overpredict their willingness to pay for an OACL, because the period-0 self underestimates period-1 self's attachment to the endowed item. This is consistent with the reduced form results on projection bias presented in Section 4.

6 Structural Estimation

Our experimental design allows us to estimate structural parameters for loss aversion, projection bias, and the valuation of each item. This gives us estimates of behavioral parameters that are have been the focus of research in laboratory settings. Our estimates are unique in that they come from decisions subjects made about actual financial products offered by a savings cooperative in a real-world setting. Our results will also shed light on the universality of previous estimates, as our subject pool of Kenyan farmers is quite different from the subject pools of existing research that estimates these parameters.

6.1 Classical Minimum-Distance Estimation

The estimation method we chose is the classical minimum-distance estimation, where one identifies some moments in the data and then finds the set of parameter values that minimize the distance between the empirical moments and the theory-predicted moments. The optimization problem we solve is:

$$\min_{\theta}(\hat{m} - m(\theta))' W (\hat{m} - m(\theta))$$

where $\theta = (\alpha, \lambda, \hat{d}, \mu_V, \sigma_V)$ is the vector of parameters we estimate in the benchmark case. As in the model in Section 5, α characterizes the agent's level of projection bias; λ is the loss aversion coefficient; $\hat{d}$ is the perceived default rate; and the auxiliary parameters μ_V and σ_V are the mean and standard deviation of item valuations, respectively.[10] $\hat{m}$ is a vector of empirical moments from the data, $m(\theta)$ is a vector of model-predicted moments, and W is a weighting matrix. In the benchmark case, the estimation moments include the means and standard deviations of the willingness to pay for SACL and OACL, the means of predicted willingness to pay for SACL and OACL, the mean of WTA, and the mean of $\widehat{WTA}$. We exclude means and standard deviations of the observed baseline WTP for each item to eliminate concerns that the measurement of the baseline WTP may be biased due to liquidity constraints or trust issues. We vary the moments we use and the parameters we estimate as robustness

[10] By the power of randomization, we could assume that the average valuations for three items are the same. Additionally, because we assume the item valuation is drawn from a log normal distribution in the welfare analysis, we choose to directly estimate the mean and standard deviation of the associated normal distribution and report implied mean and standard deviation of item valuations.

checks. Our choice of the weighting matrix is the inverse of the diagonal of the variance-covariance matrix of the moments. In an appendix, as a robustness check, we present structural estimation results with the identity weighting matrix.

6.2 Identification and Results

To make our estimation process transparent, it is important to understand which moments identify which parameters. Here, we describe the intuition behind how each of the parameters of interest are identified, and present expressions for each in terms of the moments of our data.

Projection bias. The projection bias parameter, α is identified from the difference between subjects' willingness to accept for the endowed item after one week of ownership and their predicted willingness to accept prior to ownership. Because subjects do not own the item at the baseline, they undervalue their future attachment to the it due to projection bias. We use the model from Section 5 to solve for the projection bias parameter in terms of the moments observed in our data to find that $\alpha = \frac{\widehat{WTA}-V_E}{WTA-V_E}$. If three items are valued equally ($V_E = V_O = V_S = V$), α is also identified in this way, $\alpha = \frac{V-WTP_S}{V-WTP_O}$. One can also identify α without knowing the baseline valuation of items, $\alpha = \frac{\widehat{WTA}-WTP_S}{WTA-WTP_O}$. A caveat is that we are only able to measure projection bias over the endowed goods that borrowers own legally, not for the new item that they do not have legal ownership of.

Loss aversion. Loss aversion is identified by the difference between WTA and WTP for the endowed item. Estimating loss aversion using the wedge between WTA and WTP is standard in the empirical literature. In terms of the empirical moments, the loss aversion parameter, can be expressed as $\lambda = \frac{WTA-V_E}{V_E}$. If three items have the same valuation ($V_E = V_O = V_S = V$), λ can also be expressed as $\lambda = \frac{1-\widehat{d}}{\widehat{d}}\frac{V-WTP_O}{V}$. We can also identify λ without knowing V, $\lambda = \frac{(WTA-WTP_O)(WTA-\widehat{WTA})}{WTP_S \cdot WTA - WTP_O \cdot \widehat{WTA}}$.

Perceived default rates. Mispredicting future reference points drives a wedge between WTP for SACL and OACL, but only in the case of default. In the most extreme case, if a borrower thinks that there is no chance of default, a loan's collateral will be irrelevant, and even the most loss averse or projection biased borrowers will be indifferent between SACL and OACL. Conversely, a higher perceived likelihood of default makes the loan's collateral more relevant and drives a wedge between SACL and OACL WTP for loss averse, projection biased borrowers. In this way, the percieved default rate can be identified from the difference in WTP between SACL and OACL, combined with the difference between WTA and predicted WTA for the endowed item. In terms of the moments observed in the data, the default rate can be expressed as $\frac{\widehat{d}}{1-\widehat{d}} = \frac{WTP_S-WTP_O}{WTA-\widehat{WTA}}$, given that three items are valued equally.

Table 5 displays the estimation results under different conditions. In addition to reporting parameters we directly estimate, we also report implied parameters (loss aversion λ and projection bias α) in the standard KR model and the implied mean and standard deviation of the item valuation. Column (1) displays the results of the benchmark case. People have projection bias over the endowment effect: they under-value their future attachment to the item they currently do not own by about 50%. λ equals to 2.8 (implied $\lambda = 4.6$), indicating strong aversion to losses. The perceived default probability is estimated to be 5.5%. In column (2), we include means and standard deviations of baseline WTP and estimate an additional parameter, the liquidity cost c in the baseline WTP. We can see that main parameter estimates do not change much. In column (3), we exclude the loan prediction moments and find that the results do not change substantially. In column (4), we restrict the sample to people who are not topcoded in either WTA or $\widehat{WTA}$ and find a significantly lower loss aversion λ for this

subsample. In columns (5) and (6), we fix the perceived default rate to 10%, which is equal to the mean of participants' self-reported default rates, and exclude WTA (column (5)) or $\widehat{WTA}$ (column (6)) to see how the topcoding issues may affect our results. [11] The estimated loss aversion parameters are lower in these two columns than the benchmark case.

To test the goodness of fit and to show the significant roles loss aversion and projection bias play in the theory, we compute the theory-implied moments using parameter estimates of the full model (the benchmark case), the model with λ fixed at 0, and the model with α fixed at 1, and compare those with their empirical counterparts. Figure 7 visualizes the results. We can see that the full model fits the empirical data well, but the other two models do not.

7 Welfare

7.1 Theoretical Welfare Effects of SACLs

In the following welfare analysis, we make several simplifying assumptions. We assume that the endowed item and the new items being purchased are all valued equally by the borrower, and that this valuation is drawn from a log normal distribution for each borrower: $V_E \equiv V_O \equiv V_S \equiv V \sim Lognormal(\mu, \sigma^2)$. Denote the corresponding cumulative distribution function by $F(v)$. Parameters other than V are assumed to be identical across individuals. The take-up prices for the items financed by SACLs and OACLs are set by the lender at x. We also assume that people do not mispredict their default probabilities, i.e., $\widehat{d} = d$.

In our previous analysis in Section 5.2, we implicitly assume that the collateral will remain in borrowers' reference points forever even if they default, but it is likely that people do not foresee correctly the adaptation of reference points and that they actually will not feel that bad in the case of default because their reference points would update over time and eventually exclude the collateral item. We capture the stickiness of reference points by the parameter $0 \leq \gamma \leq 1$. $\gamma = 0$ means that consumers would feel zero sense of loss in the case of default (i.e., reference points update immediately); $\gamma = 1$ means that consumers would feel a sense of loss forever if default (i.e., reference points never update). The actual sense of loss in the case of default is scaled down by γ.[12]

Thus, for a borrower with a baseline valuation of V for all items, the consumer welfare change upon taking up a loan is[13]

$$W = (1 - d)(V - x) + d(-\lambda\gamma)V$$

This is the probability-weighted sum of the borrower's utility with no default, where they keep the new asset but pay the loan price, and the borrower's utility when they do default, where they lose the collateral and therefore experience a sense of loss over the collateral. Note that once the borrower takes up a loan, the welfare consequences of both loans are the same. Once the new item fully enters the borrower's reference point, defaulting on either loan will trigger a sense of loss. Thus the welfare

[11] For the model to be identified, when we exclude one of WTA and $\widehat{WTA}$, we need to fix the default rate. The model can not be identified if we exclude WTA and $\widehat{WTA}$ at the same time.

[12] We cannot show how reference points update in our single-period model. But in an appendix, we show that γ can be mapped to parameters in a multi-period model that captures how soon the actual reference points update. We are unable to identify γ using our data, but we can demonstrate how the welfare effects change as γ varies from 0 to 1.

[13] Here and throughout the analysis, we assume the social planner cares about loss aversion.

concern is not that using a new item as collateral will make borrowers worse off, but rather that it might entice them into purchasing an item without fully realizing the losses they risk in doing so.

Consider borrowers' loan take-up decisions. A borrower whose valuation of items is V would take up a SACL if her willingness to pay using the loan is greater than the price offered. Using the expression for WTP expressed in Section 5.2, the borrower will take up the loan if $WTP_S = -\frac{\widehat{d}}{1-\widehat{d}}(1+\alpha\lambda)V + \frac{1}{1-\widehat{d}}V \geq x$. By rearranging to isolate V, we see that the borrower will take up the loan if her valuation of the item V is higher than the critical value $\underline{\widehat{V}}_S$:

$$V \geq \underline{\widehat{V}}_S \equiv \frac{x}{1 - \frac{\widehat{d}}{1-\widehat{d}}\alpha\lambda}$$

Similarly, the borrower takes up an OACL if her willingness to pay is greater than the price, and we can write the decision rule using the WTP expression from Section 5.2: $WTP_O = -\frac{\widehat{d}}{1-\widehat{d}}(1+\lambda)V + \frac{1}{1-\widehat{d}}V \geq x$. Again, by rearranging we can express this decision rule in terms of a critical value:

$$V \geq \underline{\widehat{V}}_O \equiv \frac{x}{1 - \frac{\widehat{d}}{1-\widehat{d}}\lambda}$$

Using these critical values, we can now express the welfare implications of the loans. In an environment that only has OACLs, the consumer welfare change upon taking up OACLs is

$$S(OACL) = \int_{\underline{\widehat{V}}_O}^{\overline{V}} [(1-d)(v-x) + d(-\lambda\gamma)v] \, \mathrm{d}F(v)$$

where $\overline{V}$ is the maximum possible valuation of the item.

In an environment that only has SACLs, the consumer welfare change upon taking up SACLs is

$$S(SACL) = \int_{\underline{\widehat{V}}_S}^{\overline{V}} [(1-d)(v-x) + d(-\lambda\gamma)v] \, \mathrm{d}F(v)$$

The integration intervals start from the critical values of item valuation, $\underline{\widehat{V}}_O$ and $\underline{\widehat{V}}_S$, respectively. This is because borrowers whose valuation is below the critical value will not take up any loans and therefore do not experience any change in consumer surplus.

Now, we consider the change in welfare when SACLs are introduced. For an environment that previously only had OACLs, the welfare effect (denoted by Δ) of introducing SACLs is [14]

$$\begin{aligned}\Delta &= S(SACL) - S(OACL) \\ &= \int_{\underline{\widehat{V}}_S}^{\underline{\widehat{V}}_O} [(1-d)(v-x) + d(-\lambda\gamma)v] \, \mathrm{d}F(v)\end{aligned}$$

The integration interval is from $\underline{\widehat{V}}_S$ to $\underline{\widehat{V}}_O$ because introducing SACLs makes borrowers whose valuation is above $\underline{V_S}$ but below $\underline{V_O}$ (i.e., compliers of the introduction of SACLs) willing to take up a loan. Introducing SACLs also makes those whose valuation is above $\underline{V_O}$ switch from OACLs to SACLs,

[14] Assume that each individual can take up only one loan.

but the consumer surplus of these individuals will not change after switching for reasons we explained above.

Setting $W = (1-d)(V-x) + d(-\lambda\gamma)V = 0$ gives the critical value of V, $\underline{V}^* = \frac{x}{1-\frac{d}{1-d}\gamma\lambda}$. Taking up a loan improves the welfare for people whose item valuation is above this critical value $\underline{V}^*$. Notice that $\underline{V}^*$ is also the valuation above which fully rational individuals who have no projection bias (i.e., $\alpha = 1$) and correctly predict how soon their reference points would update (i.e., correctly predict γ) choose to take up a loan. This is intuitive: fully rational agents should be indifferent between SACLs and OACLs, so introducing SACLs to an environment that previously only had OACLs should not have any effects if everyone in that environment is indifferent between the two.

The magnitude of Δ depends on the magnitude of $\underline{V}^*$ relative to $\underline{V}_S$ and $\underline{V}_O$.

$$\underline{V}_S = \frac{x}{1-\frac{\widehat{d}}{1-\widehat{d}}\alpha\lambda} \qquad \underline{V}_O = \frac{x}{1-\frac{\widehat{d}}{1-\widehat{d}}\lambda} \qquad \underline{V}^* = \frac{x}{1-\frac{d}{1-d}\gamma\lambda}$$

Clearly, given $\widehat{d} = d$, we have $\underline{V}_O \geq \underline{V}^*$, that is, people under take up OACLs because they overestimate how long the sense of loss would last in the case of default. The relationship between $\underline{V}_S$ and $\underline{V}^*$ is uncertain, depending on whether γ is greater than α. This is because in the SACL case, "two wrongs make a right": people overestimate the sense of loss in the case of default, as they do in the OACL case (captured by $\gamma < 1$), but their sense of loss is (partially) offset by their projection bias, i.e., the underestimation of future attachment to the SACL collateral (captured by $\alpha < 1$). Therefore, introducing SACLs may improve welfare by encouraging the loan take-up, but it may backfire if people end up over taking up loans. Moreover, as actual reference points adjust more quickly (i.e., γ gets smaller), introducing SACLs is more likely to increase the welfare as people are very much under taking up OACLs and it is less likely for SACLs to backfire. The detailed discussion follows.

1. If $\underline{V}^* \leq \underline{V_S} \leq \underline{V_O}$, then $\Delta \geq 0$, SACLs improve the welfare.

   The intuition is that people are under taking up OACLs ($\underline{V}^* \leq \underline{V_O}$) and SACLs improve the welfare by encouraging the loan take-up. But the take-up rate has not reached the optimal level yet ($\underline{V}^* \leq \underline{V_S}$). There is still room for welfare improvement.

2. If $\underline{V_S} \leq \underline{V}^* \leq \underline{V_O}$, then the sign of Δ is uncertain, SACLs can either improve or hurt the welfare.

   The intuition is that people are under taking up OACLs ($\underline{V}^* \leq \underline{V_O}$). Introducing SACLs may improve welfare by encouraging the loan take-up, but it may backfire if SACLs lure too many people who should not take up a loan into the loan contracts.

To summarize, the welfare analysis shows that, the welfare effects of SACLs depend on whether SACLs can help change the take-up rate to the optimal level. SACLs can be either welfare improving or reducing depending on the extent to which SACLs increase the take-up.

There are also some other potential channels through which people may under take up OACLs. For example, lacking assets that could serve as collateral may deter people from taking up OACLs. Also, if borrowers overestimate the probability of default, as our estimates suggest, they may generally overestimate the amount of risk they put on their existing assets by taking up OACLs. If people are subject to these issues, SACLs are also more likely to be welfare improving.

7.2 Numerical Welfare Analysis

With parameter estimates, we can numerically analyze the welfare effects of the SACLs. As we discussed before, the welfare implications depend on how large γ is. We show how the welfare effects of SACLs change as γ varies from 0 to 1. The parameter estimates adopted in the following calculation are from the first column of table 5, the benchmark case. Note that the welfare analysis depends on both the actual and the perceived default rates, but we could only recover the perceived default rate from the structural estimation. Hence, we need to further assume that the actual default rate equals to the perceived one. The price of a loan x is an exogenous variable whose value cannot be estimated in our experiment. In the following calculation, we set the price $x = 1500$ KES, which is close to participants' average willingness to pay for items in the experiment.

Figure 8a shows how $S(SACL)$ and $S(OACL)$ change as γ varies. To make the effect sizes easier to interpret, figure 8b displays the relationship between γ and the percentage change in welfare, defined as $\frac{\Delta}{S(OACL)}$. We can see that as γ gets larger, both $S(SACL)$ and $S(OACL)$ decrease. Before γ reaches a certain cutoff value ($\gamma \approx 0.8$), $S(SACL)$ is greater than $S(OACL)$ and the welfare effects of introducing SACLs to an environment that previously only had OACLs are positive. The maximum possible percentage change in consumer surplus, achieved at $\gamma = 0$, is around 3%. After γ reaches the cutoff value, $S(SACL)$ becomes smaller than $S(OACL)$ and the welfare effects get negative. Though we are unable to estimate γ, we do have suggestive evidence that γ is likely to be relatively small: we find an extreme loss aversion with $\lambda^S = 4.6$, which seems implausible if people are correctly anticipating their future sense of loss; to make the actual loss aversion fall in a reasonable range, we need γ to be relatively small.[15]

A caveat of our welfare analysis is that we were unable to study the potential welfare impacts of SACLs during the repayment periods, either theoretically or empirically. In the theory part, for simplicity, we leave the perceived default probability as exogenous (say, determined entirely by income shocks) and do not model the repayment behavior. We also did not survey people about the amount of repayment effort they exert. But it is possible that, once new assets enter projection biased borrowers' reference points, they will work harder to pay off the loan collateralized using the new item. If borrowers underpredict their attachment to new items, SACLs could harm consumer welfare, making them go to greater lengths than they initially anticipated in order to repay the loan. For example, people may ask their children to work instead of having them attend school. Or borrowers may have to liquidate assets quickly and incur some costs. In this way, borrowers may be willing to take up these loans without fully understanding the welfare costs they entail.

8 Conclusion

In this paper, we study a form of financing that may be attractive to lenders and borrowers alike: loans collateralized by the very asset being purchased. If borrowers experience an endowment effect over assets they presently own, they may prefer loans that do not put their existing assets at risk. Yet, once a borrower acquires the asset, it might then enter their reference point, such that they subsequently work harder to repay the loan. Thus, these same-asset collateralized loans, or SACLs, may be attractive to lenders, as they can increase demand for loans while still controlling moral hazard.

[15] Note that $\gamma\lambda$ captures the actual loss aversion and λ captures the perceived loss aversion.

To test these hypotheses, we endowed subjects with a randomly-assigned asset, and then offered them the opportunity to buy two other randomly-assigned items one week later. Both of the items were financed using loans, one using the endowed item as collateral and the other using the item being purchased as collateral. We find that borrowers are willing to pay a premium of 13% to be able to use the new item as collateral, despite that the collateral items had the same average baseline valuations. We attribute this difference to the endowment effect. This endowment effect could help explain the failure to take up credit for risky investments that is often reported in the development literature. Even if an investment has a high expected return, potential investors may hesitate to take it up if financing the investment requires them to put their existing assets at risk. This suggests that offering SACLs could be a promising way of encouraging investment.

But are these loans necessarily good for consumers? If borrowers fully understood that they would eventually become attached to new assets, then there would be little reason to prefer risking these new assets as collateral. Indeed, the predictions we elicit show that borrowers underpredict how attached they will become to new assets, and do not predict how this attachment will influence their future demand for loans. Yet this does not necessarily imply that offering SACLs will harm consumer welfare. We develop a model that shows the welfare effects of offering SACLs depend on how soon the reference points update in the case of default. There are also some other potential channels through which offering SACLs improves consumer welfare. For example, SACLs extend financing to individuals who need credit but cannot accumulate assets to use as collateral. Though SACLs could potentially improve welfare by encouraging loan take-up, they may have perverse welfare consequences during loan repayment. If the consumer is subject to the endowment effect, the new item will eventually enter their reference point. This unanticipated endowment effect will make default hurt more than the borrower initially anticipated and could drive them to go to greater lengths than they expected in order to repay the loan.

One limitation of our study is that we offer loans with a smaller principal and shorter term than those commonly offered by the SACCO and other financial institutions. However, our findings highlight a psychology that could easily be applied to larger loans. If anything, it is conceivable that the endowment effect would be even stronger over more valuable assets. Nonetheless, the scalability of these loans is a topic that merits further research.

References

[1] Anagol, Santosh, Vimal Balasubramaniam, Tarun Ramadorai, et al. *Endowment Effects in the Field: Evidence from India's IPO Lotteries*. Centre for Economic Policy Research, 2016.

[2] Andrews, Isaiah, Matthew Gentzkow, and Jesse M Shapiro. Measuring the sensitivity of parameter estimates to estimation moments. *The Quarterly Journal of Economics*, 132(4):1553–1592, 2017.

[3] Apicella, Coren L, Eduardo M Azevedo, Nicholas A Christakis, and James H Fowler. Evolutionary origins of the endowment effect: Evidence from hunter-gatherers. *American Economic Review*, 104(6):1793–1805, 2014.

[4] Banerjee, Abhijit, Dean Karlan, and Jonathan Zinman. Six randomized evaluations of microcredit: Introduction and further steps. *American Economic Journal: Applied Economics*, 7(1):1–21, 2015.

[5] Becker, Gordon M, Morris H DeGroot, and Jacob Marschak. Measuring utility by a single-response sequential method. *Behavioral science*, 9(3):226–232, 1964.

[6] Carmon, Ziv and Dan Ariely. Focusing on the forgone: How value can appear so different to buyers and sellers. *Journal of consumer research*, 27(3):360–370, 2000.

[7] Jack, William, Michael Kremer, Joost De Laat, and Tavneet Suri. Borrowing requirements, credit access, and adverse selection: Evidence from kenya. Technical report, National Bureau of Economic Research, 2016.

[8] Kahneman, Daniel, Jack L Knetsch, and Richard H Thaler. Experimental tests of the endowment effect and the coase theorem. *Journal of political Economy*, 98(6):1325–1348, 1990.

[9] Kahneman, Daniel and Amos Tversky. Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2):263–292, 1979.

[10] Kőszegi, Botond and Matthew Rabin. A model of reference-dependent preferences. *The Quarterly Journal of Economics*, 121(4):1133–1165, 2006.

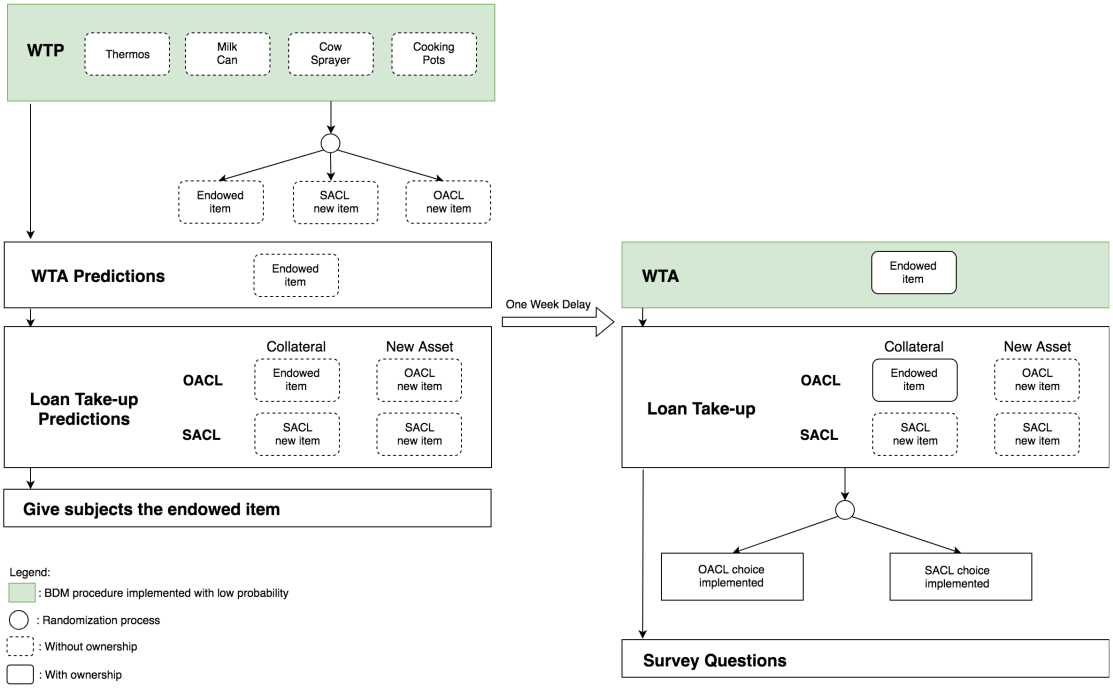
[11] List, John A. Does market experience eliminate market anomalies? *The Quarterly Journal of Economics*, 118(1):41–71, 2003.

[12] Loewenstein, George and Daniel Adler. A bias in the prediction of tastes. *The Economic Journal*, pages 929–937, 1995.

[13] Loewenstein, George, Ted O'Donoghue, and Matthew Rabin. Projection bias in predicting future utility. *The Quarterly Journal of Economics*, 118(4):1209–1248, 2003.

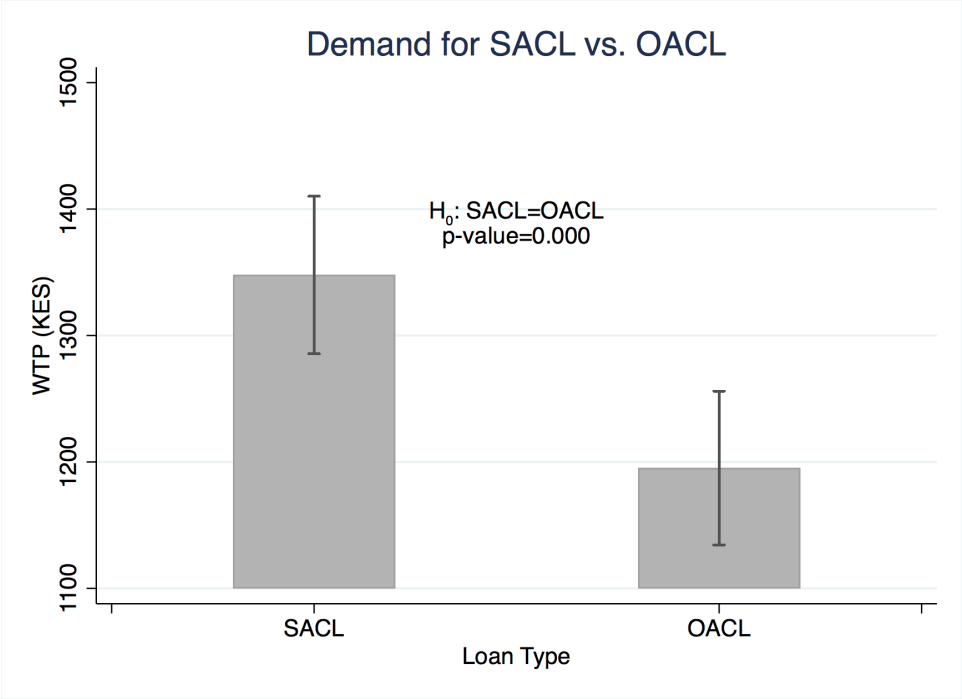
[14] Tversky, Amos and Daniel Kahneman. Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and uncertainty*, 5(4):297–323, 1992.

Figure 1: Flowchart of the Experimental Design



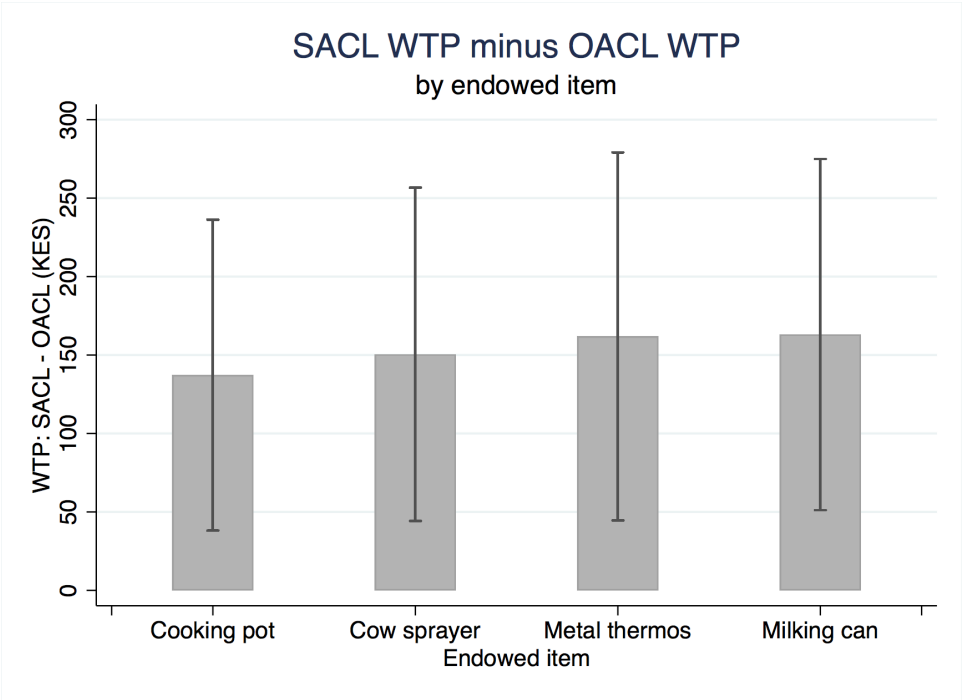
Notes: Figure 1 illustrates the experimental design. The order of different questions is randomized within sessions including "WTP", "Loan Take-up Predictions", and "Loan Take-up"; Only a randomly-selected one third of subjects made loan take-up predictions.

Figure 2: Demand for SACL vs. OACL



Notes: Figure 2 presents the raw means (bars) and 95% confidence intervals (capped lines) of willingness to pay for new items financed by SACLs and OACLs, pooling across all the individuals and items. The p-value is calculated from a permutation test

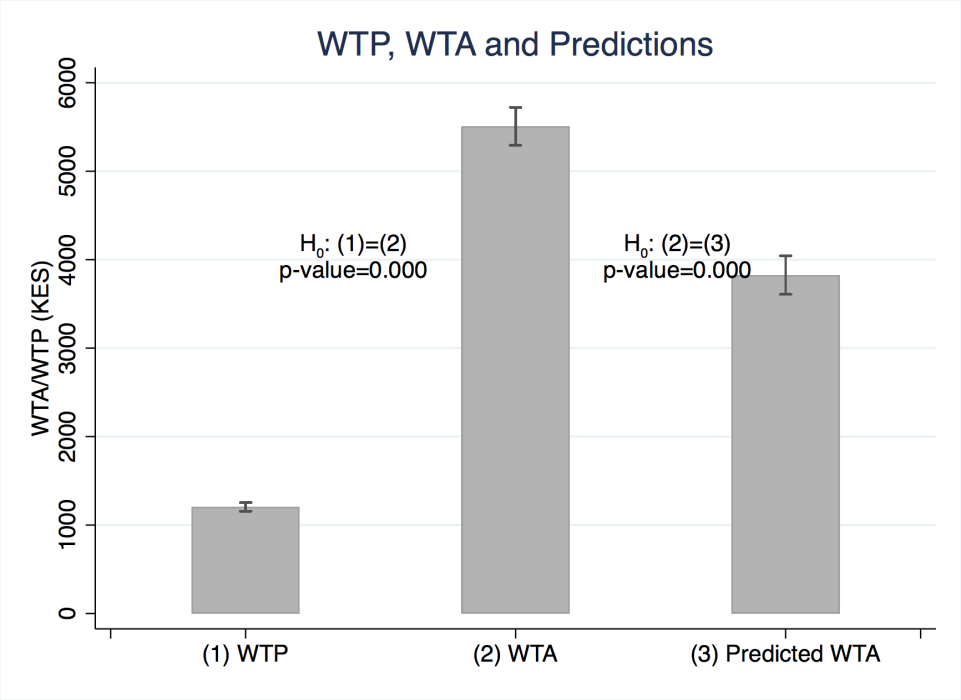
Figure 3: Demand for SACL vs. OACL by Endowed Item



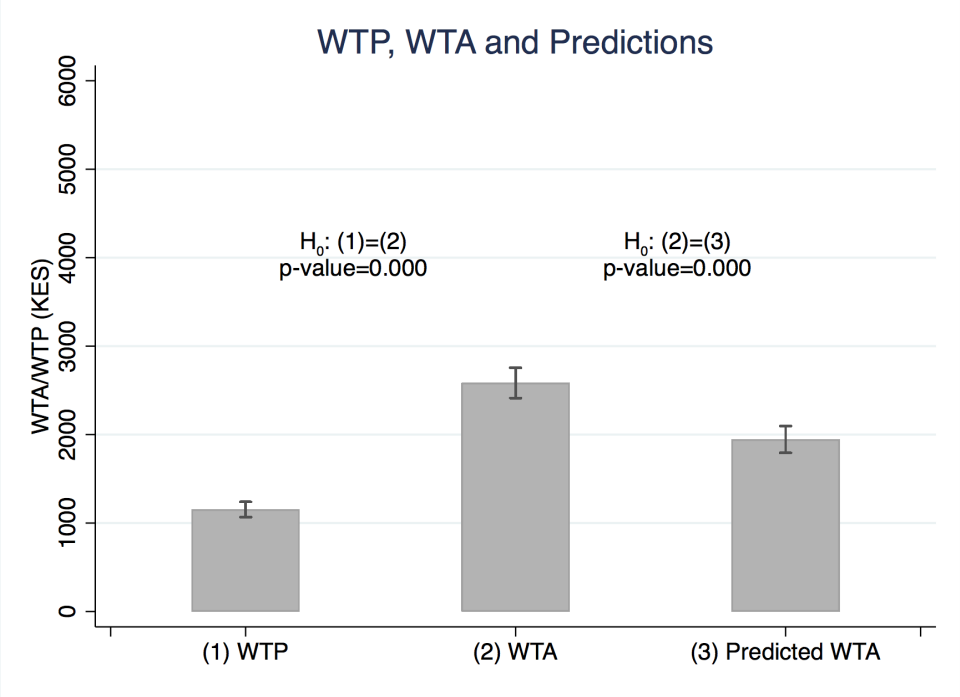
Notes: Figure 3 presents the means (bars) and 95% confidence intervals (capped lines) of the gaps between willingness to pay for new items financed by SACLs and those by OACLs, by endowed item.

Figure 4: Baseline WTP, WTA and Predicitons

(a) Full Sample



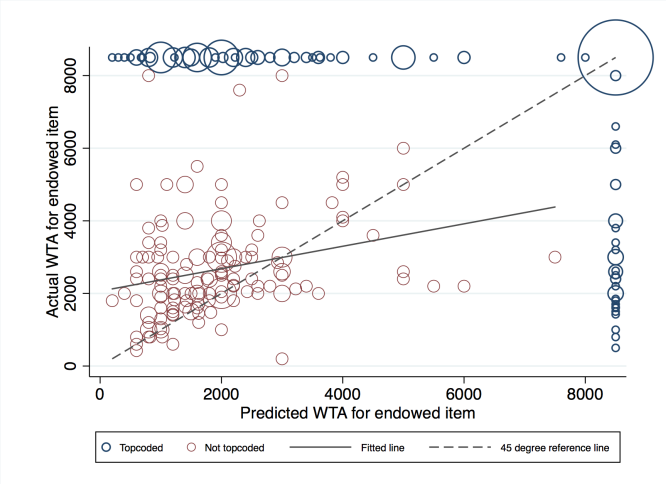
(b) Subsample: Not Topcoded



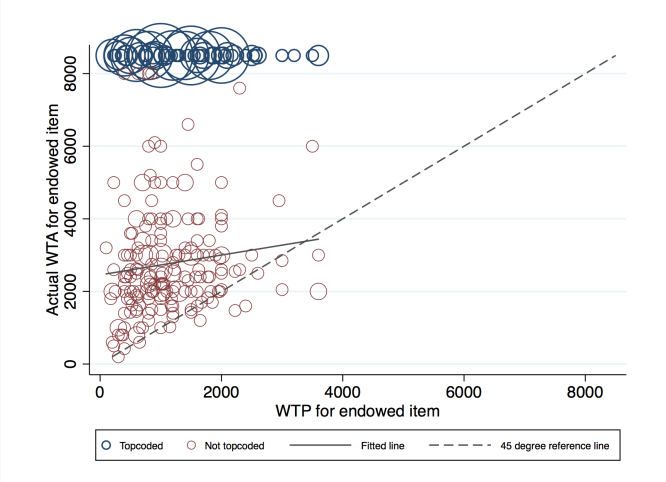
Notes: Figure 4 compares initial WTP for the endowed item, WTA for the endowed item after one week of ownership, and predicted future WTA for the item prior to its endowment. Bars show the raw means and the capped lines show the 95% confidence intervals. Figure 4a shows the results of the full sample. Figure 4b presents the results of the subsample consisting of individuals who are not top coded in either WTA or predicted WTA. The p-values are calculated from permutation tests.

Figure 5: Baseline WTP, WTA and Predictions: Heterogeneity

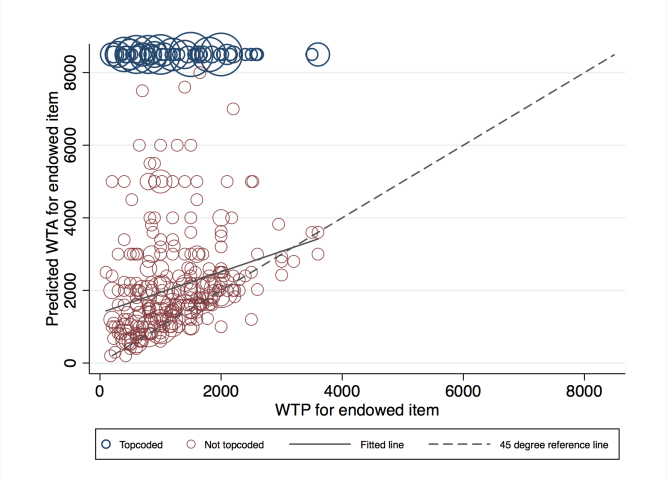
(a) WTA and WTA Predictions



(b) WTA and Baseline WTP

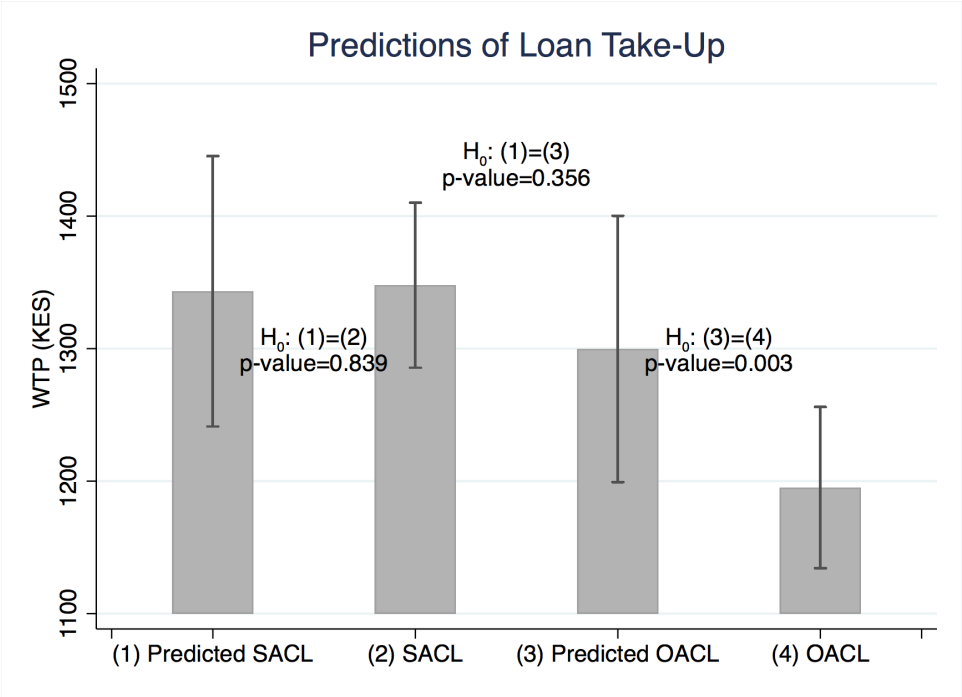


(c) WTA Predictions and Baseline WTP



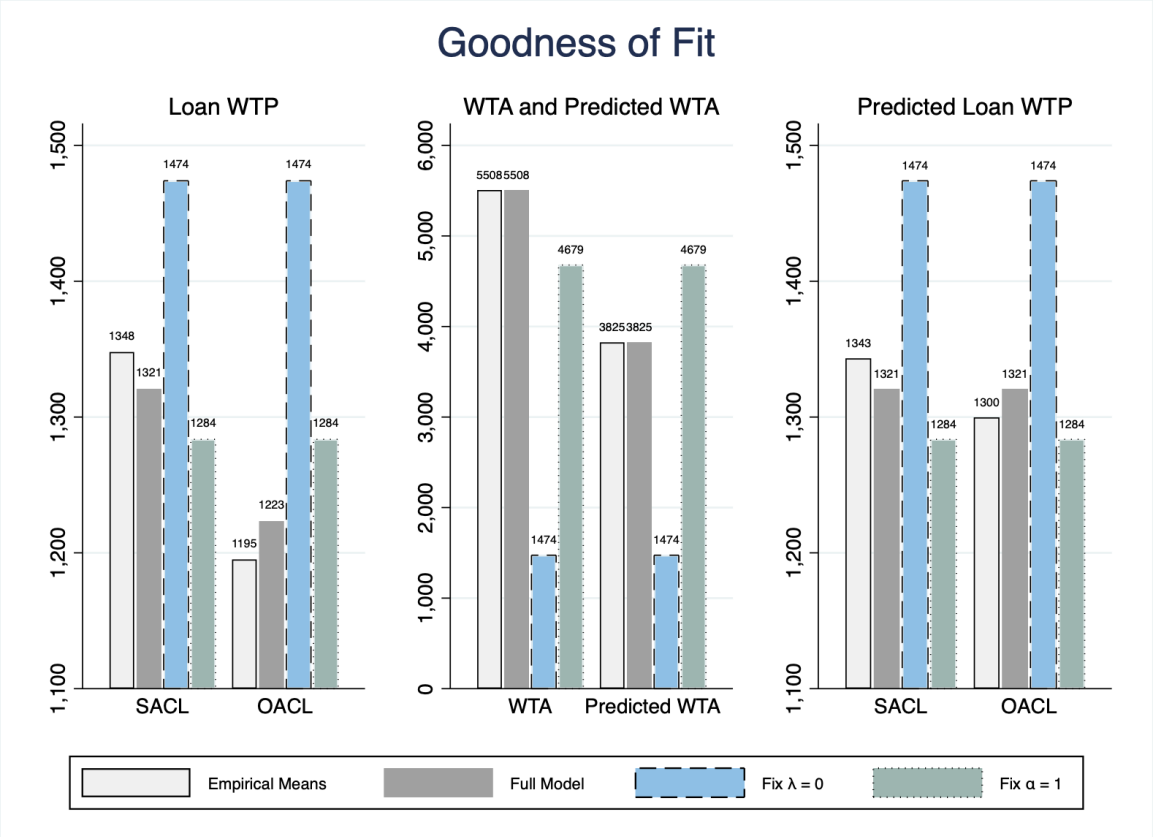
Notes: Figure 5 shows the heterogeneity of the endowment effect and projection bias for people whose price list in the BDM procedure ranges from 0 to 8000 Kenya Shillings (this is to make the figure easy to digest and less confusing). The sizes of circles are proportional to the number of participants who have the same values indicated by the center of circles. Blue thick circles stand for individuals who are topcoded in WTA or predicted WTA, while red thin circles stand for individuals who are not topcoded. The fitted line is derived from a linear regression of the variable on y axis on that on x axis for the non-topcoded subsample.

Figure 6: Predictions of Loan Take-up



Notes: Figure 6 shows the predicted and actual willingness to pay for two types of loans for the one third of subjects who were randomly selected to completed these predictions, pooling across items. Bars show the raw means and the capped lines show the 95% confidence intervals. The p-values are calculated from permutation tests.

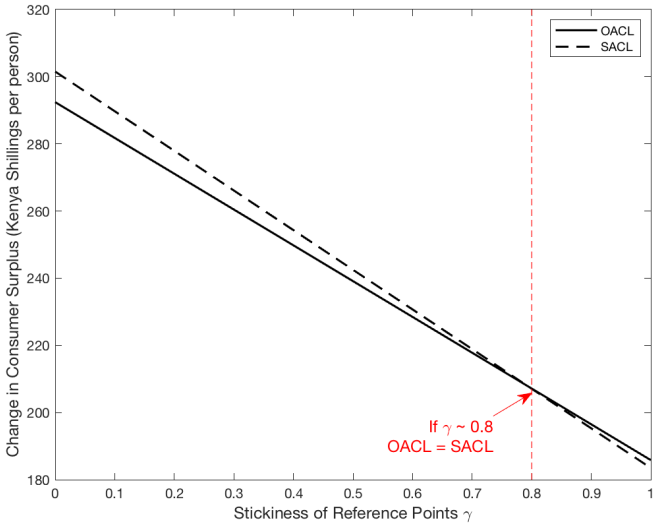
Figure 7: Goodness of Fit under Alternative Model Specifications



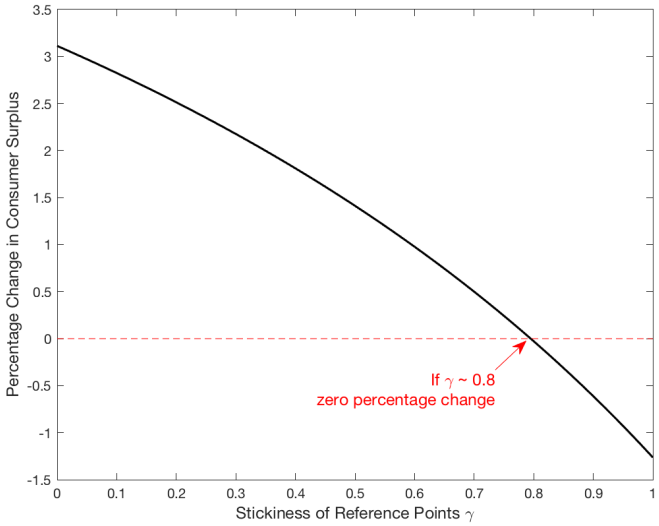
Notes: Figure 7 compares the empirical moments with theory-predicted moments calculated from parameters that are estimated using three different models: the full model, the model with λ fixed at 0 (no loss aversion), and the model with α fixed at 1 (no projection bias).

Figure 8: Welfare Effects of Introducing SACLs

(a) Consumer Surplus from OACLs / SACLs alone



(b) Percentage Change in Consumer Surplus:
Introduce SACLs to an environment that previously only had OACLs



Notes: The price of the item is set to 1500 Kenyan Shillings, which is close to participants' average willingness to pay for items in the experiment. γ measures the stickiness of reference points in the case of default. $\gamma = 0$ means that consumers would feel zero sense of loss in the case of default (i.e., reference points update immediately); $\gamma = 1$ means that consumers would feel a sense of loss forever if default (i.e., reference points never update). Figure 8a shows how consumer surplus (per person) from SACLs or OACLs alone changes as γ varies. If γ is around 0.8, the increase in consumer surplus from introducing SACLs to an environment that previously had no loans is the same as that from introducing OACLs. Figure 8b displays the relationship between γ and the percentage change in welfare when SACLs are introduced to an environment that previously only had OACLs. When γ is around 0.8, introducing SACLs to an environment that previously only had OACLs does not change the consumer surplus. Assume the baseline valuation of items follows a log-normal distribution.

Table 1: Sample Description

	mean	sd	p25	p75
Age	51.0	12.6	42.0	60.0
Female respondent	0.5	0.5	0.0	1.0
Years of education	9.8	3.6	8.0	13.0
Number of HH members	4.2	1.8	3.0	5.0
Income last month (thousand KES)	23.9	18.7	10.0	33.0
Liquid household savings (thousand KES)	15.9	12.3	3.0	31.0
Outstanding loans (thousand KES)	13.4	13.1	1.0	31.0
Share primary income: dairy	0.6	0.5	0.0	1.0
Share primary income: farming land	0.2	0.4	0.0	0.0
Number of cows producing milk	1.8	1.1	1.0	2.0

Notes: Table 1 describes the sample. The first column shows the mean value of each variable. The second column shows the standard deviation. The third and fourth columns show the 25th percentile and the 75th percentile, respectively.

Table 2: Baseline Valuations

	count	mean	sd	min	max
WTP: Milk Can	523	1177.9	642.8	200	3600
WTP: Cow Sprayer	701	1439.4	625.8	0	3600
WTP: Cooking Pot	606	1358.6	784.1	200	3600
WTP: Thermos	701	798.8	534.0	0	3600

Notes: Table 2 shows summary statistics about the baseline valuations from the initial BDM exercise for each of the four items used in the survey. Due to delays in procurement from the supplier, some subjects completed the experiment without either the milk can or the cooking pot. So the number of milk cans and cooking pots used in the experiment is less than the sample size. For all items, mean valuations were below the market price, which was approximately 2,500 Kenya Shillings for each of the items.

Table 3: Main Regression Results

	WTP: SACL loan minus OACL loan
Constant	**158.7*****
	(25.26)
New Item Baseline	0.517***
valuation: SACL minus OACL	(0.0595)
Collateral Baseline	-0.0823*
valuation: SACL minus OACL	(0.0471)
Average WTP for OACL	1195.2
Equivalent monthly interest rate premium	8.8%
Permute p-value for Constant	0.0000
R^2	0.180
N	691

Notes: Table 3 reports estimates of the main regression. The dependent variable is the within-indivdual gap between willingness to pay for a SACL versus an OACL. Note that the SACL and OACL finance different new items for an individual. The right-hand-side variables include a constant, the difference between baseline valuations of the new items randomly assigned to be financed using a SACL versus an OACL, and the difference between baseline valuations of the collateral for the SACL and the OACL. The coefficient of interest is the constant. Both the standard p value and the p value calculated from a permutation test indicate that the constant is statistically significant at the 0.01 level.
Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Main Regression Results: Heterogeneity by demographics

	WTP: SACL loan minus OACL loan							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	158.7***	173.0***	164.4***	154.7***	173.1***	173.2***	180.9***	122.2***
	(25.26)	(36.35)	(29.45)	(40.14)	(54.66)	(34.72)	(36.81)	(37.42)
New Item Baseline	0.517***	0.519***	0.518***	0.517***	0.518***	0.518***	0.519***	0.522***
valuation: SACL minus OACL	(0.0595)	(0.0595)	(0.0595)	(0.0595)	(0.0595)	(0.0594)	(0.0594)	(0.0595)
Collateral Baseline	-0.0823*	-0.0849*	-0.0833*	-0.0825*	-0.0820*	-0.0819*	-0.0849*	-0.0861*
valuation: SACL minus OACL	(0.0471)	(0.0470)	(0.0471)	(0.0471)	(0.0472)	(0.0471)	(0.0469)	(0.0471)
Endowed items owned		-27.19						
		(50.49)						
Number of endowed			-4.693					
items owned			(13.18)					
Monthly income				0.166				
(thousand KES)				(1.379)				
Number of income					-7.116			
sources					(25.54)			
Education above						-35.12		
median						(50.14)		
Female respondent							-46.35	
							(49.90)	
Gender stereotype								71.81
match								(50.89)
R^2	0.180	0.181	0.180	0.180	0.180	0.181	0.181	0.183
N	691	689	689	691	691	691	691	691

Notes: Table 4 reports estimates of regressions with demographic control variables. "Endowed items owned" is a dummy variable indicating whether the borrower owned the endowed item before. "Number of endowed item owned" is the number of endowed items previously owned by the borrower. "Monthly income (thousand KES)" is the borrower's income last month, in terms of thousand Kenya Shillings. "Number of income sources" stands for the number of the borrower's income sources. "Education above mean" is a dummy variable indicating whether the borrower's education level is above the median of the sample. "Female respondent" indicates the gender of the borrower. "Gender stereotype match" indicates whether the endowed item is more likely to be used by the respondent than by their spouse according to local gender norms.

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Structural Estimation Results: Log Normal

	(1) Benchmark	(2) Include Baseline WTP	(3) Not using loan prediction	(4) Subsample Not topcoded	(5) Fixed $d = 10\%$ no WTA	(6) Fixed $d = 10\%$ no $\widehat{WTA}$
Main Parameters						
Loss aversion (λ)	2.778	2.602	2.779	0.801	1.993	2.335
	(0.176)	(0.189)	(0.195)	(0.110)	(0.165)	(0.065)
Projection bias (α)	0.585	0.577	0.585	0.444	0.720	0.772
	(0.030)	(0.030)	(0.031)	(0.074)	(0.065)	(0.070)
Default rates ($d\%$)	5.476	7.743	5.467	10.461	10	10
	(1.687)	(2.091)	(1.811)	(7.125)	NA	NA
Auxiliary Parameters						
Mean of the associated	7.110	7.244	7.109	7.116	7.184	7.234
normal distribution (μ)	(0.041)	(0.053)	(0.048)	(0.051)	(0.019)	(0.020)
Std. Dev. of the associated	0.592	0.421	0.592	0.552	0.592	0.592
normal distribution (σ)	(0.012)	(0.019)	(0.013)	(0.020)	(0.012)	(0.012)
Liquidity	NA	320.46	NA	NA	NA	NA
cost (c)	NA	(70.87)	NA	NA	NA	NA
Implied Standard Parameters						
Loss aversion (λ^S)	4.577	4.358	4.579	2.075	3.087	3.323
Projection bias (α^S)	0.524	0.513	0.524	0.292	0.635	0.704
Mean item valuation	1457.95	1529.08	1457.50	1434.87	1571.24	1651.77
Std. Dev. of item valuation	944.45	673.78	944.27	856.39	1017.83	1070.00
Model Fit						
Number of moments used	8	12	6	8	7	7
Number of estimated parameters	5	6	5	5	4	4
Goodness of Fit	3.797	4.123	3.443	1.834	3.797	3.797

Notes: Table 5 presents results of the minimum distance estimation. Moments used in column (1) include the means and standard deviations of the willingness to pay for SACL and OACL, the means of predicted WTP for SACL and OACL, the mean of WTA, and the mean of $\widehat{WTA}$. Moments used in column (2) include the means and standard deviations of the baseline valuations of the endowed items and the new items for SACL and OACL, the means of the WTP for SACL and OACL, the means of predicted loan WTPs, the mean of WTA, and the mean of $\widehat{WTA}$. Column (3) excludes the means of predicted loan WTPs from the set of moments used in column (1), the benchmark case. Column (4) uses the same set of moments as the benchmark case, but it restricts the sample to individuals who are not top coded in either WTA or $\widehat{WTA}$. Columns (5) and (6) exclude the mean of WTA and the mean of $\widehat{WTA}$ from the set of moments in the benchmark case, respectively. The default rate is fixed at 10% in these two columns. The weighting matrix is the inverse of the diagonal of the variance-covariance matrix of the moments. We assume the baseline item valuation follows a log normal distribution. We directly estimate the mean and standard deviation of the associated normal distribution. The implied mean and standard deviation of baseline item valuation are also reported in the table. Goodness of fit is the distance between the theory-implied moments and the empirical moments at estimated parameters that minimize the distance. Lower values of goodness of fit indicate better fit of the model.

Table 6: Structural Estimation Results: Truncated Normal

	(1) Benchmark	(2) Include Baseline WTP	(3) Not using loan prediction	(4) Subsample Not topcoded	(5) Fixed $d = 10\%$ no WTA	(6) Fixed $d = 10\%$ no $\widehat{WTA}$
Main Parameters						
Loss aversion (λ)	2.778	2.602	2.779	0.801	1.993	2.335
	(0.176)	(0.189)	(0.195)	(0.110)	(0.165)	(0.065)
Projection bias (α)	0.585	0.577	0.585	0.444	0.720	0.772
	(0.030)	(0.030)	(0.031)	(0.074)	(0.065)	(0.070)
Default rates ($d\%$)	5.476	7.743	5.467	10.461	10	10
	(1.687)	(2.091)	(1.811)	(7.125)	NA	NA
Auxiliary Parameters						
Mean of the associated	995.56	1498.61	994.86	1178.57	1072.92	1127.91
normal distribution (μ)	(92.79)	(78.86)	(106.26)	(101.94)	(93.46)	(99.57)
Std. Dev. of the associated	1251.45	707.51	1251.38	1049.37	1348.69	1417.81
normal distribution (σ)	(75.63)	(18.47)	(75.79)	(86.54)	(63.01)	(65.27)
Liquidity	NA	320.46	NA	NA	NA	NA
cost (c)	NA	(70.87)	NA	NA	NA	NA
Implied Standard Parameters						
Loss aversion (λ^S)	4.577	4.358	4.579	2.075	3.087	3.323
Projection bias (α^S)	0.524	0.513	0.524	0.292	0.635	0.704
Mean item valuation	1457.95	1529.08	1457.50	1434.87	1571.24	1651.77
Std. Dev. of item valuation	944.45	673.78	944.27	856.39	1017.83	1070.00
Model Fit						
Number of moments used	8	12	6	8	7	7
Number of estimated parameters	5	6	5	5	4	4
Goodness of Fit	3.797	4.123	3.443	1.834	3.797	3.797

Notes: Table 6 presents results of the minimum distance estimation. Moments used in column (1) include the means and standard deviations of the willingness to pay for SACL and OACL, the means of predicted WTP for SACL and OACL, the mean of WTA, and the mean of $\widehat{WTA}$. Moments used in column (2) include the means and standard deviations of the baseline valuations of the endowed items and the new items for SACL and OACL, the means of the WTP for SACL and OACL, the means of predicted loan WTPs, the mean of WTA, and the mean of $\widehat{WTA}$. Column (3) excludes the means of predicted loan WTPs from the set of moments used in column (1), the benchmark case. Column (4) uses the same set of moments as the benchmark case, but it restricts the sample to individuals who are not top coded in either WTA or $\widehat{WTA}$. Columns (5) and (6) exclude the mean of WTA and the mean of $\widehat{WTA}$ from the set of moments in the benchmark case, respectively. The default rate is fixed at 10% in these two columns. The weighting matrix is the inverse of the diagonal of the variance-covariance matrix of the moments. We assume the baseline item valuation follows a truncated normal distribution (i.e., the item valuation has a normal distribution and lies within the interval $[0, +\infty]$). We directly estimate the mean and standard deviation of the associated normal distribution. The implied mean and standard deviation of baseline item valuation are also reported in the table. Goodness of fit is the distance between the theory-implied moments and the empirical moments at estimated parameters that minimize the distance. Lower values of goodness of fit indicate better fit of the model.