The Endowment Effect and Collateralized Loans

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The Endowment Effect

- Endowment effect: (Knetsch 1989; Kahneman et al. 1990)
  - Classic finding in behavioral economics
    - $WTA > WTP$
    - Unwillingness to exchange endowed good for another
  - Lots of lab evidence
  - Little field evidence, e.g. List, 2003; Anagol et al. 2016
- Typically modeled as loss aversion relative to a reference point
- We will focus on how the endowment effect among individual borrowers interacts with collateral requirements of loans

Endowment Effect and Types of Collateral

- Many loans are collateralized using the assets financed by the loans themselves, e.g. home loans, car loans, lease-to-own, many business-equipment loans.
  - **SACL**: Same-Asset Collateralized Loan
- Other loans require providing existing assets as collateral
  - **OACL**: Other-Asset Collateralized Loan
  - e.g. Using land, jewelry etc. as collateral in poor countries. Home-equity loans or pawn-shops in the US
- Many differences between these two types of collateral
  - ownership of appropriate assets, information asymmetries, difficulty of repossesion, differential rates of depreciation
- Potential psychological difference: people might anticipate stronger endowment effect in OACL

Main Idea

- Why might endowment effect feel stronger in OACLs?
  - OACL: You may lose something you already own.
  - SACL: You may lose something you never had to begin with. It may not (yet) be in your reference point.
- Key question is when financed asset enters reference point, and whether the borrower correctly anticipates this
  - Naivete/Projection Bias: Financed asset enters reference point fully, but borrower does not fully anticipate or act on this
  - Sophistication: Financed asset enters reference point fully, and borrower correctly anticipates how the financed asset enters the reference point

Research questions

1. Does the endowment effect *cause* borrowers to prefer collateralizing with new rather than old assets (i.e. prefer SACLs to OACLs)?
   - While eliminating other reasons to prefer SACLs over OACLs

2. Is this because borrowers under-estimate how "attached" they will come to feel to the new asset in the future?

Setting

- Field experiment with dairy farmers in Kenya ($n = 700$)
- Participants are all members of the same savings and credit cooperative (SACCO)
  - Provides deposit accounts and loans
  - Repeated interactions of participants with lender

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

Outline

Identification Challenge

- Want to compare demand for SACL and OACL
- And isolate the endowment effect mechanism
- Suppose we just randomized SACL vs OACL offers for a loan to purchase a particular new asset
- Problem:
  - Maybe borrowers dont have assets to provide as collateral
  - We dont know how much they value the assets they own
- So we could not attribute difference to endowment effect

Experimental Solution

- Simplified procedure:
  - Identify two items that are similarly valued ex-ante.
  - Randomly select one item and endow participant with it.
  - Later, offer loans for second item using OACL or SACL.
- Across SACL and OACL offers, due to randomization:
  - Collateral should have same valuation on average.
  - New item offered for sale should have the same valuation on average.
- Items used in experiment:
  - milk can, cow sprayer, cooking pots, and large thermos
  - All have roughly Ksh. 3000 (US$30) market value
  - Familiar items and same brands available locally. Respondents have a chance to examine them $\rightarrow$ limited scope for learning quality or usefulness

Overview of Design

First session (T=0)

- Baseline valuation of four items
  - BDM valuation, implemented with low probability
- Predictions about future decisions
- Randomly endowed with one item

— One week delay —

Second session (T=1)

- WTP for second random item financed with SACL
- WTP for third random item financed with OACL
- One loan and price randomly selected to be offered (SACL or OACL). Loan repayments over two months.

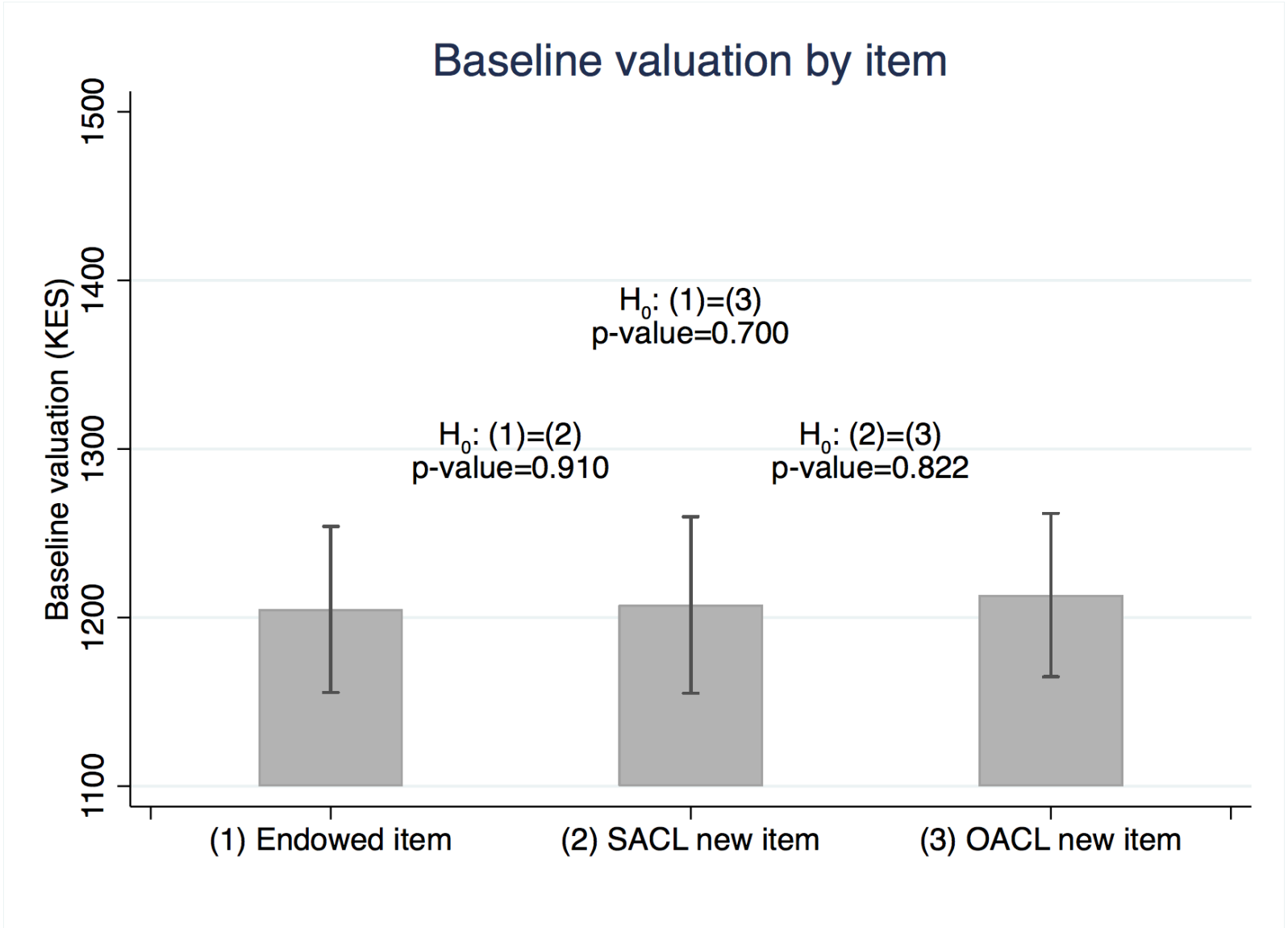
An example

	Milk can	Cow sprayer	Cooking pot	Thermos
Baseline valuation	800	1200	1200	1100
Endowed item		X		
SACL new item			X	
SACL collateral			X	
OACL new item				X
OACL collateral		X		

Use of BDM method to elicit demand

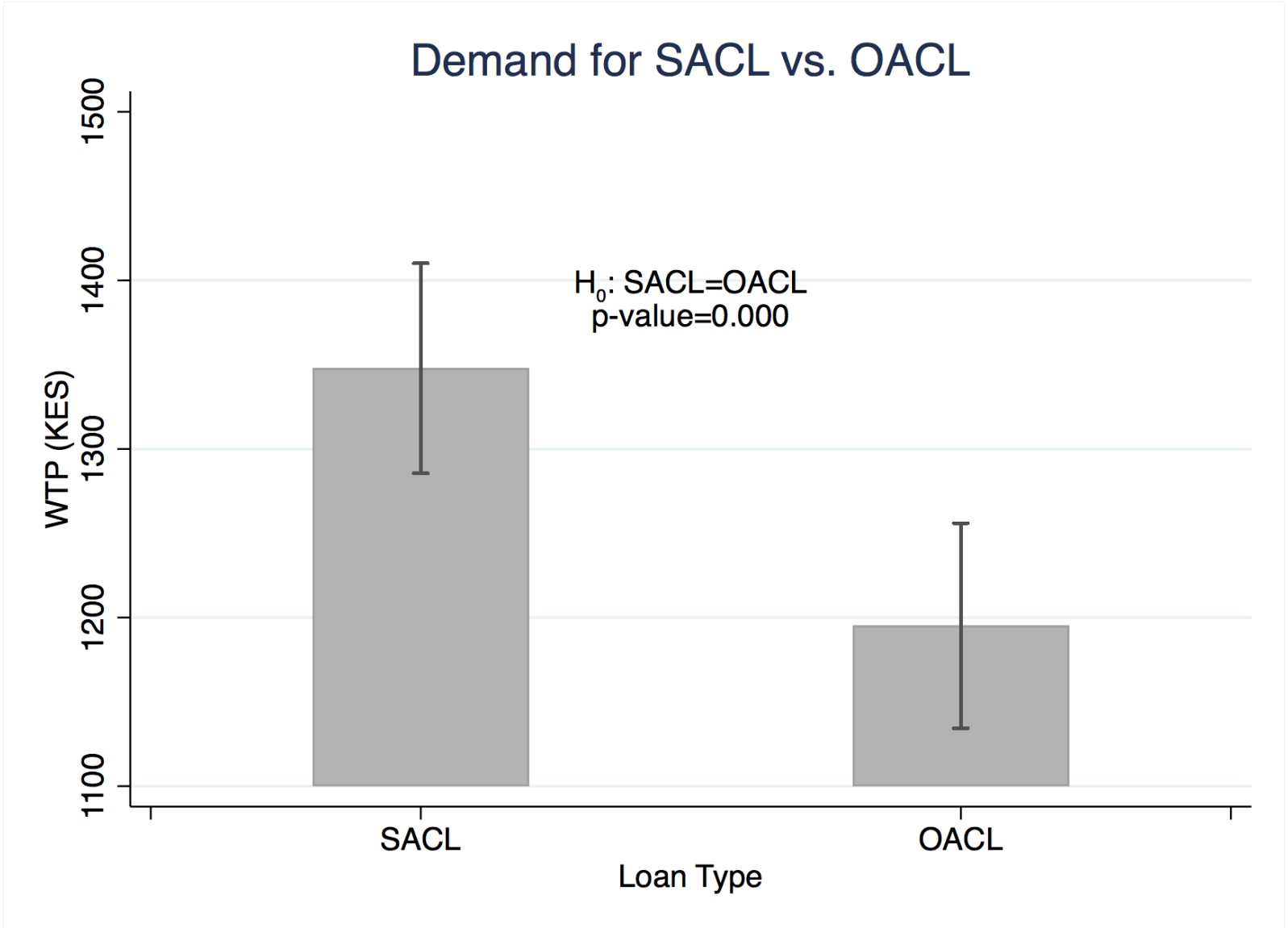
- Use Becker DeGroot Marschak (BDM) method with price lists to elicit demand and predictions
  - "Would you accept price of 200 Ksh, 400 Ksh...3600 Ksh?"
  - Must choose Yes/No for each price
  - One price then randomly drawn and choice implemented
- Incentive compatible: positive probability of implementation of each price
  - One loan randomly chosen to be offered (at random price)
  - Some choices, like baseline valuation and WTA are implemented only with low probability (but still incentive-compatible).
- Provides nearly exact WTP for each choice for each individual

Balance of Endowed, SACL and OACL items



Outline

Demand for SACL exceeds demand for OACL



Pre-specified Reduced-Form Regression

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

- ΔLoan_i is WTP for SACL minus WTP for OACL for individual i
- $\Delta \text{New Item}_i$ is the difference in baseline valuations for the new items
- $\Delta \text{Collateral}_i$ is the difference in baseline valuation for the collateral items
- $\boldsymbol{\beta_0}$ **is the coefficient of interest**. If β_0 is significantly above zero, individuals on average prefer SACL to OACL

Primary regression specification: within-individual

	WTP: SACL loan minus OACL loan
Constant	**158.7*****
	(25.26)
New Item Baseline valuation: SACL minus OACL	0.517***
	(0.0595)
Collateral Baseline valuation: SACL minus OACL	-0.0823*
	(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

Potential Confounds

- Confusion
  - Comprehension checks were excellent
  - Little evidence of heterogeneity by education levels

Table: Regression Results: Confounds

	WTP: SACL loan minus OACL loan
Constant	158.4***
	(34.72)
Baseline valuation:	0.518***
SACL item minus OACL item	(0.0594)
WTP: SACL collateral	-0.0819*
minus OACL collateral	(0.0471)
Education above median	-35.12
	(50.14)
Average WTP for OACL	1195.2
R^2	0.181
N	691

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Potential Confounds

- Learning about endowed good through ownership
  - Familiar items; would need systematic positive updating.
  - Find no heterogeneity by past experience with items.
  - No differences across four items
  - Inconsistent with beliefs (later)

Treatment-Effect Heterogeneity and Confounds

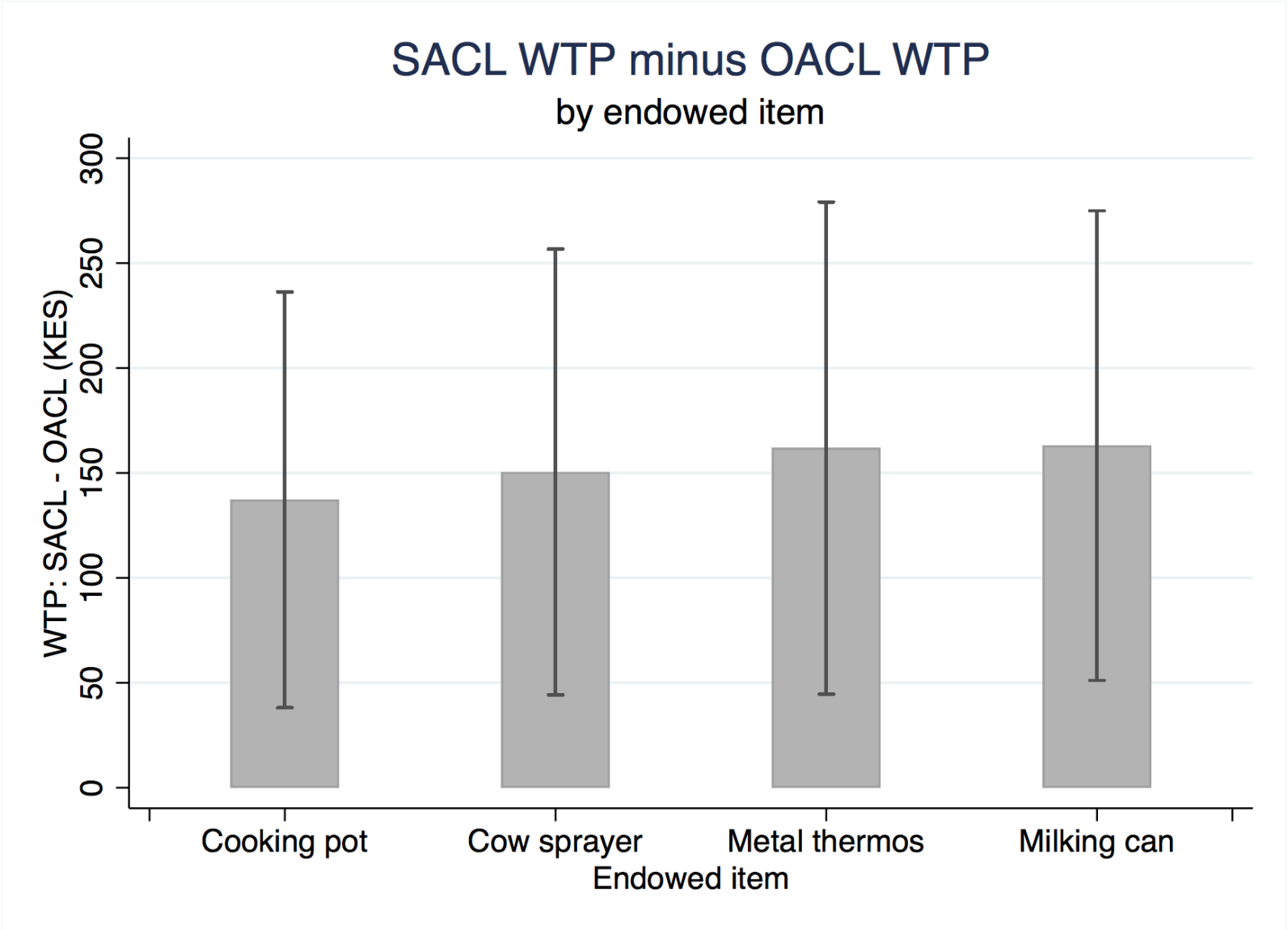
Table: Regression Results: Confounds

	WTP: SACL loan minus OACL loan	
Control variable	Number of endowed items owned	Endowed item used by borrower
Constant	158.8***	158.2***
	(29.45)	(37.42)
Baseline valuation:	0.518***	0.522***
SACL item minus OACL item	(0.0595)	(0.0595)
WTP: SACL collateral	-0.0833*	-0.0861*
minus OACL collateral	(0.0471)	(0.0471)
Control	-4.693	71.81
	(13.18)	(50.89)
Average WTP for OACL	1195.2	1195.2
R^2	0.180	0.183
N	689	691

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

SACL vs. OACL by endowed item



Potential Confounds

- Hedging due to uncertain usefulness of new asset
  - With SACL, people might think "if the item breaks before the loan is up, I can just default."
  - Durable items so most people likely do not anticipate meaningful depreciation or it breaking within two months
  - Inconsistent with beliefs (later)

Outline

Testing for naivete (projection bias)

- Key question: do people get more attached to SACL new item than they anticipated?
  - If do get attached to new item, will repay loan more
  - Under-predicting one's future endowment effect is an example of projection bias (Loewenstein et al. 2003)

- Ideally want to compare predicted and true endowment effect over SACL-financed item. But would only observe this for individuals who take up loan.

- Instead, elicit predictions before receiving "endowed good"
  1. Predict what prices they will accept a buy-back of the endowed good next week
  2. Predict what prices they will accept the loans (SACL and OACL)

Overview of Design

First session (T=0)

- BDM valuation of four items; identify three similarly valued
- Predictions about future decisions
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— One week delay —

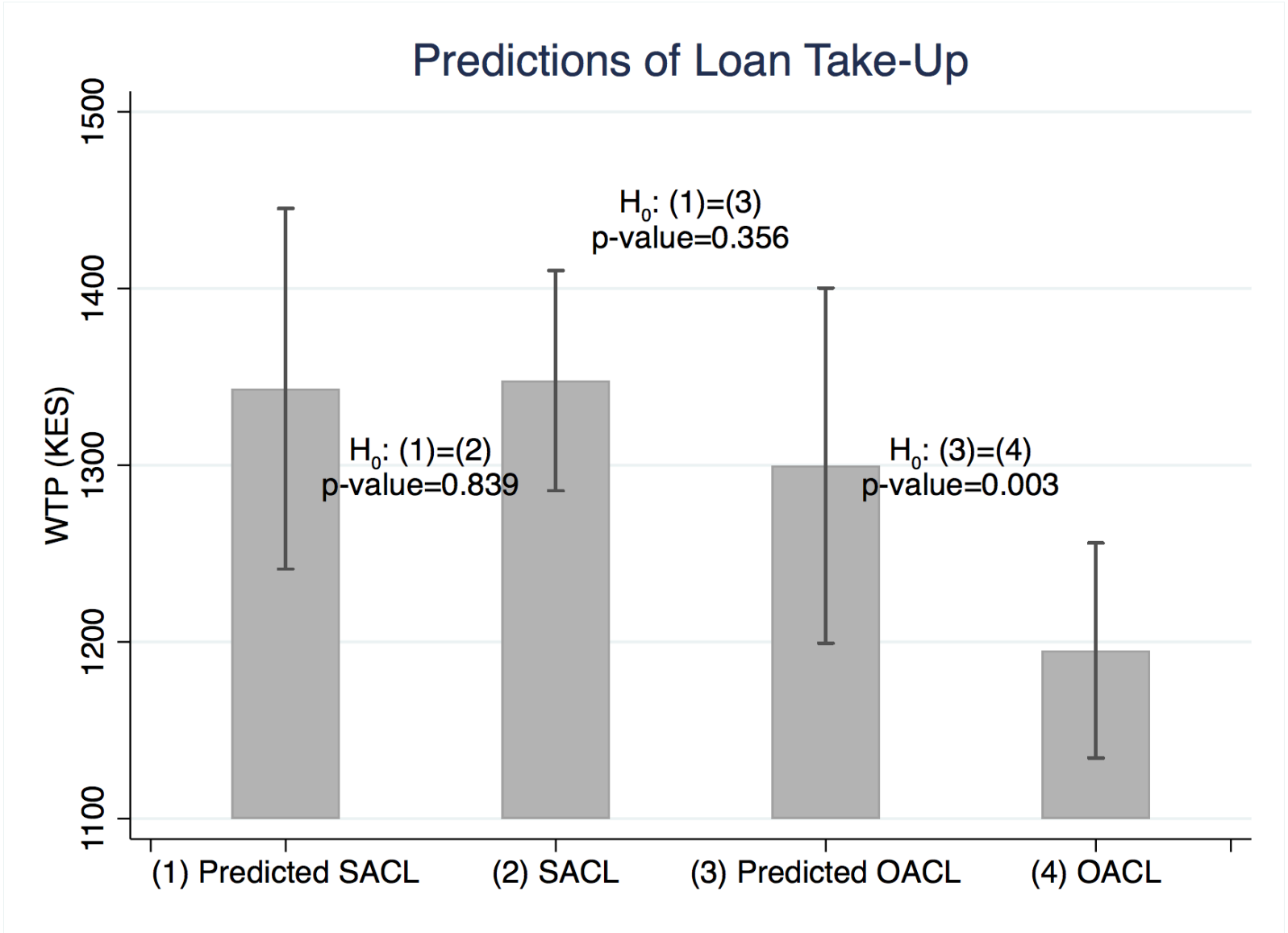
Second session (T=1)

- WTA for endowed item
- BDM WTP for second randomly assigned item using SACL
- BDM WTP for third randomly assigned item using OACL
- One loan and price randomly selected to be offered (SACL or OACL). Loan repayments over two months.

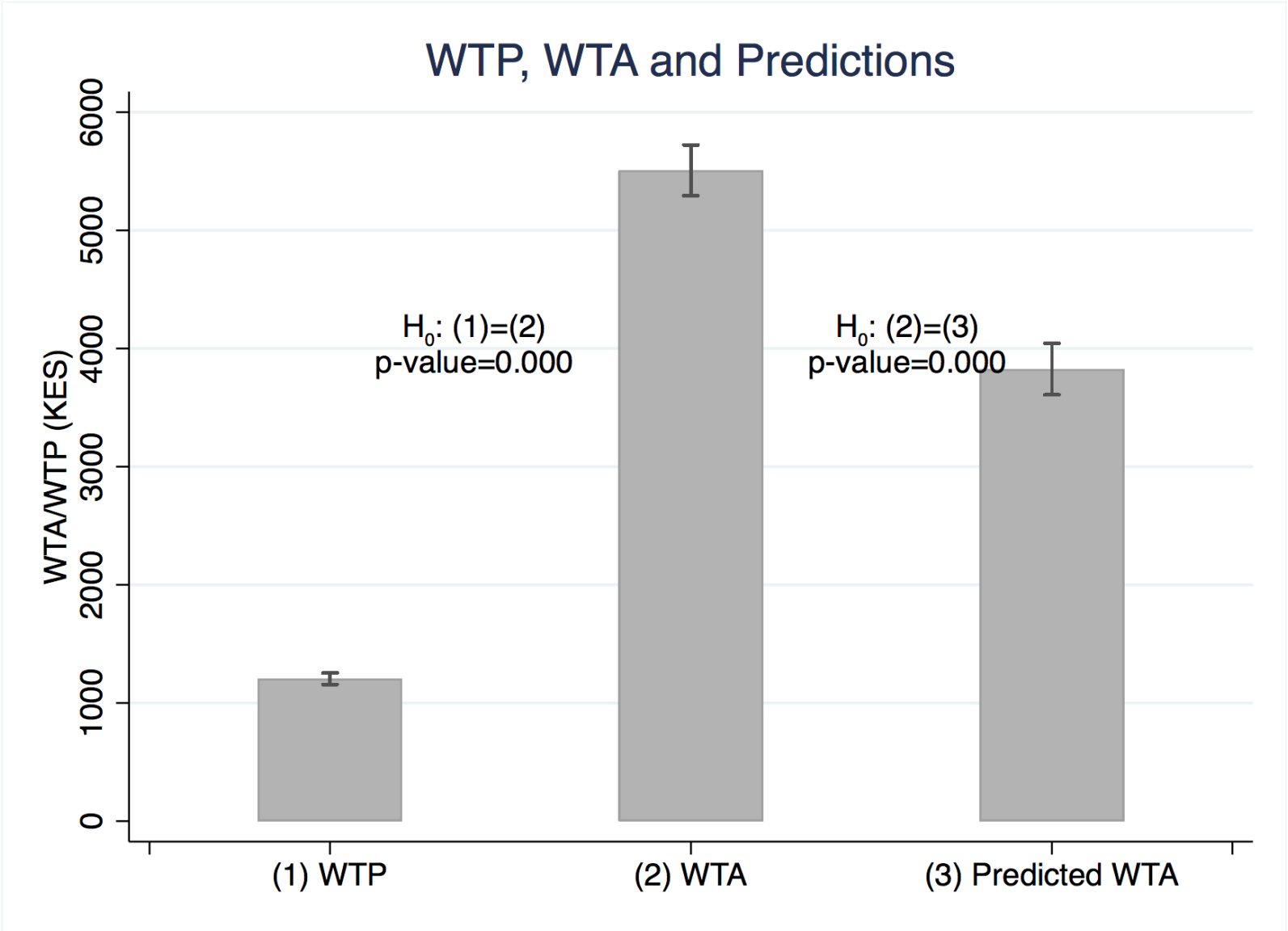
Eliciting Predictions

- Ask borrowers to predict whether they will accept the buy-back (WTA) or loan offer (SACL or OACL) for each of the prices they will be asked about a week later
  - Aware that they will make the final decision later
  - Not reminded of their past prediction the following week
- Randomize small monetary incentives for accurate predictions
  - No effect of incentives in practice
- All individuals make WTA prediction. Only 1/3 asked to make loan take-up predictions
  - Concern that making prediction would cause anchoring on predicted numbers
  - Ex post, find that making predictions does not affect eventual loan WTP

Predict SACL correctly; Over-predict OACL

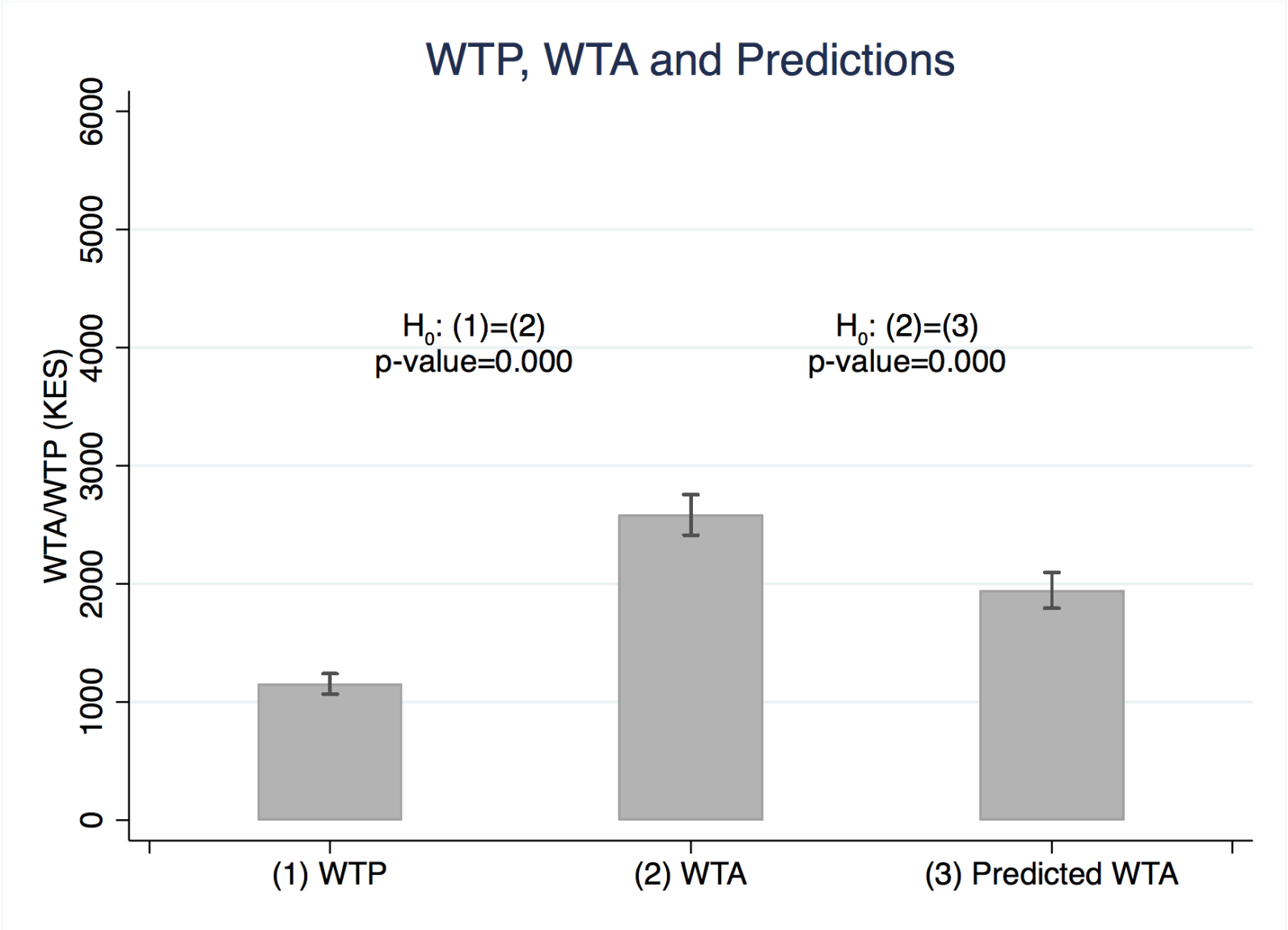


Underpredict WTA



Note: Issue with top-coding ("never sellers")

Underpredict WTA: subsample not top-coded



Confounds which might cause high WTA

- Already sold or bartered the endowed good?
  - Verified this, very uncommon (1 individual)
- Norms against selling gifts
  - Framed endowed good as compensation for participation
  - In debriefing, only 8 out of 162 individuals mentioned this
- Debriefing of participants who would not sell
  - Vast majority reported some version of "importance" or "value" of the item to them; "using" the item; or "attachment" to the item as a reason not to sell
  - Some individuals also report a preference for illiquid assets (fear of squandering cash, prefering a durable asset)

Outline

Model description

- Reference-dependent prefs with status-quo reference points
  - Consumption utility + gain-loss utility
  - Loss aversion $\lambda > 0$, suppress sense of gain
  - $U = U(c|r) = m(c) + n(c|r)$
  - Gain-loss utility: $n(c|r) = \mu(m(c) - m(r))$
  - Value function: $\mu(x) = 0$ if $x \geq 0$ and $\mu(x) = \lambda x$ if $x < 0$.
- Sophistication (α): misperception of future endowment effect
  - Equivalent to projection bias over reference points
  - $\hat{U}_t^\tau = (1-\alpha)U(c_\tau|r_t) + \alpha U(c_\tau|r_\tau) = U(c_\tau|(1-\alpha)r_t + \alpha r_\tau)$
- 3-period model
  - T=0: Predictions, then endowed with one item
  - T=1: Loan take-up and WTA decisions
  - T=2: Loan repayment (exogeneous default probability)
- Assume exogenous perceived default rates
  - Implies an extreme distribution of shocks; will discuss its implications later.

Main Predictions: WTP for SACL vs OACL

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

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

The relationship between observables:

$$(1-\widehat{d})WTP_O = WTP - \widehat{d}WTA$$

$$(1-\widehat{d})WTP_S = WTP - \widehat{d}\widehat{WTA}$$

Key comparison: SACL vs OACL

Suppose equal ex-ante values of endowed items and new items in OACL and SACL, V, and equal perceived default probabilities, $\hat{d}$. Then:

$$WTP_S - WTP_O = \frac{\hat{d}}{1-\hat{d}}(1-\alpha)\lambda V > 0$$

The preference for SACL compared to OACL:

- Increases in λ: loss aversion
- Decreases in α: (increases in naivete)
- Increases in $\hat{d}$: perceived default rates

Key Comparison: Predictions

WTA predictions:

- $WTA - \widehat{WTA} = (1-\alpha)\lambda V$
  Under-predict willingness to accept, due to under-estimation of future endowment effect

Loan predictions:

- $\widehat{WTP_S} - WTP_S = 0$
  Predict WTP for SACL correctly
- $\widehat{WTP_O} - WTP_O = \frac{\hat{d}}{1-\hat{d}}(1-\alpha)\lambda V > 0$
  Over-predict WTP for OACL, due to under-estimation of future endowment effect
- $\widehat{WTP_S} - \widehat{WTP_O} = 0$
  Predicted WTP for SACL and OACL would be the same, if item valuations are equal.

Outline

Structural Estimation

- Classical minimum-distance estimator
- Minimize distance between predicted moments $m(\theta)$ and observed ones $\hat{m}$. θ, vector of parameters.

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

- Moments $m(\theta)$
  - Loan take-up prices: means and SDs
  - WTA and $\widehat{WTA}$
  - Predicted loan take-up prices
  - Do not include baseline WTP for items
    - Worry that baseline WTP might be contaminated by liquidity constraints, trust issues, etc.

Structural Estimation

- $\theta = (\alpha, \lambda, \hat{d}, \mu, \sigma)$
- Main parameters:
  - α, projection bias
  - λ, loss aversion
  - $\hat{d}$, perceived default rates, assuming $\hat{d^S} = \hat{d^O} = \hat{d}$
- Auxiliary parameters:
  - Mean (μ) and SD (σ) of item valuations, assuming equal ex-ante values

Which moments identify which parameters?

- α (projection bias)
  - $\alpha = \frac{\widehat{WTA} - WTP_S}{WTA - WTP_O}$
  - Under predict WTA, due to under-estimation of future endowment effect
  - Projection bias makes people prefer SACL to OACL

- λ (loss aversion)
  - $\lambda = \frac{WTA - WTP}{WTP}$
  - $\lambda = \frac{(WTA - WTP_O)(WTA - \widehat{WTA})}{WTP_S \cdot WTA - WTP_O \cdot \widehat{WTA}}$ (baseline WTP is not used in the estimation; express λ in terms of other observables)
  - Estimating loss aversion using the wedge between WTA and (estimated) WTP.

Which moments identify which parameters?

- $\hat{d}$ (perceived default rates)
  - $\frac{\widehat{d}}{1-\widehat{d}} = \frac{WTP_S - WTP_O}{WTA - \widehat{WTA}}$
  - Denominator: Under-predict actual WTA, due to under-estimation of future endowment effect
  - Numerator: The wedge between WTP for SACL and OACL is also driven by misprediction of future reference points. But only when you default is there a difference in loan WTP. So the difference is scaled down.
  - By comparing two differences, we could identify the perceived default rate.

Structural Table: Benchmark

Main Parameters		**Auxiliary Parameters**	
Loss aversion (λ)	2.778	Mean item valuation	1457.95
	(0.176)	Std. Dev. of item valuation	944.45
Projection bias (α)	0.585		
	(0.030)	**Implied Standard Parameters**	
Default rates (d%)	5.476	Loss aversion (λ^S)	4.577
	(1.687)	Projection bias (α^S)	0.524

Realized default rates and late payment

- Only one repossession (default rate $< 1\%$)
- Late payment rates were 10% (OACL) and 12% (SACL)
- No evidence of higher default or late payment in SACL
  - Suggestive evidence against "partial attachment" case
- Possible reasons for the gap between the actual and perceived default rates
  - Overestimate small default probabilities
  - Understand correctly the probability of each state of the world, but underestimate the repayment effort they will exert

Outline

Summarizing

- Empirical facts:
  1. Borrowers willing to pay a meaningful premium (13.2%, equivalent to 8.8% per month in interest) for SACLs, despite the same baseline valuation of the collateral
  2. Underpredict future WTA and overpredict future OACL take-up, while predicting SACL take-up correctly

- Interpretation
  - Borrowers exhibit substantial loss aversion
  - The resulting endowment effect reduces willingness to put collateral at risk
  - Borrowers exhibit projection bias / naivete: do not anticipate how strong the endowment effect will be over new assets / how much their reference point will adjust

Implications

- Loss aversion over collateral makes collateralized credit with existing assets less attractive to borrowers
- Factors which hinder SACLs (such as barriers to repossession) may be very costly in terms of driving down demand
  - SACLs are less common in developing countries, presumably due to the difficulty of enforcement
  - The lender we work with uses OACLs (with cash deposits)
  - Jack et al. (2016) find adoption of rainwater harvesting tanks goes from 2% to 45% when replacing cash-collateralized loan with SACL

Implications

- Behavioral issues make asset accumulation more sensitive to institutions
  - Suppose assets vary in usefulness as collateral. Good collateral: money in bank, gold held by lender, land, etc; bad collateral: bicycles, etc.
  - Suppose if weak institution, lenders only accept good collateral. This implies that most purchases cannot be financed with SACL.
  - If no behavioral issues, the farmers could use land as collateral and could borrow with only modest distortion if land is subject to enforcement.
  - If behavioral issues, they will not borrow, which implies that behavioral issues make asset accumulation more sensitive to institutions.
- SACLs likely to provide higher take-up *and* high repayment
  - Since borrowers seem to get attached to new items quickly
  - Note: In our experiment, no difference in default rates across two types of loans

Welfare

- Welfare implications are tricky
- Should we value loss aversion in welfare?
- Two types of mistakes going on
  - OACL: Overestimate how long they will feel sense of loss if they lose endowed good $\rightarrow$ too little take-up of loan
  - SACL: Underestimate how attached they will get to new item $\rightarrow$ causes more take-up compared to OACL...but could be too much take-up
- Other reasons to think take-up in OACL might be too low
  - Some evidence of over-weighting or over-estimation of default probabilities in our setting
  - If borrowers simply don't have existing assets available to provide as collateral, can't take up OACL

Welfare

- γ: how quickly reference points adjust in case of default
  - Implicitly assume that the collateral will stay in borrowers' reference points forever even if they default.
  - But it is likely that people 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 this by the parameter $0 < \gamma < 1$. That is, the actual sense of loss if default is scaled down by γ.
  - Welfare implications depend on γ

Welfare

- For a borrower with a baseline valuation of V for all items, the consumer welfare change upon taking up a loan is

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

- If only OACLs available, the consumer welfare change upon taking OACLs is

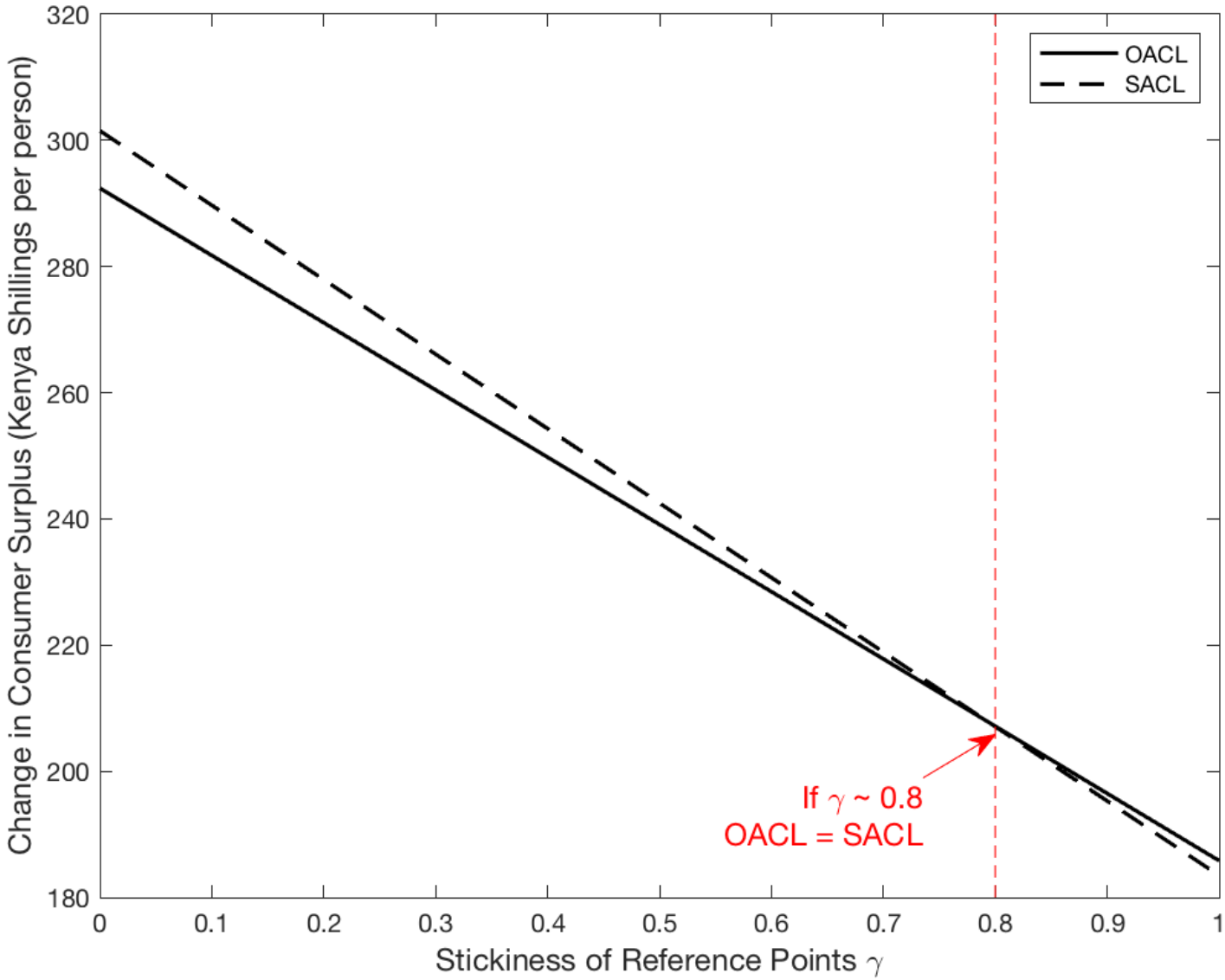
$$S(OACL) = \int_{\underline{\widehat{V}}_O}^{\overline{V}} [(1-d)(V-x) + d(-\lambda\gamma)V]\,\mathrm{d}F(v)$$

  - Take up OACL if $V > \underline{\widehat{V}}_O$
- If only SACLs available, the consumer welfare change upon taking SACLs is

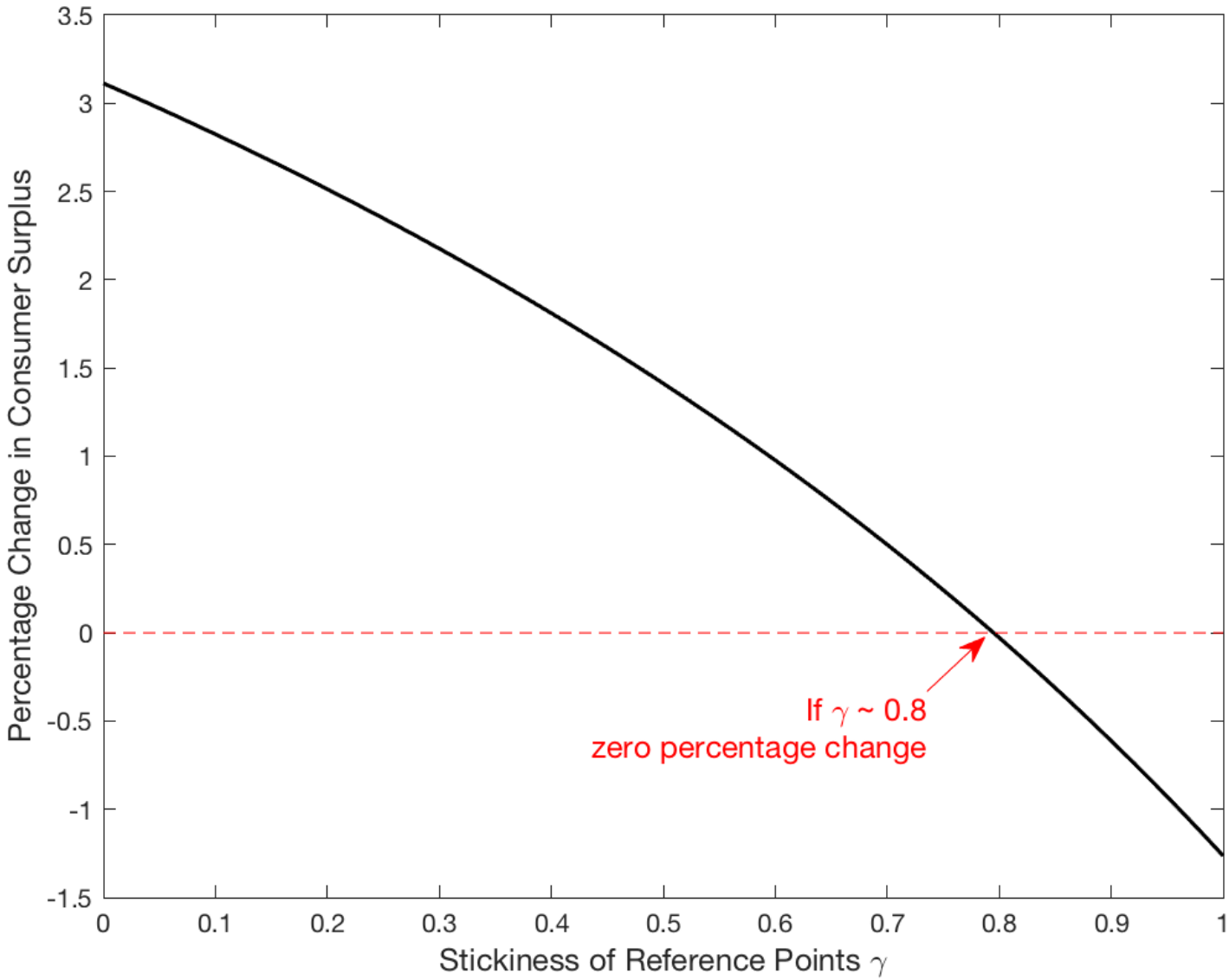
$$S(SACL) = \int_{\underline{\widehat{V}}_S}^{\overline{V}} [(1-d)(V-x) + d(-\lambda\gamma)V]\,\mathrm{d}F(v)$$

  - Take up SACL if $V > \underline{\widehat{V}}_S$

Consumer Surplus from OACLs / SACLs alone



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



Welfare: An Caveat

- Assume exogenous default rates $\Rightarrow$ the implicit assumption of an extreme distribution of shocks
  - no shocks $\rightarrow$ repay
  - severe shocks $\rightarrow$ default
- Incorporating a less extreme distribution and endogenizing the repayment behavior
  - no shocks $\rightarrow$ repay
  - mild shocks $\rightarrow$ a higher cost of repayment
  - severe shocks $\rightarrow$ default
- The mild shock case would change the welfare conclusions because people might wind up exerting a lot of effort to repay in this state even if reference points adjust quickly, because they have false beliefs about how much it will hurt to lose the item.