How a Focused Budgeting Activity Increased Savings across the Hungry Season

April 20, 2023
Budget Neglect in Consumption Smoothing: A Field Experiment on Seasonal Hunger

Ned Augenblick (UC Berkeley)
Kelsey Jack (UCSB)
Supreet Kaur (UC Berkeley)
Felix Masiye (UNZA)
Nick Swanson (UC Berkeley)
Predictable recurrent consumption cycles

Zambia Hungry Seasons

Harvest maize once per year, consume over year 8-10% decline in meals per day

Source: Fink et al. 2020

US Food Stamp Cycles

Receive food benefits at start of month 10-15% drop in calories across month

Source: Kuhn 2018
Systematic Overoptimism

Despite experience, individuals believe this cycle will be different

• In Sept, ask HHs to predict maize stocks in:
  • 3 months (early hungry season)

• Incentivized: payment at revisit if within $\frac{1}{2}$ a bag
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- In Sept, ask HHs to predict maize stocks in:
  - 3 months (early hungry season)
  - Incentivized: payment at revisit if within $\frac{1}{2}$ a bag
  - 80% over-optimistic about maize in 3 months

Notes: N=210 households
Systematic Overoptimism

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- In Sept, ask HHs to predict maize stocks in:
  - 3 months (early hungry season)
- Incentivized: payment at revisit if within $\frac{1}{2}$ a bag
- 80% over-optimistic about maize in 3 months
- 65% have less than “worst case scenario”

Notes: N=210 households
**Systematic Under-estimation of Expenses**

- Predict total non-food expenditure over year
  - School fees, farm inputs, etc
  - Unlikely to be “temptation” goods (not definitive)

- Actual expenditures are 100% higher than forecast
Hypothesis: “Budget Neglect”

• "Budget neglect": People misperceive their budget set
  – Don’t fully account for all future expenditures and shocks
  – Creates over-optimism about future budget → Excess early spending
  – Innate relationship with "planning fallacy" [Kahneman Tversky 1977]
  – Note: no strong stance on micro-foundation
Hypothesis: “Budget Neglect”

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→ Increase cognizance of budget set → alter beliefs, change behavior
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→ Increase cognizance of budget set → alter beliefs, change behavior

• Distinction from how economists think generally about mental accounting or
time inconsistency (not a commitment device)
Outline

1. Introduction
2. Context
3. Model and Results
4. Policy Implications
5. Discussion
6. Conclusion
Context

- Setting: maize farmers in rural Zambia
- Harvest maize once per year – store at home in 50kg grain bags
- “Eat the pie” problem – allocate stock over rest of year
  - Consumption
  - Expected expenditures (e.g., school fees, inputs)
  - Unexpected shocks (e.g., health, funerals)
  - Large array of potential expenditures and shocks
Model Intuition

Person with budget neglect does not appreciate some future expense
→ They will spend more money on expenses today

→ They will have less savings in the future

→ When they finally appreciate the expense, they have less money to spend

→ They must spend less on later expenses (consumption cycle)

– (Note: They will neglect this effect and therefore over-predict future savings)

• Implied intervention: Improve understanding of budget set → alter beliefs and spending profile
Model: Intuition

• Borrow two approaches from psychology literature:

1. Segmentation effect: unpack expenditures using categories for cognitive ease
2. Recall past expenditures to formulate a plan for the future
Model: Intuition

• Borrow two approaches from psychology literature:
  1. Segmentation effect: unpack expenditures using categories for cognitive ease
  2. Recall past expenditures to formulate a plan for the future

• We test three predictions:
  1. Immediate: Forecast of future expenditures rises
  2. Immediate: Willingness to pay for discretionary good goes down
  3. Over year: Flatter spending profile (less spending in early months)
Budgeting Intervention: Think through Expenditures

7 categories (based on fieldwork):

1. Consumption in each month
2. School fees
3. Households supplies
4. Farm inputs
5. Transfers
6. Health shocks and emergencies
7. Other

Note: No coaching or assistance provided
Intervention: Implementation

Planning exercise embedded in baseline survey with head of household

Treatment group

- Think through the budget via unpacking
- Recall expenditures by category for previous year
- Construct budget for coming year — allocate available harvest to categories
- Offered labels for maize bags (visual record of plan; delivered 2 months later)

Control group

- Offered same colored labels (delivered 2 months later)
- (Told that some HHs use labels to record expenditure plan)
Sample and Data Collection

- N = 837 households, 113 villages
- Household-level randomization
  - Treatment and control HHs in same village
  - Note: Spillovers (budgeting knowledge or kin pressure for food) will only weaken treatment effects
- Five rounds of data collection over 2019/20
Model: Intuition

• Our model of behavior: agents forget future expenditures

• Our treatment: make agents think through their future expenditures

• We test three predictions:
  1. Immediate: Forecast of future expenditures rises
  2. Immediate: Willingness to pay for discretionary good goes down
  3. Over year: Flatter spending profile (less spending in early months)
1) Immediate Impacts: Higher Expected Expenditures

Prediction 1:
Increase in expected expenditures (first stage)

Measurement: Treatment group only

1 Before budgeting: How many bags of maize will you need to sell for expenditures?

2 Post budgeting: Bags of maize allocated for expenditures

Treated HHs estimate they will need 20-60% more maize for future expenditures than they realized (p-value < .01)
Model: Intuition

- Our model of behavior: agents forget future consumption
- Our treatment - make agents think through their consumption plan
- We test three predictions:
  1. Immediate: Forecast of future expenditures rises
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  3. Over year: Flatter spending profile (less spending in early months)
2) Immediate Impacts: Preference for Less Consumption Today

**Prediction 2:**
Intended consumption plan changes: less consumption today (tighter perceived budget)

**Measurement:** Willingness to pay for discretionary consumption

- Elicit willingness to pay in maize for chosen good from both Treatment and Control at end of baseline survey (after budgeting)

Note: replicates common transaction - "briefcase buyers" come to village to sell goods for maize
2) Immediate Impacts: Preference for Less Consumption Today

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Intended consumption plan changes: less consumption today (tighter perceived budget)

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- Elicit willingness to pay in maize for chosen good from both Treatment and Control at end of baseline survey (after budgeting)

Note: replicates common transaction - "briefcase buyers" come to village to sell goods for maize

Treated HHs: 34% lower willingness to pay for discretionary consumption (p-value < .01)
Model: Intuition

• Our model of behavior: agents forget future consumption

• Our treatment - make agents think through their consumption plan

• We test three predictions:
  1. Immediate: Forecast of future expenditures rises
  2. Immediate: Willingness to pay for discretionary good goes down
  3. Over year: Flatter spending profile (less spending in early months)
3) Smoother Consumption Profile over the Year

**Prediction 3:**

- Reduce consumption by 15% in early months (p-value < .01)
- Reduction prior to application of labels
- HHs enter hungry season with one month more of food (p-value < .01)
Implications of Increased Savings

- Planting begins after maize stock declines
- Model predicts expenditures in later months will rise
- Implications for 2 types of investment:
  1. Farm input expenditures
     - HHs lack liquidity to hire outside labor for intensive operations
     - Fertilizer and other inputs purchased in early hungry season, when maize stocks are low
     - May help explain why HHs forecast they will buy fertilizer, but then do not (Duflo et al. 2011)
  2. Labor supply allocation
     - HHs divert labor to wage work, to raise funds to buy maize
     - Fink et al. (2020): impacts on crop yields from distortions (e.g. on HH labor supply)

→ Under-saving could reduce output, and therefore size of pie, for the next year
Implications of Increased Savings

**Farm Inputs**

<table>
<thead>
<tr>
<th>Treatment Status</th>
<th>(1) Bags Harvested</th>
<th>(2) Total Crop Revenue</th>
<th>(3) Fertilizer/Chemical Exp</th>
<th>(4) Days Hired Labor</th>
<th>(5) Days on Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Status</td>
<td>3.34* (1.86)</td>
<td>660.54* (395.05)</td>
<td>71.25 (46.60)</td>
<td>0.66* (0.38)</td>
<td>0.98* (0.59)</td>
</tr>
</tbody>
</table>

Treat x Visit 2 (Pre-Labels)

Treat x Visit 3 (Early Hungry)

Treat x Visit 4 (Hungry)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bags</th>
<th>Kwacha</th>
<th>Kwacha</th>
<th>Days</th>
<th>Days</th>
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<tr>
<td>N</td>
<td>815</td>
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<td>815</td>
<td>823</td>
<td>1654</td>
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<tr>
<td>Control Mean</td>
<td>40.94</td>
<td>7433.35</td>
<td>718.68</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Control group Visit 2</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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</table>

- 8% increase in size of subsequent maize harvest
- 9% increase in total crop revenue
### Implications of Increased Savings

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<th>(6) Meals Per Day</th>
<th>(7) Small Meals</th>
<th>(8) Wage Earnings</th>
<th>(9) Days Wage Labor</th>
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<td>-0.03 (0.03)</td>
<td>0.38 (13.15)</td>
<td>0.29 (0.24)</td>
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<tr>
<td>Treat x Visit 2 (Pre-Labels)</td>
<td>-0.03 (0.03)</td>
<td>0.38 (13.15)</td>
<td>0.29 (0.24)</td>
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<tr>
<td>Treat x Visit 3 (Early Hungry)</td>
<td>0.05* (0.03)</td>
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<td>0.43 (4.16)</td>
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<tr>
<td>Treat x Visit 4 (Hungry)</td>
<td>-0.01 (0.03)</td>
<td>-0.01 (0.03)</td>
<td>-10.67*** (4.16)</td>
<td>-0.22** (0.11)</td>
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<th>Meals</th>
<th>Yes/No</th>
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<td></td>
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<tr>
<td>Control group Visit 2</td>
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<td>2.11</td>
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<td>25.58</td>
<td>0.68</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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- 8% increase in size of subsequent maize harvest
- 9% increase in total crop revenue
- HHs less likely to sell labor during hungry season to finance consumption (42% decrease)
Forecast Error Predicts Treatment Effects

- Does treatment have a larger effect on people who underestimate expenses more?

<table>
<thead>
<tr>
<th></th>
<th>Cash &amp; Maize (1)</th>
<th>Maize Bags (2)</th>
<th>Cash &amp; Maize (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treat</td>
<td>16.715</td>
<td>0.029</td>
<td>33.010</td>
</tr>
<tr>
<td></td>
<td>(22.051)</td>
<td>(0.258)</td>
<td>(28.627)</td>
</tr>
<tr>
<td>Treat x Above Median Forecast Error</td>
<td>133.691**</td>
<td>1.287**</td>
<td>19.240*</td>
</tr>
<tr>
<td></td>
<td>(54.005)</td>
<td>(0.552)</td>
<td>(11.458)</td>
</tr>
<tr>
<td>Treat x Forecast Error (Continuous)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
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<tr>
<td>Control mean Visit 2/3</td>
<td>497.966</td>
<td>5.959</td>
<td>497.966</td>
</tr>
<tr>
<td>Week FE</td>
<td>Yes</td>
<td>Yes</td>
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Dependent Variable Unit: Kg, Maize bags, Kg

* p < 0.05, ** p < 0.01
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Generalizability: SNAP Recipients

• Preliminary pilot with low-income households near Oakland, CA
  – Most rely on SNAP / other government benefits

• Benefits arrive at start of month (stark monthly cycles)

• Most pared down version of intervention: Recall expenses by category only
  ① Does intervention increase total expected expenditures?
  ② Does intervention change optimism around spending profile & savings?

• Simple online survey (improved version coming soon!)
US SNAP recipients: Expenses Misprediction

Do people mispredict upcoming expenditures?

“There are months where more expenses come up than I had initially expected.”
- 70% say “often” or “always”
- 0% say “rarely” or “never”

“There are months where less expenses come up than I had initially expected.”
- 0% say “often” or “always”
- 65% say “rarely” or “never”
Impact on Forecasted Expenditures and Savings

(1) Compare prior estimate of monthly expenditures with sum across expense categories

- 85% revise expenses up (mean: 51.2%)

![Bar Chart]

- Amount required to spend in the next month
- Prior
- Sum Categories

```text
USD
0
1000
2000
3000
4000

Prior
Sum Categories
```
Impact on Forecasted Expenditures and Savings

(1) Compare prior estimate of monthly expenditures with sum across expense categories

- 85% revise expenses up (mean: 51.2%)

(2) Compare prior estimate of end of month savings with post-budgeting posterior

- 50% revise savings down (mean: 34%)
Policy Implications

Light-touch intervention with sizable impacts:

- Lower cost and risk than traditional approaches
- Adaptable for multiple settings where people have difficulty smoothing consumption:
  - Applicable to low income households with “lumpy” income, e.g. cash transfer recipients
  - Applicable to rural and urban settings

Partnership opportunities:

- Adapt planning interventions to different contexts (e.g., non-agricultural)
- Evaluate impacts in other contexts
- Support scale up of successful interventions
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Summary and More Open Questions

- Budget neglect generates over-optimism about budget constraint
  - Sizable consumption smoothing failures
  - Implications for investment and output

- But thinking through future budget only 1 of 3 ways to use available information to debias beliefs.

- Beliefs about when future maize will run out draw on:
  1. Forward looking (analytical forecasting)
  2. Use past experience to forecast future (recall based forecasting)
  3. Use others’ outcomes to forecast own future (reference class forecasting)
Impediments to Belief Updating

Beliefs about when future maize will run out draw on:

1. Forward looking (analytical forecasting)
   - This paper: Budget neglect makes this difficult to do well → over-optimism
   - Cognitively challenging, subject to error when many budget items
   - Less than 2% say they have done such detailed budgeting in past
   - Endline: 90% of treatment group willing to pay to receive intervention again

2. Use past experience to forecast future (recall based forecasting)

3. Use others’ outcomes to forecast own future (reference class forecasting)
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Lack of Learning from Experience (Cross-section)

- Over-optimism: forecast vs. realization
- Use age as proxy for experience
- Bottom age quartile
  - Mean age: 28 years
  - 85% are overoptimistic
- Top age quartile
  - Mean age: 62 years
  - 73% are overoptimistic

→ Some signs of updating (over 4 decades) but bias persists
Biased (Rosy) Memory

Year 2 follow-up (control HH only)

- Recall maize amount left last year on date X
  - Date corresponds to their first incentivized forecast last year
  - Relatively salient date
- Vary incentives: 1-4 day’s wages

Agents have overly rosy memory

- 71% recall past being better than it was
- Corresponds to 80% of forecast error
- Little change with higher incentives

→ Dampens ability to learn from your past
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Individuals Think They Are Outliers

- Ask participants to forecast maize in 2 months
  - For themselves
  - For 10 similar HHs in another village

- Plot shows fraction of other HH’s forecasted to have less maize than self
- 78% place themselves ≥ 50th percentile
- 57% place themselves ≥ 90th percentile

→ Know that others will run out of food, but think their HH will do better
Conclusion

- Systematic over-optimism despite experience
- Simple planning exercise to recall and budget future expenses has large effects
  - 15% increase in savings over next 2 months
  - Households enter hungry season with 1 month more of food stocks
  - Improved investment in hungry season improves crop revenue
- Suggestive evidence that individuals’ memory and beliefs make it difficult to learn and update from past cycles
- Suggests alternative interventions and policy to improve consumption smoothing
Thank You

Kelsey Jack, Associate Professor, Bren School of Environmental Science and Management, UC Santa Barbara
Outline

7 Potential Confounds

8 External Validity: SNAP Pilot
Intervention: Interpretation

Budgeting intervention provides a test for the *relevance* of budget neglect

- Unpacking expenditures should have no effect on expected expenditures or consumption plan under alternative models:
  - Features of the environment, e.g., storage constraints, kinship taxes
  - Present bias

- Alternative explanations may contribute to smoothing failures
  - But cannot explain treatment effects
Discussion: Labels

- Why labels?
  - Only pay cognitive cost of planning once, makes plan sticky

- Implementation: choose labels or bag of sugar
  - Enables us to assess demand across treatment vs. control group

- Potential concern: effects of labels rather than correcting budget neglect
  - Introduces potential alternate mechanisms: present bias, reminders (salience)

- Address with 2 features of our design
  1. Control group also has option to take-up labels (access to technology)
  2. Examine impacts during 1-2 months before labels were delivered
Confound: Effect of the Labels

- Does differential take up of labels drive our results?
  - Self control: labels act as commitment
  - Reminders: labels make plan salient
  - Other control: labels solve intra-hh coordination

- Summary: Impacts of planning before labels ever go on:
  1. Beliefs: 20-60% increase in “remembered” expenditure needs (immediate)
  2. Discretionary consumption: 34% reduction in willingness to pay (immediate)
  3. Savings: 15% higher savings stock (1-2 months later)
  4. Endline: <2% of treatment group says labels helpful without budgeting exercise
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- Labels may have contributed to later effects but cannot explain full results
Potential confounds?

- Soft commitment
  - Most natural version through labels (but effects in first 2 months)
  - Told stranger, shame at revisit (but 90% demand in year 2 - no revisit)
  - Telling a stranger changes 2-month behavior (small effects in literature)

- Experimenter demand / normative message
  - No normative messaging; everyone gets survey and follow-up visits
  - Would need to explain why expenditure forecast rises
  - No interaction for 2 months with effects on real behavior

- Simply reminder effect
  - Cannot simply be reminder of something already know/want (beliefs change)
  - If reminder gets people to think through and change belief, fits our mechanism
  - Note: no clear reminder for 2 months with big impacts

- Intra-household bargaining
  - Intentionally did exercise with only HH head (cannot explain beliefs, WTP)
  - Most natural version through labels; why mistaken at baseline?
Outline

7 Potential Confounds

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SNAP Pilot

- Preliminary pilot with low-income households near Oakland, CA
  - Most rely on SNAP / other government benefits

- Benefits arrive at start of month (stark monthly cycles)

- Simple online survey (large scope for improving engagement)
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Do people mispredict upcoming expenditures?
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Expenditures: Initial Forecast

Please think about how much money you will need to spend in total this next month (September).

For example, this includes rent and food (including what you buy using CalFresh/SNAP and other benefits).

What is your best guess of how much you will spend in total in September?

$
Expenditures: Forecast in Categories

For each of the following, please think through the following categories and then tell us your best guess of how much you will need to spend in September on:

Please fill out every row (unless it says *optional*). If it doesn't apply, put zero "0".

$ ___________ Rent

$ ___________ Housing - Electricity

$ ___________ Household and personal items - Clothing

$ ___________ Household and personal items - School supplies

$ ___________ Social (e.g., people coming over to house, obligations, birthdays, get-togethers)

$ ___________ Emergencies: how much should you set aside for emergencies (e.g. car repairs, medical expenses, house repairs)

– Note: Most pared down version of intervention – Think through upcoming expenses by category
– Examine impact on forecasts
Forecast Error in Expected Expenditures

- 85% revise upwards
- Mean = $1099 (51.2%)
- Median = $1162 (54.1%)
80% agree with either:
- "It is hard to think about all the expenses without going through them one at a time"
- "I forgot to include some expenses in my initial guess"
Impact on Savings Forecast

- “How much cash will you have remaining on September 28?”

- Mean: Decrease of $175 (34%)

- (Note: conservative – censored below by $0)