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The Persistent Power of Behavioral Change: Long-Run Impacts of Temporary Savings Subsidies for the Poor[†]

By Simone Schaner*

I use a field experiment in rural Kenya to study how temporary incentives to save impact long-run economic outcomes. Study participants randomly selected to receive large temporary interest rates on an individual bank account had significantly more income and assets 2.5–3.5 years after the interest rates expired. These changes are much larger than the short-run impacts on experimental bank account use and almost entirely driven by growth in entrepreneurship. In contrast, interest rates on joint accounts and modest cash payments did not significantly impact long-run economic outcomes. (*JEL* C93, D13, D14, D90, G21, I32, O12)

Despite recent progress, approximately 700 million people still live in extreme poverty (Cruz et al. 2015). As such, understanding how to help poor families grow their incomes remains a top policy priority. At least some individuals in the developing world seem to have the potential to do this on their own: recent studies have found very large, on the order of 5–30 percent per month, marginal returns to capital among microenterprises in contexts as varied as Sri Lanka, Ghana, India, Mexico, and Uganda.[1] Other researchers have documented individuals regularly revolving debt at interest rates as high as 10 percent per day (Aleem 1990; Ananth, Karlan, and Mullainathan 2007; Banerjee and Duflo 2007), while Schofield (2014) finds a 75–225 percent (financial) return to caloric

*Center for Economic and Social Research, University of Southern California, Dartmouth College, 635 Downey Way, Los Angeles, CA 90089, JPAL, NBER, and BREAD (email: schaner@usc.edu). I thank Erica Field, Dean Karlan, Erzo F.P. Luttmer, Rohini Pande, Joshua Schwartzstein, Jonathan Zinman, and seminar participants at USC, UC Berkeley, Boston University, Brown University, IFPRI, Notre Dame, Tufts University, UC San Diego, and the University of Missouri for numerous useful comments. This project would not have been possible without the tireless assistance, hard work, and commitment of many employees of Family Bank. I am particularly indebted to Victor Keriri Mwangi, Steve Mararo, and Michael Aswani Were. I also thank James Vancel, Noreen Makana, and Thomas Ginn for superb field management and the IPA field officers for their excellent assistance with the data collection. I gratefully acknowledge the financial support of the Russell Sage Foundation, the George and Obie Shultz Fund, MIT's Jameel Poverty Action Lab, the National Science Foundation's Graduate Research Fellowship, and the Yale Savings and Payments Research Fund at Innovations for Poverty Action, sponsored by a grant from the Bill & Melinda Gates Foundation. Research activities were approved by Institutional Review Boards at MIT, the Kenya Medical Research Institute, Innovations for Poverty Action Kenya, and Dartmouth College. This RCT was registered in the American Economic Association Registry for randomized control trials under trial number AEARCTR-0001358. All errors are my own.

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[1]For Sri Lanka, see de Mel, McKenzie, and Woodruff (2008, 2012). For Ghana see Udry and Anagol (2006) and Fafchamps et al. (2014). For India see Banerjee and Duflo (2014) and Field et al. (2013). For Mexico see McKenzie and Woodruff (2008). For Uganda see Blattman, Fiala, and Martinez (2014).

consumption in India. When returns are this high, modest changes in investment behavior can lead to substantial gains in longer-run economic wellbeing; yet existing research provides little guidance as to how (or whether) such behavior change can be activated.

In this paper, I ask whether temporary, but high-powered, incentives to save can have persistent impacts on economic outcomes. I also ask whether directly incentivizing saving has a greater impact than delivering a comparable transfer via an unconditional cash payment. I analyze the results of a field experiment in rural Kenya, in which married couples were given the opportunity to open up to three new formal bank accounts: one in the name of each spouse and one held jointly by both spouses. Before participants decided which accounts to open, each account was randomly assigned a temporary interest rate, which lasted for six months and ranged from 0 to 20 percent in annual terms. Thus, the experiment created variation in overall incentives to save *and* variation in the way that couples were incentivized to save (i.e., jointly versus individually). A subset of respondents were also randomly selected to receive modest cash payments ranging from $0.13–$3.75.

In the short run, the interest rates had their intended effect: study participants were much more likely to open and use accounts with higher interest rates when the interest rates were active.[2] But, the effect sizes are modest: moving from no interest to 20 percent interest increased the six-month closing balance of individual and joint accounts by $1.31 and $2.08, respectively.

In the longer run (2.5–3.5 years after the interest rates expired), I find that the interest rates changed savings behavior in more notable ways. When an individually owned bank account received a high interest rate, assets were reallocated toward the owner of that account and as a result both individual and overall household income increased. These gains are driven by growth in entrepreneurship. Study participants who received the highest interest rate on their individual account were 28 percent more likely to be entrepreneurs and had substantially more business profit and capital at endline. Importantly, the long-run impacts of the individual interest rate are much larger than the short-run impacts on experimental bank account use. Moving from the lowest to the highest individual rate increased the short-run balance in individual accounts by less than $2, yet in the long run the interest rate increased *monthly* individual business profit by $7 and business capital by $33. While these long-run effects are large, they are quite consistent with treatment effects on short-term account use and the implied return to capital, which is within the range of returns found by other researchers.[3]

Why didn't study participants simply revert back to their old savings and investment behaviors after the interest rates expired? Perhaps the most straightforward explanation is that the interest rates helped study participants accumulate more capital in the short run, which helped them grow output in the long run. To test this

[2] I analyze the short-term response to the interest rates in detail in Schaner (2015) Although all couples respond to interest rates, I find that couples who are well matched on time preferences are more likely to save in a way consistent with efficient investment.

[3] I also find some marginally significant evidence that the joint interest rate increased investment in livestock and the home, but these results are not robust to adjustments for multiple hypothesis testing, so I do not emphasize them in the analysis.

hypothesis, I contrast the impact of the interest rates to that of the randomly assigned cash payment, which did not explicitly incentivize saving. The cash payment had an average value of $3.09, could be deposited in respondents' newly opened bank accounts, and was delivered within three months of account opening. Although the cash payment increased short-run bank account balances more than the interest rates, it had no meaningful impact on long-run economic outcomes. It is therefore highly unlikely that the interest rate effects are driven by changes in the short-run capital stock alone. I also find no evidence that the interest rates helped study participants by easing external savings constraints or increasing access to bank credit.

Rather, the difference between the interest rate and cash payment results suggests that explicitly incentivizing study participants to exert effort to save was important. For example, making a conscious, concerted attempt to save could have helped individuals establish new savings and investment practices that persisted after the interest rates expired. A notable prediction of models of habit formation is that behavior change induced by temporary incentives can continue after those incentives are removed (Becker and Murphy 1988). Consistent with this, long-run treatment effects are concentrated among individuals who exhibited the largest responses to the interest rates in the short run. Moreover, I find that respondents treated with higher individual interest rates were 26 percent more likely to save regularly 3.5 years after the interest rates expired. I also find evidence that the interest rates induced individuals to adopt new financial heuristics to support long-run behavior change. Those treated with higher individual interest rates were 34 percent more likely to explicitly budget for business expenses, and this increase is entirely driven by growth in downwardly rigid business budgets: that is, budgets in which the respondent stated s/he would not reduce the allocated amount to meet an unexpected expense. Taken together, these results support the hypothesis that behavioral mechanisms like habit formation and mental accounting were important for sustaining the impact of the individual interest rate in the long run.

This paper shows that temporary financial incentives can generate persistent changes in savings and investment behavior, and that these changes can translate into meaningful impacts on income. To date, most research on temporary incentives for behavior change has focused on education or health-related behaviors like gym attendance or substance abuse in developed-country contexts. Here, studies that track outcomes after incentives expire tend to do so for a limited period (e.g., one year or less after the intervention ends) and usually find that treatment effects decay over time.[4] This paper provides novel evidence that temporary incentives can have amplified effects in the long run, at least in the financial domain.

[4] In terms of financial behavior, de Mel, McIntosh, and Woodruff (2013) find evidence that deposit collection services helped Sri Lankan study participants form a savings habit, but they do not study impacts on outcomes beyond saving. Studies of incentives to exercise or lose weight generally find that initial short-run effects dwindle over time, especially when habits are interrupted by holiday breaks (Charness and Gneezy 2009; John et al. 2011; Acland and Levy 2015; Royer, Stehr, and Sydnor 2015). Financial incentives to reduce consumption of alcohol, drugs, and tobacco have been shown to have effects on consumption after incentives expire, though treatment effects decay over time (Higgins, Alessi, and Dantona 2002; Prendergast et al. 2006; Volpp et al. 2009; Giné, Karlan, and Zinman 2010). In contrast, Schilbach (2017) finds that incentives to stay sober do not impact the drinking behavior of Indian rickshaw peddlers after incentives expire. In education, Jackson (2010) finds that paying students for passing advanced placement tests improved standardized test scores and increased college matriculation.

One reason for this difference could be the fact that some individuals in my sample had very high returns to saving, which could provide dynamic feedback to help reinforce new behaviors.

The high returns to capital I find echo returns estimated by researchers studying the impact of cash or in-kind grants on small and medium enterprises in a variety of developing countries. Indeed, recent research has found that large cash and in-kind grants (sometimes coupled with additional support) can raise income and consumption levels long after grants are disbursed.[5] This paper demonstrates that resource-intensive "big push" interventions are not always necessary to help people realize high returns to capital; rather, some people simply need the right incentive to jump-start behavior change.

Finally, my results contribute to a growing body of research on saving in the developing world. Researchers have evaluated the impacts of a range of savings products, including basic formal bank accounts (Dupas and Robinson 2013a; Prina 2015; Dupas et al. 2017), commitment savings accounts (Ashraf, Karlan, and Yin, 2006b; Brune et al. 2016; Dupas and Robinson 2013b), savings accounts with reminders (Karlan et al. 2016), savings groups that leverage peer pressure and support (Kast, Meier, and Pomeranz 2016; Dupas and Robinson 2013b; Breza and Chandrasekhar 2015), and deposit collection services (Ashraf, Karlan, and Yin 2006a; Callen et al. 2016), among others. Although this literature has identified a number of services that help individuals increase savings balances, there is little evidence as to whether, or under what conditions, behavioral changes persist after services are discontinued. This paper helps fill this gap.

The remainder of the paper proceeds as follows: Section I begins by describing the experimental context and design, then Section II presents the main results. Section III provides additional discussion with a focus on mechanisms, and Section IV concludes.

I. Experimental Design and Data

A. *Experimental Context*

The experiment was conducted between July and September 2009 in partnership with Family Bank of Kenya—online Appendix Figure A1 illustrates a timeline of major experimental activities. Study participants were recruited from 19 communities in 2 districts near the bank's Busia branch in Western Province. Even though six formal banks were operating in Busia at the time, most of these banks did not offer low-cost accounts suitable for a low-income clientele. Importantly, Family Bank had just begun to market a new, low-fee account at the onset of the experiment.

[5] For evidence on cash and in-kind grants to entrepreneurs, see de Mel, McKenzie, and Woodruff (2008); de Mel, McKenzie, and Woodruff (2012); and Fafchamps et al. (2014). For evidence on small business grants plus training or technical assistance for small business see Macours, Premand, and Vakis (2012) and Blattman, Fiala, and Martinez (2014). For evidence on ultra-poor graduation programs, which combine grants of productive assets (usually livestock) with intensive technical assistance, see Banerjee, Duflo, Goldberg, et al. (2015); Bandiera et al. (2017); and Blattman et al. (2016). See Gertler, Martinez, and Rubio-Codina (2012) for the long-term impact of Opportunidades, Mexico's well-known conditional cash transfer program.

In contrast to traditional Kenyan bank accounts, which required relatively large minimum balances (around Ksh 1,000, or US$12.50 at a 2009 exchange rate of Ksh 80 per dollar) and charged monthly account maintenance fees, the new Family Bank account had a minimum operating balance of Ksh 100 ($1.25), no maintenance fees, and no deposit fees. The only fees charged were for withdrawals, which cost Ksh 62 over-the-counter and Ksh 30 at the ATM. Like most bank accounts on the market, the new Family Bank account did not bear any interest.

Just one other bank apart from Family Bank offered a similar low-cost account when the experiment began. The bank accounts in this study were therefore a relatively new technology and many study participants were unfamiliar with them. When interpreting the results it is important to keep in mind that Kenya's financial services landscape has evolved dramatically since 2009. By the time of the 2012 endline survey nearly all banks offered low-cost accounts. Banking services have also been integrated into mobile money products and banks have expanded their reach into rural areas via agency banking. Thus, while the experimental accounts dominated most other accounts on the market in 2009, this was no longer the case at the time of the endline survey.

B. *Experimental Design*

The experiment targeted married couples who did not have any accounts with Family Bank but expressed interest in opening one. Trained enumerators recruited couples in 19 communities surrounding the bank branch. Couples who expressed initial interest were issued invitations to attend a group meeting at a local primary school. All baseline interviews, account opening paperwork, and randomization activities were conducted at these meetings. Upon arrival, couples were informed that they could open up to three accounts with Family Bank at the meeting: a joint account, an individual account for the husband, and an individual account for the wife. All accounts opened at the meetings were funded with the Ksh 100 minimum balance to eliminate barriers to account use.

Before deciding which accounts to open, participants were given the opportunity to draw a temporary six-month interest rate for each account. This process was designed so that interest rates on the three accounts were independent of one another. All randomization was conducted in the field, with respondents drawing folded envelopes from plastic bins.[6] Individual accounts were assigned an annual interest rate of either 0, 4, 12, or 20 percent with equal probability, while joint accounts were assigned an annual interest rate of either 4, 12, or 20 percent with equal probability. The interest rates in the experiment were purposely chosen to exceed market rates by a large margin, with the hope that such substantial subsidies would stimulate a short-run savings response. At the time, most formal financial institutions offered

[6] Respondents took separate draws for each potential account. The field staff were carefully trained not to allow respondents more than one draw for each treatment. I find no evidence of protocol problems when comparing the empirical distribution of treatments to the theoretical distribution of treatments.

no interest on small-scale savings balances, at best participants could have earned 0.5–2 percent annually elsewhere.[7]

Since many study participants had little to no experience with banks, project staff carefully explained what an interest rate was, provided numerical examples for each interest rate, and explained that the promotion would only last for six months. While very few couples chose to open all three bank accounts, all couples opened at least one account. As a result, 99 percent of study participants had access to either a newly opened joint account or a newly opened individual account in their own name (online Appendix Table A1 shows the distribution of account opening choices). Thus, the experimental design allows me to study the impact of interest rates on different account types holding access to a new bank account constant. Participants were also given a pocket-sized card for each account that they opened, which featured a reminder to save and, when applicable, the interest rate.

Before leaving the meeting all individuals participated in a final drawing for a "cash prize."[8] This prize was the incentive for baseline questions on rates of time preference, which consisted of choices between a smaller monetary amount at time t and a larger amount at time $t + \tau$ (see the online data Appendix for additional detail). All individuals had a 20 percent chance of being selected for a cash prize; selected individuals then drew one of their time preference questions at random for payout. Payouts ranged from Ksh 10 to Ksh 300, with an average payout of Ksh 247.[9] All payouts could be either picked up in person at the project field office or deposited automatically into the individual's newly opened bank account. In practice, 77 percent of individuals elected to have their payouts deposited into a bank account, even though accessing these funds would require payment of the Ksh 62 withdrawal fee. This suggests that most individuals saw some value to the bank accounts and intended to use them for saving.

C. *Data and Randomization Verification*

My analysis uses data from four sources. The first is a baseline survey conducted during the experimental sessions. The baseline collected basic demographic information, information on rates of time preference, and data on income and use of several popular savings devices. Second, I use three years of administrative data from the bank to get an accurate measure of short- and long-run use of the experimental accounts. The administrative data include the date and amount of all transactions posted to experimental accounts. Finally, I use data from two waves of endline surveys. The first wave was conducted between August and November of 2012, three years after the initial experiment. The wave 1 endline collected detailed information about respondents' financial lives: in addition to basic demographic

[7] For comparison annualized inflation over the six-month subsidy period averaged 3.4 percent. Hence, heavily subsidized experimental accounts offered a very attractive return in real terms.

[8] Individuals were also selected for an information sharing treatment and free ATM card treatments at this stage. I do not discuss these interventions in the main paper as they have no impact on the results in this paper. Robustness Appendix R provides additional detail on these interventions and shows that explicitly controlling for them has no impact on my results.

[9] These amounts were designed to be substantial enough to ensure that individuals made choices carefully. For comparison, the median weekly income at baseline was Ksh 500.

information it asked about income, savings, and debt by source as well as financial transfers and household decision-making. The wave 2 endline was conducted between July and August of 2013 and was much shorter. This wave was informed by results from wave 1 and was explicitly designed to collect additional detail on study participants' budgets and savings attitudes. The online Data Appendix gives more detail on the data sources and how key variables used in the analysis were constructed.

A total of 1,558 individuals (779 couples) opened 1,152 bank accounts during the initial experiment. The survey team was able to reinterview 1,417 (91 percent) of these individuals during the wave 1 endline and 1,331 (85 percent) of these individuals during the wave 2 endline. Table 1 presents baseline demographic characteristics and verifies that these characteristics are not systematically correlated with the interest rates. The first column of the table shows means and standard deviations of the variables of interest. The next three columns present the coefficients and standard errors from regressions of individual characteristics on the treatment of interest. For ease of interpretation I divide the interest rate variables by 20 before running regressions. Thus, a change from 0 to 1 can be interpreted as the effect of moving from no interest rate to a 20 percent interest rate. This convention is maintained for the rest of the paper. The final row of the table presents *p*-values from chi-squared tests that the coefficient on the treatment is jointly equal to zero across all outcomes.

The first two rows of Table 1 verify that follow-up is uncorrelated with treatment status.[10] Overall, participants have relatively low levels of human capital, income, and financial access. While three quarters of individuals are literate, average educational attainment is low, at 6.87 years. The most common occupations are subsistence farming and small-scale entrepreneurship, each accounting for 41–42 percent of respondents. Individuals reported an average income of Ksh 4,602 ($58) per month, but the median income is much lower, at Ksh 2,167 ($27).[11]

Just 22 percent of respondents reported owning a bank account at baseline. However, nearly all individuals reported saving in some way, with the most popular methods being storing cash at home (87 percent of respondents) and saving with a rotating savings and credit association, or ROSCA (58 percent of respondents). Individuals report saving roughly Ksh 1,600 in the bank and in savings and credit cooperatives (SACCOs), and keep an average of Ksh 845 at home. Although my study sample was drawn from just two districts in Western Kenya, online Appendix Table A3 uses the 2009 Kenyan Census and FinAccess Survey to show that my sample is quite similar to the broader population of adult married Kenyans in terms of age, education, fertility, engagement in entrepreneurship, and savings device ownership.

Columns 2–4 of Table 1 show that the randomization functioned well, with none of the joint tests rejecting the null of no relationship. Since none of the joint tests reject and the randomization was not stratified, I do not control for any baseline

[10] Moreover, there is no evidence of selective attrition—see online Appendix Table A2.

[11] Income, savings, and debt measures in my sample are all highly skewed—I therefore topcode all variables denominated in Kenyan Shillings, in baseline, endline, and administrative bank account data at the ninety-ninth percentile.

Table 1—Demographic Characteristics and Randomization Verification

	Variable mean	Interest rates		Cash prize	N
		Individual	Joint		
	(1)	(2)	(3)	(4)	(5)
No endline survey: Wave 1	0.091	−0.021	−0.008	0.015	1,558
	[0.287]	(0.019)	(0.024)	(0.019)	
No endline survey: Wave 2	0.146	−0.033	−0.010	0.021	1,558
	[0.353]	(0.024)	(0.030)	(0.023)	
Female	0.500	0.036	—	0.006	1,558
	[0.500]	(0.034)	—	(0.033)	
Age	40.3	−0.709	2.63	0.712	1,558
	[13.5]	(0.891)	(1.34)	(0.883)	
Years education	6.87	0.444	0.097	−0.128	1,551
	[3.98]	(0.265)	(0.363)	(0.252)	
Literate	0.753	0.027	−0.027	−0.009	1,558
	[0.431]	(0.029)	(0.035)	(0.029)	
Number children	5.18	0.071	0.758	−0.035	1,555
	[3.44]	(0.219)	(0.328)	(0.210)	
Polygamous	0.234	−0.024	0.091	0.035	1,546
	[0.424]	(0.027)	(0.048)	(0.029)	
Subsistence farmer	0.411	0.016	0.005	−0.049	1,551
	[0.492]	(0.033)	(0.044)	(0.032)	
Entrepreneur	0.420	−0.016	−0.006	0.026	1,551
	[0.494]	(0.033)	(0.042)	(0.032)	
Monthly income	4,602	−183	−368	−856	1,513
	[7,446]	(524)	(633)	(439)	
Has bank account	0.220	0.030	0.024	0.008	1,558
	[0.414]	(0.028)	(0.035)	(0.027)	
Has SACCO account	0.039	0.021	0.009	−0.004	1,554
	[0.193]	(0.013)	(0.015)	(0.012)	
ROSCA participant	0.581	0.011	0.095	0.020	1,558
	[0.494]	(0.033)	(0.040)	(0.032)	
Saves at home	0.872	0.017	−0.035	0.034	1,556
	[0.334]	(0.022)	(0.026)	(0.020)	
Bank savings	1,587	591	−380	312	1,499
	[5,646]	(402)	(468)	(429)	
SACCO savings	1486	545	247	−660	1,551
	[10,326]	(713)	(858)	(552)	
Home savings	855	68.2	−223	−40.9	1,522
	[1,777]	(121)	(145)	(118)	
I mostly save	0.428	−0.022	-0.037	0.018	1,550
	[0.495]	(0.033)	(0.038)	(0.032)	
My spouse mostly saves	0.350	0.002	0.013	−0.020	1,550
	[0.477]	(0.032)	(0.036)	(0.031)	
Impatient now—patient later	0.217	0.013	−0.030	−0.034	1,537
	[0.412]	(0.027)	(0.032)	(0.026)	
Patient now—impatient later	0.293	−0.029	−0.016	0.011	1,537
	[0.455]	(0.030)	(0.037)	(0.030)	
Weekly discount factor	0.757	−0.017	−0.027	−0.026	1,558
	[0.243]	(0.016)	(0.019)	(0.017)	
Distance to bank (miles)	3.82	−0.179	0.109	−0.020	1,558
	[2.16]	(0.143)	(0.243)	(0.132)	
p-value—Joint test		0.452	0.245	0.258	

Notes: Standard deviations are in brackets; robust standard errors clustered at the couple level are in parentheses. Each row represents a separate regression. All income and savings variables top-coded at the ninety-ninth percentile. In 2009, Ksh 80 ≈ US$1. The joint test is an F-test of the null hypotheses that the coefficients on the treatment variable across all equations/outcomes are jointly equal to zero. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1.

characteristics in the main analysis. All the results are, however, essentially unchanged when controlling for all variables in Table 1.

II. Main Results

A. *Empirical Strategy*

I begin the analysis by studying the impact of the interest rates and the cash prize on bank account use in both the short and long run. Following this, I turn to long-run impacts on broader economic outcomes, including income, assets, entrepreneurship, and decision making. Since each couple received multiple interest rate offers, crowd-out and within-household reallocation could be important. The bulk of my analysis therefore uses an individual-level regression that lets me estimate both individual-level and couple-level impacts within a single specification. The underlying regression equation is as follows:

$$(1)\quad y_{ic} = \beta_0 + \beta_1 intI_{ic} + \beta_2 intI_{-ic} + \beta_3 intJ_c + \beta_4 cash_{ic} + \beta_5 cash_{-ic} + \varepsilon_{ic},$$

where y_{ic} is the outcome of interest for individual i in couple c, $intI_{ic}$ is the interest rate on spouse i's individual account, $intI_{-ic}$ is the interest rate on the other individual account (owned by spouse $-i$), $intJ_c$ is the interest rate on the couple's joint account, $cash_{ic}$ is a dummy variable equal to 1 if individual i was selected to receive a cash prize, and $cash_{-ic}$ indicates that i's spouse was selected to receive a cash prize. All standard errors are clustered at the couple level and all variables denominated in Kenyan Shillings are top-coded at the ninety-ninth percentile.

This specification lets me study direct individual-level effects of the individual interest rate (β_1), spillover effects of the individual interest rate onto the spouse (β_2), and the direct effect of the joint interest rate (β_3). The household-level impact of targeting individual interest to one spouse is therefore given by the direct effect plus the spillover effect ($\beta_1 + \beta_2$). Similarly, the household-level impact of giving the cash prize to one spouse is $\beta_4 + \beta_5$. The household-level effect of the joint rate is given by $2\beta_3$, since both spouses are treated with the same joint interest rate.[12]

An alternative way of calculating the household-level effect of the individual interest rates is to aggregate outcomes to the couple level and run the following specification:

$$(2)\qquad y_c = \gamma_0 + \gamma_1\left(intI_c^1 + intI_c^2\right) + \gamma_2 intJ_c + \gamma_3\left(cash_c^1 + cash_c^2\right) + \upsilon_c,$$

where $intI_c^1$, $intI_c^2$, $cash_c^1$, and $cash_c^2$ are the individual interest rates and cash prize dummies for spouses 1 and 2. When the outcome of interest is always observed for both spouses, the equalities $\hat{\gamma}_1 = \hat{\beta}_1 + \hat{\beta}_2$, $\hat{\gamma}_2 = 2\hat{\beta}_3$ and $\hat{\gamma}_3 = \hat{\beta}_4 + \hat{\beta}_5$ will hold exactly. When outcomes are not always observed for both spouses (and

[12] When testing for equality of the individual and joint interest rate, I test the null hypothesis that $2(\beta_1 + \beta_2) = 2\beta_3$, that the effect of giving both spouses a higher individual interest rate is equal to the effect of giving both spouses a higher joint rate.

attrition is uncorrelated with treatment), the equalities will only hold in expectation. Online Appendix R (Tables R4–R6) verifies that my household-level estimates are essentially unchanged (both in terms of sign and significance) when using this couple-level specification.

Since my analysis asks how several treatments impact a range of economic outcomes, I also compute sharpened q-values that control the false discovery rate (FDR).[13] I follow Anderson (2008) and use the two-step procedure described by Benjamini, Krieger, and Yekutieli (2006) to calculate q-values. The FDR procedure includes p-values from regression coefficients in all the main tables in this paper (except the randomization verification in Table 1), as well as coefficients in online Appendix Tables A6–A8, which show income, assets, and debt by source. I group the results into families by treatment, pooling across all outcomes. The main tables display sharpened q-values in brackets below traditional standard errors.

B. *Impacts on Bank Account Use*

Figure 1 illustrates the impact of the individual and joint interest rates on experimental account use over time. Panel A graphs the share of individual or joint accounts that received at least one transaction within a given quarter following account opening. Panel B graphs average account balances (top-coded at the ninety-ninth percentile) by quarter. Note that since the interest rate randomization was unconditional on account opening, unopened accounts are always kept in the sample and coded like unused accounts. This convention is held throughout the paper. Lighter lines correspond to higher temporary interest rates.[14] There are three noteworthy patterns apparent in the graphs. First, usage rates fall off rapidly after the first quarter, which suggests that many individuals who experimented with the accounts failed to establish a regular savings practice. Second, both individual and joint accounts with higher interest rates were more likely to be used in the short run. Third, the individual interest rate had a persistent effect on rates of account use, with account balances growing over time. In contrast, the impact of the joint interest rate appears to dissipate after the first six months.

Table 2 takes a more detailed look at short-run treatment effects on experimental accounts using regression specification 1. The first three columns of Table 2 focus on individual account use. Column 1 shows that moving from no individual interest to 20 percent interest increased the probability someone opened an individual account by 17 percentage points (55 percent), increased the likelihood that the account would receive at least one deposit in the first 6 months by 9 percentage points (150 percent), and increased the 6-month account balance by Ksh 105 ($1.31). Much more money passes in (and out of) the accounts, however online Appendix Table A4 shows that the individual interest rate increased deposits into the account

[13] The false discovery rate refers to the share of rejected null hypotheses that are type I errors; the q-value is the lowest FDR at which a hypothesis would be rejected.

[14] In order to give a picture of account use absent the cash prize, I drop accounts randomly selected to be eligible for a cash prize when performing calculations for the first quarter. Results are very similar, but first quarter usage rates are higher, when including these accounts.

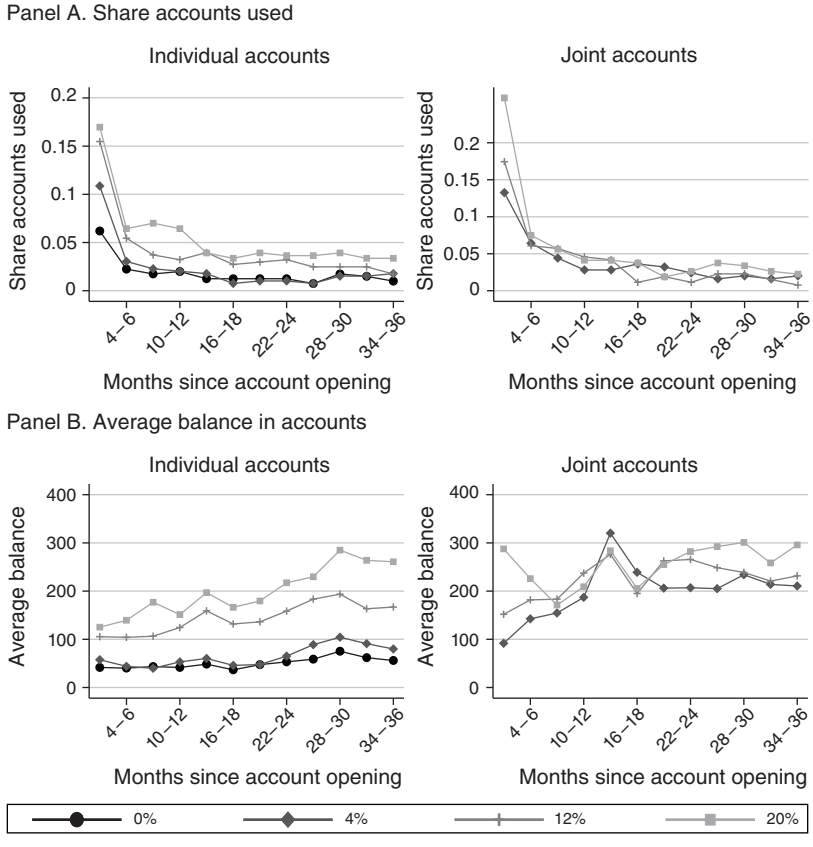


FIGURE 1. USE OF EXPERIMENTAL ACCOUNTS OVER TIME

Notes: The figure plots the share of "potential" individual and joint accounts that received either a deposit or withdrawal by quarter in panel A. Panel B graphs the average balance, top-coded at the ninety-ninth percentile by quarter. "Potential" signals that unopened accounts are coded the same as open, but unused accounts. The first three-month period drops all cash-prize eligible accounts to reflect transaction rates independent of the cash prize.

by Ksh 625, while the value of withdrawals (excluding fees) increased by Ksh 475.[15] Since just 16 percent of individual accounts in the 20 percent interest group received any deposits in the first 6 months, treatment effects for compliers are much larger.

I also find some evidence that other interest rates crowded out use of individual accounts: higher spousal and joint interest rates are consistently associated with lower rates of individual account use, though none of these point estimates have a sharpened q-value below 0.10. Finally, note that the cash prize had large impacts on rates of individual account use, with no crowd-out from the spousal cash prize.

Columns 4–6 present analogous treatment effects for joint accounts. Since couples share the joint account, I assign half of all joint resources to the wife and half to the husband. This convention is maintained for the rest of the paper. Since both spouses

[15] The treatment effect on deposits less the treatment effect on withdrawals does not add up to the treatment effect on ending balances due to fees and top-coding.

TABLE 2—USE OF EXPERIMENTAL BANK ACCOUNTS IN FIRST SIX MONTHS

	Individual accounts			Joint accounts			All accounts	
	Opened account	Used account	Ending balance	Opened account	Used account	Ending balance	Used individual or joint	Ending balance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β_1: Individual interest	0.17	0.090	104.5	−0.085	−0.024	−20.5	0.052	84.0
	(0.033)	(0.019)	(33.8)	(0.031)	(0.028)	(25.3)	(0.028)	(42.2)
	[0.0010]	[0.0010]	[0.017]	[0.021]	[0.28]	[0.30]	[0.078]	[0.063]
β_2: Spousal interest	0.055	0.016	−57.4	−0.085	−0.024	−20.5	−0.010	−77.9
	(0.033)	(0.018)	(30.3)	(0.031)	(0.028)	(25.3)	(0.028)	(39.3)
	[0.49]	[0.87]	[0.41]	[0.17]	[0.87]	[0.95]	[1]	[0.41]
β_3: Joint interest	−0.15	−0.013	6.75	0.19	0.13	83.3	0.096	90.1
	(0.050)	(0.026)	(34.8)	(0.051)	(0.048)	(45.5)	(0.044)	(57.4)
	[0.14]	[1]	[1]	[0.020]	[0.17]	[0.56]	[0.53]	[0.61]
β_4: Cash prize—self	0.029	0.27	98.7	-0.048	0.27	35.2	0.52	133.9
	(0.033)	(0.030)	(35.8)	(0.032)	(0.034)	(23.1)	(0.028)	(41.9)
	[0.86]	[0.0010]	[0.090]	[0.50]	[0.0010]	[0.50]	[0.0010]	[0.027]
β_5: Cash prize—spouse	0.016	0.049	48.5	−0.048	0.27	35.2	0.32	83.7
	(0.033)	(0.023)	(34.6)	(0.032)	(0.034)	(23.1)	(0.032)	(40.9)
	[1]	[0.38]	[0.64]	[0.60]	[0.0010]	[0.60]	[0.0010]	[0.38]
p-values from F-tests								
$\beta_1 + \beta_2 = 0$	0.000	0.000	0.136	0.006	0.386	0.417	0.423	0.918
$\beta_1 + \beta_2 = 2\beta_3$	0.000	0.002	0.455	0.000	0.013	0.056	0.423	0.312
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.038	0.000	0.131	0.423	0.000	0.088	0.000	0.019
DV mean (0% individual)	0.31	0.060	40.7	0.74	0.29	128.2	0.35	168.9
DV mean (4% joint)	0.47	0.11	71.0	0.60	0.21	88.7	0.33	159.7
Observations	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558

Notes: Robust standard errors clustered at the couple level are in parentheses; Benjamini, Krieger, and Yekutieli (2006) sharpened q-values are in brackets. All variables denominated in Kenyan shillings are top-coded at the ninety-ninth percentile. In 2009, Ksh 80 ≈ US$1. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

have the same value of y_{ic} in these regressions, estimates of β_1 (individual interest) will mechanically equal β_2 (spousal interest); the same is true for the coefficients on the own and spousal cash prize. The joint interest rate significantly increased the probability that joint accounts were opened and used, and increased the couple's joint savings by Ksh 167 ($2\beta_3$), though effects on actual balances are only marginally significant with conventional standard errors. Also note that joint accounts were less likely to be opened when couples drew higher individual interest rates.

Although the crowd-out estimates in columns 1–6 are not robustly significant, they are important in practice. Columns 7 and 8 make this clear by calculating treatment effects on couples' overall use of experimental accounts. Since regressions are at the individual level, each study participant is assigned all of his/her individual resources plus half of all joint resources.[16] The household-level effect of the individual interest rate on resources in experimental accounts ($\beta_1 + \beta_2$) is small and not significantly different from zero. Although the household-level effect of the

[16] An individual is coded to have "used" an experimental account if his/her own individual account or the joint account was used.

TABLE 3—LONG-RUN USE OF BANK ACCOUNTS

	Experimental accounts in year three (administrative data)						All banks in year three (endline data)	
	Individual accounts		Joint accounts		Individual and joint		All accounts	
	Used account	Ending balance	Used account	Ending balance	Used individual or joint	Ending balance	Has account	Account balance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β_1: Individual interest	0.042	106.7	0.0020	−18.3	0.041	88.4	0.089	796.2
	(0.013)	(28.3)	(0.015)	(16.3)	(0.019)	(32.4)	(0.032)	(438.6)
	[0.014]	[0.0050]	[0.53]	[0.20]	[0.049]	[0.021]	[0.021]	[0.078]
β_2: Spousal interest	0.0020	−36.1	0.0020	−18.3	0.0078	−54.3	0.019	−480.0
	(0.012)	(25.2)	(0.015)	(16.3)	(0.019)	(29.7)	(0.032)	(450.9)
	[1]	[0.60]	[1]	[0.79]	[1]	[0.46]	[1]	[0.80]
β_3: Joint interest	−0.033	−59.9	0.051	42.9	0.015	−17.0	0.072	−497.8
	(0.015)	(30.9)	(0.025)	(24.8)	(0.028)	(39.6)	(0.039)	(524.0)
	[0.53]	[0.56]	[0.56]	[0.56]	[1]	[1]	[0.56]	[1]
β_4: Cash prize—self	0.025	37.6	−0.011	17.5	0.016	55.1	0.037	1252.4
	(0.014)	(22.7)	(0.013)	(15.2)	(0.019)	(26.6)	(0.031)	(584.1)
	[0.30]	[0.41]	[0.86]	[0.79]	[0.86]	[0.22]	[0.79]	[0.21]
β_5: Cash prize—spouse	0.0081	35.5	−0.011	17.5	−0.0014	53.0	−0.0098	313.0
	(0.012)	(28.2)	(0.013)	(15.2)	(0.018)	(31.4)	(0.031)	(425.4)
	[0.96]	[0.69]	[0.95]	[0.73]	[1]	[0.50]	[1]	[0.96]
p-values from F-tests								
$\beta_1 + \beta_2 = 0$	0.009	0.017	0.890	0.262	0.141	0.430	0.033	0.591
$\beta_1 + \beta_2 = 2\beta_3$	0.002	0.003	0.217	0.067	0.444	0.403	0.560	0.322
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.679	0.957	0.518	0.071	0.471	0.211	0.259	0.179
DV mean (0% individual)	0.020	96.5	0.057	116.7	0.077	213.3	0.66	1,529.8
DV mean (4% joint)	0.046	168.2	0.032	81.5	0.078	249.7	0.67	2,017.0
Observations	1,558	1,558	1,558	1,558	1,558	1,558	1,413	1,237

Notes: Robust standard errors clustered at the couple level are in parentheses; Benjamini, Krieger, and Yekutieli (2006) sharpened q-values are in brackets. All variables denominated in Kenyan shillings are top-coded at the ninety-ninth percentile and deflated to 2009 values. In 2009, Ksh 80 ≈ US$1. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

joint interest rate on balances is larger in magnitude, it is not significant. Thus, the first-order effect of the interest rates was to change where couples saved and, by extension, who within the couple did the saving. That said, I do find evidence that couples who received higher absolute interest rates saved more: online Appendix Table A5 shows that the maximum interest rate available to the couple significantly increased all measures of overall experimental account use.

I also find strong evidence that the cash prize increased overall use of experimental accounts. Columns 7 and 8 of Table 2 show that the cash prize increased the ending balance in experimental accounts by Ksh 218 ($\beta_4 + \beta_5$; very close to the average cash payout of Ksh 247).

The first six columns of Table 3 repeat the administrative data analysis for long-run (year three) measures of experimental account use. Both the individual and joint interest rates increased long-run measures of account use (columns 1–4), but only the individual results are robust to the FDR adjustment and some of this reflects a reallocation across accounts. Note that the vast majority of study participants

TABLE 4—LONG-RUN IMPACTS ON OVERALL ECONOMIC OUTCOMES

	Level values					Hypersine			
	Total assets	Assets net debt	Monthly income wave 1	Monthly income wave 2	Monthly income pooled	Total assets	Monthly income wave 1	Monthly income wave 2	Monthly income pooled
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
β_1: Individual interest	5,994.2	7,672.7	1,137.0	1,805.3	1,467.8	0.51	0.32	0.16	0.24
	(2,641.8)	(2,782.2)	(476.6)	(733.6)	(477.4)	(0.15)	(0.12)	(0.087)	(0.084)
	[0.042]	[0.021]	[0.035]	[0.032]	[0.017]	[0.012]	[0.025]	[0.076]	[0.021]
β_2: Spousal interest	−5,871.1	−6,577.9	139.4	−70.6	38.0	−0.070	0.12	−0.026	0.045
	(2,499.3)	(2,788.3)	(463.0)	(691.4)	(458.0)	(0.14)	(0.12)	(0.092)	(0.085)
	[0.28]	[0.28]	[1]	[1]	[1]	[1]	[0.87]	[1]	[1]
β_3: Joint interest	5,095.5	−1,299.8	557.7	1,628.9	1,080.2	0.11	0.10	0.087	0.093
	(3,282.9)	(3,593.7)	(542.4)	(952.6)	(612.6)	(0.20)	(0.15)	(0.11)	(0.11)
	[0.61]	[1]	[0.96]	[0.56]	[0.56]	[1]	[1]	[1]	[1]
β_4: Cash prize—self	−2,004.8	−2,424.3	227.6	−74.2	75.0	−0.17	0.20	−0.060	0.068
	(2,467.7)	(2,681.1)	(436.1)	(808.6)	(519.6)	(0.15)	(0.11)	(0.093)	(0.083)
	[0.86]	[0.86]	[1]	[1]	[1]	[0.79]	[0.33]	[1]	[0.86]
β_5: Cash prize—spouse	−981.5	−553.7	543.6	−1,546.6	−479.4	−0.17	0.20	−0.17	0.016
	(2,599.2)	(2,789.6)	(450.8)	(620.3)	(446.2)	(0.15)	(0.11)	(0.093)	(0.082)
	[1]	[1]	[0.71]	[0.17]	[0.74]	[0.73]	[0.42]	[0.42]	[1]
p-values from F-tests									
$\beta_1 + \beta_2 = 0$	0.976	0.792	0.065	0.120	0.037	0.086	0.011	0.318	0.023
$\beta_1 + \beta_2 = 2\beta_3$	0.359	0.676	0.387	0.941	0.637	0.317	0.160	0.775	0.233
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.551	0.451	0.574	0.021	0.046	0.020	0.867	0.054	0.243
DV mean (0% individual)	21,913.3	13,579.1	4,264.6	6,932.6	5,562.9	9.72	8.11	8.99	8.54
DV mean (4% joint)	24,028.7	19,105.0	4,656.9	7,513.6	6,053.7	9.95	8.32	9.08	8.70
Observations	1,053	1,039	1,279	1,225	2,504	1,053	1,279	1,228	2,504

Notes: Robust standard errors clustered at the couple level are in parentheses; Benjamini, Krieger, and Yekutieli (2006) sharpened q-values are in brackets. All variables denominated in Kenyan shillings are top-coded at the ninety-ninth percentile and deflated to 2009 values. In 2009, Ksh 80 ≈ US$1. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

abandoned the experimental accounts in the long-run; just 3 percent of individual accounts (8 percent of individual accounts that were actually opened) and 5 percent of joint accounts (8 percent of opened accounts) were used in their third year. Columns 7 and 8 of Table 3 show that this does not mean that most study participants abandoned formal banking altogether. Two-thirds of study participants who received no individual interest subsidy reported owning a bank account (individual or joint) at the wave 1 endline. Moving from no interest to 20 percent interest increased this share by either 9 percentage points (individual interest) or 7 percentage points (joint interest). These effects are largely driven by small-scale savers at the extensive margin, as treatment effects on overall bank balances (column 8) are less apparent.

C. *Impacts on Broader Economic Outcomes*

The interest rate subsidies clearly changed how couples (and who within couples) saved, but did this impact households' broader economic lives? Table 4 presents impacts on overall assets, assets net debt, and income, measured 2.5–3.5 years after

the experimental interest rates expired.[17] Columns 1–5 present outcomes in levels, top-coded at the ninety-ninth percentile, while columns 6–9 present results using the inverse hyperbolic sine transformation.

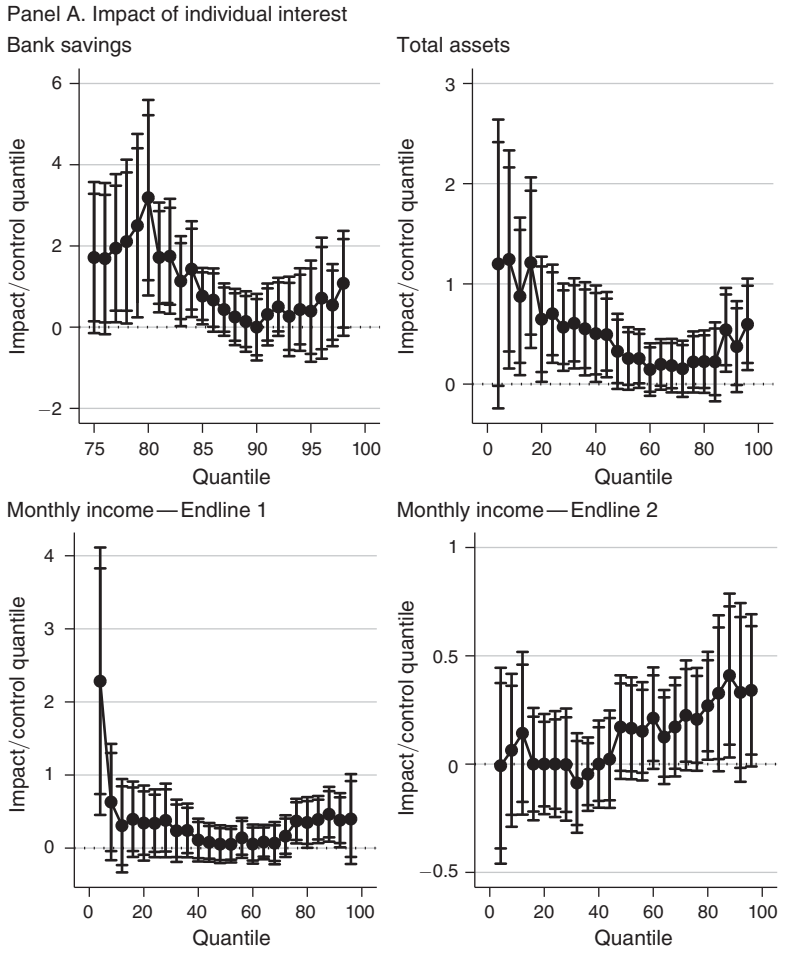
Impacts on Overall Assets and Income.—Columns 1 and 2 show that the individual interest rate reallocated assets within the household—study participants who received the highest individual interest rate reported Ksh 5,994 ($75) more in total assets, while their spouses reported a Ksh 5,871 reduction in assets. I do interpret this finding with caution, however, since the effect of the spousal interest rate has a q-value of 0.28 and is not robust to the hypersine transformation (column 6). The asset reallocation appears to have been productivity enhancing: study participants who received higher individual interest rates report Ksh 1,137 ($14) more income per month at endline 1 and Ksh 1,805 more income per month at endline 2. Although the point estimate for endline 2 is notably larger than the point estimate for endline 1, inspection of the dependent variable means shows that overall income is higher at endline 2 as well—as such, both point estimates represent a 26–27 percent increase relative to the no interest comparison group.[18] The impact of the individual interest rate on income does not reflect a reallocation within the household—the impact of the spousal interest rate on income is very small in magnitude and not significantly different from zero at both endlines. As a result, I am able to formally reject that the individual interest rate had no impact on household income at endline 1 and when pooling rounds. Also note that all the individual interest effects remain statistically significant after controlling the false discovery rate. In contrast, none of the point estimates on the other interest and cash prize treatments remain significant after this adjustment.

In order to give a sense of distributional impacts, Figure 2 graphs quantile treatment effects for bank savings, total assets, and endline 1 and 2 monthly income. In order to improve legibility of the graphs, I normalize treatment effects by the quantile value in the lowest interest comparison group. Hence, coefficients reflect growth in each quantile relative to the control. The figure makes it clear that the impacts of the individual interest rate are not driven by a narrow part of the distribution.

Impacts on Business Outcomes.—What types of income and assets are driving the aggregate changes in Table 4? Table 5 shows that the individual interest rate had large and important effects on business outcomes, while online Appendix

[17] I use the Central Bank of Kenya's consumer price index to deflate all monetary amounts into 2009 values for comparability with the baseline.

[18] This apparent growth in income is likely driven by survey design, rather than economic progress. The wave 2 endline allowed respondents to specify income in daily, weekly, or monthly terms, while the baseline and endline 1 enforced a common look-back period for all respondents. The data Appendix (online Appendix D) shows that the income distributions for baseline, endline 1, and endline 2 closely overlap for respondents who chose to specify income monthly, while the endline 2 income distribution is skewed far right relative to baseline and endline 1 for those who specified income on a daily or weekly basis (online Appendix Figure D1). This is likely driven by enumerators recording income during working periods for those who work sporadically for short intervals, thereby overstating total income on a monthly basis.



(*continued*)

FIGURE 2. DISTRIBUTIONAL IMPACT OF INTEREST RATES ON LONG-RUN ECONOMIC OUTCOMES

Tables A6 and A7 show that the individual interest rate had no detectable impact on any other type of asset or income.[19]

Table 5 shows that receiving the highest individual interest rate increased study participants' probability of running a business at the wave 1 endline by 10 percentage points (a 26 percent increase versus the no interest group), and increased the probability that a study participant reported entrepreneurship as his or her main occupation by 8 percentage points (28 percent). Moreover, the individual interest rate increased business capital by Ksh 2,651 ($33) and business profits by Ksh 548 ($7) per month. The wave 2 endline did not ask about business assets or occupation, but it did ask about business profit and hours spent working on a business. Column 6

[19] Online Appendix Table A8 illustrates impacts on debt.

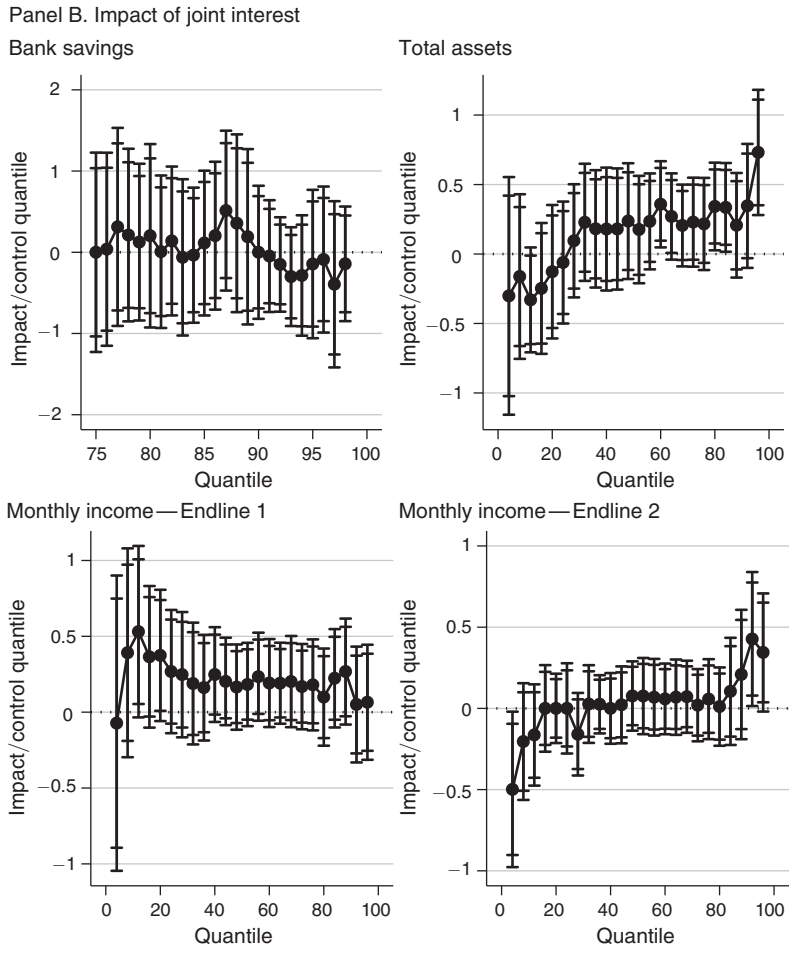


FIGURE 2. DISTRIBUTIONAL IMPACT OF INTEREST RATES ON LONG-RUN ECONOMIC OUTCOMES (*continued*)

Notes: Panels A and B of this figure graph coefficients from quantile regressions of the outcome of interest on the individual, spousal, and joint interest rate, as well as own and spousal cash prize. The interest rate variables have been normalized to run from 0 to 1 (individual and spousal interest) or 0.2 to 1 (joint interest). All point estimates have been divided by the quantile in the lowest interest group so that point estimates give percent changes. Whiskers give 90 and 95 percent confidence intervals and are scaled in the same way.

shows that the four-year impact on business profits is quite similar to the three-year impact, at Ksh 638 ($8) per month. I find no significant impact of the individual interest rate on business operation at endline 2, although there is evidence of significant spillover effects on spouses. This could be driven by respondents drawing spouses in to work on growing businesses or helping support spouses to start new businesses. Columns 8 and 9 present results for business operation and profits with both waves pooled. Here, I robustly reject the null that the individual interest rate had no effect on household-level business outcomes. These results are robust to adjusting for multiple testing concerns: all individual interest rate estimates that are significant with conventional standard errors have q-values below 0.05. Online Appendix Figure A2 graphs quantile treatment effects on business profits

TABLE 5—LONG-RUN IMPACTS ON ENTREPRENEURIAL ACTIVITY

	Wave 1				Wave 2			Pooled	
	Operating business	Main occupation entrepreneur	Business capital	Business profit	Operating business	Business profit	Hours worked on business	Operating business	Business profit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
β_1: Individual interest	0.10	0.079	2,651.2	547.7	0.047	638.1	0.35	0.077	592.4
	(0.036)	(0.032)	(1,142.3)	(199.9)	(0.036)	(263.9)	(0.26)	(0.030)	(181.4)
	[0.020]	[0.032]	[0.039]	[0.021]	[0.17]	[0.034]	[0.16]	[0.025]	[0.014]
β_2: Spousal interest	0.068	0.036	−371.1	342.7	0.081	375.1	0.60	0.078	358.3
	(0.036)	(0.032)	(1,049.2)	(203.6)	(0.036)	(264.9)	(0.27)	(0.029)	(183.9)
	[0.41]	[0.79]	[1]	[0.49]	[0.28]	[0.60]	[0.28]	[0.17]	[0.41]
β_3: Joint interest	0.022	0.023	819.7	254.3	−0.023	31.7	0.093	−0.0082	151.7
	(0.044)	(0.042)	(1,340.3)	(221.9)	(0.045)	(317.2)	(0.33)	(0.036)	(218.2)
	[1]	[1]	[1]	[0.82]	[1]	[1]	[1]	[1]	[1]
β_4: Cash prize—self	0.0022	0.036	−746.2	−186.5	0.015	−527.8	0.073	0.016	−341.1
	(0.034)	(0.033)	(1,026.1)	(161.2)	(0.037)	(222.0)	(0.26)	(0.029)	(150.7)
	[1]	[0.79]	[0.91]	[0.79]	[1]	[0.17]	[1]	[1]	[0.20]
β_5: Cash prize—spouse	−0.022	−0.058	15.8	−21.5	−0.024	−619.8	−0.47	−0.020	−302.3
	(0.033)	(0.031)	(1,106.2)	(177.4)	(0.036)	(215.4)	(0.24)	(0.027)	(163.6)
	[0.96]	[0.42]	[1]	[1]	[0.96]	[0.063]	[0.40]	[0.96]	[0.42]
p-values from F-tests									
$\beta_1 + \beta_2 = 0$	0.002	0.017	0.166	0.003	0.018	0.014	0.020	0.001	0.001
$\beta_1 + \beta_2 = 2\beta_3$	0.030	0.149	0.524	0.081	0.030	0.052	0.099	0.005	0.023
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.013	0.057	0.163	0.005	0.087	0.000	0.021	0.013	0.000
DV mean (0% individual)	0.40	0.28	3,263.5	796.0	0.42	1,504.1	2.04	0.41	1,128.4
DV mean (4% joint)	0.49	0.36	4,574.7	1,036.3	0.50	1,814.9	2.43	0.49	1,402.1
Observations	1,409	1,417	1,380	1,368	1,328	1,196	1,291	2,605	2,564

Notes: Robust standard errors clustered at the couple level are in parentheses; Benjamini, Krieger, and Yekutieli (2006) sharpened q-values are in brackets. All variables denominated in Kenyan shillings are top-coded at the ninety-ninth percentile and deflated to 2009 values. In 2009, Ksh 80 ≈ US$1. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

and assets. Here I find significant impacts across a broad range of quantiles, though gains in percentage terms are smaller at larger quantiles.

Overall, I reject that the individual interest rate had no impact on *household-level business* outcomes for all variables except business capital. In contrast, estimated impacts for the joint interest rate and the cash prize are generally close to zero and insignificant, no coefficients have q-values below 0.05. I formally reject that the impact of the individual interest rate is equal to the joint interest rate for seven out of nine specifications on Table 5. I reject that the individual interest rate and the cash prize had equivalent impacts in eight out of nine specifications.

The data also reveal a great deal of business churning—just 50 percent of individuals who reported entrepreneurship as their main occupation at baseline reported the same at endline 1, while 23 percent of non-entrepreneurs transitioned into entrepreneurship. Online Appendix Table A9 explores heterogeneity in main effects by baseline occupation. Here we see that the impact of the individual interest rate is concentrated among participants who were entrepreneurs at baseline. Hence, the individual interest rate helped existing entrepreneurs stay in business, but did not

Table 6—Long-Run Impacts on Public Goods and Spousal Agreement

	Value livestock (hypersine)	Any renovations last year	Home has permanent roof	Agreement—How to spend money	Agreement—How much to save	Savings decision making—Decide together
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: Individual interest	0.096	0.018	0.0035	−0.11	−0.066	−0.057
	(0.20)	(0.035)	(0.031)	(0.18)	(0.21)	(0.034)
	[0.44]	[0.44]	[0.53]	[0.37]	[0.48]	[0.10]
β_2: Spousal interest	−0.048	0.020	0.011	0.24	0.075	0.020
	(0.19)	(0.035)	(0.031)	(0.17)	(0.21)	(0.034)
	[1]	[1]	[1]	[0.60]	[1]	[1]
β_3: Joint interest	0.59	0.087	0.092	0.39	0.41	0.0048
	(0.26)	(0.045)	(0.050)	(0.22)	(0.24)	(0.042)
	[0.53]	[0.56]	[0.56]	[0.56]	[0.56]	[1]
β_4: Cash prize—self	−0.16	−0.065	−0.067	0.14	−0.019	0.0026
	(0.19)	(0.035)	(0.032)	(0.17)	(0.21)	(0.035)
	[0.86]	[0.30]	[0.22]	[0.86]	[1]	[1]
β_5: Cash prize—spouse	−0.27	−0.010	−0.041	0.26	−0.067	−0.036
	(0.19)	(0.035)	(0.031)	(0.17)	(0.21)	(0.034)
	[0.63]	[1]	[0.64]	[0.60]	[1]	[0.74]
p-values from F-tests						
$\beta_1 + \beta_2 = 0$	0.891	0.487	0.802	0.617	0.976	0.468
$\beta_1 + \beta_2 = 2\beta_3$	0.213	0.489	0.313	0.463	0.328	0.523
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.307	0.145	0.160	0.459	0.833	0.965
DV mean (0% individual)	8.78	0.47	0.72	7.55	7.34	0.43
DV mean (4% joint)	8.63	0.46	0.68	7.34	7.11	0.41
Observations	1,366	1,404	1,411	1,398	1,397	1,411

Notes: Robust standard errors clustered at the couple level are in parentheses; Benjamini, Krieger, and Yekutieli (2006) sharpened q-values are in brackets. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

facilitate much business creation. These results mirror recent findings from a number of capital drop and microfinance experiments, which suggest that only individuals with preexisting entrepreneurial skill are able to benefit from interventions to grow self-employment income (Crépon et al. 2015; Angelucci, Karlan, and Zinman 2015; Banerjee et al. 2015b; Field et al. 2013; Fafchamps et al. 2014). Online Appendix Table A10 shows that the positive impacts of the individual interest rate are driven by men, which is consistent with de Mel, McKenzie, and Woodruff (2009) and Fafchamps et al. (2014), who find that women (especially those operating small, subsistence businesses) have lower returns to capital than men.

Impacts on "Joint" Household Outcomes.—Table 6 uses wave 1 endline data to explore how the interest rates affected measures that capture investment in household public goods and levels of spousal alignment (the second endline did not cover these topics). The first column of the table focuses on livestock holdings. Livestock are arguably the most important class of assets held by study households. Nearly all households (95 percent) own some sort of livestock and their value accounts for half of total assets. Livestock are also inherently joint investments, as they are easily observed and accessed by both members of a couple. Although the joint interest

rate did not significantly impact average livestock holdings (see online Appendix Table A6), Table 6 uses the inverse hyperbolic sine transformation to show that the joint rate did substantially increase livestock holdings at the lower end of the distribution.[20] This estimate is not significant after the FDR adjustment, however.

It is common practice in the study area for households to make periodic, incremental investments in their homes. Investments in home improvement are also inherently joint, as all members of the household benefit from them. Column 2 of Table 6 shows that nearly half of individuals reported making some investment in home renovation in the past year, and moving from the lowest to the highest joint interest rate increased this share by 6 percentage points (recall that the joint interest rate variable runs from 0.2–1, so I multiply the point estimate in Table 6 by 0.8 to get this effect). There is also some evidence of increased home investment based on actual home quality. Column 3 shows that individuals who received higher joint interest rates were more likely to live in a home with a permanent (i.e., iron sheet as opposed to thatch) roof at endline. However, as with the livestock result, none of these point estimates have a sharpened q-value below 0.10.

The next two columns of Table 6 test whether the joint interest rate increased spousal alignment over decision making: at endline, all individuals were asked to rate, on a scale of zero to ten, how much they and their spouse agreed about consumption and savings decisions.[21] Columns 4 and 5 show that individuals who received higher joint interest rates reported greater levels of agreement about both topics. In spite of this, I do not observe any significant impacts on self-reported joint decision making regarding savings (column 6).

The results in Table 6 are consistent with the hypothesis that the joint interest rate moderately increased investment in "joint" assets and spousal alignment over financial decisions. However, these results are modest in magnitude and do not survive the FDR adjustment—I therefore interpret them as suggestive at best.

Robustness.—Importantly, my results are robust to alternative empirical specifications and treatments of outliers. Robustness online Appendix R provides a number of sensitivity tests, showing that there is no evidence that the results are driven by reporting bias, and showing that the main results are robust to a variety of top-coding, trimming, and imputation strategies. Another concern is that constraining the effect of the interest rates to be linear distorts estimates or obscures important patterns. My decision to highlight the linear specification is motivated by a desire to keep the analysis clear and focused, not by substantive differences in results. Online Appendix Tables R7–R9 present long-run results where the interest rates are dummied out instead of entered linearly. Here, the effect of the 20 percent individual interest rate (relative to the no interest comparison group) is remarkably similar to the coefficients from the linear specification. I reject linearity for the individual interest rate in just two out of 24 specifications.

[20] Quantile regressions on level values reveal significant, positive impacts on the twenty-eighth to the seventieth quantile.

[21] Individuals who were no longer married were asked to refer back to when they were married.

D. *Are the Long-Run Estimates Reasonable in Magnitude?*

The estimated coefficients on the individual interest rate in Tables 4 and 5 are quite large in magnitude, especially when compared to the much more modest short-run effects found in Table 2. The average interest payout on open individual accounts with 20 percent interest was just Ksh 42 ($0.53), yet 2.5–3.5 years later this group reported Ksh 548–638 more per month in business profit. Are these two observations compatible with one another? In this subsection, I take the point estimates at face value and ask if they are both internally consistent and consistent with other studies that estimate the returns to capital in the developing world.

I address the latter question first. The ratio of the treatment effect on endline 1 business profits to the treatment effect on endline 1 business capital implies a monthly return to capital of 20.7 percent.[22] Although this is high, it is in line with existing estimates in the literature, which range from 4 percent per month (Blattman, Fiala, and Martinez 2014) to 33 percent per month (McKenzie and Woodruff 2008). My estimates are strikingly consistent with other evidence from Africa—Udry and Anagol (2006) estimate a 17–25 percent monthly return to pineapple cultivation in Ghana, while Fafchamps et al. (2014) find a 21–29 percent monthly return to a 150 cedi in-kind grant to Ghanaian microentrepreneurs.

While the *relative* changes I observe in income and assets are consistent with existing evidence, one must also ask whether the *absolute* changes make sense given the observed impacts on short-run bank account use. To help put my results in perspective, consider the following thought experiment. Assume that study participants who received large individual interest rates accumulated savings over the course of the six-month subsidy period, some of which they subsequently invested in productive activities. Call this "new" investment (or initial treatment effect on capital) K_0. Further assume that the monthly return to capital is r, and that all subsequent capital accumulation is driven by reinvesting some of the returns on K_0. If the marginal propensity to reinvest is i, then after t months the treatment effect on capital stocks would be $K_0 \left(1 + ir\right)^t$. I observe study participants roughly 32 months after the interest rate expired. Given this, a 0.5 marginal propensity to reinvest, and a 20.7 percent monthly return to capital, a Ksh 114 ($1.43) initial investment would be needed to generate my treatment effects on business profit and capital. If the marginal propensity to reinvest were 1, an initial investment of just Ksh 7 would be needed. These numbers compare favorably to the short-run treatment effects on bank account use in Tables 2 and A4, where I find that the individual interest rate increased deposits into the individual account by Ksh 625 and the six-month balance in individual accounts by Ksh 105. The hypothetical initial investment amounts are also modest relative to the average amount of cash study participants reported keeping at home at baseline (Ksh 845). Online Appendix Table A11 summarizes these calculations and existing estimates of returns to capital in the literature.

[22] The wave 1 endline survey did not ask about labor supply and individuals were not asked to report profits net of the value of their time. To the extent that capital accumulation led participants to increase labor supply, these estimates give an upper bound on the true marginal return to capital.

Another relevant issue is the number of potential compliers: when the individual interest rate was 20 percent, 49 percent of study participants opened an individual account. Just 16 percent of study participants opened and used the account. If one assumes that only people who opened an individual account benefited from the interest rate, then the absolute maximum fraction of compliers in the population would be 49 percent, while a more reasonable maximum fraction of compliers would be closer to 16 percent.[23] If 16 percent of individuals complied, the short-run investment among compliers needed to generate my treatment effects would be either Ksh 706 ($9—when $i = 0.5$) or Ksh 38 ($0.48—when $i = 1$), which is still quite reasonable. This discussion underscores that the long-run treatment effects are plausible *assuming* the interest rates generated sustained behavior change that allowed returns to compound over time. Since the short-run changes in experimental bank account use are relatively modest, it is much more difficult to justify the magnitude of the long-run results without a compounding mechanism.

It is also important to keep in mind that the long-run point estimates are drawn from sampling distributions with high variances. As such, the confidence intervals contain a range of much more modest (and more extreme) values. For example, the 95 percent confidence interval for the impact of the individual interest rate on business capital is $[412, 4890]$, while the 95 percent confidence interval for monthly business profits (wave 1) is $[156, 940]$, and the 95 percent confident interval for the return to capital implied by changes in business assets and profits is $[0.03, 0.38]$. Therefore a more conservative way to interpret the results is that I am able to reject that the individual interest rate had only moderate impacts on income and assets. Given that the average open individual account with a 20 percent interest rate earned just Ksh 42 in interest, even this interpretation is compelling.

III. Discussion and Mechanisms

The results for the individual interest rate present an apparent puzzle: although its short-run impacts were modest, the treatment increased monthly income by Ksh 1,137 at endline 1 (or Ksh 1,635 in nominal 2012 shillings). Given a 2012 PPP exchange rate of Ksh 37 per US dollar, this is almost enough extra income to support an additional household member at a poverty line of PPP$1.90/day. Why did study participants need the interest rate to take advantage of such a lucrative income-generation opportunity? The rest of this section discusses competing answers to this question.

Capital Stock-Based Mechanisms.—The individual interest rate generated long-run *divergence* between the high- and low-interest groups, as differences

[23] It is possible that some participants who opened an individual account but did not use it still benefited—if, for example, individuals accumulated a stock of money at home earmarked for the bank account but never got around to actually making a deposit. Given the experimental context, this is plausible: most individuals had to commute into town to use the bank, so making small frequent deposits was less practical than making a smaller number of large deposits.

in savings behavior were amplified over time rather than attenuated.[24] One of the simplest explanations for my results is that they are driven by the short-run changes in the capital stock generated by the temporary interest rate. This could create divergence if, for example, entrepreneurs have nonconvex production functions, which in turn generate multiple steady-state levels of output. If the interest rate helped people save past a nonconvexity, then income and capital levels could have continued to diverge after the interest rate expired. Alternatively, short-run savings accumulation could have served as a buffer stock that encouraged households to make higher risk, higher return investments after the subsidy period ended.[25] In either case, the key mechanism is the short-run increase in the stock of savings.

One issue with a "capital stock only" story is that the individual interest rate did not increase overall bank savings in the short run, while the cash prize did (Table 2). Yet it is the interest rate, and not the cash prize, that had persistent impacts on economic outcomes. Moreover, I can strongly reject that the cash prize and individual interest rate had equivalent impacts on business outcomes in Table 5. I also reject equality for overall income in columns 4, 5, and 8 in Table 4. Since the cash prize had no impact on long-run outcomes, but a larger impact on short-run balances in experimental accounts, mechanisms working solely through the household-level capital stock are unlikely.

However, the individual interest rate did increase the amount of money stored in individual accounts, thereby changing responsibility for (and ownership of) saving within the household. Moreover, the individual interest rate's short-run implied local average treatment effect on individual account balances exceeds that of the cash prize; hence, a capital stock-based explanation could still be relevant if intra-household control of resources matters for how those resources are invested, e.g., due to innovations in bargaining power or other intra-household constraints (Mazzocco 2007; Ashraf 2009; Schaner 2015). To think through the plausibility of such a mechanism, consider the utility of an individual in the experiment. I assume that this utility can be written as follows:

$$V^i(\mathbf{A}_t, \mathbf{R}_t) \;=\; \max_{\mathbf{c}_t, \mathbf{b}_t, \mathbf{k}_t} u^i(c_t^i) + \delta V^i(\mathbf{A}_{t+1}, \mathbf{R}_{t+1})$$

subject to: intra-household constraints,

$$\mathbf{c}_t'\mathbf{1} + \mathbf{b}_t'\mathbf{1} + \mathbf{k}_t'\mathbf{1} \;\leq\; \mathbf{A}_t'\mathbf{1},$$

$$f(\mathbf{k_t}) + \mathbf{R}_t'\,\mathbf{b}_t \;=\; \mathbf{A}_{t+1}'\mathbf{1},$$

[24] Although I do not have short-run data on income and overall assets, this pattern is directly evident for experimental bank balances. The individual interest rate increased the six-month balance in experimental individual accounts by Ksh 105, three-year balances in experimental individual accounts by Ksh 137, and overall endline bank balances by Ksh 1,020.

[25] Karlan et al. (2014); Cole, Giné, and Vickery (2017); Elabed and Carter (2015) all find that access to weather or yield insurance induces agricultural households to make riskier investments, and Carvalho, Prina, and Sydnor (2016) find that giving Nepalese households access to formal bank accounts increases their willingness to choose riskier lotteries. But is it not obvious that access to savings will increase risk taking: Carter, Laajaj, and Yang (2016) find evidence that access to savings accounts decreases long-run adoption of higher-return, riskier agricultural technologies.

where $\mathbf{A}_t = \left[A_t^i, A_t^{-i}, A_t^J\right]'$ represents individually and jointly owned assets available at the start of period t, $\mathbf{R}_t = \left[R_t^i, R_t^{-i}, R_t^J\right]'$ are period t interest rates on bank accounts, $\mathbf{b}_t = \left[b_t^i, b_t^{-i}, b_t^J\right]'$ is saving in each bank account, $\mathbf{k}_t = \left[k_t^i, k_t^{-i}, k_t^J\right]'$ is individual and joint investment outside the bank (e.g., business capital or livestock), $f(\mathbf{k}_t)$ is the household production function, $\mathbf{c}_t = \left[c_t^i, c_t^{-i}\right]'$ is period t consumption, and $\mathbf{1}$ is a 3×1 vector of ones.

I do not place an explicit structure on the household bargaining process—I only assume that individual i makes the best choice possible, subject to these constraints. To match the experiment, let each t interval be six months. In what follows, I will contrast the impact of a shock to the individual interest rate $\left(R_t^i\right)$ with the impact of a shock to individual assets $\left(A_t^i\right)$, while keeping all other interest rates and assets levels fixed. To simplify notation, I write utility in terms of these focal quantities $-V_t^i\left(A_t^i, R_t^i\right)$.

Let $V_t^i\left(A_t^i, \underline{R}_t^i\right)$ be utility when the period t individual interest rate is low and $V_t^i\left(A_t^i, \overline{R}_t^i\right)$ be utility when the period t interest rate is high. Next, note that if an individual were given

$$\gamma_t^i = \frac{1}{\underline{R}_t^i}\left(\overline{R}_t^i - \underline{R}_t^i\right)\overline{s}_t^i$$

in the first period (where $\overline{s}_t^i$ is i's optimal savings when the individual interest rate is $\overline{R}_t^i$), then the household could reproduce the high-interest allocation in the low-interest state of the world by simply increasing individual savings to $\overline{s}_t^i$. As long as the allocation under $\overline{R}_t^i$ is available when the interest rate is low and spouse i is given γ_t^i (which seems reasonable in this case since spouse i has property rights over γ_t^i and savings in account i), then it must be that

$$V_t^i\left(A_t^i + \gamma_t^i, \underline{R}_t^i\right) \geq V_t^i\left(A_t^i, \overline{R}_t^i\right) > V_t^i\left(A_t^i, \underline{R}_t^i\right).$$

Consider the 16 percent of households who saved in the individual account. When the individual interest rate was 20 percent, γ_t^i for this group is just Ksh 116 ($1.45). Put another way, the above inequality implies that "complier" study participants would prefer an up-front payment of Ksh 116 to the higher interest rate. Recall that the cash prize, which had an average payout of Ksh 247, had no impact on long-run income. This in turn implies that study participants put little value (less than Ksh 247) on having substantially more income three years in the future, which would only be true if the discount factor and/or elasticity of intertemporal substitution are very low. Since study participants *did* robustly respond to the temporary interest rates in the short run, this seems unlikely. Thus, the combined facts of (a) a robust response to the short-run interest rates, (b) modest interest rate payouts, and (c) no long-run effects of the cash prize underscore that my results are very difficult to explain with mechanisms that only work through the short-run capital stock.

Increased Use of Formal Bank Accounts.—Another possibility is that the individual interest rate worked by encouraging participants to adopt individual bank accounts, which in turn impacted business outcomes. Bank accounts may have been useful for savings-constrained individuals long after the interest rates expired.[26] For example, when production requires lumpy expenditures it could be helpful to store resources at the bank until it is time to purchase additional working capital. This could be particularly important if resources kept at home are "taxed" away by other members of the community or household (Platteau 2000; Anderson and Baland 2002; Jakiela and Ozier 2016).[27]

Recall that all couples opened at least one bank account as part of the experiment and bank accounts were widely available on the market—the individual interest rate did not solve an access problem. However, the majority of study participants were unbanked at baseline; these individuals may not have fully understood bank accounts and their benefits. If individuals learn about these benefits as they experience the accounts, temporary interest rates that increase experimentation could have long-run impacts. Online Appendix Table A12 tests this hypothesis by estimating the impact of the interest rates separately by baseline bank account ownership.[28] The table shows that the individual interest rate benefited banked respondents just as much or more than unbanked respondents, which suggests that the interest rate did not work by helping people learn about bank accounts.

Alternatively, increased bank account use in the short run may have facilitated future access to bank credit, which could have helped study participants build their businesses. However, online Appendix Table A8 shows that recipients of higher individual interest rates actually report (insignificantly) less bank debt, and administrative data from the bank shows that just 1.5 percent of couples received a loan from Family Bank. It is therefore unlikely that the interest rates worked by connecting respondents with financial services that relieved savings or credit constraints.

Psychological Channels.—The final possibility I consider is that the individual interest rate operated through a behavioral channel. The idea here is that actively responding to the interest rate in the short run may have had lasting impacts on psychological forces governing financial behavior. Consider, for example, a participant who wishes to take advantage of a 20 percent interest rate on his individual account. First, he must decide where to get deposits for the account. Will he reallocate his existing wealth? Or cut back on consumption? If the latter, he must decide what to cut back on and may need to devise new strategies to overcome

[26] Dupas and Robinson (2013a) find that giving female Kenyan entrepreneurs access to no-interest bank accounts had very large impacts on productive investment in the short-run (four to six months after account opening). This paper does not, however, study longer run impacts.

[27] Household constraints could also help explain why the individual and joint interest rates had different long-run impacts.

[28] Of course, this test is only useful for evaluating the learning hypothesis to the extent that the baseline banked did not stand to learn from additional experimentation with family bank accounts. I focus on the inverse hyperbolic sine of income and assets because banked individuals reported substantially more resources at baseline and treatment effects scale roughly proportionally with baseline resources. Using level values does not change conclusions, however.

Table 7—Long-Run Impacts on Savings and Investment Behaviors

	Savings a priority (1)	Saves regularly (2)	Has business budget (3)	Downwardly rigid business budget (4)
β_1: Individual interest	0.036	0.074	0.055	0.059
	(0.028)	(0.032)	(0.029)	(0.021)
	[0.17]	[0.040]	[0.075]	[0.021]
β_2: Spousal interest	0.011	0.00081	0.051	0.022
	(0.028)	(0.032)	(0.030)	(0.022)
	[1]	[1]	[0.49]	[0.87]
β_3: Joint interest	0.057	−0.0022	0.033	−0.011
	(0.033)	(0.041)	(0.036)	(0.027)
	[0.56]	[1]	[1]	[1]
β_4: Cash prize—self	0.039	−0.027	−0.028	−0.018
	(0.025)	(0.033)	(0.028)	(0.021)
	[0.46]	[0.86]	[0.86]	[0.86]
β_5: Cash prize—spouse	−0.00042	−0.090	−0.055	−0.019
	(0.026)	(0.031)	(0.027)	(0.021)
	[1]	[0.063]	[0.38]	[0.90]
p-values from F-tests				
$\beta_1 + \beta_2 = 0$	0.271	0.118	0.017	0.012
$\beta_1 + \beta_2 = 2\beta_3$	0.850	0.224	0.205	0.032
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.897	0.004	0.002	0.008
DV mean (0% individual)	0.82	0.29	0.16	0.066
DV mean (4% joint)	0.81	0.34	0.20	0.12
Observations	1,320	1,325	1,308	1,308

Notes: Robust standard errors clustered at the couple level are in parentheses; Benjamini, Krieger, and Yekutieli (2006) sharpened q-values are in brackets. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

temptation to spend money. Second, he must decide what to do with his new savings once the interest rate expires. Should he keep it in the bank for emergencies? Or invest the money in something productive, like his business or the family farm? The interest rate may have helped some individuals build better savings habits, or set up new savings and investment heuristics. If these changes persisted after the interest rates expired, then small short-run changes in behavior could compound over time, especially when returns to investment are high.

The idea behind Becker and Murphy's (1988) model of habitual consumption is that individuals accumulate a "habit stock" as they engage in a particular behavior, and that the habit stock lowers the marginal cost of engaging in that behavior in future periods. This can give rise to multiple steady states, where price changes or other shocks can lead to dramatically different behavioral patterns in the long run.[29] Recall that both the endline data on overall bank account use and administrative data on experimental account use shows that respondents who received higher individual interest rates were more likely to use individual bank accounts

[29] A related possibility is that the experience of saving (and investing) in the short-run helped individuals learn about their marginal returns to capital, which in turn supported sustained saving and investment.

both during and after the promotional period. Table 7 takes a closer look at survey data on savings and budgeting behaviors four years after the initial experiment. Here, I find that respondents treated with the highest individual interest rate were 7.4 percentage points (26 percent) more likely to say that they "saved regularly," which is consistent with the habit formation hypothesis.

Habit and experience-based explanations imply that individuals who had the largest treatment effects on short-run bank account use should also exhibit the largest treatment effects on long-run outcomes.[30] I test this implication by constructing an index of short-run account use by standardizing all the six-month bank account outcomes except withdrawals in Table 2 and online Appendix Table A4, and taking a simple average of the standardized outcomes.[31] I then regress this outcome on the individual interest rate and its interactions with all baseline demographic variables in Table 1. I use the interaction terms to obtain a predicted treatment effect for all individuals, and then split the sample based on whether that predicted treatment effect is below median (noncompliers) or above median (compliers). Figure 3 graphs individual interest rate treatment effects by complier status for short-run bank account use and long-run economic outcomes. The figure makes it clear that compliers had notably larger treatment effects in both the short and the long run.

Mental accounting may have also played an important role in helping study participants sustain business investment after the interest subsidies expired. Thaler (1999) defines mental accounting to be "the set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities." One aspect of mental accounting that is particularly relevant in my context is the idea that individuals mentally allocate income and wealth into a series of differentiated, non-fungible "accounts," which help constrain financial decision-making. If the individual interest rate cued respondents to set up mental accounts for business, this could help explain why study participants were able to make continued investments in their businesses after the interest rates expired.

Columns 3 and 4 of Table 7 use data from the wave 2 endline to ask whether observed changes in business outcomes are accompanied by changes in mental accounting for business. Here I make use of a budgeting module that was the primary focus of the second endline: this module first asked individuals if they made spending decisions with a preplanned budget in mind. Respondents were then asked to list each of their budget items and indicate whether the budgeted amounts were flexible (i.e. would the respondent reduce spending on the item to meet an unexpected Ksh 1,000 expense). I term budget items that would not be reduced to meet an unexpected expense as "downwardly rigid." Here, I find that the individual interest rate increased the share of respondents explicitly budgeting for business by 5.5 percentage points (34 percent). This effect is entirely driven by growth in downwardly rigid budgeting, which is a relatively uncommon practice in the no individual interest group (although 16 percent of individuals had a business budget,

[30] This implication is, of course, not unique to theories of habit formation.

[31] Since treatment effects at the lower end of the distribution are often important (see Figures 2 and A2), I use hypersine transformations of variables denominated in Kenyan shillings to identify compliers in terms of percentage changes in outcomes. Results are very similar if I use level values instead.

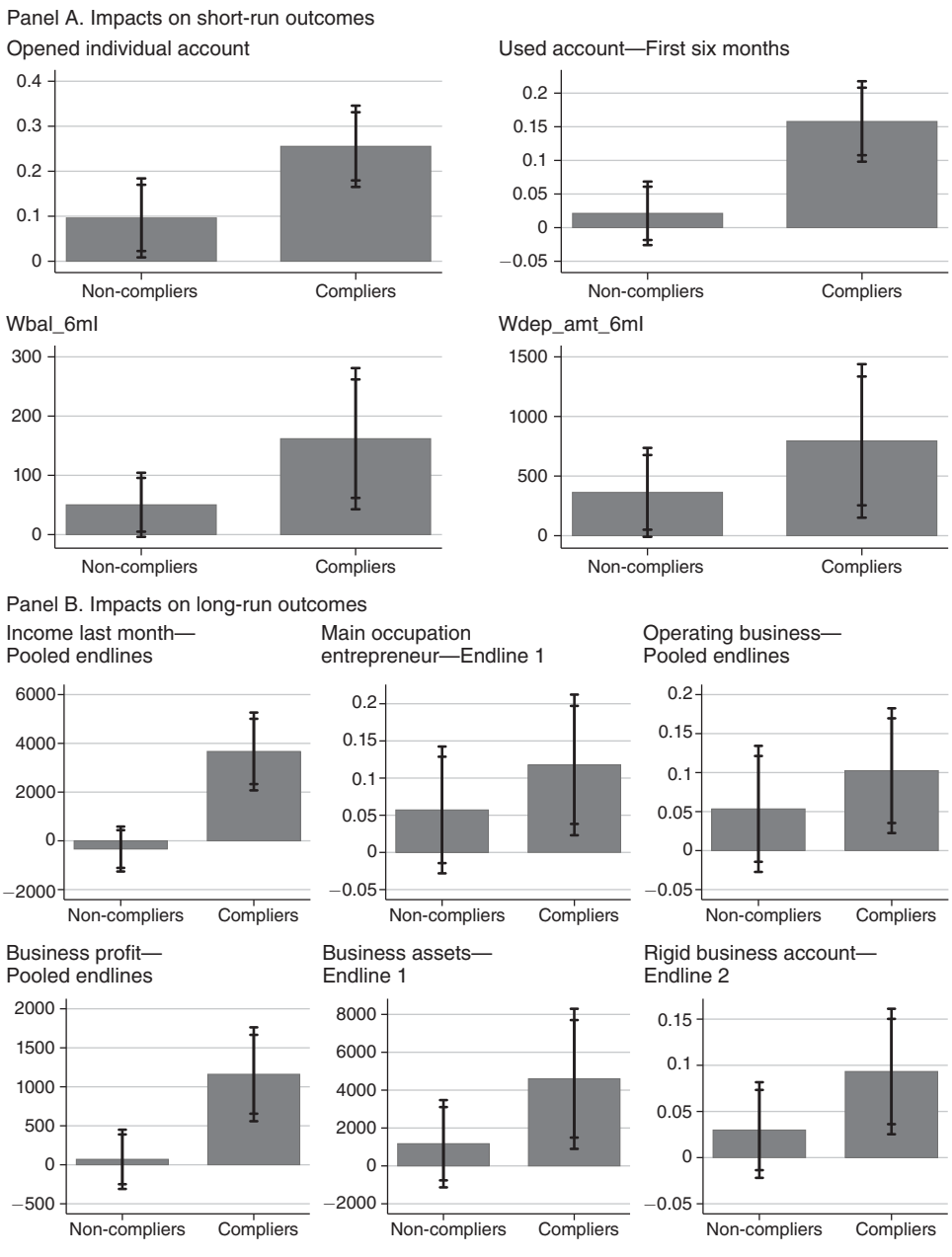


FIGURE 3. IMPACTS OF THE INDIVIDUAL INTEREST RATE BY PREDICTED SHORT-RUN "COMPLIER" STATUS

Notes: I identify compliers by regressing the individual interest rate and its interactions with all baseline variables in Table 1 on an index of short-run individual account use. The index is the simple average of standardized versions of all measures of individual account use in Tables 2 and online Appendix Table A4 except withdrawals. I use the inverse hyperbolic sine of all variables denominated in Kenyan shillings. I use this regression to predict individual-specific treatment effects and then split the sample into non-compliers (below median predicted response) and compliers (above median predicted response). This graph plots coefficients from regressions of the specified outcome on the individual interest rate, the spousal interest rate, and own cash prize selection. The individual interest rate is renormalized to run from 0-1. All outcomes in Kenyan shillings are topcoded at the ninety-ninth percentile and deflated to 2009 values (panel B). In 2009, Ksh 80 $\approx$ \$1. All regressions are run separately for compliers and non-compliers with standard errors clustered at the couple level. Whiskers give 90 and 95 percent confidence intervals on point estimates.

just 6.6 percent of individuals had a downwardly rigid budget). As with earlier results, all the individual interest rate estimates in Table 7 retain their significance after the FDR adjustment. None of the other treatments have effects that remain signicant at the 5 percent level after the FDR adjustment, with one coefficient on the spousal cash prize (a negative effect on saving regularly) remaining significant at the 10 percent level.

Finally, my results underscore that the nature of the interest rate (individual versus joint) was important for determining the type of savings and investments that households made. Small businesses are generally independently operated in this part of Kenya, while investments such as livestock and the home are inherently joint. Priming effects—where different contextual stimuli lead individuals to make systematically different decisions—could have been particularly important in my experiment because all couples had the option to open both individual and joint accounts.[32] Married couples attended the experiment together and were able to directly observe the interest rate for their own, their spouse's, and the joint account. Thus, a particularly high joint rate could have cued the idea that "we need to start saving together," while a particularly high individual interest rate could have made it more acceptable for the relevant account owner to redirect more resources toward his or her own enterprise.

The wave 1 endline was specifically designed to shed light on the extent to which couples viewed income and assets as "individual" versus "joint." For each type of income and asset, respondents were asked to report how much was individually earned/held versus jointly earned/shared with a spouse. In the previous tables, I have focused on overall measures of resources, which include individually held resources plus half of jointly held resources. Table 8 breaks down my results for income and assets by individual and joint ownership. The table shows that the individual interest rate effects are entirely driven by growth in individually owned income and assets. In contrast, none of the other treatments have effects that remain significant after controlling for the false discovery rate.

In summary, I find no evidence that the interest rates worked solely by changing the short-run capital stock or by helping participants learn about bank accounts. Instead, I find multiple pieces of evidence that behavioral savings channels are important. My preferred interpretation is that two forces interacted to generate my results. First, higher individual interest rates pushed couples to consider higher return "individual" forms of investment beyond the bank accounts. Second, the experience of making a concerted effort to save in the short run helped individuals sustain greater levels of saving and investment in the long run. Here, a mix of factors could be at play, including habit formation, mental accounting, and learning about the return to saving.

[32] See Kamenica (2012) for an economics-focused review of priming.

Table 8—Long-Run Impacts on Individually- and Jointly-Held Resources

	Individually-held resources				Jointly-held resources			
	Income—All sources	Assets—All sources	Business profits	Business capital	Income—All sources	Assets—All sources	Business profits	Business capital
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β_1: Individual interest	1,142.4	3,535.9	568.8	1,712.0	−75.6	1,641.8	−1.97	603.1
	(411.5)	(1,488.7)	(190.8)	(854.7)	(98.4)	(1,592.2)	(39.1)	(518.2)
	[0.021]	[0.035]	[0.019]	[0.063]	[0.32]	[0.22]	[0.55]	[0.20]
β_2: Spousal interest	112.2	−2,506.2	265.4	28.0	33.8	−2,051.3	10.1	25.7
	(406.2)	(1,452.1)	(186.8)	(785.7)	(103.0)	(1,529.1)	(45.1)	(492.9)
	[1]	[0.49]	[0.60]	[1]	[1]	[0.61]	[1]	[1]
β_3: Joint interest	390.7	251.7	216.2	361.3	−33.1	2,896.4	−3.01	84.9
	(465.5)	(1,822.3)	(208.3)	(1,043.3)	(138.9)	(1,904.2)	(52.1)	(553.6)
	[1]	[1]	[0.96]	[1]	[1]	[0.61]	[1]	[1]
β_4: Cash prize—self	252.5	754.8	−180.9	728.7	−19.3	−1,732.7	10.3	−839.7
	(381.9)	(1,467.7)	(152.0)	(918.4)	(93.4)	(1,373.0)	(41.0)	(375.8)
	[1.00]	[1]	[0.79]	[0.87]	[1]	[0.79]	[1]	[0.20]
β_5: Cash prize—spouse	244.7	2,031.0	−128.4	174.6	219.9	−2,159.1	60.4	−257.7
	(390.0)	(1,628.7)	(161.4)	(855.4)	(106.5)	(1,416.5)	(45.2)	(438.2)
	[0.96]	[0.69]	[0.95]	[1]	[0.38]	[0.60]	[0.64]	[0.96]
p-values from F-tests								
$\beta_1 + \beta_2 = 0$	0.039	0.609	0.003	0.104	0.797	0.882	0.903	0.454
$\beta_1 + \beta_2 = 2\beta_3$	0.241	0.791	0.077	0.391	0.965	0.310	0.885	0.608
$\beta_1 + \beta_2 = \beta_4 + \beta_5$	0.342	0.544	0.003	0.586	0.285	0.341	0.432	0.070
DV mean (0% individual)	3,110.1	7,547.6	628.8	1,998.0	902.5	13,545.9	106.0	1,056.1
DV mean (4% joint)	3,550.0	10,282.6	865.7	3,080.5	943.3	13,202.0	137.4	1,335.1
Observations	1,317	1,207	1,375	1,397	1,363	1,223	1,410	1,399

Notes: Robust standard errors clustered at the couple level are in parentheses. All variables denominated in Kenyan shillings are top-coded at the ninety-ninth percentile and deflated to 2009 values. In 2009, Ksh 80 ≈ US$1. The individual interest rate is renormalized to run from 0–1, while the joint interest rate is renormalized to run from 0.2–1. DV mean refers to the dependent variable mean.

IV. Conclusion

I show that large short-term incentives to save have long-run implications for the economic lives of low-income, rural Kenyans. It is not just the absolute value of the incentive that matters, but how it is delivered: incentivizing study participants to save in individually owned bank accounts increased rates of entrepreneurship and overall household income. In contrast, incentivizing participants to save jointly, or simply delivering an unconditional payment in the form of a modest cash prize, had no robustly significant impact on long-run outcomes. The magnitude of the individual interest rate's impact is quite large but given the high returns to capital in my sample, the effect sizes can be accounted for by simply assuming that people continuously reinvest a portion of the returns on a modest initial capital investment.

The main contribution of this paper is to demonstrate that temporary financial incentives to save can generate sustained behavior change and long-run growth in economic outcomes. The contrast between my results for the interest rate and the cash prize suggests that incentivizing individuals to accumulate capital on their own

can be more effective than simply giving out equivalent (modest) amounts of capital without condition.

The cash prize results also imply that the interest rates did not simply help people make a short-run push to save past a nonconvexity in the production function. Moreover, my results are inconsistent with the hypothesis that the interest rates helped respondents by exposing them to bank accounts or giving them access to credit. Rather, my results are better reconciled by behavioral channels such as priming, habit formation, and mental accounting.

It is also important to ask *what*, exactly, about the interest rate treatments stimulated behavior change, especially since other studies that consider more market-oriented ranges of interest rates (up to five percent per year), find little-to-no impact on savings behavior (Karlan and Zinman 2018; Kast, Meier, and Pomeranz 2016). There are several potential explanations for this difference. First, unlike those studies, this paper evaluates the impact of interest rates that were very large (and well above market rates) both in nominal and real terms. Thus, high-powered incentives may be needed to bring about lasting behavior change. Second, the interest rates in my experiment were time-limited. The temporary nature of the treatments may have given individuals a deadline that helped them break a cycle of savings procrastination. Third, individuals in my study were given the opportunity to open and save in multiple bank accounts. As a result, a large part of the experiment's impact on bank account use was driven by switching *between* accounts (i.e., individual versus joint). Simply subsidizing one type of account could have different psychological effects, especially if buy-in from the spouse is needed to make real change, or if individuals make different choices in private as opposed to in full view of their spouse (Ashraf 2009).

Since my experiment bundled all the features listed above, I cannot identify which features were most important for generating persistent behavior change. Further research focused on more scalable and standard short-term savings subsidy programs would help fill this evidence gap. However, the simple fact that I reject that the interest rates had no impact offers important evidence that savings behaviors can be sticky, and that activating the right set of short-run behavioral changes can have important, persistent effects on overall income and asset holdings, especially when individuals have access to high-return investment opportunities. Thus, I provide empirical evidence that individuals with high returns to capital have the capacity to improve their economic situation without sustained external assistance or a large, expensive "big push" intervention—rather, they simply need the "right push."

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