Does Time and Distance Really Matter in Banking?

Evidence from a Randomized Controlled Trial Introducing Mobile Phone Saving Deposits

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Connecting individuals to formal savings institutions through mobile phones arguably reduces prohibitive transaction costs, improving savings rates and deepening financial intermediation. We test this potential in Sri Lanka by offering randomly selected individuals a mobile-deposit service for formal savings. Using high frequency panel survey data and an individual based randomized controlled trial methodology, we find small amounts of savings are redirected to the partner institution. However, despite the 25 percent adoption rate of the free service, we find no support for the mobile-deposit service offer increasing total savings, reducing personal expenditure, or redirecting savings to the formal financial sector. Using a difference-in-difference and individual fixed effects approach with a complete year of monthly panel data prior to the rollout of the intervention, we continue to find no support for changes in formal or total savings even among *users* of the service. We additionally randomized the fee charged for the service (2%, 4%, and 8%) and find relatively low sensitivity to price, though use of the service is consistently higher when provided for free. Though adoption of the service may have been particularly low due to the controlled environment of the research design, our findings suggest that reducing transaction costs (distance and time) through mobile phones is not enough for individuals to reallocate towards a higher savings rate or substitute formal saving devices for informal devices.

I. Introduction

Access to formal savings devices not only allows households to smooth consumption and tolerate risk, but also furthers financial intermediation, an important driver of economic growth. Yet, the reach of the formal financial sector remains severely limited in many low-income countries. The recent expansion of mobile money provides a possible solution to expand the financial sector through branchless banking services. The resulting reduction in transaction costs (associated with distance and time) would arguably improve access to formal savings devices for the poor, thereby increasing total savings and redirecting savings towards the formal sector to improve financial intermediation. We test this potential through a rigorous randomized controlled trial in which we offered randomly selected individuals a mobile-deposit service allowing them to deposit local currency into a formal bank using a mobile phone. While the mobile-deposit service did redirect a small amount of savings towards the service provider, we do not find that this reduction in transaction costs increased either formal savings or total savings.

Our results are surprising as recent evidence on savings among the poor suggests that transaction costs, such as time and distance, are critical barriers to formal saving devices. Evidence of temptation to use money, either from oneself or others, suggest a safe saving device is important for efficient saving rates. Relative to informal saving devices, formal saving devices tend to offer higher interest rates at lower risks, but transaction costs and regulatory barriers have led to market failures in providing formal markets for financial services in savings (Karlan et al. 2014). As a result, many rely on informal saving devices, but such devices often lack security, privacy, and flexibility.

The expansion of mobile money provides a potential platform for saving-deposit services with greatly reduced transaction costs. From the consumer's perspective, such "branchless banking" reduces many of the costs associated with saving in the formal banking system (e.g., reduced distance and time) with the benefits of the formal banking system (e.g., return, privacy, security). Currently, mobile money usually allows consumers to save money on their phone in "airtime minutes", but regulatory barriers have prevented the expansion of branchless banking where mobile savings could be held in local currency and connected to formal financial institutions. From a broader macroeconomic perspective, increasing savings in formal financial institutions not only increases private returns to savings, but deepens financial markets. Given this added benefit of fostering economic growth via increased financial intermediation, effort has been concentrated on reducing these regulatory barriers to expand branchless banking services (Goss et al. 2011). However, this objective assumes that providing improved access to formal savings devices through mobile-deposit services will increase total savings, or at least redirect informal savings to formal financial institutions thereby deepening financial intermediation. Though there is suggestive evidence of mobile money being stored on phones, akin to savings, (Aker and Wilson 2013, Demombynes and Thegeya 2012), there has yet to be a rigorous methodology testing whether mobile money increases overall savings or can be used to redirect savings into the formal financial sector.

To directly assess this potential, we partnered with a local bank and mobile provider in Sri Lanka to introduce a mobile-deposit service which allowed consumers to make saving deposits in a formal bank account through their mobile phone. We additionally tested price elasticity for this service by randomizing the fee for the service, including a treatment arm that received the service for free, providing estimates for a completely frictionless model.

We observe 25 percent of those offered the service for free making deposits over the two year study period, a usage rate that is similar to most studies on saving interventions. In addition, the average deposited amount was relatively low even among users; LKR 1,510 LKR (USD 11.79[1]) over 16 months among those using the service for free. We find the fee did not deter deposits on average when including all users; however, when excluding the highest 1% of deposit amounts, each 2% increase in the fee reduced deposits by 21 to 54 percent.

Using detailed survey panel data on financial decisions, we find a small increase in reported savings with the partner bank, but no support for an increase in formal or total savings deposits generally. In addition to estimating the effect of the offer of the mobile-deposit service, as in most randomized controlled trials on savings, we collect one year of monthly survey data prior to the rollout of the intervention and use a difference-in-difference and individual level fixed effects approach to estimate the causal effect of the service itself on users. We again find no support of increased savings or redirecting of savings towards formal banks. This is surprising given the mobile-deposit service drastically reduced the cost of making a deposit at the bank, suggesting the following: the time and distance costs to the banks was 1) less than the cost of substitution between formal banks and informal savings (or other formal banks), and 2) low enough that individuals did not reallocate resources towards a higher savings rate.

Though adoption of new technology is generally slow, and perhaps dampened further in our setting by the controlled environment of the research design, 75 percent of those offered the free service received a free personal demonstration and 23 percent used the service themselves. Despite directly experiencing the benefits of the service, most individuals did not have high

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[1] We use the average exchange rate from February 2012 – May 2013 as reported by the Central Bank of Sri Lanka.

demand for the service. It may be the case that eventually the setting of this study experiences high adoption of branchless banking, but our results suggest that the convenience of the service alone was not enough to garner high levels of demand and increase formal savings. We find this suggestive of transaction costs related to distance and time being lower than hypothesized, particularly relative to the benefits of using informal saving devices.

Previous studies promoted the benefits from increasing proximity to banks and reducing affiliated transaction costs, but as mirrored in our findings, also cautioned against the commonly low rates of adoption in saving interventions. Non-experimental evidence on bank expansion and government postal saving bank, in India and Mexico respectively, find that the expansion resulted in lower levels of poverty (Burgess and Pande 2005, Aportela 1998). More direct studies on reducing distances through such interventions as deposit collection service (Phillipines, Ashraf et al. 2006), "bank on wheels" (Malawi, Flory 2011), and ATM cards[2] (Kenya, Schaner 2016), all find savings being redirected to the service provider, though none measure the effects on total savings. Other reductions in transaction costs, such as providing subsidizing bank account fees or implementing direct deposits, have created demand for the saving services, and in some cases, have even found evidence in support of increased total savings (Dupas and Robinson 2013, Prina 2015, Cole et al. 2011, Dupas et al. 2016, Schaner 2016). However, these interventions have also generally found use of the savings device to be quite low, even if initial adoption of the program was high. This literature suggests that by reducing transaction costs, mobile deposits has the promise of increasing savings and deepening financial markets, but also

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[2] This intervention increases ATM cards, but this is also accompanied by reducing the withdrawal fees, making it difficult to know how much of the effect they find on increased use of the product stemming from reduced distance versus reduced fees.

raises the concern that reducing such transaction costs may not be enough to garner widespread demand and redirect savings to the formal sector or increase total savings.

This paper contributes to this literature on improving access to formal savings devices by being the first to rigorously test the effectiveness of using a mobile platform to collect saving deposits. Our analysis is based on a large individual level randomized controlled trial with high-frequency panel data on savings. The significant sample size, individual unit randomization, and frequent surveying greatly improves the validity of our findings. The length of time period observed after the intervention's roll out, perfect compliance with the randomization, and low attrition provides convincing causal estimates of the mobile-deposit service on savings. In addition to the study's rigor, the design improves upon most of the literature by commenting on total savings (rather than savings in the specific product being tested) and implications on financial intermediation by measuring formal savings. The lack of effect on savings suggests that eliminating transaction costs through mobile money is not enough to increase total savings or redirect savings to improve financial intermediation.

We additionally add to the growing literature assessing mobile money's capacity to reduce market failures. Though Jack and Suri (2014) providing convincing evidence of mobile money transfers insuring against risk, we fail to find similar evidence of mobile banking increasing household savings or financial intermediation through increasing formal saving deposits.

II. Background

A Simple Framework

Individuals not only have to decide how much to save, but also on how to hold those savings. Using a simple two period framework[3], we assume individuals face a tradeoff between incurring a fixed cost, D, based on distance, to save in a formal bank or forego the higher interest, r, earned on deposits in the bank and hold cash in hand (i.e., informal saving). For any given time period (e.g., period between being paid), individuals will only incur the cost D if the interest earned on the deposit results in a higher utility:

$$U(c_1^f, c_2^f) > U(c_1^i, c_2^i)$$

where $U(c_1^i, c_2^i) = \max(c_1, c_2) \; s.t. \; W_1 = c_1 + c_2, \; U(c_1^f, c_2^f) = \max(c_1, c_2) \; s.t. \; (W_1 - D) = c_1 + \frac{c_2}{r}$, and W is wealth in the initial period, c is consumption in the current period, subscripts refer to the time period, and postscripts refer to formal or informal saving devices. [4] Figure 1 illustrates the maximization decision for an individual whose utility is higher when saving informally rather than depositing savings at the formal bank.

Wealth in the initial period is comprised of earned income and current level of stockpiled informal savings. Transferring earned income or informal savings into the formal bank account incurs the fixed cost D. Assuming homotheticity, an increase in wealth increases the likelihood of saving in the formal banking sector. This new increase in formal savings is comprised partly from current consumption (as the intertemporal rate of substitution for consumption becomes $\frac{U_1^f}{U_2^f} = r > 1 = \frac{U_t^i}{U_{t+1}^i}$, shifting consumption away from today and into tomorrow) and from informal savings holdings. Thus, informal savings serve partly as a method to stockpile wealth,

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[3] Though saving devices differ in many ways, we abstract away from other differences to highlight the benefit of reducing transaction costs based on the time and distance often associated with formal banking.
[4] For simplicity, we assume that individuals are credit constrained and cannot borrow to fund consumption in the first period.

some of which is eventually transferred to formal savings where a higher interest rate can be earned.[5]

Figure 1: Deciding Where to Save
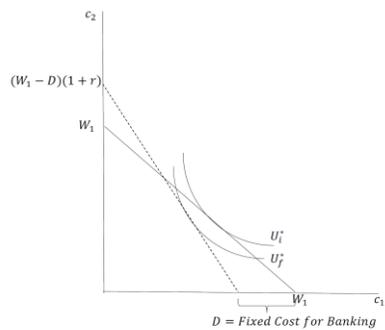
Figure 2: Reducing Distance Costs
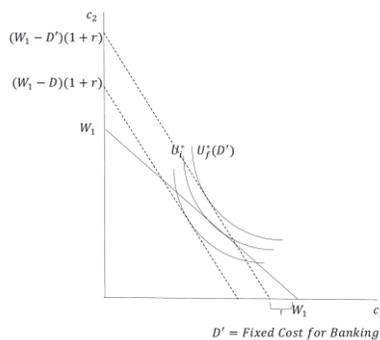
An intervention which reduces D, such as a mobile-deposit service, will shift the budget constraint associated with using the formal banking system. This shift will result in an increased likelihood of depositing savings into the bank through reducing the use of the informal savings mechanism and a shift away from current consumption, as illustrated in Figure 2.

All else equal, use of informal savings is increasing in D and decreasing in W. We should therefore expect individuals with higher D and lower W to benefit most from the intervention: those who are paid more frequently (lower W, live further away from the bank, and have greater constraints on mobility (e.g., women).

Product Description and Distribution Timeline

In 2009, we began working with a large mobile operator and a small software company in Sri Lanka to develop a savings product allowing deposits to be made directly through the mobile

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[5] Indeed, our survey data suggests 8 percent of seetu transfers (an informal saving mechanism) are deposited into the bank, and that deposits into formal institutions are larger on average than savings "retained [as] cash in hand."

network to a savings account in a large, government-owned bank. Customers could purchase mobile phone top-up scratch cards to deposit funds into a bank account that followed a procedure similar to adding minutes to their mobile phone. The user would dial a number, enter the scratch card serial number, and deposit the amount on the card into an *m-purse* account. The m-purse account is linked to a savings account, and by entering a PIN, the user can move the money from the *m-purse* to the savings account.[6] This is the first product of this type offered in Sri Lanka.

The mobile operator agreed not to market the product in the region where we were conducting the research for a period of at least one year, ensuring perfect compliance with the randomized controlled trial. This unusual degree of control over access to the product is a major advantage for estimating causal effects relative to other studies of mobile banking products. However, the product being unavailable commercially has disadvantages as well, primarily there was no advertising for the product and so treatment individuals were rightfully suspicious and lacked a community of users that may have sped up usage and learning of the mobile-deposit service. We took a series of steps to overcome the lack of advertisement and stimulate usage of the product. First, we worked with the mobile operator to inform and train customer service representatives of the product so that someone was always available at the service call center. Second, we offered participants a free basic phone and sim card. Third, we helped them open the savings account which would link to the phone, including providing 500 LKR (USD 2.86[7]) required to open a savings account at the bank. And finally, we arranged a demonstration of how to use the product, which included making two deposits of 50 LKR each. These incentives were provided to all treated individuals to help offset the product being unavailable commercially during

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[6] The PIN offers protection for the account in the event the phone is lost or stolen. It also means that other members of the household could use the phone for calls without having access to the account, a feature which may be important in some households.

[7] Using the average exchange rate in 2011 as reported by the Central Bank of Sri Lanka.

the experiment. In addition, for two months in each municipality, we encouraged use of the service by conducting a lottery among users of the service. Each deposit into the account generated one chance of winning a deposit of LKR 5,000 for the participant.

In addition to the lack of commerciality, the development and implementation of the product was subject to numerous delays. The first offer letters were delivered in December 2011, one year after our baseline survey. Demonstrations began by February 2012 in one municipality, by April 2012 for four more municipalities, and by September 2012 in the remaining municipality. Despite the delays, by September 2012, 86% had accepted the offer (i.e., received the phone and sim card), and only 3 more individuals accepted the offer after this date (in December 2012).

Sampling

To select the sample for the study, we conducted a listing exercise in August 2010 in six municipalities[8] in central Sri Lanka from which 13,435 economically active adults from 10,300 households were identified. We then narrowed this sample based on characteristics hypothesized to be correlated with demand for the mobile-deposit service: households with members paid on a daily or weekly basis (and therefore having higher value for frequent deposits) and stated willingness to have an interest-bearing savings account.

From the remaining 3,102 individuals (2,372 households), we selected a sample of 2,006 individuals from unique households. This final selection oversampled characteristics that would arguably have greater ability for adopting the savings service (those located within .5 km of the nearest mobile phone agent, used their phones to send SMS messages regularly, had previously changed a SIM card, and were under 50 years of age) or were of particular interest (female).

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[8] Kandy (KN), Katugastota (KT), Pelimathalawa (PL), Matale (MT), Kurunegala (KR), and Kegalle (KG)

Commented [u3]: I do not discuss our effects as a response to reduced enthusiasm due to delays as we find the same results for ITT effects (and fixed effects TET) when excluding Kandy and Kurunegala, where per the 3ie report were the only two places that had delays after the product had been rolled out.

To be more precise, when excluding these two towns: less balanced controlled on bank ownership, average deposit much higher among 0% (but still not statistically significant); age, muslim, education increase demand, but less significance on distance/time cost measures for the bank; ITT: slightly greater magnitudes and statistical significance on savings with partner institution, other outcomes look the same; no difference in TET estimates (diff-in-diff, FE); relatively similar results to treatment fee price sensitivity.

However, given that we select an individual from 85 percent of the households (2,006 out of 2,372), these oversampling criteria more so determined which individual in the household we selected rather than which households were selected.

The mobile-deposit service was randomly offered to 1,625 individuals of the baseline sample of 2,006 individuals. Within this treatment group, individuals were randomly assigned the price of the product: free (683 individuals), 2% fee (316 individuals), 4% fee (310 individuals), and 8% fee (316 individuals). The treatment randomization was stratified on baseline saving balances quartiles and ease of reading a text message terciles.

Data

We conducted a baseline survey shortly after the sample selection in November and December 2010. From 2011 to 2013, three detailed annual surveys were conducted each December. To more precisely estimate potential changes in cash flow, we surveyed the control sample and a random sub-sample (456 individuals) of the free mobile-deposit service treatment arm every month from January 2011 to December 2012 and in January and May of 2013. This high-frequency panel data has the advantage of increasing statistical power for detecting the causal effect of the free mobile-deposit product. The surveys collected detailed information on individual and household income sources, expenditures, and savings decisions using a monthly recall period. We continued to collect monthly financial survey data on participants after we implemented the

baseline but prior to the unforeseen delay on rolling out the service, providing one year of monthly panel data on financial behavior prior the intervention.

We also observe deposits made through the mobile-deposit service and into the partner bank account from the start of the program until May 2013. We are unable to observe account balances and withdrawals.

Study Sample and Balance

Table 1 provides summary statistics for each treatment arm and validates the randomization by testing for baseline differences of each treatment sample relative to the free mobile-deposit service treatment sample. On average, our sample completed 10 years of education, and is 41 years of age, 20 percent female, 84 percent married, 3.7 percent Muslim, 61 percent head of household, and 73 percent self-employed. We observe high penetration of mobile phones (89 percent owns a mobile phone and 93 percent reporting "excellent" cellular reception at home), with 59 percent topping up weekly and 72 percent having a top-up provider within 200 meters from their home. On average, our sample would accept 8% less today than LKR 1,500 (USD 8.80) [9] in a month (monthly discount rate) and report 5.6 on a scale from 0 to 10 increasing in willingness to take risks.

Table 1, Column 1, also highlights the relatively high level of financial access in Sri Lanka – 88 percent of the sample has a bank account and 61 percent report having "a great deal" of trust in banks and financial institutions. However, only 20 percent of the sample have visited an ATM to withdraw funds in the previous year, suggesting use of electronic bank services may be low. Despite the high number of bank accounts, utilization of the formal banking sector for savings is

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[9] All baseline amounts use December 2010 exchange rates as reported by the Central Bank of Sri Lanka.

low: 77 percent report not having saved in a bank in the previous month, only 10 percent report using a formal savings account more frequently than once a month, and 40 percent reported not using a formal savings account in the previous three months (not shown). In the previous month, average formal savings deposits were LKR 1,105 (USD 6.48) and average total savings deposits were LKR 4,062 (USD 23.81), where formal savings deposits are reported responses to being asked about "Saving in an institution such as a bank.[10] On average, traveling to the closest bank requires 16 minutes (21 minutes for a deposit) and costs 9 LKR (USD .05). We observe strong hypothetical demand for our intervention: 81.2 percent stated they would be interested in a free service that allowed for bank deposits to be made using a mobile service, and the average reported a willingness to pay for such a service was a 5% fee.

Column 2 denotes statistical differences between those who received the mobile-deposit service for free with those who did not (the control), limiting observations to those sampled to be surveyed monthly. This comparison forms the preferred sample for estimating the causal effect of the mobile-deposit service when there are no additional financial frictions leveed on the consumer. We exclude those who were surveyed annually due to potential differences reflecting the effect of being surveyed frequently rather than the mobile-deposit service itself. (Appendix Table 1 reports baseline differences among the free treatment who were surveyed annually versus more frequently, and finds the samples to be relatively balanced at baseline.) The control sample is slightly older and less Muslim, though the magnitudes of such differences is relatively small. We also observe that the willingness to pay for the mobile-deposit service and the monthly discount rate is slightly lower among the control sample. Other than these four characteristics in which we observe small

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[10] Other saving category options that comprise total saving deposit are "retain as cash in hand", "deposit in a seetu", and "savings in another form."

Commented [u4]: The 3ie report says 38 minutes?

differences in magnitude, we find the free mobile-deposit service and control group are statistically similar and relatively well balanced.

Columns 4 to 7 report means of those who were surveyed annually by their respective treatment status (i.e., fees charged for the mobile-deposit service) and statistical differences relative to those that received the mobile-deposit service for free (Column 3). These comparisons form the basis for estimating price elasticity for the mobile-deposit service. Again, we find small statistically significant differences in a few baseline demographic characteristics (married, Muslim), but overall the 2% and 4% treatment arms are statistically similar to the free treatment arm and each other. We do observe that the 8% treatment sample is statistically less likely to have a bank account and has fewer total saving deposits at baseline, a primary outcomes of interest. Though not statistically significant, the magnitude of formal saving deposit of the 8% is also half of the average formal saving deposits of the other treatment arms. This does suggests some concern in our interpretation of differences between those charged 8% relative to the other treatment arms.

III. Demand for the mobile-deposit service

In the following order of sequence, a treatment individual was offered the service at the randomly designated price (*Offer Made*), he/she decided whether or not to accept the offer (*Offer Accepted*), and conditional upon acceptance, a demonstration of how to use the service was provided in which LKR 100 was deposited in the person's account (*Demonstration Completed)*. The person could continue to make deposits on their own into their account. Table 2 provides summary statistics on each stage of the process. Because these events happen in succession, a later stage can only occur if the previous stage was completed affirmatively.

The delay in implementation resulted in offers being made over a year after the baseline survey with the first letters being sent in December 2011. We therefore observe some attrition in

these initial offers, but are still able to reach 95 percent of the free treatment sample to make the initial offer (Column 1). 88 percent of those in the free-treatment study sample accepted the offer, defined as agreeing to the service and receiving LKR 500 and a free phone. Column 2 and 3 show the 2% and 4% fee treatment samples have offer rates and take up rates that are not statistically different from the free treatment sample (or each other). However, in Column 4, we observe the 8% fee treatment sample does have a higher attrition rate, resulting in fewer offers being made and take up being lower. Given that the offer was provided by the research team/supplier(?), this is unlikely to reflect differential demand from the potential consumers.

> **Commented [KS5]:** This is correct?

The demonstration was provided to 76[11] percent of the free treatment sample. This measure does not reflect actual use of the service, but rather general acceptance of the product and undertaking barriers to learn how to use the service. The 2% and 4% treatment sample are less likely to have been provided a demonstration. This initial difference may reflect some potential clients being deterred by the fee and therefore not wanting to go through the demonstration.

The service is used at least once by 25 percent of those who received the mobile-deposit service for free (*Used Service*). Though this usage rate is far from universal, it is similar to take up rates of savings products in other studies (Karlan et al. 2014). The 2% and 4% fee treatment arms are three to five percent less likely to have used the service, though this difference is only statistically significant for the 2% fee. When observing actual amounts deposited through the service, the magnitudes of differences in deposits suggest individuals are not very price sensitive to the service at low fee services and deposits drop off only when charged the highest amount at

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[11] . The research team recorded providing demonstrations to 77% of the sample, but only 76% are observed as having made a LKR 100 deposit in the institutional dataset provided by the partner bank. Though there are these small discrepancies, the patterns between treatment samples are similar whether the research team records are used or the proxy of being observed in the institutional dataset.

8%. However, when high deposits are capped at the highest 99% of deposit values (i.e., the top 1% of deposit values are replaced with the 99th percentile of deposit amounts), we do observe the amount deposited is significantly lower when charged a fee, and the point estimates of the average amount deposited decreases consistently as the fee charged increases. These patterns are robust to limiting the observations to annual surveyed depositors (average deposits when capped are LKR 298.3 (USD 2.32) and without being capped are LKR 432.2 (USD 3.37)), but the fewer number of observations reduces the statistical power and the amounts are no longer statistically significant from the free mobile-deposit service.

The 8% fee continues to exhibit the same patterns, and results appear robust despite the higher attrition and baseline differences in savings found among this treatment sample. Relative to the free mobile-deposit service, the 8% fee treatment sample experiences fewer demonstrations, lower likelihood of using the service at least once, and less total amount deposited through the service. The reduced offer rate cannot account completely for the lower demonstration rate and usage rates relative to the free treatment arm, but can explain the differences across the different fees. The reduced amount deposited remains statistically lower even when controlling for baseline characteristics, including baseline savings. To what extent this is due to the lower initial offer rate versus the higher fee is difficult to ascertain. However, even conditional upon receiving a demonstration, the average amount deposited is still only 17 percent of the average amount deposited by those in the free mobile-deposit treatment sample, suggesting the high 8% fee did significantly reduce demand.

Unlike differences in averages, which are heavily influenced by large deposits, Figure 3 provides the cumulative distribution function of "log deposits" by fee charged *conditional on using the mobile-deposit service* to further illustrate price sensitivity for the mobile deposit service. The

CDFs suggest that individuals are responding to fee increases, with less deposits made as the fee rises. Note that this figure is shows only the intensive margin of deposits and therefore is an endogenous measure. However, the pattern is similar using the unconditional sample (and using deposit amounts), but is difficult to view as the majority did not use the service.[12] Mirroring the differences in averages, we find that when using the full samples for 0, 2%, and 4% fees, a linear regression model estimates that a two percentage point increase in the fee has an insignificant effect on the total deposit (LKR -26.43, USD -.21) and a statistically significant effect on the total deposit when the high deposits are capped (LKR -85.13**, USD -.66**). When including the 8% sample, we find whether or not the deposits are trimmed, a 2% increase in the fee results in a LKR 59 (USD .46) reduction in deposits.

In all cases, the free treatment arm does experience the highest usage rates: 5 percentage points more likely to have tried the service, and on average, deposited higher amounts. This suggests a fee did reduce demand for the mobile-deposit service and that this reduced demand was apparent early in the process of signing up for the service. However, the fee does not seem to affect those who are depositing heavily into the system, therefore obscuring this relationship when comparing only averages. The differences in deposits and consistent reduction in the amount deposited as the prices increases suggest significant magnitudes in price sensitivity most depositors, with the greatest reductions in demand among those charged an 8% fee[13].

Table 3 estimates which baseline characteristics predicted demand for the mobile-deposit service. As hypothesized, difficulty accessing banks is strongly associated with using the mobile-

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[12] If the entire sample was used for the figure, the first order stochastic dominance feature of the figure would be increased between the 0%, 2 and/or 4% fee, and 8% fee, as the number of users decreases over this range. However, the 2% fee does have fewer users than the 4% fee, so the distance between two CDFs narrow, though the 4% fee continues to be above the 2% fee sample.

[13] Baseline savings nor having a bank account at baseline predicts uptake of the mobile-deposit service, suggesting that preexisting differences is not driving differences in usage rates between the 8% fee sample and other treatment

deposit service and the amount deposited (when trimming the top 1% of deposit amounts). When including these high amount deposits, we observe a similar pattern, but the results are no longer statistically significant. Increased time to the bank is most strongly associated with trying the service, but the cost of visiting the bank is predictive of the amount deposited through the service. In general, living 2 to 5 km from the bank is where we observe highest use of the product, an increase in the likelihood of trying the service by 7 percentage points and the total amount deposited being LKR136 (USD 1.06)[14] higher. These magnitudes are quite large as the service had a 22% usage rate overall and the average amount deposited was LKR 199 (USD 1.55). Though the time and costs associated with going to the bank for a deposit are likely to be correlated, the relationships do not fade (or appear) when any distance or time variable is dropped from the regression. This suggests that the accessibility of formal banking is indeed improved upon by a mobile-deposit service.

Being female, owning a mobile phone at baseline, and being less risky is also associated with having made a deposit. Again, the 8 to 9 percentage point increase from being female and owning a phone, respectively, are high in magnitude. The greater use among females may reflect greater value for a product that is costless, can keep money away from others in the household, and does not require as much freedom of mobility. This finding also supports the estimates provided by Dupas and Robinson (2013) in which providing free formal bank accounts in Kenya increased savings among women, but not men. In our case, being female does not indicate

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arms. However, an alternative interpretation of differential attrition is also consistent with lower rates. Formal baseline savings is correlated with increased amounts deposited through the mobile-deposit service and total baseline savings is correlated with decreased amounts deposited through the mobile-deposit service, perhaps partly explaining the significant reduction in total amounts deposited among the 8% fee treatment sample.

[14] Using exchange rate average for the period deposits were collected, Feb 2012 to May 2013, as reported by the Central Bank of Sri Lanka.

greater amounts deposited through the service, but this is likely a reflection of females having lower savings amounts than men in general. Other than having owned a mobile phone at baseline, no other measures of phone-savviness predicted usage of the service. This suggests that general phone savviness or distance from top up locations did not prevent use of the service.

The greater the use of informal deposits at baseline, the lower the amount deposited through the service. When we include all deposits, formal deposits and total deposits cancel each other perfectly, suggesting that increased formal savings has no effect on deposits, but increased non-formal savings reduces the total amount deposited through the service. This suggests that those with greater utilization of informal saving devices were most unlikely to find value in the mobile-deposit service. The same pattern persists, though at lower magnitudes, for the bottom 99% of deposits.

IV. The Effect of a Free Mobile-Deposit Service

We now estimate whether the mobile-deposit service resulted in increased savings or a relocation of informal to formal savings. We estimate the causal effect of *offering* the free mobile-deposit service using the following linear regression model:

$$(1) outcomes_{it} = \alpha + \beta_1 TreatmentFree_i + Stratification_i + \epsilon_{it}$$

where *outcomes* are formal savings, total savings or personal expenditure, *TreatmentFree* is an indicator for whether the individual was assigned the free mobile-deposit service, and *Stratification* are fixed effects representing the variables upon which the randomization was stratified; *i* represents individual and *t* represents months. We limit the estimation to individuals interviewed frequently in the control group or the free mobile-deposit service offer treatment arm. We focus our comparison on the free mobile-deposit service for the following two reasons.

First, the free service offers an estimate that is not confounded by financial frictions leveed on the consumer and therefore provides an upper bound of the effect of a mobile-deposit service. Secondly, the control sample was interviewed monthly whereas the fee-treatment samples were interviewed annually. Because being surveyed at different frequencies may differentially affect responses, we focus our comparison on the control sample and the random subset of the free mobile-service deposit that were also surveyed monthly. The monthly surveys provide a high-powered estimate of a frictionless mobile-deposit service offer.

Table 4 provides the intent-to-treat estimates from Eq (1) on the causal effect of the free mobile-deposit service offer. Panel A uses each month of the project (25 survey rounds spanning January 2011 to November 2013), whereas Panel B restricts the period to months after the offer letters began being sent to participants (14 survey rounds spanning December 2011 to November 2013). Panel C further restricts the period observed to when partner institution savings and other-bank savings were separately identified and all municipalities were introduced to the product (7 survey rounds spanning September 2012 to November 2013). Finally, Panel D limits observations in Panel C to those living within two to five km from a bank, where we observed higher demand for the mobile deposit service. Column 1 estimates the effect on savings in the partner bank, Column 2 in other formal institutions, and Column 3 combines the two for the total saved in formal institutions. Column 4 estimates the treatment effect on total savings (i.e., formal institutions, seetu, cash in hand, and other), and Column 5 on total personal expenditure. Columns 6 estimates whether there were significant differences in the response to surveys as a proxy for non-response bias affecting our estimates.

In all observed periods, we fail to find support for the mobile deposit service increasing bank savings (i.e., formal savings), total savings, or personal expenditure. When asking

specifically about deposits into our partner bank, we do find a significant increase (LKR 509.9, USD 2.69) for those living between 2 and 5 km of a bank. The magnitude of this effect is relatively large, particularly given that a large majority of the sample did not use the product and total saving deposits in the baseline month averaged slightly above LKR 4,200 (USD 24.6). However, we continue to find a lack of evidence that the service affected financial decisions elsewhere – in other formal savings institutions, the total amount deposited in formal savings institutions, the total amount saved in general, and the total amount spent on personal expenditure in the month. The results suggests that though the mobile deposit service redirected savings deposits to the partner institution (for those most likely to benefit due to distance from a bank), the mobile-deposit service failed to increase total savings meaningfully and did not shift saving deposits towards the formal sector to improve financial intermediation.

Given the delayed implementation of the intervention and the high frequency panel data collected both before and after the actual implementation of the mobile-deposit service, we can use this pre-variation as a robustness check to the results found in Table 4. We can estimate a difference-in-difference model, expanded to include individual fixed effects, comparing differences by treatment status before and after December 2011 (when initial offer letters were sent) to confirm the lack of impact found on savings in Table 4.

In Table 5, we expand Eq (1) to estimate the following difference-in-difference specification:

$$(2) outcomes_{it}$$
$$= \alpha + \beta_1 TreatmentFree_i + \beta_2 Post_t + \beta_3 TreatmentFree * Post_{it}$$
$$+ Stratification_i + \epsilon_{it}$$

in which $Post_t$ is an indicator for observations December 2011 and after. Our parameter of interest is β_3, which estimates the intent to treat effect on outcome variables for those offered the mobile-deposit service during the time period after the offers were made. Given the randomization of the treatment status, we should expect that there is no effect from being offered the mobile-deposit service (relative to those who did not receive the offer) prior to the offers being made (i.e., $\beta_1 = 0$). Given the significant delay after the baseline survey, this specification has the advantage of directly controlling for differences between the baseline survey and prior to the offer letters being sent. However, we are only able to estimate the effect on total formal saving deposits, total saving deposits, and personal expenditures as we do not collect information identifying deposits into the partner institution versus non-partner institution prior to December 2011. In Table 6, we expand Eq (2) once more by including individual level fixed effects. This specification directly estimates whether treatment individuals' savings increased after the rollout of the intervention relative to their own savings mean more so than control individuals.

Similar to Table 4, we continue to find no support for increased formal saving deposits, increased saving deposits, or a change in personal expenditure in Table 5 and 6, despite the more restrictive specifications. The difference-in-difference estimates in Table 5, continue to find insignificant negative point estimates on both formal and total saving deposits. This pattern holds true for the fixed effects specification estimated in Table 6. It is not surprising that the results do not differ based on the various specifications as the treatment status was randomly assigned, but does increase confidence in our estimates given the significant delay of implementation and the possibility of different time trends by treatment status emerging during this delayed period.

Heterogeneity by Gender

Previous studies have found that reducing barriers to savings are more beneficial to females, who arguably have greater difficulty accessing formal savings accounts. We therefore estimate heterogeneous effects for females using the basic models of Eq (1), Eq (2), and Eq(3) in Table 7. Despite females' greater willingness to try the service, our results generally do not find support for evidence that females benefited from the mobile-deposit service. Panel A expands Eq (1) and does not find differential savings and expenditure behavior for females by treatment status. Panel B expands Eq (2) and uses a triple difference-in-difference (adding female) and continues to find no differential effects on formal savings deposits. However, we do observe statistically significant increases in total saving deposits and reductions in personal expenditure. These patterns are similarly found in Panel C, using Eq (3)'s fixed effects approach. However, Panel B finds that though the difference in total savings deposits between females and males offered the mobile-deposit service in the post period is less than the difference between control group females and males during the same period, females do not have significantly different saving deposits in the months following the offer based on treatment status (i.e., the coefficient on treatment*post + treatment*female*post gives the total treatment effect for females and is not significantly different from 0). Instead, this difference is driven by men having lower total saving deposits in the treatment assignment than men in the control assignment in the post period. In other words, the gender gap in saving deposits is reduced among treated individuals, but this gap reduction is driven by a reduction in men's saving deposits, not an increase in women's savings deposits.

This is less true for differences found in personal expenditure. For personal expenditure, women spent significantly less than men among the treated individuals relative to the control individuals. In this case, the difference appears less driven by treated males adjusting their

personal expenditure and the difference among treated and control females is significantly different (at the 1% level).

Effects on Users

One concern is that the mobile-deposit service did affect savings deposits, but we are unable to detect these effects because the majority of those offered the service did not use it. Thus, it may be the case that the intent to treat effects (i.e., causal effect of the offer) are insignificant, but the treatment effect on the treated (causal effect on users) is significant. Direct comparisons between users and non-users of the service are unreliable *causal* estimates due to concerns of selection bias: those that opted to use the service generally have different saving and expenditure behaviors. However, given the lack of characteristics predicting use of the service, such selection bias may not be a significant concern in this setting. Furthermore, we can use the same difference-in-difference and fixed effects strategies employed in Eq (2) and Eq (3) to directly control (and test) for differences in saving deposits and expenditure patterns in the months prior to the offer letters. Table 8 estimates Eq (1), Eq (2), and Eq (3) replacing *Treatment* with *User*, in which a *User* of the service is defined as having made at least one transaction using the mobile deposit service, excluding the demonstration. We limit observations to those who were offered the mobile deposit for free and were surveyed monthly to ensure consistency in our samples with the previous tables. However, Appendix Table 2 expands the sample to all individual who were offered the mobile deposit service, regardless of the fee paid or the frequency surveyed, and the results remain the same. In addition, because using the mobile deposit service is not randomly assigned, we also include all covariates in Table 1 to control for observable differences between users and non-users.

Panel A, the analogue of Eq (1), finds that those who used the service at least once did not differ in the savings amount they deposited in the partner institution or in other formal institutions. We also observe no difference in total or formal savings deposits or personal expenditure. This lack of finding an effect may be due to selection bias or non-response bias (Column 6).

If is the case that the type of person who used the service was less likely to save in general, then this should bias our estimates downward, preventing us from detecting the expected increase in saving deposits. However, Panel B finds that prior to the offer letter, there are no significant differences in saving deposits and personal expenditures between the eventual users and non-users. This increases our confidence that selection bias is not a driving concern in interpreting our results. Surprisingly, the coefficient of interest (*User*Post)* is not only not statistically different from zero, but the magnitudes of the point estimates are also very small. This suggests that even among users, we do not observe a significant increase in formal or total savings deposits. This is further supported by the lack of a difference in personal expenditure. Panel C finds a similar result, again suggesting that the mobile-deposit service did not increase or redirect savings deposits even among users.

Even if selection bias is not a concern, it may still be the case that non-response is driving our results. Column 6 finds that those who used the service were significantly less likely to respond to the surveys, more so during the period after offer letters were sent. However, average non-partner institution saving deposits, formal saving deposits, total saving deposits, and personal expenditure between those who did not miss any surveys with those who missed at least one survey do not differ statistically. We do observe that those who missed at least one survey have statistically significantly higher savings with the partner institution (LKR 188, USD 1.02)

at the 10% level. It may still be the case that saving deposits are higher in months when individuals do not report, but it at least does not appear that those who attrite differ from non-attriters for months their savings deposits and personal expenditure are reported. In addition, Appendix Table 2 expands the sample to include all individuals offered the mobile-deposit service, and the results are strikingly similar with smaller differences in non-response

Therefore, it does not appear that selection bias or non-response bias are driving the lack of redirected or increased saving deposits among users of the service. While it is the case that uptake of the service may have been low due to the lack of a community of users and lack of advertising, it is quite surprising that we fail to find any effects among those who used the service itself. For these individuals, they had hands on experience with the service suggesting that trust or lack of familiarity were unlikely reasons for the lack of effect. This suggests that even those who were using the service were not increasing their savings generally or redirecting savings to formal financial institutions. Of the users offered the service for free and surveyed monthly, 70% of the users made more than one deposit. However, it is the case that only 29% of users used the service 10 or more times. Though it is likely that a greater mass of users and advertising may have increased demand for the service, our results suggest that experiencing the benefit (through demonstrations and personal use at least once) was not enough to sustain high demand.

V. Price Sensitivity

Our research design permits us to test for price elasticity of the mobile-deposit service. Though we fail to find support for a free mobile-deposit service affecting saving deposits and personal expenditure, Table 2 did suggest higher fees reduced deposited amounts through the service. Therefore, we expand Eq (1) and Eq (2) to test for differences in saving deposits and

personal expenditures by fees levied on the service offer in Table 9, Panel A and B. We further use the same technique in Eq (4) to estimate whether the treatment effect on the treated led to differences in savings deposits and personal expenditures by the fees levied on service users in Table 9, Panel C. We limit our observations to those offered the service and were surveyed annually. Unlike the previous analysis that used high frequency (primarily monthly) survey data, these estimations include four observations for each individual corresponding to the annual surveys in December, two of which occurred prior to the offer letters of the mobile deposit service.

Table 9 Panel A suggests that offering higher fees, particularly 4% and 8%, for the mobile deposit service resulted in reduced saving deposits and personal expenditures. However, we fail to find support for the expected increase of deposits in the partner institution that would arguably be the causal mechanism for the reduced saving deposits elsewhere. Panel B suggests that some of the effects were present prior to the introduction of the mobile-deposit service, though the significant reduction in saving deposits by those offered a 4% fee remains robust. Panel C estimates the treatment effect on those who used the service and we no longer observe a reduction in the saving deposits among users. This suggests that the reduced saving deposits were driven by those who did not use the service. Though it may still be the case that selection bias is driving the results in Panel C, the lack of general effects of the free mobile service, including the treatment effect of the treated relative to the control group, suggest that the reduced saving deposits among those offered the service at 4% are unlikely due to the intervention.

Incentive Months: Too low power and relatively ineffective – I suggest we ignore.

VI. Conclusion

Mobile phone technology has expanded rapidly in low-income countries and has the potential to drastically reduce transaction costs and improve market failures, particularly in financial markets. However, we find that offering mobile money for saving deposits did not result in the expected increase in total savings or even savings being redirected to the formal sector to increase financial intermediation. Our findings suggests that reducing distance and time transaction costs through mobile phones had limited effect in reducing barriers to increasing total savings, and even to the extent they do divert savings to the specific providers, we find no support of increased formal savings to enhance financial intermediation. We do find that those who are most likely to use the mobile-deposit service are those with intermediate barriers to accessing banks – i.e., those who live far enough away that depositing is difficult, but still close enough that withdrawing funds at a bank is feasible. While being free did increase usage and deposits, we found overall price sensitivity to be low, partly due to low use of the mobile-deposit service generally.

We recognize that the lack of the service being commercially available may have reduced adoption of the service. We do not argue that over time mobile deposits will not become a dominant method of interacting with formal savings accounts, but in the absence of a community of users and advertising, the convenience benefits alone were not enough to encourage greater savings or to divert savings to the formal sector. This suggests that distance costs or convenience benefits are lower than expected, particularly relative to other savings methods that are currently being used. Our results suggest that the elasticity of substitution between formal and non-formal is low and despite reductions in transaction costs, other differential features between formal and informal saving devices may inhibit greater use of formal devices. For example, the cost of withdrawing funds or the liquidity of cash may continue to make informal saving devices

preferable despite a reduction in the cost of depositing savings. Our findings highlight that reducing transaction costs, with respect to distance and time, may be limited in its ability to increase access to formal banking.

Our findings are one of the first to understand the potential and limits of mobile phones in encouraging savings. The surprising results suggest that better understanding of technology adoption and substitutability of different saving mechanisms are important factors in attempting to increase savings in the formal sector.

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Figure 3: Intensive Margin of Deposits by Fee Charged

Table 1: Summary Means

	(1) Total Sample	(2) Monthly Sample Control	(3) Monthly Sample 0%	(4) Annual Sample 0%	(5) Annual Sample 2%	(6) Annual Sample 4%	(7) Annual Sample 8%
Age	40.94	41.05*	39.77	41.37	41.51	41.95	40.63
Female	0.195	0.210	0.178	0.189	0.190	0.197	0.209
Married	0.843	0.816	0.844	0.881	0.861	0.887	0.788**
Muslim	0.0374	0.0262*	0.0482	0.0529	0.0475	0.0161**	0.0348
Household Head	0.613	0.601	0.640	0.639	0.617	0.606	0.570
Self Employed	0.733	0.730	0.724	0.705	0.759	0.732	0.747
Highest Level of Education	9.917	10.08	9.978	9.833	9.665	9.926	9.930
Owns Mobile Phone	0.893	0.903	0.893	0.899	0.902	0.871	0.889
Call Quality at Home	0.934	0.919	0.943	0.938	0.953	0.935	0.918
Tops Up Weekly	0.585	0.585	0.618	0.581	0.598	0.526	0.582
Top Up Within 200m	0.724	0.748	0.726	0.687	0.741	0.694	0.730
Has Bank Account	0.877	0.866	0.886	0.894	0.883	0.887	0.848*
Used ATM (Yearly Recall)	0.196	0.186	0.191	0.225	0.180	0.190	0.215
Time to Bank	15.91	16.26	15.70	16.15	16.01	15.75	15.67
Time for Deposit	20.74	20.31	20.99	21.88	21.30	20.18	20.05
Costs for Bank Travel	9.038	9.331	9.033	8.921	10.02	7.948	8.867
Nearest Bank Btwn 2 and 5 km	0.399	0.415	0.366	0.410	0.402	0.403	0.411
Trusts Banks	0.613	0.633	0.612	0.626	0.589	0.603	0.617
Interest in Mobile Deposit Service	0.812	0.798	0.813	0.841	0.845	0.790	0.794
Willingness to Pay for Mobile Deposit Service	4.096	3.750**	4.219	4.205	4.367	3.896	4.183
Monthly Discount Rate	0.0833	0.0729**	0.0879	0.0812	0.0874	0.0745	0.0956
Self Reported Risk	5.584	5.444	5.559	5.705	5.642	5.545	5.684
Formal Savings Deposited (Monthly Recall)	1104.7	1024.8	1011.7	1373.6	1357.9	1324.7	673.3
Total Savings Deposited (Monthly Recall)	4062.2	3906.8	4309.1	4287.0	4235.8	4362.5	3263.4*
Personal Expenditure (Monthly Recall)	13006.2	12354.4	12240.4	14209.1	12310.1	15657.3	12128.2
Observations	2006	381	456	227	316	310	316

Notes:

1. For any given variable, at most 2 observations in a given category were missing a response.

2. Willingness to pay is assumed to be 0 for those not interested in the mobile-deposit service.

3. Comparisons are made to 0% treatment status of the same survey frequency: Column 2 is compared to Column 3, and Column 5 - 7 is compared to Column 4.

4. Regressions include variables upon which the random assignment were stratified and uses robust standard errors.

5. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 2: Mobile Deposit Service Adoption Statistics by Fees Charged

	(1)	(2)	(3)	(4)
Fee Offered (Randomized):	0%	2%	4%	8%
Offer Made	0.952	0.962	0.961	0.918*
Offer Accepted	0.88	0.873	0.874	0.820**
Demonstration Completed	0.758	0.668**	0.665**	0.617***
Used Service	0.247	0.193*	0.213	0.171***
Amount Deposited (Trimmed)	299.7	176.6*	139**	63.32***
Amount Deposited (Not Trimmed)	373.6	290.1	333.9	117.5***
Observations	683	316	310	316

Notes:

1. Demonstration completed indicates that the individual is observed in the partner bank's dataset as having used the service.

2. Amount Deposited Trimmed: the highest 1% of deposit amounts are replaced with the 99th percentile deposit amount.

3. Comparisons are made to 0% fee offer.

4. Regressions include variables upon which the random assignment were stratified and uses robust standard errors.

5. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 3: Predicting Use of the Mobile Deposit Service

Dependent Variable:	(1) Used Service	(2) Amount Deposited (Trimmed)	(3) Amount Deposited (Not Trimmed)
Age	-0.000163	-1.920	-6.993
	(0.893)	(0.519)	(0.341)
Female	0.0873***	-45.08	-65.47
	(0.009)	(0.478)	(0.672)
Married	-0.0312	16.68	-159.8
	(0.331)	(0.811)	(0.525)
Muslim	-0.0129	76.09	-0.0862
	(0.791)	(0.664)	(1.000)
Household Head	0.0444	20.12	35.65
	(0.129)	(0.773)	(0.753)
Self Employed	-0.0259	11.58	-69.99
	(0.299)	(0.831)	(0.625)
Highest Level of Education	0.00566	10.52	36.24*
	(0.118)	(0.129)	(0.074)
Owns Mobile Phone	0.0792**	83.77	228.6*
	(0.018)	(0.244)	(0.089)
Call Quality at Home	-0.0250	-11.55	67.22
	(0.584)	(0.921)	(0.624)
Tops Up Weekly	0.000758	-56.48	-261.6
	(0.974)	(0.376)	(0.169)
Top Up Within 200m	0.0318	31.40	22.37
	(0.171)	(0.598)	(0.862)
Has Bank Account	-0.0157	52.82	116.1
	(0.626)	(0.413)	(0.325)
Used ATM (Yearly Recall)	-0.00707	86.15	155.2
	(0.795)	(0.300)	(0.461)
Time to Bank	0.00460***	0.974	-0.439
	(0.000)	(0.731)	(0.919)
Time for Deposit	-0.0000267	0.523	1.357
	(0.974)	(0.792)	(0.685)
Costs for Bank Travel	0.000725	4.876*	7.016
	(0.378)	(0.073)	(0.136)
Nearest Bank Btwn 2 and 5 km	0.0681***	136.0**	207.0
	(0.002)	(0.017)	(0.123)
Trusts Banks	0.0278	6.293	11.27
	(0.178)	(0.903)	(0.913)
Interest in Mobile Deposit Service	0.0288	-6.588	-87.61
	(0.375)	(0.937)	(0.575)
Willingness to Pay for Mobile Deposit Service	-0.00341	3.589	39.18
	(0.348)	(0.758)	(0.238)
Monthly Discount Rate	0.123	267.6	534.8
	(0.213)	(0.323)	(0.308)

Table 3: Predicting Use of the Mobile Deposit Service (continued)

Dependent Variable:	(1) Used Service	(2) Amount Deposited (Trimmed)	(3) Amount Deposited (Not Trimmed)
Self Reported Risk	-0.00665*	-1.858	-1.740
	(0.083)	(0.821)	(0.870)
Formal Savings Deposited (Monthly Recall)	0.00000195	0.00919*	0.0138*
	(0.408)	(0.055)	(0.098)
Total Savings Deposited (Monthly Recall)	-0.00000156	-0.00767**	-0.0137**
	(0.269)	(0.012)	(0.026)
Personal Expenditure (Monthly Recall)	0.000000641	-0.000522	-0.000564
	(0.300)	(0.467)	(0.759)
Treatment: 2%	-0.0552**	-129.5*	-81.92
	(0.047)	(0.060)	(0.557)
Treatment: 4%	-0.0325	-149.5**	-13.41
	(0.253)	(0.023)	(0.953)
Treatment: 8%	-0.0824***	-242.1***	-279.7***
	(0.002)	(0.000)	(0.006)
Constant	0.0368	6.870	-37.10
	(0.696)	(0.976)	(0.933)
Observations	1613	1613	1613

Notes:

1. Amount Deposited Trimmed: the highest 1% of deposit amounts are replaced with the 99th percentile deposit amount.

2. Comparisons are made to 0% fee offer.

3. Regressions use robust standard errors.

4. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 4: Monthly Intent to Treat Effects (ITT) for Free Mobile Deposit Service

Dependent Variable	(1) Ceylon Savings	(2) Non-Ceylon Savings	(3) Bank Savings	(4) Total Savings	(5) Personal Expenditure	(6) Non-Response
Panel A: All Months						
Free Mobile Deposit Service			-553.0	-746.7	582.5	0.0168
			(0.436)	(0.564)	(0.546)	(0.235)
Observations			19313	19313	19313	20925
Panel B: December 2011 - November 2013						
Free Mobile Deposit Service			-700.1	-1456.7	570.2	0.0175
			(0.438)	(0.361)	(0.650)	(0.282)
Observations			12241	12241	12241	13392
Panel C: September 2012 - November 2013						
Free Mobile Deposit Service	122.3	-1416.0	-1293.6	-3861.0	1321.8	0.00729
	(0.191)	(0.132)	(0.172)	(0.150)	(0.368)	(0.664)
Observations	5384	5384	5384	5384	5384	5859
Panel D: September 2012 - November 2013 (2 to 5km)						
Free Mobile Deposit Service	509.9***	-1700.5	-1190.6	-1376.7	4739.0	0.0224
	(0.003)	(0.377)	(0.539)	(0.575)	(0.211)	(0.432)
Observations	2067	2067	2067	2067	2067	2275

Notes:

1. Sample conditional upon being selected to be surveyed monthly.

2. Regressions include variables upon which the random assignment were stratified and standard errors clustered at the individual.

3. p-values in parantheses

4. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 5: Difference-in-Difference Estimates (ITT) for Free Mobile Deposit Service

Dependent Variable	(1) Bank Savings	(2) Total Savings	(3) Personal Expenditure	(4) Non-Response
Panel A: All Months				
Free Mobile Deposit Service	-257.7	473.5	536.2	0.0138
	(0.615)	(0.638)	(0.516)	(0.236)
Post (Indicator for Dec 2011 and after)	923.6	2362.5**	1663.8**	0.0288***
	(0.193)	(0.046)	(0.035)	(0.000)
Free Mobile Deposit Service*Post	**-448.5**	**-1927.7**	**31.13**	**0.00373**
	(0.550)	**(0.126)**	**(0.980)**	**(0.748)**
Observations	20150	20150	20150	21762
Panel B: All Months (2 - 5 km)				
Free Mobile Deposit Service	1198.6	1511.8	2859.6**	0.0240
	(0.277)	(0.326)	(0.037)	(0.206)
Post (Indicator for Dec 2011 and after)	1686.2	2004.0*	3848.2***	0.0357***
	(0.248)	(0.092)	(0.007)	(0.010)
Free Mobile Deposit Service*Post	**-1278.3**	**-1454.6**	**-1041.1**	**0.0133**
	(0.405)	**(0.291)**	**(0.657)**	**(0.479)**
Observations	7753	7753	7753	8450

Notes:

1. Sample conditional upon being selected to be surveyed monthly.

2. Regressions include variables upon which the random assignment were stratified and standard errors clustered at the individual.

3. p-values in parantheses

4. * p<0.1, ** p<0.05, *** p<0.01

Table 6: Fixed Effect Estimates (ITT) for Free Mobile Deposit Service

Dependent Variable	(1) Bank Savings	(2) Total Savings	(3) Personal Expenditure
Panel A: All Months			
Post (Indicator for Dec 2011 and after)	1013.5***	2473.3**	1804.6**
	(0.007)	(0.023)	(0.013)
Free Mobile Deposit Service*Post	-520.9	-1923.8	-157.0
	(0.294)	(0.154)	(0.873)
Observations	20150	20150	20150
Panel B: All Months (2 - 5 km)			
Post (Indicator for Dec 2011 and after)	1700.4***	1995.9***	3928.6***
	(0.001)	(0.001)	(0.005)
Free Mobile Deposit Service*Post	-1358.4	-1439.3	-1290.2
	(0.163)	(0.186)	(0.534)
Observations	7753	7753	7753

Notes:

1. Sample conditional upon being selected to be surveyed monthly.

2. Robust standard errors.

3. All regressions include individual fixed effects.

4. p-values in parantheses

5. * p<0.1, ** p<0.05, *** p<0.01

Table 7: Heterogeneous Estimates (ITT) by Gender

Dependent Variable	(1) Ceylon Savings	(2) Non-Ceylon Savings	(3) Bank Savings	(4) Total Savings	(5) Personal Expenditure	(6) Non-Response
Panel A: ITT (December 2011 - November 2013)						
Free Mobile Deposit Service	36.47	-1701.3	-1032.8	-2234.3	725.8	0.0175
	(0.694)	(0.162)	(0.369)	(0.270)	(0.622)	(0.337)
Female	-133.8	-1548.3	-1705.6	-5082.1**	-2871.5*	-0.00917
	(0.220)	(0.204)	(0.122)	(0.015)	(0.066)	(0.750)
Free Mobile Deposit Service*Female	456.6	1305.3	1538.4	3392.3	-1398.0	-0.00116
	(0.156)	(0.351)	(0.250)	(0.144)	(0.498)	(0.978)
Observations (Individuals)	5384	5384	12241	12241	12241	13392
Panel B: Difference-in-Difference by Gender						
Free Mobile Deposit Service			-388.9	332.5	-83.48	0.0171
			(0.541)	(0.787)	(0.931)	(0.196)
Female			-1026.2*	-2731.0***	-5130.4***	-0.00683
			(0.061)	(0.006)	(0.000)	(0.713)
Free Mobile Deposit Service*Female			553.9	327.2	2559.3	-0.0198
			(0.450)	(0.817)	(0.121)	(0.470)
Post (Indicator for Dec 2011 and after)			1072.4	2859.6*	1175.7	0.0293***
			(0.232)	(0.056)	(0.221)	(0.001)
Free Mobile Deposit Service*Post			-643.0	-2557.5	835.8	0.000489
			(0.496)	(0.106)	(0.576)	(0.970)
Female*Post			-697.0	-2332.8	2313.1	-0.00209
			(0.460)	(0.137)	(0.101)	(0.919)
Free Mobile Deposit Service*Female*Post			943.2	3033.8*	-4111.5**	0.0178
			(0.379)	(0.078)	(0.036)	(0.535)
Observations			20150	20150	20150	21762
Panel C: Individual Fixed Effects						
Post (Indicator for Dec 2011 and after)			1179.7**	2998.8**	1334.5	0.0293***
			(0.012)	(0.030)	(0.131)	(0.000)
Free Mobile Deposit Service*Post			-738.2	-2564.3	624.1	0.000489
			(0.227)	(0.127)	(0.597)	(0.931)
Female*Post			-787.9	-2492.7*	2229.3*	-0.00209
			(0.167)	(0.083)	(0.088)	(0.798)
Free Mobile Deposit Service*Female*Post			1070.1	3126.1*	-3944.0**	0.0178
			(0.140)	(0.075)	(0.023)	(0.100)
Observations			20150	20150	20150	21762

Notes:

1. Sample conditional upon being selected to be surveyed monthly.

2. Panel A and Panel B: Regressions include variables upon which the random assignment were stratified and standard errors clustered at the individual.

3. Panel C: Regressions include individual fixed effects with robust standard errors.

4. p-values in parantheses

5. * p<0.1, ** p<0.05, *** p<0.01

Table 8: Monthly Treatment Effects on the Treated (TET) for Free Mobile Deposit Service

Dependent Variable	(1) Ceylon Savings	(2) Non-Ceylon Savings	(3) Bank Savings	(4) Total Savings	(5) Personal Expenditure	(6) Non-Response
Panel A: December 2011 - November 2013						
Used Service	99.11	-189.0	-681.5	-1302.2	2011.5	-0.125***
	(0.653)	(0.587)	(0.435)	(0.292)	(0.431)	(0.000)
Observations	2905	2905	6576	6576	6576	7248
Panel B: Difference in Difference						
Used Service			-311.8	-1264.5	1411.3	-0.0770***
			(0.686)	(0.259)	(0.333)	(0.000)
Post (Indicator for Dec 2011 and after)			578.9**	545.3	1577.4	0.0450***
			(0.019)	(0.244)	(0.116)	(0.000)
Used Service * Post			-319.7	3.116	516.2	-0.0472***
			(0.665)	(0.997)	(0.846)	(0.000)
Observations			10836	10836	10836	11778
Panel C: Individual Fixed Effects						
Post (Indicator for Dec 2011 and after)			581.6	528.2	1468.4***	0.0450***
			(0.135)	(0.618)	(0.005)	(0.000)
Used Service * Post			-327.6	47.27	606.1	-0.0472***
			(0.635)	(0.971)	(0.768)	(0.000)
Observations			10836	10836	10836	11778

Notes:

1. Used Service is an indicator that the individual used the mobile-deposit service at least once after the demonstration.

2. Column (1) and Column (2) include only observations from September 2012 to November 2013.

3. Sample conditional upon being selected to be surveyed monthly and offered the mobile-deposit service at 0% fee.

4. Panel A and Panel B: Regressions includes all baseline characteristics listed in Table 1 and standard errors clustered at the individual.

5. Panel C: Regressions include individual fixed effects with robust standard errors.

6. p-values in parantheses

7. * p<0.1, ** p<0.05, *** p<0.01

Table 9: Price Sensitivity to Fees Offered

Dependent Variable	(1) Ceylon Savings	(2) Non-Ceylon Savings	(3) Bank Savings	(4) Total Savings	(5) Personal Expenditure	(6) Non-Response
Panel A: Intent to Treat (ITT), December 2011 - November 2013						
2% Fee Offer	111.4	-1285.3	-1173.9	-1536.4	-2325.9**	0.0187
	(0.780)	(0.280)	(0.381)	(0.371)	(0.037)	(0.306)
4% Fee Offer	-266.8	-2336.1**	-2602.9**	-3663.0**	-2450.9*	0.0330*
	(0.229)	(0.033)	(0.021)	(0.013)	(0.065)	(0.083)
8% Fee Offer	138.7	-2089.1*	-1950.4*	-2814.6*	-2228.2**	0.0565***
	(0.647)	(0.053)	(0.084)	(0.054)	(0.049)	(0.005)
Observations	2149	2149	2149	2149	2149	2336
Panel B: Difference in Difference (ITT)						
2% * Post			-1044.2	-1325.2	-2161.8	0.0126
			(0.457)	(0.445)	(0.189)	(0.460)
4% * Post			-2321.9**	-4982.9**	-2467.2	0.0165
			(0.049)	(0.014)	(0.199)	(0.357)
8% * Post			-1161.5	-1906.3	587.4	0.0347*
			(0.326)	(0.190)	(0.685)	(0.059)
Observations			4405	4405	4405	4672
Panel C: Treatment Effect on the Treated (TET)						
Used Service * Post			-1267.2	-2242.6	-104.0	-0.0385*
			(0.487)	(0.298)	(0.972)	(0.072)
2%*Used Service*Post			1634.8	3380.0	-918.6	-0.00294
			(0.543)	(0.310)	(0.803)	(0.912)
4%*Used Service*Post			1125.8	3975.3	-2024.1	-0.0285
			(0.547)	(0.176)	(0.658)	(0.300)
8%*Used Service*Post			897.5	-12.37	-854.6	-0.00439
			(0.629)	(0.996)	(0.808)	(0.909)
Observations			4369	4369	4369	4636

Notes:

1. Used Service is an indicator that the individual used the mobile-deposit service at least once after the demonstration.

2. Column (1) and Column (2) include only observations from September 2012 to November 2013.

3. Panel A includes only observations after December 2011, when the initial offer letters were implemented.

4. Sample conditional upon being surveyed annually.

5. Panel A and Panel B: Regressions include variables upon which the random assignment were stratified and standard errors clustered at the individual.

6. Panel C: Regressions includes all baseline characteristics listed in Table 1 and standard errors clustered at the individual.

7. p-values in parantheses

8. * p<0.1, ** p<0.05, *** p<0.01

Appendix Table 1: Summary Means by Survey Type for Free Mobile Deposit Service

	(1)	(2)
	Monthly Sample	Annual Sample
Age	39.77*	41.37
Female	0.178	0.189
Married	0.844	0.881
Muslim	0.0482	0.0529
Household Head	0.640	0.639
Self Employed	0.724	0.705
Highest Level of Education	9.978	9.833
Owns Mobile Phone	0.893	0.899
Call Quality at Home	0.943	0.938
Tops Up Weekly	0.618	0.581
Top Up Within 200m	0.726	0.687
Has Bank Account	0.886	0.894
Used ATM (Yearly Recall)	0.191	0.225
Time to Bank	15.70	16.15
Time for Deposit	20.99	21.88
Costs for Bank Travel	9.033	8.921
Nearest Bank Btwn 2 and 5 km	0.366	0.410
Trusts Banks	0.612	0.626
Interest in Mobile Deposit Service	0.813	0.841
Willingness to Pay for Mobile Deposit Serice	4.219	4.205
Monthly Discount Rate	0.0879	0.0812
Self Reported Risk	5.559	5.705
Formal Savings Deposited (Monthly Recall)	1011.7	1373.6
Total Savings Deposited (Monthly Recall)	4309.1	4287.0
Personal Expenditure (Monthly Recall)	12240.4*	14209.1
Observations	456	227

Notes:

1. For any given variable, at most 2 observations in a given category were missing a response.

2. Willingness to pay is assumed to be 0 for those not interested in the mobile-deposit service.

3. Regressions include variables upon which the random assignment were stratified and uses robust standard errors.

4. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Appendix Table 2: Monthly Treatment Effects on the Treated (TET) Using Full Treatment Sample

Dependent Variable	(1) Ceylon Savings	(2) Non-Ceylon Savings	(3) Bank Savings	(4) Total Savings	(5) Personal Expenditure	(6) Non-Response
Panel A: December 2011 - November 2013						
Used Service	70.64	-739.0	-752.2	-1882.2*	1175.6	0.0567**
	(0.501)	(0.147)	(0.315)	(0.094)	(0.548)	(0.021)
Observations	7499	7499	14338	14338	14338	31888
Panel B: Difference in Difference						
Used Service			-293.3	-1024.0	1004.2	0.0669***
			(0.492)	(0.128)	(0.338)	(0.003)
Post (Indicator for Dec 2011 and after)			852.2**	1649.1***	1515.4***	0.0601***
			(0.019)	(0.007)	(0.004)	(0.000)
Used Service * Post			-443.0	-765.6	173.1	-0.0101**
			(0.500)	(0.410)	(0.931)	(0.014)
Observations			24461	24461	24461	51818
Panel C: Individual Fixed Effects						
Post (Indicator for Dec 2011 and after)			862.8***	1717.2***	1507.4***	0.0601***
			(0.000)	(0.008)	(0.000)	(0.000)
Used Service * Post			-475.4	-874.9	-89.88	-0.0101
			(0.352)	(0.315)	(0.955)	(0.178)
Observations			24461	24461	24461	51818

Notes:

1. Used Service is an indicator that the individual used the mobile-deposit service at least once after the demonstration.

2. Column (1) and Column (2) include only observations from September 2012 to November 2013.

3. Sample conditional upon being selected to be offered the mobile deposit service, regardless of fee offered or frequency of surveys.

4. Panel A and Panel B: Regressions includes all baseline characteristics listed in Table 1 and standard errors clustered at the individual.

5. Panel C: Regressions include individual fixed effects with robust standard errors.

6. p-values in parantheses

7. * $p<0.1$, ** $p<0.05$, *** $p<0.01$