Resisting social pressure in the household using mobile money: Experimental evidence on microenterprise investment in Uganda

Emma Riley*

October 19, 2020

Job Market Paper

Latest Version Here

Abstract

I examine whether changing the form that a microfinance loan is disbursed in, from cash to directly onto a digital account, enables female microfinance borrowers to grow their businesses. Using a field experiment of 3,000 female borrowers in Uganda, I compare disbursement of a loan as cash to disbursement of a loan onto a mobile money account. After 8 months, women who received their microfinance loan on the mobile money account had 11% higher levels of business capital and 15% higher business profits compared to a control group who received their loan as cash. Total household income and consumption were also higher. Impacts were greatest for women who experienced pressure to share money with others in the household at baseline, suggesting that providing the loan in a digital account gives women more control over how the loan is used, to the benefit of both their business and household. This suggests that widespread mobile money services can be utilised to improve the performance of female-owned enterprises.

*Department of Economics, Manor Road Building, Oxford OX1 3UQ, UK. (email: emma.riley@economics.ox.ac.uk). I would like to thank my supervisors, Climent Quintana-Domeque and Stefan Dercon for their feedback, advice and support. I would like the thank Mahreen Mahmud and Richard Sedlmayr for their comments and suggestions. I would like to thank my field manager and enumerator team at BRAC for all their hard work on this project. I thank an anonymous donor for generous financial support of this research. The trial is registered at https://www.socialscienceregistry.org/trials/1836 and the pre-analysis plan was uploaded there on 11th December 2017 before endline data collection had finished and analysis began. An amendment to the pre-analysis plan documenting further intermediate outcomes based on admin data was lodged on the 31st July 2018. All analysis in this paper follows these pre-analysis plans unless clearly stated otherwise. Ethical approval was obtained from Oxford University on the 23rd November 2016 with reference ECONCIA16-17-006.

1 Introduction

76% of workers in developing countries are self-employed, but their businesses often remain small and provide little income (International Labour Organisation, 2020). Microfinance was championed as the solution to this by enabling lending to the poor. As such, credit constraints would be overcome and small enterprise owners would be able to expand and increase their business profits, thus generating increased income and so raising them out of poverty. Indeed, microfinance has proved to be extremely popular across developing countries, with an estimated 140 million clients worldwide, 80% of whom are women, and client growth of 10% a year in 2019 (Convergences, 2019). In some markets, over 10% of the population have a microfinance loan and the value of loans to GDP reaches 13% (Buera et al., 2020).

This strong growth in borrowers is despite evidence showing that the introduction of microfinance did not led to improvements on average in business profits, or wider improvements in household outcomes (Banerjee et al., 2015). In addition, grants given to business owners seem to lead to increases in profit for male-owned businesses but the picture is more complex for female owned businesses (De Mel et al., 2008, 2009). Given the important of businesses income for households in developing countries, it is essential to understand how to enable their growth.

One possible reason for the lack of female enterprise growth in response to business loans or grants is family sharing pressure. Experimental evidence has suggested intra-household dynamics as a key constraint to female enterprise growth, with family diverting funds away from the woman's business and the woman underinvesting as a result (Jakiela and Ozier, 2016, Squires, 2018). In circumstances where women are not subject to family sharing pressure, either because they can hide money or they own the only household business, women are able to expand their businesses in response to grants and loans (Bernhardt et al., 2019, Fiala, 2017). This suggests that finding ways to help female entrepreneurs overcome intra-household sharing norms could improve their business performance.

Sharing norms have been shown to be different for cash on one's person versus money kept in other forms (Anderson and Baland, 2002, Platteau, 2000). Changing the form that a loan is given in, from cash with its associated sharing pressure, to a private, digital form, may therefore by-pass social norms around sharing the loan when it is kept as cash. I examine whether changing the form that microfinance loans are disbursed in, from cash to a private mobile money account, changes how that loan is allocated towards the woman's business investment. I test whether sharing norms are the channel by which changes in the form of a loan influences its use, as opposed to alternative channels such as self-control or saving constraints.

To do this, I use a Randomised Controlled Trial of 3,000 female existing micro-enterprise owners in Kampala, Uganda. Clients of the microfinance NGO BRAC Uganda[1] who applied for a new loan for their business were individually randomised into two treatments or a control group of 1000 women each. In the Mobile Account treatment, a mobile money account labelled as for the woman's business was provided to the woman[2], but the microfinance loan was disbursed as cash. In the Mobile Disbursement treatment, the same business-labelled mobile money account was provided to the woman, but the microfinance loan was disbursed directly onto the mobile money account rather than disbursed as cash. A control group continued to receive their microfinance loan as cash and were not given a new mobile money account.

I find that 8 months after disbursing the microfinance loan, the Mobile Disbursement treatment leads to a 15% increase in business profits and an 11% increase in the value of business capital compared to the Control group. These findings are robust to multiple testing corrections and alternative specifications. I do not see any change in the business profit or level of capital in the control group between baseline and endline, matching the findings of other studies of microfinance loans (Banerjee et al., 2015). In fact, the control group primarily spend the loan on buying household assets rather than investing in their businesses. I do not find any effects from the Mobile Account treatment, the loan must be deposited onto the mobile money account for their to be beneficial impacts.

I use transaction records provided by the mobile money operator to gain an in-depth picture of how the accounts were used. I see those assigned to the Mobile Disbursement treatment hold significant balances on the account: on average, those who received their loan on the mobile money account hold 343,000 USH ($80) on the account, approximately 25% of the loan value, on the account during the first 7 days of account ownership[3]. They hold 165,000 UGX during the first 30 days after loan disbursement, 34% of their baseline value of total savings. The Mobile Disbursement group drawn the loan down over a 6 month period by making multiple withdrawals, using the mobile money account as a way to safely store the loan and draw on it as needed. Neither the Mobile Disbursement nor Mobile Account group used the accounts for regular deposits of their own money: only 13% of either treatment group ever make a single deposit of their own onto the account,

[1]BRAC is one of the largest NGOs in the world and the largest microfinance provider in Uganda

[2]Note that 97% reported having used mobile money before, so these treatments principally look at the impact of designating a mobile money account for business use rather than studying any impacts of the initial take-up of mobile money.

[3]I exclude the day of loan disbursement from this. Therefore if someone assigned to the Mobile Disbursement treatment withdrew the entire loan on the first day, their average balance over 7 days would be zero.

and these are for very small amounts (median 20,000 USH ($5.33))[4]. This fits with other research studies that have found that just depositing money into an account does not necessarily cause people to make deposits themselves (Field et al., 2020, Somville and Vandewalle, 2018).

I examine the potential mechanisms by which the Mobile Disbursement treatment had an impact on the women's businesses by looking at whether the treatment targeted primarily self-control difficulties, helped women to resist family pressure to share money or just provided a safe place to store money. I find that those who experienced most pressure at baseline to share money with family experience the largest treatment impacts on their businesses from having their loan disbursed on a mobile money account: this group see a 25% increase in business profits from receiving their loan on a mobile money account and a 24% increase in business capital, compared to the control. I validate this by examining expenditure patterns, and see less of the loan going to the family, and fewer transfers to the spouse, of women assigned to the Mobile Disbursement treatment compared to those who got their loan as cash. I do not see heterogeneous impacts of either treatment by an index of self-control difficulty or evidence that the women were saving constrained. This suggests the Mobile Disbursement treatment worked primarily by providing a way to keep the loan separated from family sharing pressure, so that it could be used for reinvestment into the businesses when needed.

I break down how the Mobile Disbursement Treatment is changing business investment, and hence profits, by examining changes to the capital structure of the business. The women primarily own inventory intensive businesses such as fruit stands, small shops and clothes re-sale. I see that the Mobile Disbursement Treatment is primarily working through increasing inventories further and adding more diverse, low value assets. I do not see any changes in the type of business, or evidence of purchases of assets that are of a significantly higher value than those previously used in the business.

The lack of impact of the Mobile Account treatment also opens the question of why this group didn't simply imitate the Mobile Disbursement group and deposit the entire loan directly onto the mobile money account they received at disbursement[5]. I might expect to find some women begin to do this over time if they observed other women receiving their loan this way. However I do not see this occurring. I also do not see women in the Mobile Disbursement group depositing subsequent loans onto the mobile money account,

[4]Mobile money accounts have been shown to to be an effective way to save for business expenditures, school fees, health expenses, agricultural inputs and unexpected shocks (Bastian et al., 2018, Batista and Vicente, 2020, Blumenstock et al., 2018, Dizon, 2017, Habyarimana and Jack, 2018, Lipscomb and Schechter, 2018). My paper differs from the majority of these by looking at unincentivised saving in a mobile money account, and in an urban context with many other ways to save.

[5]Other studies have found similar differences depending on the form capital is initially given in, particularly for women, with Fafchamps et al. (2014) finding that giving capital in-kind has a large impact on women's businesses than giving the equivalent amount as cash, even though women could easily convert the cash into the in-kind asset by themselves

suggesting needing to learn about the benefits of keeping the loan on a mobile money account cannot explain the lack of deposit by the Mobile Account group. I argue instead that this is due to the power of default effects, combined with procrastination and small-time costs of depositing yourself, effects that have been shown to be powerful drivers of saving behaviour in other studies (Blumenstock et al., 2018, Bruhn and Mckenzie, 2018, Brune et al., 2017, Somville and Vandewalle, 2018).

I examine many alternative hypothesis to explain the impact of the Mobile Disbursement treatment, but I do not find compelling evidence for any of these potential explanations. Firstly, I look at whether the increase in profits is just a redistribution of income within the household, with other household businesses losing out (Bernhardt et al., 2019). Secondly, I look at backlash effects and women's empowerment. Thirdly, I look at whether the mobile money account, which is designed for sending money, changes remittances flows. Fourthly, I examine experimenter demand effects and whether the Mobile Disbursement treatment led to misreporting of business outcomes. Fifthly, I look at measurement error and whether the Mobile Disbursement treatment increased the accuracy of business accounts. Sixthly I look at social network changes and whether the women saw a reduction in risk sharing as a result of the treatments. Lastly, I look at changes in repayment and default using the microfinance institution's admin data.

This paper contributes to the literature in three areas: how to improve the return of microfinance loans by digitising the loans; hiding of money and inefficiency within the household; and default effects in payment and saving mechanisms.

Firstly, to my knowledge, this is the first experiment looking at the impact of integrating a digital financial instrument into a microfinance loan product. The microfinance literature has found little growth on average in enterprises after receiving loans (Banerjee et al., 2015), and found that when cash grants are given to female-owned enterprises little growth in profits results (De Mel et al., 2008, 2009). However, more recent studies have found that grants and loans for female-owned businesses can lead to increases in profits in certain circumstances: if women are able to hide money from their spouse, or live in households with no other members who have businesses (Bernhardt et al., 2019, Fiala, 2017). Additionally, when grants are given in-kind, women are able to increase the size and profitability of their businesses (Fafchamps et al., 2014). This suggests that providing loans or grants to women in a manner that's harder for other household members to secure allows the money to be used for the woman's business and hence leads to investment and profit growth. This paper expands this literature by showing that if female entrepreneurs are given their loan in a digital form that keeps it separate and specified for their business, and so not subject to the same sharing norms as cash, they are able to invest more of the loan into their business, particularly as stock, and experience high returns on their business investment. I therefore show that harnessing the growth and

widespread availability of digital technologies can make microfinance loan products better meet women's needs.

Secondly, this paper also adds to the literature on hiding and inefficiency within the household by showing high rates of hiding of money by the woman[6], and that the household, as well as the woman, is better off as a whole when the woman can better control the microfinance loan. I find over 50% of women are willing to give up $8 for the spouse in order to control $2 themselves, similarly high rates of hiding to those found in other field and experimental settings (Almås et al., 2018, Ashraf, 2009, Boltz et al., 2019, Castilla, 2018, 2019, Fiala, 2017, Jakiela and Ozier, 2016). This level of hiding contradicts models of efficiency within the household and supports those showing inefficiency (Attanasio and Lechene, 2014, Bobonis, 2009, Duflo and Udry, 2004, LaFave and Thomas, 2016, Mani, 2020, Udry, 1996). Similarly I find evidence of women employing costly ways to spend the loan themselves rather than hold cash and feel pressured to give it to others. I see that the control group spends much of the loan on household durable goods, and in focus groups women described struggling to hold the loan as cash for their businesses due to requests for money from their spouse, and so preferring to spend it on something they valued. This matches findings from other contexts, where women have been shown to prefer to take loans even when they have savings, in order to make their family think they do not have much money and so reduce sharing pressure (Baland et al., 2011), and women use strategies to try to retain control over their money and reduce spousal access to it, even to their detriment (Schaner, 2015). Reducing the need for women to rely on these costly hiding strategies improves outcomes for the household as a whole. I also contribute to the literature on women's empowerment by showing that giving women more control over their money benefits women by moving outcomes towards their preferences and raising their decision making power (Aker et al., 2016, Ashraf et al., 2010, Field et al., 2020)

Lastly, my paper is the first to show that the default (status-quo) choice matters in a business investment context: even small costs of switching combined with procrastination prevent the Mobile Account treatment group from imitating the Mobile Disbursement group by depositing the loan onto the mobile money account provided to them and so reaping the benefits of keeping the loan protected from sharing pressures. The default position for the Mobile Disbursement group of keeping the loan on the mobile money account has large impacts by ensuring left-over funds remain on the account and reducing the trickle of money from the account into other people's hands. A growing literature in developing countries has shown that defaulting savings into saving devices results in higher savings (Blumenstock et al., 2018, Brune et al., 2018, 2016, 2017, Somville and Vandewalle, 2018) and higher control of the money for women (Field et al., 2020). My research suggests that formal bank accounts or saving devices with restrictive commitment

[6]and that willingness to hide money is an important predictor of heterogeneous treatment effects

features aren't needed to help women save and invest their microfinance loan in a way that's aligned with their needs. Instead the default position just needs to be that the loan is kept in a non-cash form until needed for business investment.

The rest of this paper is organised as follows: Section 2 contains the theoretical framework. Section 3 discusses the interventions and experiment design. Section 4 goes over the data used in this study. Section 5 contains the empirical specification and the results. Section 6 discusses mechanisms, section 7 looks into why the Mobile Account group didn't deposit their loan themselves onto the mobile money account I provided, and section 8 alternative explanations for my results. Section 9 concludes.

2 Theoretical framework

I develop a simple model of how the intervention might impact a woman's investment behaviour in her business to allow me to make predictions about the impact of the interventions. The model is premised on the idea of a working capital type business model, where new stock is bought for the business and sold each period. In the next period, new stock must be purchased using savings carried over from the previous period.

As discussed in the Data section, the vast majority of the businesses in my sample are inventory focused, such as clothes resale, small general stores or fruit and vegetable sellers.[7] Additionally, during my focus group discussions, the women frequently discussed the difficulty of maintaining enough saving to repurchase stock for their business, with stock-outs common. Purchases from wholesalers cannot be made in a piecemeal fashion, but must be combined together to purchase in bulk every few periods depending on the business and the perishability of the stock. Women also seemed risk averse to purchasing too much stock at once, concerned they could end up with goods they are unable to sell. It is therefore likely they under-stock and purchase smaller amounts from wholesalers more frequently than might be optimal, although I am unable to confirm this from my data. In particular, women said they would rarely use the entire loan at once to purchase stock, but instead preferred to use some of loan to purchase a smaller quantity of stock, see how it sold and then purchase more if necessary. They try to make the loan last a few months of stock purchases. In my model, I try to replicate this observed behaviour.

I develop a simple, two-period model in which a woman receives a loan and chooses between consumption and investment. Time is indexed by t=1,2. At the end of period 0, the woman receives a loan $A > 0$. I assume there is no other source of wealth apart from the loan, and no other source of income apart from business profits. In period one, the woman invests k_1 in her business resulting in profit $f(k_1)$, where $f()$ is an increasing

[7]Even for those that own fixed assets, the average value of an asset is only 100,000UGX ($20), and the most frequently owned assets are cooking pans and pots and tables and chairs.

and concave function. From the profit and any portion of the loan not invested in the business, she can consume (c_1) and saves s for period two.

In period two she can invest in her business only what she saved from period one, giving her profit $f(k_2)$. She must also repay the loan with interest, $(1+r)A$. The remainder is her period two consumption c_2. However, her cash savings between period one and 2 are taxed by the spouse at a rate $\theta \leq 1$ such that $k_2 = (1-\theta)s$. This follows others in the literature who have modelled business income as being subject to a spouse or sharing tax (Ashraf, 2009, Boltz et al., 2019, De Mel et al., 2009, Jakiela and Ozier, 2016, Squires, 2018), though I instead impose the tax on between period savings. I assume that the taxed savings do not reenter the woman's utility function in anyway, and so are only used by the spouse.

Allowing the woman's discount factor to be denoted as β, with $0 < \beta < 1$, the woman's inter-temporal optimisation problem can be written as follows:

$$\max_{\{c_1,c_2\}} U(c_1) + \beta U(c_2)$$

subject to:

$$c_1 > 0, c_2 > 0$$

where:

$$c_1 = f(k_1) - s - k_1 + A$$

$$c_2 = f(k_2) - (1+r)A$$

$$k_2 = (1-\theta)s$$

The woman chooses how much to save in order to maximise the above function.

It is simple to show that the solution to the woman's optimisation problem is:

$$(1-\theta)f'(k_2) = (1+r)$$

In equilibrium, the net marginal return to business working capital (after the husband has taken his cut) is equal to the interest rate on the loan. Investment in the business in period two is distorted by the husband taking a share of savings, such that $f'(k_2) > (1+r)$ and there is too little business investment in period two. The woman therefore over consumes in period one and under invests and under consumes in period two compared to first best. The household is inefficient, since it would be better for the husband to let the wife run her business at its most efficient level, and then take a lump-sum transfer of the profits.

2.1 How could the treatments affect the spousal tax

The treatments enter the model by changing the extent that savings between periods one and two are subject to capture (reduce θ). I classify these channels broadly as by providing a private saving device, mental accounting (labeling) effects, commitment effects, and default effects.

Private saving device The mobile money account provides a private and safe storage device for keeping the loan and saving business income, and so negate the need to hold cash. This decreased visibility may decrease unplanned expenditures on personal items or pressure to give money to others. At baseline, 20% of the sample reported carrying some savings as cash, despite also using more structured saving devices like bank accounts and ROSCA. Prior research has shown that people are willing to pay to use mobile money accounts to avoid carrying cash (Economides and Jeziorski, 2017). The mobile money account may represent an in-between point of flexibility compared to the ways women currently save: it is more accessible than a bank account or ROSCA but less accessible than cash. Note that there are no fees for depositing money to mobile money account, but the woman does need to visit an agent to do this.

Mental accounting The mobile money account may increase savings through mental accounting effects. Evidence suggests that simply labelling something as a saving account can increase savings (Thaler, 1985, 1999). Previous studies have found that a separate, labelled mobile money account can increase saving for the labelled purpose (Dizon, 2017, Habyarimana and Jack, 2018, Lipscomb and Schechter, 2018). Money in this saving account is viewed as being unavailable for day-to-day spending. This therefore helps people to resist the temptation to spend the money on other things or to resist pressure to give money to other people. During focus group discussions, some of the women discussed using the fact that the loan was disbursed into a mobile money account explicitly for their business as a way to deter requests for money. They found it easier to argue that the loan can only be used for their business when it was so obviously in an account assigned for that purpose.

Soft Commitment device Providing the microfinance loan on a mobile money account may act as a soft commitment device compared to giving the loan as cash as it requires a trip to a mobile money agent to actively withdraw money before spending it. This contrasts with cash, which is easy to spend instantly. This would not necessarily be the case if paying for goods with mobile money was common, but less than 1% of mobile money users have used it to pay for goods at a store or shop (Intermedia, 2016). The commitment features of the mobile money account may help to resist the pressure to give money to others. While sending money to others is a feature of mobile money accounts,

it still requires more steps than to simply hand them some cash. It also requires the receiver to withdraw the money from an agent the other end and to pay a fee. This may therefore be enough to dissuade others that it is worth asking for money from the women, and so reduce social pressure to share.

Default effects A common theme across these mechanisms is the default difference between the treatments. The Mobile Account treatment requires active deposit of funds onto the account for any of its saving, mental accounting or commitment features to be relevant. The Mobile Disbursement treatment however, automatically provides a safe place labelled for the business to store the loans until the money is actively withdrawn. If the woman chooses not to invest the entire loan[8] in her business when she first receives it, but instead chooses to retain some directly for period two, this money will not be subject to the tax by the spouse. Prior literature has shown default effects around whether money is given as cash or into a saving account to be an important predictor of savings, with any active input required into the saving decision reducing savings (Blumenstock et al., 2018, Brune et al., 2017, Somville and Vandewalle, 2018).

2.2 Model predictions

The model generates three empirical predictions of the treatments that are testable with my data. Firstly, in period one consumption will be higher, and saving lower, in the control group than the treatment groups. Secondly, in period two, consumption, investment and profits will be higher in the treatment groups. Finally, the impacts of the treatments will be larger for inventory-intensive businesses, businesses where the loan is used for a series of transactions over time and for women who are more subject to sharing pressure (higher θ).

3 Background and Experiment Design

3.1 Mobile Money

51% of the population used mobile money services in Uganda in 2017 (Demirguc-kunt et al., 2017) and over 40% of users are women. Mobile money services operate via a simple SMS-message interface on a sim card to allow the transfer and storage of up to $1000. The account is PIN protected and so can only be accessed by the owner provided this PIN number is kept private and the sim card secure. Withdrawal and deposit of money take place using widespread networks of mobile money agents, who are found throughout a city like Kampala. Mobile money services are increasingly being integrated

[8] for example if $f'(A) < 0$

in bank account offerings and the mobile money operators themselves are increasingly offering services ranging from bill payment to providing short term loans.

3.2 Setting

The study location is Kampala, Uganda, chosen as it has both a high prevalence of microfinance borrowing and high mobile money penetration. The study took place in just under half of the microfinance branches of BRAC Uganda in the Kampala and Entebbe areas[9].

BRAC Uganda is one of the largest providers of financial services to the poor in Uganda. It offers microfinance loans to women only of between 250,000 USH and 4mn USH ($70 - $1000) for expanding a small enterprise. Owning an existing enterprise is a prerequisite for obtaining a microfinance loan, and a check of the business is carried out by credit officers before a loan is given. Loan durations vary between 20 and 40 weeks depending on the needs of the woman, with the interest rate set at 13% for the 20 week loan and 25% for the 40 week loan. Women apply for loans in groups of between 8 and 30 women, and each woman meets weekly with the other members of her group to repay their loans. Women in the same group were from the same community, and so generally already knew each other. Groups are not formally liable for repayment of their members' loans, and women each have a guarantor from outside the group who is meant to repay the loan if a woman defaults.

The study population was composed of any microfinance client applying for a new loan (whether as a first time borrower or a repeat loan) who owns a mobile phone of her own[10]. This sample of women is therefore highly representative of female microfinance clients throughout Kampala, and likely similar to other urban populations of microentrepreneurs.

3.3 Treatment arms

The study involved two treatments and a control group:

Mobile Account

Women approved for a loan from BRAC were randomly offered a mobile money account designated for their business. Women were provided with a new sim card, helped in setting up their mobile money account and trained how to use it. The account was described as specifically for their business, and suggestions made like takinng payments and saving for their business, but no formal restrictions were placed on how they use the account. Women in this group receive their microfinance loan as cash. No money was transferred

[9]branches were chosen as they had a pre-exisiting bank account with Stanbic bank, which offered integration with mobile money

[10]Only 6 women were excluded from taking part in this study because they did not have their own mobile phone.

to the mobile money account

Mobile Disbursement
Women approved for a loan from BRAC were offered the same business mobile money account, explanation and training as in Intervention One but, additionally, their microfinance loan was paid directly into this account through a mobile money provider. An additional amount was included to cover the fee of approximately 1% of the loan amount for withdrawing the money from an agent so as not to disadvantage women receiving the loan this way[11]. This was fully explained so as to maximize take-up.

Control
Women approved for a new loan with BRAC received the loan as cash. Nothing was changed from the existing loan disbursement process of BRAC.

3.4 Experiment design

The study involved 3,000 female micro-entrepreneurs, split as follows: 1,000 acted as controls receiving the microfinance loan in the usual way as cash and nothing else; 1,000 were signed up for a business designated mobile money account but still received their loan as cash; 1,000 were signed up for the business designated mobile money account and received their loan digitally on that account. All other aspects of the BRAC microfinance loan product remained the same, including the requirement to be physically present at the branch for the disbursement of the loan and signing of final agreements, and the repayment of the loans in cash via weekly group collection meetings within the borrower's community.

Randomisation took place weekly in blocks of 150-200 women determined by the timing of requesting a new loan. All women who were both accepted for a loan with BRAC and who had a mobile phone were individually randomised into the treatment or control groups. Randomisation continued weekly for approximately 5 months until the sample size of 3,000 was achieved.

The randomisation was done in Stata and stratified by five variables: a dummy variable capturing present bias from a multiple price list incentivised game (Harrison et al., 2002), a dummy variable capturing if the woman always hid money in a willingness-to-pay-to-hide-money from the spouse game (Almås et al., 2018) (see Section 4.1 for more details on the incentivised games), a dummy variable capturing if the client is a first time borrower with BRAC, 6 microfinance branch dummies and a dummy capturing if the woman had above median business profits at baseline.

[11]This amount would cover 5 withdrawals of approximately one-fifth of the loan. Fees are set amounts based on tiers of withdrawals, rather than being a fixed percentage.

The present bias and willingness to pay to hide money variables were chosen for stratification based on the idea that women who are present bias or show a desire to hide money from their spouse might benefit more from having their loan disbursed on a mobile money account instead of as cash. I stratified by first time borrower and branch in case there were systematic differences between new and established entrepreneurs and to ensure an even amount of mobile money disbursement by branch. I stratified by profit since Fafchamps et al. (2014) showed heterogeneous effects of loans for women based on their profitability.

For those assigned a treatment, the treatment was offered when the woman went to have her loan disbursed. At this point, if she was assigned to the Mobile Account treatment she was offered a mobile money account and trained in how to use it. The training included a component of account security, including setting a secure PIN and not allowing others access to the account, as well as how to deposit and withdraw money and check the balance. Women were told it was their choice if they told anyone else about the account or not. The account was framed as for her business, but without any constraints on how it was actually used. If a woman refused the Mobile Account treatment, she continued to receive her loan as cash as usual.

If she was assigned to the Mobile Disbursement treatment, she was offered both the mobile money account and to have her loan disbursed on this account. The additional amount to cover fees was explained to the woman and the same training and framing as for the Mobile Account treatment given. Women were told that BRAC was testing a new method of disbursing loans, and so some women would be offered disbursement on a mobile money account and others not. Women could refuse either the disbursement and/or the sim card, permitting partial compliance if she wanted the sim card but not the disbursement. If a woman refused part of all of the Mobile Disbursement treatment, she received her loan as cash.

Women were free to apply for a new loan whenever it suited their needs, rather than being on the same schedule with other members of their group. Therefore, within any group, there would be a mix of women over time who were recruited into the study and assigned to the treatment and control groups, as well as some women who were still paying back a previous loan and were not in the study at all.

4 Data

I have four sources of data for the analysis, three of which were self-reported by the women, and one of which is administrative data. Firstly, a baseline survey was conducted on all women applying for a new loan at the six BRAC microfinance branches. Baseline surveys were conducted between January and June 2017 before randomisation and assignment to treatment group occurred. Approximately one week after the baseline

survey, randomisation took place and the woman's loan was disbursed by BRAC in the assigned manner. Lists of treatment assignment were sent to the BRAC branches weekly, and only women who had been baselined and assigned a treatment could have a loan disbursed to them. This ensured that all women applying for loans during this five month period were part of the study.

Secondly, an endline survey of all women was completed. The endline survey began in October 2017 and ran until January 2018. This is approximately eight months after the loan disbursement, and was chosen so that those women who had 40 week loans[12] were still repaying them when the endline survey took place, helping to reduce attrition.

Thirdly, focus groups were conducted with a sample of 16 women from three different microfinance groups during September 2018. There were eight women from the Mobile Disbursement treatment, five from the Mobile Account treatment and three from the control group. The purpose of these focus groups was to obtain qualitative, descriptive information on how women used the mobile money accounts and how they felt they affected their businesses, along with a comparison to the control group. Though this is a small sample, the focus groups give richness and a deeper understanding into the mechanisms by which the treatments had an impact.

Finally, I obtained transaction records obtained from MTN Uganda of all the mobile money transactions between January 2017 and January 2018 made using the mobile money accounts provided to clients as part of the study. All respondents gave their consent for the transaction records from these accounts to be used for the study and this data includes the type of transaction (including transfer, payment, cash-in, cash-out), account numbers for whom the transaction was from and to, date and time, amount, fee and balance on the account. The transaction records are available for both treatment groups but not the control group.

4.1 Behavioural games

In order to test whether the women who benefit most from receiving the loan on a mobile money account are those who are most likely to give in to temptation goods or most subject to pressure to transfer money to others, incentivised games were played at baseline to elicit time preferences and willingness to pay to hide money from the spouse.

The time preference games used were standard multiple price lists (Andersen et al., 2008), which have been used frequently in a developing country context (Ashraf et al., 2006). Individuals were asked to choose between a fixed monetary reward in one period and various larger rewards in a later period. The periods were either today and 2 weeks or 2 weeks and 4 weeks time. The near payment was fixed at $2 and the far payment

[12]BRAC began offering a new 30 week loan just before the start of the study. 40 week loans were therefore a lower proportion than expected, but still the majority (51%). 25% had 30 week loans and 25% 20 week loans

varies between $1.8 and $8. One in five respondents was randomly chosen to be paid one of her choices from this game at the specified time period.

The propensity to pay to hide money from the spouse game has been used as a measure of women's empowerment in the literature (Almås et al., 2018, Ashraf, 2009, Fiala, 2017). Here I expand upon the version used in Fiala (2017) by conducting a variant of the (Almås et al., 2018) game with multiple choices between whether the woman or her spouse receives set amounts of money the next day. Women had to make a series of 8 choices between receiving a fixed amount of money themselves ($2) or having their spouse receive varying amount of money between $1.8 and $8.

One in five respondents was randomly chosen to be paid one of her choices from this game to either herself or her spouse tomorrow. Tomorrow was chosen to be the payment date to remove effects of strong present bias and to allow the enumeration team time to contact and find the spouse if necessary.

4.2 Balance test and baseline characteristics

I confirm the validity of my randomisation by performing a balance test, results of which are shown in Table 1. I perform an F-test of equality of the means across the three groups for each characteristic, as shown in the final column. None of the characteristics are significantly different across the 3 groups at the 10% level. I also perform a joint orthogonality test for each treatment separately. This regresses all the characteristics on each treatment indicator and tests if all the characteristics are jointly zero. This has a p-value of 0.63 for the Mobile Account treatment and 0.84 for the Mobile Disbursement treatment. Thus I cannot reject overall balance.

A few characteristics of the sample are worth highlighting: Looking at the game behaviour; 20% of the women displayed hyperbolic preferences, which is similar to the level found in other studies (Ashraf et al., 2006). 60% of them switched above the median in the hiding money game, meaning they are willing to give up $6 in order retain control over $2 rather than their spouse be given it. Again this large amount of hiding is similar to that found in other studies (Almås et al., 2018, Fiala, 2017) and suggests inefficiency in the household. Moving onto demographics; 80% of women had completed primary school and 15% completed secondary school. On average, they were 35 years old with 3 other household members. Two-thirds of them were married and 20% had a job in addition to their business.

The average loan was 1.4mn USH ($370) and half the loans were for 40 weeks. Women reported making 440,000 USH ($120) a month in their businesses. The households earned on average 1mn USH ($274) a month, so the woman's business brought in just under half the household income, and spent 900,000 USH ($245) a month. 93% of women owned their business alone, with the remainder owning jointly with their spouse. Married women

Table 1: Summary statistics and balance test

	Mobile disburse			Mobile account			Control			
	mean	sd	obs	mean	sd	obs	mean	sd	obs	p
branch1	0.23	0.42	984	0.23	0.42	993	0.24	0.42	982	0.98
branch2	0.24	0.43	984	0.24	0.43	993	0.26	0.44	982	0.53
branch3	0.12	0.33	984	0.15	0.36	993	0.13	0.33	982	0.19
branch4	0.12	0.32	984	0.11	0.31	993	0.13	0.33	982	0.52
branch5	0.11	0.31	984	0.11	0.31	993	0.10	0.30	982	0.68
branch6	0.18	0.38	984	0.16	0.37	993	0.16	0.36	982	0.49
high profits	0.47	0.50	984	0.48	0.50	993	0.48	0.50	982	0.91
hide money	0.65	0.48	641	0.63	0.48	647	0.62	0.49	659	0.64
repeat borrower	0.82	0.38	984	0.82	0.38	993	0.81	0.39	982	0.83
hyperbolic	0.21	0.40	984	0.22	0.41	993	0.18	0.39	982	0.13
respondent age	35.78	8.70	984	36.01	9.06	993	35.99	8.95	981	0.82
married	0.65	0.48	984	0.66	0.48	993	0.67	0.47	982	0.60
hh size	4.22	1.70	984	4.27	1.55	993	4.30	1.65	982	0.54
completed primary	0.81	0.39	984	0.81	0.40	993	0.79	0.41	982	0.70
completed secondary	0.14	0.35	984	0.12	0.32	993	0.14	0.35	982	0.11
job	0.21	0.41	984	0.19	0.39	993	0.19	0.39	982	0.47
loan amount	1382	749	967	1430	774	985	1372	767	977	0.20
loan 40	0.52	0.50	984	0.52	0.50	993	0.50	0.50	982	0.46
monthly profit	628	714	982	633	750	993	612	644	982	0.73
monthly profit (self-report)	435	407	984	443	426	993	421	379	982	0.49
business asset value	550	890	984	577	890	993	568	880	982	0.80
inventory value	1692	1401	982	1691	1412	993	1709	1372	981	0.95
weekly hours business	96.21	46.89	984	98.82	47.28	993	99.53	47.77	982	0.26
women owns alone	0.93	0.25	984	0.93	0.25	992	0.91	0.28	981	0.18
spouse business	0.57	0.50	575	0.58	0.49	592	0.58	0.49	587	0.91
household business	0.43	0.50	874	0.45	0.50	885	0.45	0.50	883	0.66
have saving	0.88	0.33	984	0.87	0.34	993	0.86	0.35	982	0.35
amount saved	434	703	984	462	761	993	465	818	982	0.60
mobile account	0.97	0.18	984	0.96	0.19	993	0.97	0.18	982	0.68
agent distance (min)	4.70	5.60	984	4.43	6.06	993	4.46	5.68	982	0.56
household income	1042	887	984	1040	804	993	1037	829	982	0.99
household asset value	3369	2628	984	3440	2786	993	3351	2476	982	0.73
household consumption	871	487	984	856	461	993	879	469	982	0.53

All monetary amounts in '000 Ugandan Shilling and winsorised at the 99% level

lived in a household where their spouse had a business 57% of the time, and all women in the sample lived in a household with another business 43% of the time. Nearly 90% had savings, and these averaged 430,000 USH ($100). 97% of women reported already having used mobile money before and the nearest mobile money agent was less than 5 minutes from their home. They owned nearly 3.4mn USH ($1000) in household assets on

average.

The women's business capital was predominantly in inventory, which made up 80% of the total capital stock on average. As Figure 3 in the Appendix shows, over 55% of the businesses are selling items without any direct value being added to them, such as selling foods in a market, selling clothes or operating small shops. Food stalls in particular have a highly perishable form of stock that would require regular purchases. In general, the women are operating working capital type businesses, rather than fixed capital based business, and so need to frequently purchase new stock with money saved from the previous period's sales. In terms of more capital intensive businesses, 8% operate a hairdressing salon, 6% grow their own crops for sale or raise livestock, and 4% make and repair clothes.

4.3 Take-up

Since women were free to accept or reject the assigned treatment, take-up rates were a concern. However, the interventions had high take-up rates. 94% of the individuals assigned to Mobile Account received a mobile money account. 71% of those assigned to Mobile Disbursement received this in full.

Additionally, 14% of those assigned Mobile Disbursement received only a mobile money account and their loan as cash (they were assigned to receive Mobile Disbursement and got Mobile Account). The reasons for those assigned to Mobile Disbursement getting Mobile Account was both refusal of the disbursement of the loan onto the mobile money account (5%), but also external problems completing mobile disbursement, such as power cuts or networks outages (10%). Lastly 15% of women assigned to Mobile Disbursement refused the entire treatment (sim card and mobile disbursement). This is summarized in Table 2 below.

I look at correlates with treatment take-up to see if different types of women take up the different treatments. Appendix Table A1 shows OLS regression results from regressing baseline variables one-by-one on take-up dummy variables for each of the two treatments. For the Mobile Account treatment, there is no variable that predicts take-up, likely because take-up is so high. For the Mobile Disbursement treatment, being married and having a higher index of family pressure predicts lower take up of the treatment. This is potentially concerning since these groups benefit the most from receiving this treatment, and could indicate a lack of awareness of how the Mobile Disbursement treatment could assist them in overcoming sharing pressures.

Below each column, I also include a p-value from an F-test of regressing all the characteristics on the take-up dummies. I cannot reject that all the characteristics are jointly zero for take up of either treatment.

Table 2: Treatment compliance

	Mobile Account	Mobile Disbursement
Received mobile money account	-	700
and loan as mobile money	-	(71%)
Received mobile money account	931	
and loan as cash	(94%)	
Refused mobile disbursement		51
		(5%)
Technical problem for		88
mobile disbursement		(9%)
Received no mobile money	62	145
account (refused)	(6%)	(15%)
Total	993	984
	(100%)	(100%)

4.4 Attrition

The survey team made a substantial effort to follow up with this highly mobile population of women. Even though the endline survey was on average only 8 months after the baseline, half the sample had taken loans of a shorter duration than this and so were not necessarily still attending their microfinance groups. Despite this 90% of the sample were found and re-surveyed for endline. Of the 10% who were not resurveyed, 25 refused to be surveyed and 292 couldn't be found. Attrition rates of approximately 10% are common in mobile populations such as this urban sample.

Table 3: Attrition

	(1)
	attrition
Mobile account	0.008
	(0.014)
Mobile disbursement	0.011
	(0.014)
Constant	0.101***
	(0.010)
Observations	2,959
R-squared	0.000
p-value T1=T2	0.83

Linear regression of treatment indicators on a variable equal to one if the woman was not surveyed at endline. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

However, of concern is whether treatment was correlated with attrition. I test for this in Table 3 by regressing a dummy variable indicating if the woman was not found at endline on treatment indicators. I find no significant differences in attrition rates across treatment arms. Correlates of attrition are shown in Appendix Table A2. Three variables are significant at the 5% level: older women, those in larger households and those with larger loans are less likely to be surveyed at follow-up. The size of the coefficients are very small, and less than 2% of attrition is explained by the baseline characteristics I examine.

5 Empirical strategy

McKenzie (2012) showed that in the case of a single baseline and follow-up with an auto-correlation less than 0.5 (as is the case for business profits, saving and spending), power is highest when regressing an outcome measure at endline on baseline covariates, the treatment measure and the baseline value of the outcome measure. I therefore estimate intent-to-treat (ITT) effects using an ANCOVA specification of the form:

$$Y_{i1} = \alpha_0 + \alpha_1 T_{1i} + \alpha_2 T_{2i} + \alpha_X X_{i0} + Y_{i0} + \epsilon_{i1} \quad (1)$$

Where Y_1 is the outcome of interest, T_1 the Mobile Account treatment dummy, T_2 the Mobile Disbursement treatment dummy, X a set of randomization strata dummies (Bruhn and McKenzie, 2009), Y_0 the baseline value of the outcome (if measured at baseline, otherwise excluded) and ϵ random error for individual i.

For every outcome, I test whether each treatment had significant effect ($\alpha_1 = 0$, $\alpha_2 = 0$), as well as whether the treatments differ from each other ($\alpha_1 = \alpha_2$).

As I am considering three primary outcome measures (profit, saving and business capital), I adjust the p-values of the coefficients of interest for multiple statistical inference by calculating sharpened q-values that control for the false discovery rate (FDR). These q-values correct for the fact that I conduct 3 tests across the 3 primary outcomes. Rather than pre-specifying a single q, I report the minimum q-value at which each hypothesis is rejected, following Anderson (2008) and Benjamini et al. (2006).

For some summary measures of outcome families, I group several related variables into index variables following Anderson (2008). I construct the indices in three steps. First, I re-code all contributing outcomes so that higher values correspond to treatment effects in the same direction ("better" outcomes). Second, I standardize the individual outcomes using the baseline mean and standard deviation of the control group for that outcome. Third, I calculate the average of the standardized constituent outcomes, weighted by the inverse covariance matrix. Where a specific outcome value is missing for a respondent, I calculate the value of the index for that respondent using the remaining outcomes.

When looking at secondary and intermediate outcomes I do not correct for multiple testing as this analysis is informative for exploratory analysis of additional impacts, robustness checks and mechanisms analysis, not the main impact.

5.1 Administrative data

The administrative data is only available for the two treatment groups that I gave mobile money accounts to, not the control group. Analysis will therefore give the additional impact of disbursing the loan on the mobile money account on how it is used.

I estimate ITT effects for the administrative data using an OLS regression of the form:

$$Y_i = \alpha_0 + \alpha_2 T_{2i} + \alpha_X X_i + \epsilon_i \tag{2}$$

Where Y is the outcome of interest, T_2 the Mobile Disbursement treatment dummy, X a set of randomization strata dummies and ϵ random error, for individual i.

For the administrative data, I test whether disbursement of the loan onto the mobile money account had a significant effect ($\alpha_2 = 0$) as compared to just being given the mobile money account.

5.2 Impact on primary business outcomes

As outlined in my pre-analysis plan, the primary outcomes of this study are profits, savings and the value of enterprise capital (defined as the value of business assets and inventory). The results for intent-to-treat estimate on those three outcomes are shown in Table 4. I find a positive and significant effect on both profits and business capital for the Mobile Disbursement treatment. Both of these results also remain after a multiple testing correction is applied. Those in the Mobile Disbursement treatment experience a 15% increase in their profits and a 11% increase in the value of their business capital compared to the control group. These results are consistent with the hypothesis that disbursing the loan on a mobile money account increased the amount of the loan used to invest in the business and that this increased businesses investment led to gains in profit, and confirms prediction two of my model.

In the appendix in Table A6 I examine the different components of profit: monthly and weekly sales and calculated monthly and weekly profits. I find similar patterns of results as for my primary profit outcome, with the Mobile Disbursement Treatment increasing significantly all measures of sales and profits.

Also of note from Table 4 is the difference for the control group between baseline and endline. In the control groups, profits actually decline by 25,000 USH ($5), 6%, between baseline and endline despite the control group obtaining a loan. This result matches that

Table 4: Treatment effects on primary outcomes

	(1) profit	(2) savings	(3) capital
Mobile account	10.41	3.33	38.27
	(13.01)	(34.35)	(76.19)
	[0.99]	[0.99]	[0.99]
Mobile disburse	63.72***	30.44	254.59***
	(12.73)	(36.82)	(74.51)
	[0.00]	[0.74]	[0.01]
Observations	2,639	2,639	2,639
R-squared	0.44	0.35	0.51
Control mean endline	395.3	559.2	2375
Control mean baseline	419.8	483.6	2297
p-value T1=T2	0.00	0.50	0.00

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

of other studies which have found no overall impact of getting a microfinance loan on a woman's business (Banerjee et al., 2015).

The increase in business capital from the Mobile Disbursement treatment of 254,000 UGX is approximately 16% of the mean loan value of 1.4mn UGX. Note that in thee control group, business capital did not change at all between baseline and endline, suggesting little investment in the business. The Mobile Disbursement treatment therefore seems to be working by increasing capital investment into the business, though still only a relatively small fraction of the loan value. In Section 6.5 I show that most of the loan is being channeled into household wealth in the control group.

There are no effects of the Mobile Disbursement treatment on the amount of saving. In the Appendix Table A7 I look at alternative measures of saving, finding that savings on a mobile money account increase a small amount from both treatments, though this seems to be at the expense of other forms of saving.

I find no significant or large coefficients from the Mobile Account treatment on any of

the three outcomes. I am able to reject equality of the treatment effects for the Mobile Account and Mobile Disbursement treatments for both business profits and business capital, but not savings.

In the Appendix Figure 4, I show cumulative distribution functions for the three primary outcomes by treatment group. These allow me to see distribution shifts that might not be apparent in a comparison of means. These are shown as both raw values and in logs. I see that for both profit and business capital, the Mobile Disbursement treatment group shows a strong shift to the right in the CDF. Using a two-sample Kolmogorov-Smirnov test I can reject equality of the distributions of profit and capital when comparing the Mobile Disbursement group to control group (p=0.002 and p=0.007 for profit and capital respectively) and to the Mobile Account group (p=0.059 and p=0.030 for profit and capital respectively). The Mobile Disbursement Treatment therefore first order stochastically dominates the Mobile Account and Control groups for both profits and capital. I find no evidence of differences in the distribution of savings across the treatments.

5.3 Mobile money transactions and balances

I look at mobile money account usage outcomes based on administrative data collected from the mobile telecoms operator, MTN. This data gives an indication of how the accounts were used, allowing me to understand if the accounts were primarily used to facilitate business transactions or for the saving and safe storage of the loan and other funds. This data also allows me to verify that indeed the loan was successfully disbursed onto the mobile money account for the 697 of the 982 women assigned to Mobile Disbursement, matching the take-up numbers recorded in the survey data.

A summary of some of the mobile money account usage outcome statistics is shown in Table 5[13]. Ever deposit captures if the woman ever deposited money onto the mobile money account, for example, by topping up the account herself, receiving money from someone else or by being paid for goods or services on the account. It excludes the loan disbursement for the Mobile Disbursement group. As seen in the table, both groups are similarly likely to deposit money onto the account, with 13% ever depositing. This means that for the Mobile Account group, only 13% ever used the account (since they could not withdraw or save money without first depositing some). Both groups make similar low numbers of deposits (0.6-0.8 of a deposit at the mean, though some make as many as 60), and the deposit amount conditional on making a deposit is similar for both treatments at around 50,000 USH ($13). While the maximum deposits made onto the accounts are relatively large, 600,000 ($160) and 1mn USH ($270) for the Mobile Account and Mobile

[13]These statistics are for all shown for all individuals that received a sim card - including for the Mobile Disbursement group those who received a sim card but had their loan disbursed as cash either because they refused the mobile money disbursement or because a technical issue meant they were unable to get it

Disbursement treatments respectively, the most common outcome for both groups is that they don't deposit anything.

Larger differences appear between the treatments when looking at withdrawals. The Mobile Disbursement treatment group make a withdrawal 83% of the time[14]. For the Mobile Account group withdrawals are similar to deposits at 12% ever making one.

The number of withdrawals is much higher for the Mobile Disbursement group. This is important, as in principal the Mobile Disbursement group could just withdraw all the loan the day they got it and so only needed to make 1 withdrawal. However, on average, women in the Mobile Disbursement treatment makes nearly 4 withdrawals. Likewise, the average withdrawal amount was less than the average loan - 600,000 USH ($160) compared to 1.4mn USH ($370) for the Mobile Disbursement group. 49% of the Mobile Disbursement group made a withdrawal on the same day that the loan was disbursed, and this was on average for 37% of the loan value. Qualitative questions and survey responses suggest this was not because mobile money agents didn't have enough float to withdraw all the loan at once, but because the women were choosing to retain some money on the accounts.

Table 5: Summary statistics of mobile money account usage

	Mobile account						Mobile disburse					
	obs	mean	sd	max	min	median	obs	mean	sd	max	min	median
ever deposit	892	0.13	0.33	1.00	0.00	0.00	830	0.14	0.35	1.00	0.00	0.00
ever withdrawal	892	0.12	0.33	1.00	0.00	0.00	830	0.83	0.38	1.00	0.00	1.00
number deposit	892	0.61	2.87	47.00	0.00	0.00	830	0.76	3.83	63.00	0.00	0.00
number withdrawal	892	1.09	6.11	103.00	0.00	0.00	830	3.80	7.44	101.00	0.00	2.00
average deposit	112	48.15	84.03	635.00	1.00	26.90	117	54.59	120.88	1002.75	0.30	21.00
average withdrawal	107	42.26	128.27	1250.00	0.50	16.60	688	648.97	599.71	3484.80	1.00	502.68
total deposit	892	26.50	136.52	1687.00	0.00	0.00	830	31.91	204.09	4011.00	0.00	0.00
total withdrawal	892	28.85	172.60	3326.00	0.00	0.00	830	1107.27	893.89	7631.00	0.00	966.01
% loan withdrew day 1	891	0.00	0.00	0.00	0.00	0.00	829	0.37	0.44	1.00	0.00	0.00
Withdrew day 1	892	0.00	0.03	1.00	0.00	0.00	830	0.49	0.50	1.00	0.00	0.00

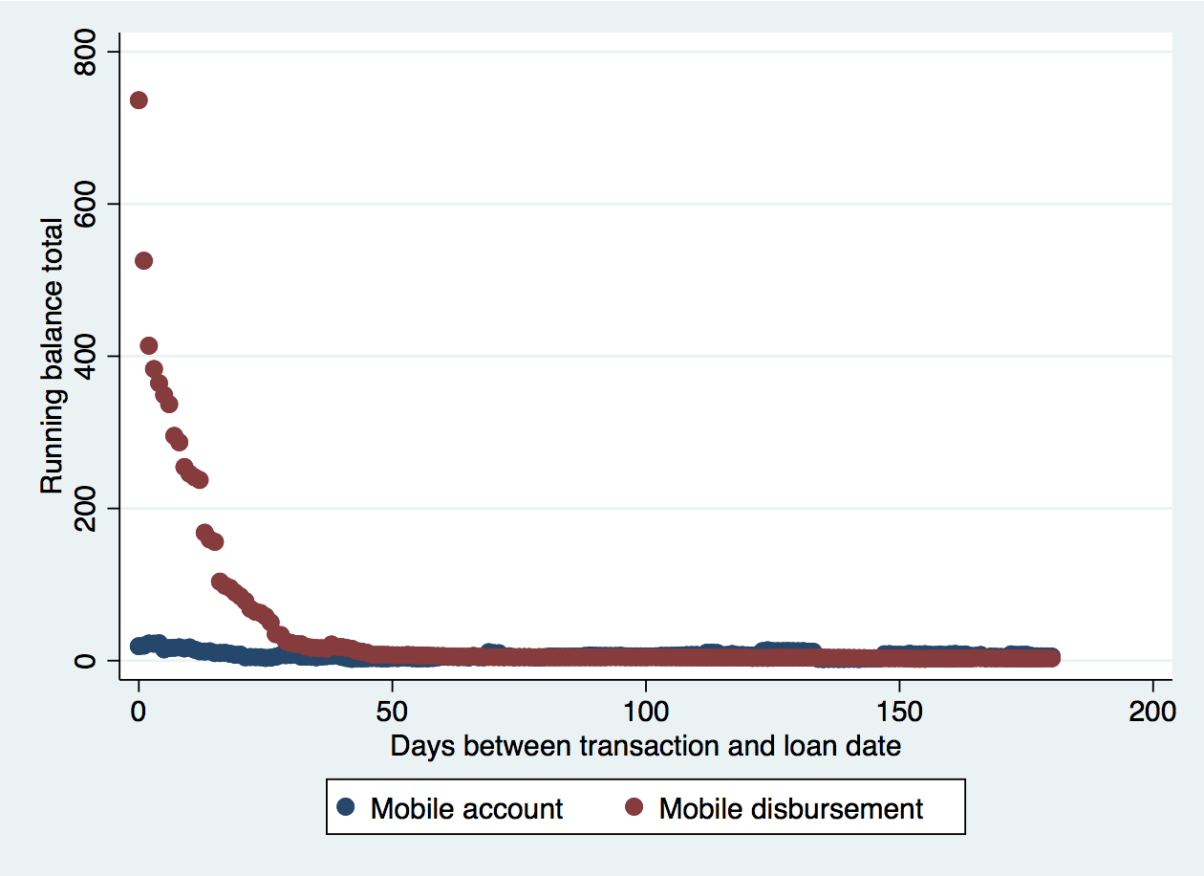
Monetary outcomes are in '000 Ugandan Shillings. All variables are defined over the first 180 days after the account was provided. I cap transactions at 180 since the last mobile money accounts were given out in June 2017 and the administrative data ends in January 2018. Deposits always excludes the loan disbursement for the mobile disbursement treatment group. Ever deposit and withdraw are dummy variables if at least one transaction of that type occurred. Number of deposits and withdrawals is the count of each transaction for an account. Deposit amount and withdrawal amount summarises the mean transaction amount if that type of transaction occurred. Total deposits and withdrawals are cumulative transactions on an account. Withdrew day 1 and % loan withdrew loan day 1 are only captured for the Mobile Disbursement group and capture whether the woman withdrew any of the loan the day it was disbursed and what percentage of the loan she withdrew the day the loan was disbursed.

In Figure A4, I show the end of day balance in '000UGX on the mobile money account over time by treatment status. If the Mobile Disbursement group simply withdrew the entire balance on day 0 the end of day balance would be zero. I do not see this. Instead Figure A4 clearly shows that the average balance on the mobile money account for the Mobile Disbursement treatment is large and remains large over the first 30 days after loan disbursement. The Mobile Account group on average hold almost zero balances throughout the period. This indicates that microfinance clients treated with Mobile

[14]This is not 100% as some of the Mobile Disbursement group did not receive their loan on the mobile money account, but were still given the mobile money account (see section 4.3)

Disbursement are choosing to hold some of the loan as a balance on their accounts, which they are slowly dipping into and running down over time. While some clients in the Mobile Account treatment do deposit into the mobile money account, they are few and their balances are tiny. This therefore confirms prediction four of my model, that the impacts of the Mobile Disbursement treatment will be larger if clients choose to save the loan on the mobile money account when it is directly deposited there.

Figure 1: Mean balance in the mobile money account over time by treatment group



Running balance total in '000 UGX. Balance captured at end of day for a 6 month period after the disbursement of the loan.

In the Appendix in Tables A3 and A4, I show regression estimates capturing use of the accounts and the average balance on the account over different time periods. During the first 7 days after loan disbursement, women in the Mobile Disbursement group are on average holding 343,000 USH ($80) on the account, approximately 25% of the loan value. Between 15 and 30 days this falls to 50,000 USH ($14). The average balance held on the account during the first 30 days after the loan is disbursed is 165,000 UGX, 10% of the average loan value and 34% of baseline savings. By the end of the study, average balances on the account are not statistically different between the Mobile Disbursement and Mobile Account treatments.

I show the types of transactions by treatment status in the Appendix in Figure 5. The majority of transactions are cash out (55% of transactions for the Mobile Disbursement group, 32% for the Mobile Account group), though both treatment groups also often buy airtime or data (30% of transactions for both groups) and make transfers to and from other mobile money accounts (10% of transactions for both groups). The mean value of transactions by type for both treatment groups is shown in Appendix Table A5. This table shows that for the Mobile Disbursement group, the cash out transaction type has a mean value of 441,000 UGX and hence represents the main method by which people withdrew their loan. Transfers out to another mobile money account are only 114,000UGX in the Mobile Disbursement group, so while some women are withdrawing their loans by sending it to another mobile money account, this is not the majority. Note that paying a supplier using mobile money directly with the loan would also be counted under the transfer heading, as would being paid for goods or services using mobile money.

I also check if women are sending the loan to their personal mobile money account but only 2% of transactions (10% of transfers out) are where a woman sent money to her own mobile money account, so this does not seem to be a frequent type of transaction. Less than 0.5% of transactions (3% of transfers out) are to the woman's spouse, showing that the mobile money form of payment did not make it easier to give the loan to the spouse.

Overall, the summary of transaction records suggests that for both treatments the mobile money accounts were not used for frequent deposit and withdrawal of money. This means the accounts were not used by the majority of women for either business transactions or to frequently save either business or other income. This differs to the findings of Dizon (2017) and Habyarimana and Jack (2018) who find that labelling a mobile money account for a saving goal increases savings, even if those people already had another mobile money account, though they provided additional monetary incentives to save. It also conflicts with Bastian et al. (2018) who find providing information about a mobile saving account increases saving, though partly through crowding out other forms, and Batista and Vicente (2020) who find a mobile money linked saving account increased savings in Mozambique, though again, bonus interest rates were offered to induce savings in this study. This could suggest that actually people will not use mobile money for saving unless induced by other incentives, such as offering interest on balances, at least in an urban context with access to alternative forms of saving. I discuss this further in section 7.

However, my findings fit with evidence from mobile linked saving accounts in Sri Lanka, which had relatively low levels of use and did not led to higher overall savings (De Mel et al., 2018). My study context is similar to De Mel et al. (2018) in that women already had access to other forms of saving such as bank accounts at relatively high levels (38% already used a bank account at baseline). Also being in an urban setting means

women are closer to other methods of saving such as a bank, and so any reduction in transaction costs from using mobile money is likely to be small.

Instead, it appears as though the accounts were predominantly used by the Mobile Disbursement group to save some of the loan and withdraw it down over time, cashing it out when needed to purchase something. This confirms the fourth prediction of my model, that the impact of the Mobile Disbursement treatment will be larger than of the Mobile Account treatment if the account is used for saving the deposited loan. Somville and Vandewalle (2018) and Field et al. (2020) also both compare, in different contexts, paying money as cash versus into a saving account, finding that making payments directly into the saving account results in higher levels of savings, but no increases in own payments into the account.

5.4 Robustness

I perform a permutation test to compute exact test statistics which do not depend on asymptotic theorems. To do this I use Stata's permute function which randomly assigns women to the two treatments and control group and calculates the probability of observing the treatment effect I did under the null hypothesis that there is no treatment effect. I use 1000 permutations within strata. These are reported in Appendix Tables A8. The permutation p-values reject the null hypotheses at the same levels as the robust p-values.

My results are robust to alternative specifications and the treatment of outliers. I include a time trend of the number of days between disbursement and endline, both linearly and as a quadratic. This will control for seasonality effects, which could be important as the endline finished just before Christmas. Including a time trend does not affect my results[15], as seen in appendix Table A9.

I also examine alternative treatment of outliers by winsorizing at the 0.5 and 2% levels. This makes no difference to my results, as seen in Tables A10 and A11. I show average treatment on the treated effects from instrumenting actual take-up of the treatments with random treatment assignment in the Appendix in Table A12. Since my take-up was relatively high at 71%, these are approximately one-quarter larger than the estimates in Table 4.

I also confirm that my main results are unchanged if I control for any variable correlated with take-up in the regression specification in Appendix Table A13.

[15]The mean (and median) number of days between loan disbursement and the endline survey was 200 days, or 7 months

6 Mechanisms: Self-control, spousal pressure or saving constraints

There are three main channels through which mobile money accounts, and disbursement of loans onto those accounts could impact women's businesses: Firstly, the Mobile Disbursement treatment in particular, may have facilitated both learning and credibility about saving in a mobile money account and so relaxed saving constraints. Secondly, disbursement of the loan onto the mobile money account may have helped women to exercise self-control, both through mental accounting effects of having an earmarked account for the business and through the soft commitment of having to withdraw money from the account rather than have it as cash in hand. Finally, the mobile money accounts, and the disbursement of loans onto these accounts, may have kept the loan out of view of family, and, by not being kept as cash, circumvented social norms around sharing, and so given the woman more control over the loan.

6.1 Saving constraints

One reason the mobile money accounts could have an effect is if the women were saving constrained. The mobile money accounts may then have presented the women with a new avenue to save with. In this case, getting the loan on the mobile money account may have had a larger impact due to learning effects: the women might have not thought to save on a mobile money account before, or at least to save large amounts. The disbursement of the loan onto the mobile money account may therefore have taught the women that its possible to save so much on a mobile money account. They may also have implicitly assumed BRAC was validating that keeping so much money on a mobile account is safe and a good idea, helping them to overcome any reservations about doing this.

At first glance it seem unlikely that women who already have mobile money accounts (as 97% of them do) would not think to use them to save. However, according to survey data collected by the Financial Inclusion Initiative (2013) only 3% of households that use mobile money have used it to 'Save money for a future purchase or payment'. A further 5% use mobile money to 'Set money aside just in case/for an undetermined purpose'. Similarly in my data I find only 12% of the control group reported saving on a mobile money account. This suggests very low use of mobile money services for saving. A reason for this could be that people must learn about saving on a mobile money account, and build trust that money would be as safe in the mobile money account as in, say, a bank.

The Mobile Disbursement treatment may have provided a shock that forced women to at least temporarily hold a lot more money on the mobile money account than they were used to. BRAC also was implicitly providing information that this was a safe thing to do. The women were also told that they could use the mobile money account to safety store business funds.

However, there are potential problems with this explanation: if the Mobile Disbursement treatment group had learnt that mobile money accounts were a good place to save money I'd expect to see more deposits onto the accounts as women shift to putting more of their savings there. Instead I see no differences between the two treatment groups in terms of deposits into the accounts. I also do not find evidence that those treated with Mobile Disbursement deposited subsequent BRAC loans onto the mobile money account, again suggested learning and saving constraints cannot explain my findings[16]. Self-reported savings with mobile money, while significantly different for both treatments from the control group, are of economically tiny magnitudes (See Table A7 - the treatments increase mobile money savings from 2% of all savings to 3% and 5% in the Mobile Account and Mobile Disbursement treatments respectively).

The women also already had access to many other forms of saving, including over one-third who save in a bank account. If the women did learn that mobile money accounts are a good way to save, it seems difficult to reconcile this with the data on how they actually use the accounts. This makes me doubtful that saving constraints can explain my effects.

6.2 Self-control

To examine if self-control difficulties are a key channel trough which the accounts had an impact, I look at heterogeneity by an index of self-control difficulties at baseline. I construct this index using the method of Anderson (2008)[17]. The index is composed of whether a woman had hyperbolic time preferences (stratified) at baseline, whether she was impatient at baseline, where impatience was defined as always preferring money now over the future in the near-far time frame, and whether she didn't report saving for her business. It's important to note that while a component of the self-control index was used to stratify the original randomisation, the other variables could be picking up a correlation with another variable.

I show these results in Table 6[18]. I see no heterogeneous effects by the index of prior self-control difficulties for either treatment. This contrasts with Somville and Vandewalle (2018) and Fafchamps et al. (2014) who argue self-control difficulties might explain their findings.

[16]See Section 7.1 for further details on deposit of subsequent loans

[17]However, results are unchanged using an index constructed using principal components.

[18]Heterogeneous effects of the individual components of the index are shown in Tables A29-A31.

6.3 Family pressure

During focus groups prior to the research beginning, the women discussed the pressure they experience to share some of the loan with their family when they first get it. This is compounded by the visibility of large amounts of cash in small denomination bills. The women discussed the many strategies they employ to quickly use all or part of the loan when they first receive it, even spending on household items or their children rather than keep the loan as cash.

When the loan is disbursed onto a mobile money account, it is not subject to the same norms around sharing cash on hand (Platteau, 2000). Additionally, though mobile money accounts were designed to send money, they still involve multiple steps to making a transfer, which are considerably more of an obstacle compared to taking cash out of a pocket. They also require a fee to be paid on all withdrawals, which is a larger percentage of small withdrawals. The fact that the money was disbursed onto a mobile money account may also make it more credible for the woman to argue that this money was given to her by BRAC for her business, and that it would be known if she used it for other things. This may make it easier for her to argue that this money is earmarked only for her business. Both treatment groups could also use the account to obscure business profits by making deposits to the account, though I do not see this occurring in the data.

To examine whether mitigating social pressure was the main mechanisms by which the mobile money treatments affected women's businesses, I look at an index of family pressure at baseline and examine heterogeneous effects by this index. I construct this index in the same way as for self-control using the method of Anderson (2008)[19]. The index is composed of the following components at baseline: whether she switched above the median in the hiding game (stratified); whether she was married; whether she reported that when she had money on hand her spouse and family takes it; and whether her spouse or another household member had a business at baseline. Heterogeneous effects by this index are shown in Table 6.

I find strong heterogeneous effects for the Mobile Disbursement treatment by the index of family pressure at baseline for both profit and business capital. Those with high family pressure at baseline see a additional increase in their profits of 109,000 USH ($28) from getting the Mobile Disbursement treatment, or approximately 25% of profits at baseline. There is no impact of the Mobile Disbursement treatment for those who didn't experience above median pressure to share with family at baseline. This fits with the third prediction of my model, that impacts of the treatment would be largest for those who experienced the greatest family pressure at baseline.

I likewise see similar heterogeneity for business capital by family pressure at baseline for the Mobile Disbursement treatment. Overall, those who experience family pressure

[19] those results are unchanged if the index is constructed using principle components instead

Table 6: Heterogeneous treatment effects by baseline self control and family pressure index

	(1) profit	(2) savings	(3) capital
MA*self control	-5.26	7.22	24.14
	(28.96)	(73.82)	(166.49)
	[0.99]	[0.99]	[0.99]
MD*self control	35.13	25.00	53.85
	(27.17)	(76.75)	(159.99)
	[0.99]	[0.99]	[0.99]
MA*family pressure	32.39	-14.57	-19.40
	(28.34)	(77.46)	(166.49)
	[0.56]	[0.99]	[0.99]
MD*family pressure	109.30***	-54.12	595.17***
	(27.45)	(81.87)	(160.54)
	[0.01]	[0.99]	[0.03]
Mobile account	-1.67	9.36	32.29
	(21.67)	(53.87)	(117.40)
	[0.99]	[0.99]	[0.99]
Mobile disburse	4.57	46.25	-12.30
	(20.40)	(59.55)	(115.18)
	[0.49]	[0.99]	[0.99]
Self control	-2.34	-59.44	1.61
	(20.42)	(55.64)	(129.56)
Family pressure	-38.54*	93.81	5.10
	(19.89)	(59.49)	(126.88)
Observations	2,639	2,639	2,639
R-squared	0.44	0.35	0.57
Control mean self control	387.2	510	2335
Control mean family pressure	382.3	629.3	2521
Control mean baseline self-control	425.2	445.4	2315
Control mean baseline family pressure	429.5	526.6	2440
p-val MD self control=MD family pressure	0.047	0.475	0.020
p-val MA self control=MA family pressure	0.315	0.838	0.857

Intent-to-treat estimates. Monetary outcomes are winsorized at the 99% level and in '000 Ugandan Shillings. All regressions include strata dummies. Mobile Account (MA) is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse (MD) is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Heterogeneous indexes are defined in section 6. The interaction is for someone who is above the median in the index. Profit is self-reported monthly profit. Savings is total savings in each form of saving used. Capital is composed of business assets and inventories. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

to share at baseline see their business capital increase by 595,000 USH ($150), or 24% of baseline , from the Mobile Disbursement treatment. The heterogeneous effects by family pressure survive a multiple testing correct for profits and business capital, remaining significant at the 5% level. I see no heterogeneous effects from the Mobile Account treatment and no heterogeneous effects for the saving outcome.

Looking at the individual components of the family pressure index in the Appendix Tables A29-A31, I see that it is primarily hiding money, being married and self-reporting that if you have money on hand your spouse/family takes it at baseline that are driving the index (columns (2), (10) and (13)) for profit. The spouse or other family member owning a business also driving heterogeneous effects on business capital (columns (15) and (16)), though these estimates are noisier.

6.3.1 Expenditure patterns

If the Mobile Disbursement treatment helped women to resist family pressure to share money then this should appear in the expenditure data[20]. I have measures of the amount of money the women reports giving to her spouse. I therefore examine whether the treatments changed the amount and whether the woman reports giving money to her spouse. This is shown in Appendix Table A14.

I find that women who received the Mobile Disbursement treatment give significantly less money to their spouse, 10,000 USH ($2.7) on a mean of 22,000 USH ($5.4), or nearly 50% less. They are also significantly less likely to give any money to their spouse, with the Mobile Disbursement treatment group being 9 percentage points less likely to give money to their spouse. This is on a mean of one-third of women giving any money to their spouse. What is interesting about these results is that between baseline and endline the control group go from giving 11,000 USH ($2.9) to 22,000 USH ($5.4) and from 22% of them giving money to 30% of them giving money. For the Mobile Disbursement group there is no change in the probability of giving or the amount given to spouse.

I find no significant impact of the Mobile Account treatment on money given to the spouse or the probability of giving money to the spouse, though the coefficients are negative and I cannot reject equality with the Mobile Disbursement treatment at the 10% level.

This suggests that following receipt of the loan, spouses are receiving higher amounts of money from their wives. The Mobile Disbursement treatment mitigates this impact, and allows the women who receive this treatment to continue giving to their spouse at the baseline level. This suggests that receiving their loan on a mobile money account assists women in resisting pressure to share with their spouses.

[20] these outcomes were not pre-specified and are exploratory only

I also confirm that as a result of giving less money to her spouse, or because she has higher income from her business, those treated with Mobile Disbursement don't receive less money from their spouses. This is shown in column (3) of Table A14. While women only give 20,000 USH ($5) to their spouse, they receive on average 160,000 USH ($40) from their spouses. This is unchanged between baseline and endline and does not differ by treatment. The spouse is therefore not giving the woman less money in light of her higher income, suggesting that this increased income may be hidden from him.

I additionally collected data on how the loan was used immediately after disbursement. It's important to note that these questions about use of the loan in the week following disbursement were asked on average 8 months later, and so may be subject to large measurement error and recall bias compared to other questions which ask about the current period. They may also be more sensitive for the women to answer, since the loan is meant to be explicitly for their business, and so show over reporting of business expenditures. This bias however, would not be expected to differ by treatment group. I also did not pre-specify this outcome in the pre-analysis plan. Despite this, finding out how the loan was used immediately after disbursement provides important information about how the Mobile Disbursement treatment had an impact on business outcomes.

Results for how the loan was used across 7 categories are shown in Appendix Table A15. Spending on the business was the largest use of the loan immediately after disbursement, with an average of 760,000 USH ($200) or 54% of the mean loan size of 1.4mn USH ($370). However, spending on other categories was also large, with 135,000 USH ($36) going to sharing with others (10%), 112,000 USH ($29) on school fees (8%) and 110,000 USH ($28) on the household assets (8%). On average only 150,000 USH ($40) of the loan is 'saved' after the first week, suggesting that the loan is put to use very quickly rather than held as savings or spent on the business over a longer time period. On average, women reported expenditures accounting for 1.27mn ($340) of the 1.4mn USH loan, suggesting some under reporting may be occurring.

I see significant differences for the Mobile Disbursement treatment in the composition of loan spending. The Mobile Disbursement treatment group spend 29,000 USH ($7.7) less giving money to their family, 29,000 USH less on their home and save 45,000 USH ($12) more beyond the first week. This suggests a general slow down in spending as well as less spending on non-business expenditures. Combined with the findings of largest effects from the Mobile Disbursement treatment on profits and business capital for women who felt pressure to share money with family, and the reduction in transfers to the spouse, this suggests the Mobile Disbursement treatment could be helping women to protect their loan from their family, and as a result they are able to both spend the loan more slowly and spend more of it on their business. The finding that the Mobile Disbursement group reports greater savings immediately after getting the loan fits with prediction one of my model.

This evidence on heterogeneity, money given to the spouse and use of the loan is further supported by anecdotes from focus groups carried out with a small sample of women from the study. A common theme that ran through all the discussions was the control that the Mobile Disbursement treatment gave to women to use the loan in the way they intended rather than spending it on other things or giving it to other people. Women described the disbursement of the loan onto the mobile money accounts as helping them to refuse requests for money by arguing that 'BRAC gave me this money for my business and placed it in this account so that I would only use it for my business. If I give some to you they'll (BRAC) will know[21]'. Women may therefore have used the loan being on the mobile money account as a method of refusing to give money to others in a way that wouldn't be seen to be violating social norms. The fact that the fee for cashing out from a mobile money account is a higher percentage for small amounts may have also acted to deter small drains of money from the account as these would have been relatively more costly. In section 8, I show that I do not find any evidence that treatment affected women's place in or amount of support from her wider social networks.

6.4 Clustering analysis

I perform clustering analysis using k-means on the baseline variables described in Table 1 to classify entrepreneurs into different types. I select the number of clusters by using the k-means command in stata to cluster in groups of 1-20. I then examine the sum of within-cluster distances by number of clusters to choose the natural breakpoint. I also use the Calinski-Harabasz pseudo-F index stopping rule to confirm the chosen breakpoint, with a larger pseudo-F index suggesting more distinct clustering. Both these approaches suggest 4 clusters.

Summary statistics for the women in each of these 4 clusters are shown in the Appendix in Table A16. While groups 1-3 are mainly married, group 4 is composed primarily of widows. Groups 1 and 3 have much larger and more successful businesses than groups 2 or 4. Both groups 1 and 3 are more likely to say their family take their money when they have it, perhaps because they generally have more money than women in group 2 and 4. Group 1 is composed primarily of women who own their business jointly with their spouse, these women are also less likely to say they decide how to spend the income they earn. Group 3 employees more workers and is more likely to be a long term client of BRAC. Both group 2 and 3 are more likely to not even switch to giving their spouse money in the money hiding game. Group 3 make more household decision on their own than the other married women in groups 1 and 2.

[21]BRAC never had access to the account transaction data, only the researcher did, and the women were informed of this at the start of the study. The woman saying this in the focus group knew BRAC didn't actually have the ability to know what she used the loan for if it came out of the mobile money account, but seemed to be using the fact that other people didn't know this to refuse their requests for money

I examine heterogeneity by these 4 clusters in Table 7. Group 4 is the comparison group against which the 3 married groups are compared. I see no impact of either treatment on profits or capital for group 4. I see that there is a significant effect of treatment on capital and profits only for group 3, where profits increase 27% and capital increases 16%. The other 2 married groups do not show statistically different treatment effects from group 4. Using t-tests I also show that group 3 has a significantly larger impact from the Mobile Disbursement treatment than group 2 (but not group 1). This is likely due to group 3 having high profits that are subject to sharing pressure.

Interestingly I do see significant impacts on saving of the Mobile Disbursement treatment for group 4. Group 3 save less as a result of the Mobile Disbursement treatment, though they saved considerably more than the other 3 groups at baseline.

Overall, these findings suggest that it is married women, with more successful businesses that they own themselves, who report their family takes their money when they have it and who hide money in the hiding game that are driving the impact of the Mobile Disbursement treatment on profit and capital. This finding supports that seen in the family pressure index, but adds a dimension that its only if women had sufficiently successful businesses that they alone control, and so have money they are pressured to share with others, that they see improvements in business outcomes from the Mobile Disbursement Treatment. This fits with other studies which have found more successful women benefit more from receiving a loan not as cash (Fafchamps et al., 2014).

6.5 How is the Mobile Disbursement treatment increasing profits?

Here I examine why giving women more control over the loan by providing it on a secure, separate mobile money account resulted in improvements in business outcomes. Firstly I examine what is happening to the loan in the control group, and how this differs for the Mobile Disbursement group. The, I examine in more detail changes in business capital, and, the other main business input, labour. Additionally, I look at whether there are changes in types of activities women do for their business. I also examine whether the impacts are larger for certain types of business based on their baseline capital structure.

I show in Appendix Table A24 the impact of the treatments on total household wealth. This is the value of all assets the woman reports as owned by the household, regardless of whether they are primarily used by the household or for the business. What is interesting here is that total wealth increases between baseline and endline for all groups by over 1mn UGX, two-thirds of the loan value. Since there were no increases in business assets for the control and Mobile Account groups, the loan is primarily being spent by these groups on household assets, rather than business investment. It is therefore not surprising that the loan is not leading to enterprise growth, when it is being used more like a consumer

Table 7: Treatment effects by 4 groups on primary outcomes

	(1) profit	(2) saving	(3) capital
Mobile Account	20.61	9.08	-10.53
	(27.60)	(71.37)	(167.68)
Mobile Disbursement	29.22	148.08**	-24.51
	(26.18)	(74.22)	(155.67)
group1*MA	16.68	51.79	-425.95
	(74.14)	(236.49)	(508.74)
group2*MA	2.86	-15.84	92.30
	(34.50)	(90.36)	(218.64)
group3*MA	25.51	-99.16	212.45
	(55.83)	(165.93)	(366.51)
group1*MD	89.37	-318.81	190.85
	(64.75)	(205.45)	(515.94)
group2*MD	16.62	-134.34	198.16
	(33.34)	(96.02)	(210.25)
group3*MD	179.58***	-410.23**	967.66***
	(58.32)	(165.81)	(345.90)
group 1	25.89	262.37	1,712.24***
	(41.74)	(162.59)	(378.50)
group 2	-19.83	54.57	57.57
	(24.52)	(64.94)	(159.52)
group 3	117.33***	499.30***	1,270.41***
	(37.46)	(127.80)	(255.44)
Observations	2,616	2,616	2,616
R-squared	0.30	0.19	0.26
Mean group 1	492.1	501.9	3835
Mean group 2	332.8	395.5	1918
Mean group 3	681.4	1025	3710
Mean group 4	417	337.3	1855
p-value MA=MD	0.740	0.07	0.93
p-value group1*MA= group2*MA	0.85	0.77	0.30
p-value group1*MA= group3*MA	0.92	0.57	0.27
p-value group2*MA= group3*MA	0.65	0.60	0.73
p-value group1*MD= group2*MD	0.23	0.35	0.98
p-value group1*MD= group3*MD	0.25	0.70	0.18
p-value group2*MD= group3*MD	0.00***	0.08*	0.02**

Groups selected from k-mean clustering on baseline covariates. Means are shown overall and for each group at baseline. The bottom panel shows p values from comparing each treatment and treatment interaction against the others Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

goods loan. The Mobile Disbursement group see a significant increase in both business and total wealth.

I break down the capital measure into different dimensions of business assets and inventory in Appendix Table A17. I find a significant positive effect of the Mobile Disbursement treatment on the asset index as well as the number of unique assets used in the business, implying that it is not simply that those who receive their loan on a mobile money account are purchasing higher value assets, or more of the same assets, they also seem to be increasing the diversity of assets used in the business. This could reflect the idea that getting the loan on the mobile money account makes it easier to purchase a number of different, moderate valued assets, rather than trying to tie-up as much of the cash loan as possible into an asset as quickly as possible. I find no significant impact of the Mobile Account treatment on the business asset index.

I also examine the value of business assets, which was a component of the primary outcome capital, along with the value of inventory. Inventory was by far the largest component of capital (80%), but even looking just at business assets I still see a significant impact of the Mobile Disbursement treatment of 130,000 USH ($35). I also find a significant effect of the Mobile Disbursement treatment on inventory value, of 90,000 USH ($32). I see no impact of either treatment on the total number of assets used in the business. This shows that women treated with Mobile Disbursement invest in diverse business assets and higher value assets, as well as greater inventory.

One important point to highlight is the value of business assets and inventory compared to the loan size. At endline, women have increased the total value of their assets by 130,000 UGX ($34) and of their inventory value by 120,000 UGX ($32). The mean price of an asset in the sample is only 100,000 UGX, while the mean loan size is 1.3mn UGX ($340). Hence based on these number, businesses who received the Mobile Disbursement treatment are not buying very high value assets that use the majority of the loan, but instead seem to be buying both inventory and one moderate value asset of a different variety to their existing assets. This also fits the pattern seen in the transaction records, with the loan drawn down over 3 months in an average of 4 batches. The Mobile Disbursement treatment seems to be working through enabling the loan to be channeled into on-going inventory purchases and a small amount of asset investment for the business. While the increase in inventory in the business is relatively small at less than 10% of the baseline value, other studies have shown that lack of inventory is extremely costly and small increases in inventory can significantly increase profits (Kremer et al., 2016). I do not see any impact of either treatment on hours worked either household or non-household employees or the number of employees (see Appendix Table A18).

In the Appendix I examine heterogeneity for the primary outcomes by median splits of baseline assets and inventories, to further examine whether the impacts seen are concentrated in particular types of business structure (Table A29-A31). I do not find any heterogeneous effects of either treatment on business profits from the business being below or above median at baseline for either assets or inventories, suggesting my impacts

are not concentrated in a particular type of business. However, I do see that increases in capital from being assigned to the Mobile Disbursement treatment are concentrated in those with above median baseline levels of inventory (and this is being driven by further increases in inventory - results not shown). This suggests that business with more working capital based businesses rather than fixed asset business are benefiting from treatment, thus confirming the third prediction of my model.

In Appendix Table A28 I examine whether the business industry changed as a result of treatment. While I see some indication that those treated with the Mobile Disbursement Treatment were more likely to operate motorbike rental (boda boda) and shops, and less likely to operate hairdressing/beauty parlors, these do not survive multiple testing (results not shown). If I look at a dummy variable capturing if the business changed between baseline and endline (column (18)), I do not find a significant impact of either treatment. I therefore conclude that the Mobile Disbursement treatment did not have an impact on business performance through changing the type of business.

Overall, I see that the control and Mobile Account groups primarily use the loan for buying household assets. I find that the Mobile Disbursement Treatment is having an impact on business performance through increasing the range and value of business assets and inventory, and not through changes in labour input or shifting into different industries. I do not see impacts concentrated in particularly asset or inventory focused businesses at baseline, though there is some evidence inventory heavy businesses grow their inventories even further when treated with Mobile Disbursement. The pattern and size of asset increases, when examined alongside the transaction records, suggest the Mobile Disbursement treatment helps channel more of the loan into inventory and at least one additional (moderate value) asset that the business did not previously use.

7 Why didn't the Mobile Account treatment imitate the Mobile Disbursement treatment?

One puzzle about the results found here is why the Mobile Account treatment, and even the control treatment, did not just imitate the treatment received by the Mobile Disbursement group. In other words, why didn't the Mobile Account group take their loan and deposit some of it directly onto the sim card I gave them? Equally, why didn't the control group, the majority of whom already did have a mobile money account, also deposit some of their loan onto the account? Note that while imitation of the Mobile Disbursement treatment was entirely possible by the Mobile Account and even Control groups, since I provided a small amount for withdrawal fees to the Mobile Disbursement group, the benefits of imitating would not be as large. Even so, it is puzzling that almost no-one in the Mobile Account group deposits a significant amount onto the account[22].

7.1 Learning

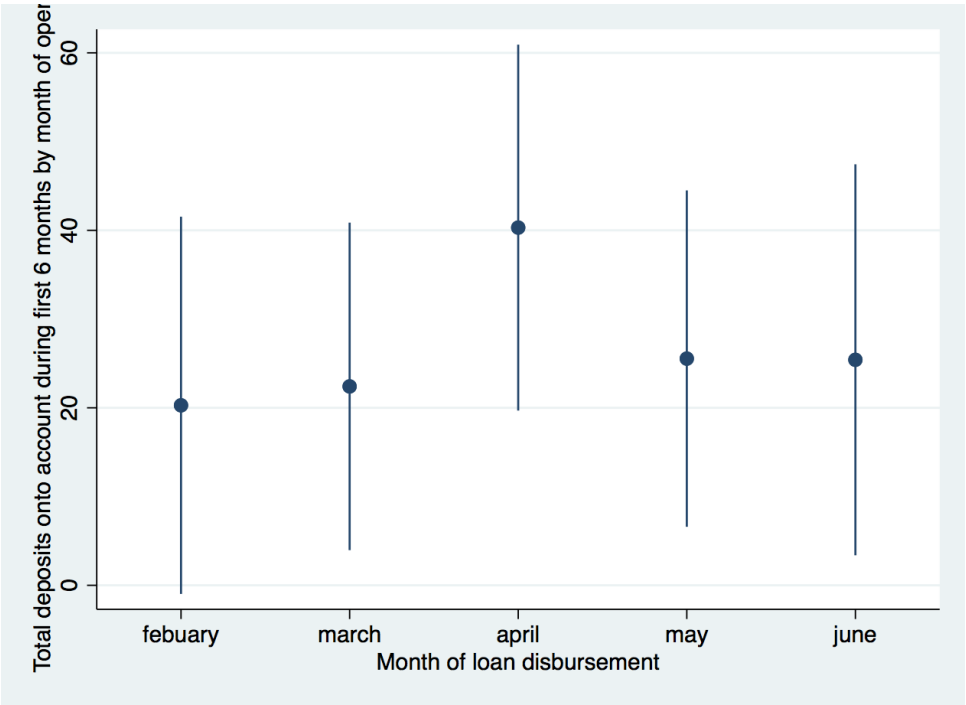
As already discussed saving via mobile money was not very popular at baseline, with less than 20% of the sample saving in this manner. The amounts saved on a mobile money account were also relatively small, with a mean of 135,000 USH ($36) and a median of 100,000 USH ($27), compared to total savings of 800,000 USH ($210) (median 500,000 USH ($130)) for those that saved using mobile money[23]. There may therefore have been learning effects around keeping money on a mobile money account and it being safe to store so much money on the account, since the average loan size was 10 times what the average women saved on mobile money. BRAC might also have legitimised that keeping so much money on a mobile money account is a safe and secure thing to do.

However, if this was true I'd expect to see the Mobile Account group becoming more likely to deposit the loan on their mobile money account over time, as they increasingly saw members of their group receive the loan on the mobile money account. I can therefore use natural time variation in the proportion of women treated to examine this. I do this by regressing the cumulative deposits onto the mobile money account during the first 180 since opening on month dummies for the month of the study, between February and June 2017. The coefficients on the month dummies are shown in figure 2. While at first it looks like the balances added to the account by the Mobile Account group are increasing over time, this trend breaks down in May and June. In total the Mobile Account group deposit very small amounts onto the mobile money account, on average

[22]Only 25 people in the Mobile Account group deposit more than $70 onto the sim card, where $70 is the smallest possible loan size

[23]This is saving as self-reported from the survey, not balances on the mobile money accounts from the admin data

Figure 2: Total deposits to mobile money account during first 180 days of account opening by month of account opening, Mobile Account group, '000 USH



Cumulative deposits made to the mobile money account by month of account opening for the Mobile Account treatment group.

just 20,000 USH ($5) during a 6 month period[24]. Additionally, I look at if anyone else in the same microfinance group received the Mobile Disbursement treatment before them, whether a woman is more likely to make a deposit to the mobile money account. I do not see any evidence of women being more likely to make a deposit to the mobile money account if they observed women getting the Mobile Disbursement treatment before them (results not shown). Overall this evidence suggests that there is no learning by the Mobile Account group to deposit their loan on the mobile money account, and so casts doubt that learning and validating by BRAC as a safe way to store money are responsible for my findings.

Additionally, I am able to examine whether the treatment groups chose to deposit any subsequent loans from BRAC onto the mobile money account I gave them. Given the benefits seen in the Mobile Disbursement group from receiving a loan this way, I might expect this group to be more likely to deposit a subsequent loan onto the mobile money account. I examine this by combining BRAC admin data with the mobile money transaction records for the whole of 2017. I restrict the sample to women taking out a subsequent loan during 2017, of which 1417, or almost half my sample did, and examine

[24]Amongst those who make at least one deposit (12%), the average total deposits are 200,000 USH ($50) (median 76,000 USH). There is still no significant difference by month of loan disbursement.

the deposits and withdrawals to the mobile money account I provided. I show results comparing the Mobile Disbursement to Mobile Account group in deposit behaviour on a subsequent loan in Appendix Table A19.

I first look at whether the woman made any deposit to the mobile money account in the 2 weeks after the subsequent loan was disbursed. 10% of the Mobile Account group make a deposit in this period, and I see no difference with the Mobile Disbursement group. Secondly, I look at the amount deposited, again seeing no significant difference between the treatment groups and extremely small values (10,500 UGX, $3). As a share of the loan value, this is less than 2%. Overall, I do not see any significant differences between the Mobile Disbursement group and Mobile Account group in terms of willingness to deposit any of the subsequent loan on the mobile money account[25], suggesting the Mobile Disbursement group haven't needed to learn about the benefits of keeping the loan on a mobile money account to do it themselves. I therefore think it unlikely that a need for learning explains why the Mobile Account group do not deposit their loan onto the mobile money account.

7.2 Social norms

Secondly, a key benefit of receiving the loan on the mobile money account is the ear-marking of the loan as for the business. This ear-marking may relax social norms around sharing of money. It is possible that going to an agent yourself and deposit some of the loan would not sufficiently ear-mark the loan as for the business compared to BRAC depositing the money for you. It might also be viewed as you trying to get around the social sharing norm, resulting in guilt. If this is the case, then women can only overcome this norm through BRAC depositing the loan for them, not through their own actions. However, given that the main person the woman is getting pressure from to share the loan with is the spouse, and he does not know whether BRAC deposited the loan for the woman or gave her cash which she deposited onto the mobile money account, this doesn't entirely explain the lack of depositing of the loan by women. Additionally, women seem to engage in widespread hiding of money from their spouse, and from the focus group discussions this did not seem to cause guilt. Given the large number of mobile money agents available in Kampala, it seems perfectly possible for the women to go directly from BRAC to an agent and deposit her loan, without her spouse knowing about it. However, this result does fit with others which have found that female-enterprise-owners are only able to expand their business when given an asset for their business, not when given the equivalent amount of cash, when it should likewise be perfectly easy for them to convert the cash into an asset themselves (Fafchamps et al., 2014). Additionally, they find that

[25]it is possible that women are instead using their personal mobile money accounts to deposit the loan to, in which case I would not be able to observe this

the benefits of being given an in-kind transfer over cash are largest for more successful women, and I also see evidence in my sample that women with more profitable and larger businesses benefit most from receiving the loan on a mobile money account.

7.3 Procrastination

A third hypothesis relates to the time investment in depositing the loan into the mobile money account. Evidence has shown that even small costs can have large impacts on behaviour, particularly for those with hyperbolic preferences (O'Donoghue and Rabin, 1999). I confirm that distance to the nearest mobile money agent does not vary by treatment in the balance Table 1, and on average the women are less than 5 minutes from a mobile money agent. This suggests that transaction costs at least in terms of finding an agent are extremely low. However, even this cost combined with the costs of waiting in line and depositing the money with the agent may have been enough of a deterrent to the women to prevent them depositing the loan themselves. Considering that 20% if the sample have hyperbolic preferences and 34% are defined as impatient, I cannot rule out that even very small time costs combined with procrastination could explain why the Mobile Account group does not imitate the Mobile Disbursement group.

7.4 Default effects

A final explanation is default effects. Default effects have been shown to have large impacts on behaviour, including saving behaviour (Chetty et al., 2014, Choi et al., 2004). A number of studies have also looked at default effects as a driver of low savings in developing countries. Two studies have found that when people are given a bank account and then paid in either cash or directly onto that account, even when payment takes place at the bank itself those paid in cash do not deposit the money onto the accounts and as a result save less than those paid directly onto the account (Brune et al., 2017, Somville and Vandewalle, 2018). Another study showed that there are large differences in use of an employer-based saving scheme dependent on whether payments are automatically deducted from workers wages or whether the employee has to actively deposit money to be saved (Brune et al., 2018). This is despite the manual deposits taking place next to the office where workers received their wages.

The reasons for these impacts are argued to be default effects, since the cost of transacting in these settings are so small, possibly combined with some element of procrastination[26]. Additionally, when people are encouraged to save part of their salary, defaults were found to be equivalent to a 50% matching incentives in terms of the increase in

[26]An alternative explanation would be a cash in hand effect, where physical cash is treated differently to electronic or saved cash. However Spantig (2019) does not find evidence that there is a strong cash in hand effect

savings they induced (Blumenstock et al., 2018). In my study, Mobile Account makes the default around adding savings onto the mobile money account. Mobile Disbursement makes the default removing money from the account. It is therefore very possible that the lack of imitation of Mobile Disbursement by those assigned to Mobile Account is entirely due to default effects and the inertia associated with them, potentially combined with some small cost of depositing money oneself and procrastination to avoid this cost.

8 Alternative explanations

I examine a number of different potential reasons for the results I find. Firstly, the profit increase for the woman's business may be simply a reallocation within the household that may actually leave the household worse off. Secondly, there may be backlash effects against the woman from the spouse as a result of her handing over less money to him. Thirdly, since the mobile money account facilitate remittances, any benefit to the household in terms of higher income may have been eroded by higher transfers to others. Fourthly, there may be experimenter demand effects combined with the salience of the loan being disbursed onto a business-designated mobile money account that made households report better business outcomes. Fifthly, there may be measurement error in business outcomes and the mobile money disbursement of the loan may have helped households keep better track of their finances and so report better outcomes. Sixthly, if women give less to their social networks, they may receive less in return, damaging their ability to withstand shocks. Lastly, women may be more likely to default on their loan repayments, and as a result have more net income. I examine each of these in turn.

8.1 Redistribution within the household

It is possible that if the mobile money disbursement helped women retain use of the loan for their own business over transferring it to other members of the household, that this could lead to a reduction in total household income and welfare if other household members have higher returns to capital in their businesses (Bernhardt et al., 2019). I therefore examine whether the income of other household members changed as a result of the treatments, as well as household consumption. Note that the incomes of other household members are as reported by the woman, they were not asked directly, and hence if the husband keeps some of his income hidden from the woman I may not be able to observe household income effects.

Looking at Table 8, I see an overall increase in household income of just under 90,000 USH ($24) for households in which the woman got her loan disbursed on the mobile money account. This is a similar figure to the increase in income I see for the woman's business (60,000 USH ($16)), with the difference seeming to be made up of (insignificant) increases in wage earnings for both the spouse and other household members. I see small and insignificant at the 5% level reductions in women's wage earnings from both treatments.

I see no differences in either the spouse or other household members business earnings as a result of giving women mobile money accounts. Note that at baseline, business and wage incomes were not distinguished for the spouse and other household members but combined under primary and secondary sources of income in general. At endline, I explicitly distinguish between household business and wage income and collect more

Table 8: Treatment effects on secondary income outcomes

	(1) total household income	(2) woman's wage earnings	(3) spouse wage earnings	(4) spouse business earnings	(5) other hh wage earnings	(6) other hh business earnings	(7) spouse all earnings	(8) other hh all earnings
Mobile account	10.04	-7.86*	-11.52	10.30	11.83	-2.57	1.05	9.02
	(35.66)	(4.18)	(18.67)	(7.83)	(24.81)	(7.08)	(27.93)	(11.70)
Mobile disburse	87.14**	-2.39	11.03	12.99	-2.35	-3.95	18.67	10.31
	(36.48)	(4.49)	(19.16)	(8.07)	(24.78)	(7.04)	(28.83)	(11.72)
Observations	2,642	2,642	2,561	2,642	2,642	2,642	2,561	2,642
R-squared	0.33	0.18	0.25	0.24	0.16	0.15	0.33	0.27
Control mean endline	1010	25.42	187.1	56.56	281.09	38.34	477.55	99.31
Control mean baseline	1041	66.40	-	-	-	-	423.46	126.48
p-value T1=T2	0.03	0.19	0.22	0.75	0.57	0.84	0.53	0.91

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. All incomes are monthly and are reported by the woman on behalf of other household members. Note at baseline spouse and household wage and business income was captured as a combined total. At endline they were captured separately. Difference between total household earnings and columns in this table is woman's business earnings. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

detailed information on other household business, including since when and for how long other household members have been running businesses. Even looking at total spouse and other household member earnings, I find no significant impacts of either treatment, and, if anything, the coefficients on the Mobile Disbursement treatment is positive.

These findings suggests that in fact enabling the loan to be used by the woman for her business generates more income for the household. These results differ to the interpretation in Bernhardt et al. (2018), where women are investing the loan in whichever household businesses has the highest return, and on average women's businesses have lower returns in multi-business households. This could be because significant amounts of hiding are occurring in this sample[27], which may differ from other contexts, and so women may be engaging in costly hiding strategies to retain control over their loans. If the mobile money disbursement of the loan alleviates costly hiding by providing a more effective hiding device, then more profit and overall household income can be generated from the loan. Potential costly hiding strategies were discussed in Section 6 when I examined how the loan was spent immediately after disbursement, and found that significant amounts of the loan were used for household spending and that 90% of the loan was spent within the first week after disbursement. These findings are in line with Goldberg (2017) who finds households given a windfall income both predict they will spend and actually spend more of it in the weeks immediately after getting it if the windfall is public.

I also validate that the increase in profits from the woman's business is feeding through into higher consumption[28]. Looking at consumption in Table A20, I see significant increases in overall consumption for the Mobile Disbursement treatment. This shows that the increase in profit from obtaining the Mobile Disbursement treatment is feeding through into higher household welfare overall. This increase in consumption is of a similar value to the increase in business profits seen (50,000 USH ($13) compare to a 60,000 USH ($16) profit increase), and so suggests the majority of the profit increase is actually being spent by the household. This could also explain why I find no impacts on savings from the treatment, as any additional income is being spent.

8.2 Backlash and female empowerment

Giving the woman more control over her loan may have resulted in a backlash against her by her spouse, since he now gets less money from her (as seen in Appendix Table A14). While I do not have explicit measures of discord, arguments or violence in the household, I did ask the woman questions on happiness and life satisfaction, which might act as a proxy for marital well-being and should capture any change in violence or discord

[27] 55% of the sample would be willing to give up $7 to retain control of money over giving it to their spouse

[28] since I find no increase in saving, this additional income must appear in consumption, remittances or as assets

sufficiently large to affect overall happiness. I also look at worries about money as a proxy for financial stress[29]. These results are shown in Table A21. I see no differences in happiness or life satisfaction by treatment group, though for all groups happiness and life satisfaction are both lower at endline than baseline. I see a small decrease in worries about money for the Mobile Disbursement group.

I also examine female empowerment in the form of household decision making in Appendix Table A22. I see an increase in decision made by the woman alone when the woman is in the Mobile Disbursement treatment group (column (2)), and an increase in an index of all the variables capturing female empowerment when combined into an index (columns (7) and (8)). Overall, these results suggest that women are gaining decision making power as well as control over their income when assigned to the Mobile Disbursement treatment, and see no change to their overall happiness or life-satisfaction.

8.3 Remittances

Mobile money accounts make it easier to send remittances (Jack and Suri, 2011). Any benefits of the accounts in terms of ease of saving money may therefore be outweighed by the increased ease of sending money. I examine this by looking at remittance flows.

Looking at remittances in Appendix Table A23, which are defined as money sent/received from non-household members, I see relatively large coefficients on amount of money sent for both the Mobile Account and Mobile Disbursement treatments of approximately 10,000 USH ($3). However, only the coefficient on the Mobile Account treatment is significant at the 10% level. I see no other large or significant effects of the treatments on amount received as remittances, the net amount received (amount received minus amount sent), whether the woman used a mobile money account to send the remittances or the probability that she received or sent remittances.

Overall, this suggests there might be a small increase in the amount of remittances sent as a result of treatment, but no increase in use of mobile money or likelihood of sending remittances using other forms. The fact that I see little to no effects on remittances might be partly because the mobile money account provided in the study was a second mobile money account for most of the women. If the account had been the first and primary mobile money account for the women it is possible more leakages of the loan in the form of remittances might have occurred.

[29]This variable was only measured at endline

8.4 Experimenter demand effects

The salience of giving mobile money accounts designed for the business and of disbursing the loans specifically onto those accounts may have caused those women who received the Mobile Disbursement treatment to over report their business outcomes because they believed that is what the study intended to do. However this increased salience around reporting for the business should not also affect other outcomes, such as household consumption and assets.

I test this by seeing if there is an overall increase in total household assets. For the households in this sample the distinction between household and business assets is not clear, and often the same asset is used both by the household and by the woman's business. The survey therefore asked for all assets owned by (anyone in) the household, and of those, which were used for the woman's business. Total household assets then by definition captures all those used in the woman's business as well as those used only by the household.

In Table A24, I see that the Mobile Disbursement treatment led to a significant increase in overall asset levels of 330,000 USH ($90) compared to control. In Table A17, we saw in column (2) that the value of business assets is 132,000 USH ($35) higher for the Mobile Disbursement treatment. This implied that 200,000 USH ($55) was additionally invested by the Mobile Disbursement group in household assets. In addition the control group increased by 1mn USH ($270) their household assets between baseline and endline in household assets. This means that actually one of the key uses of the loan for all the women in the study is increasing household assets, and the Mobile Disbursement treatment appears to have increased both business and household assets even further.

As already noted, consumption in the Mobile Disbursement women's households increased by close to the amount that woman's business profits increased. Since it is less clear why the woman would inflate her consumption because she thinks we wanted her business to grow, this provides further evidence that the business improvement is not due to experimenter demand effects.

Additionally, it is not clear that just providing a business-designated mobile money account is significantly less salient as a treatment designed to affect their business than also providing the loan on the account. If experimenter demand effects were strong in this population, it would be strange to see no effect of this treatment. Experimenter demand effects have been found to be relatively small (de Quidt et al., 2018), and so combined with the fact I find impact across a range of household, not just business, outcomes, I do not believe experimenter demand effects could be driving my results.

8.5 Tracking expenditures

The mobile money accounts may have made it easier to keep track of business outflows, sales and profits if the mobile money account was used for these activities. The disbursement of the loan onto the mobile money account may also have made it easier to keep track of what the loan was spent on. These are unlikely to be responsible for the impacts I see for the following reasons.

Firstly, the mobile money accounts given to either treatment group were not used by the majority of the women for frequent deposits and withdrawals of funds[30]. The treatments therefore are unlikely to have made it easier to keep track of regular business expenses and sales since these activities did not take place on the accounts. Additionally, I would only see impacts from use of mobile money accounts correcting measurement error if measurement error only downwardly biased estimates of profit and business capital. It is not clear why measurement error would only downward bias reported business outcomes.

Secondly, the balance on the accounts in the Mobile Disbursement treatment was withdrawn to near zero by 30-60 days after loan disbursement. If the treatment allowed better tracking of business expenditures, I would not expected to find impacts 8 months later when the accounts are barely used anymore.

Thirdly, while the Mobile Disbursement treatment may have made it easier to track the use of the loan, this would only be expected to impact capital expenditures on inventory and assets. There should not be any additional effect on profits, or the downstream outcomes of household consumption.

To try and see if the Mobile Disbursement treatment led to any permanent changes in record keeping, I look at a variable capturing the sort of record keeping occurring in that business. In Appendix Table A25 I see that there is no impact of treatment on likelihood of using any method of record keeping. Overall, this suggests that the idea that the mobile money accounts improved tracking of business outcomes seems unlikely as an explanation for the impacts I see.

8.6 Social networks

I argue that the Mobile Disbursement treatment helped women resist pressure to give money to others, particularly the spouse. However, if women are giving less to their social network they may also receive less and be less able to withstand shocks. I did not collect survey data on social network links or experiences of negative shocks. However, I do have some data on money given to and received from others and on the number of people the woman can rely on when in need from her microfinance group. I can use these as proxies for social networks.

[30] Only 13% of either group made a deposit

Firstly, I do not see any changes for either treatment group in the amount of remittances either given by or received from others, see Appendix Table A23, suggesting women are not contributing less or being cut off from wider remittance networks. Instead, I argue it is primarily the spouse and immediate household who receive less.

Secondly, I look at women's peers in the microfinance group. Many of the women described their friends in the microfinance group as those they rely on most when in need. I asked questions on the number of women in the microfinance group a woman talks to at least once a week outside the group, how many they could ask for financial help from and how many they'd offer financial help to. The results of treatment on each of these outcomes is shown in Table A26. On average, women talk to 7 other group member at least once a week outside the group but would ask for help from, and be happy to give help to just around 4 of these. This is from a mean group size of 21 women. I find no difference by treatment status, suggesting getting the loan on a mobile money account did not isolate women from other members of their microfinance group.

8.7 Changes in microfinance default

Finally, I check whether the treatments lead to any changes in loan performance. I use BRAC administrative data to look at whether those receiving their loan on a mobile money account were more likely to miss a payment, how late any missed payments were, the balance due on the principle and interest, the balance due of any missed payments and whether there are any changes in the saving balance they hold with BRAC. These results are shown in Appendix Table A27. I do not see any changes in re-payment behaviour as a result of my treatments.

9 Conclusion

This paper shows that the manner in which loans are disbursed to microfinance clients leads to significant differences in how those loans are used. Women assigned to receive the loan on the mobile money account hold significant balances equal to 10% of the loan value or 34% of household savings on their account during the first 30 days after getting the loan. They draw down this balance over a 6 month period. Clients who receive their loan on a mobile money account invest in 11% more business capital and as a result have 15% higher profits. These impacts are largest for women who experiences family pressure to share money at baseline, and result in them giving less of their loan to their spouse and other household members. This suggests the benefits to women's business from the Mobile Disbursement treatment come from a way to store the loan that's not subject to the same sharing pressure as cash, ready to invest when needed.

My study suggests that microfinance loan providers should consider disbursing the loan onto a private account, as opposed to the current default in much of the world

of cash. This small change could have significant benefits to the profitability of female entrepreneurs. With the increasing spread of mobile money services, this intervention is a low cost way to raise the benefits of microenterprise loans to women and an easy policy recommendation for NGOs and other organisations disbursing microfinance loans to follow. The women in the study demonstrated strong demand for getting a loan on a mobile money account, with 71% initially taking up this form of the loan, and by the end of the study 77% reported that they would prefer to get future loans in this manner[31]. It is therefore a popular, low cost and easy change to the current default of disbursing loans as cash.

One limitation of this study is the short time horizon over which it took place: 8 months was chosen as the follow up period to allow the endline survey to be completed before most clients loan repayment period had ended, thus improving tracking. However, as a result of this design it is not clear whether the benefits to the women's profitability would persist going forward. This is especially true since BRAC Uganda reverted to disbursing loans using only cash after the study ended, despite many clients expressing their preference for mobile money[32]. Ideally, future work would both replicate my findings and also look at how the effects persisted over a longer period of time of making loan disbursements using mobile money.

A second limitation is that all surveys were only carried out with the woman. Hence while she doesn't notice any impact on her husband's income, I cannot entirely rule out negative impacts there. Collecting data from both the woman and the spouse will allow a clearer picture of what is happening in the household.

A final limitation is that my study only took place in an urban sample amongst women familiar with mobile money services. Women in rural locations may stand to benefit more from disbursement of a loan onto a mobile money account if they also are saving constrained. However, they may struggle to use the service and require more training, and limitations in the amount of float that agents hold in rural areas may prevent them cashing out as much of the loan as they'd like. Further research is needed to understand how my results generalise to rural locations and other contexts where people are less familiar with mobile money.

[31] 70% of the cash and Mobile Account groups reported they would like to receive future loan via mobile money, suggesting the Mobile Disbursing treatment was experienced more positively than expected

[32] BRAC Uganda are currently transforming to a full banking license, and are planning to pilot mobile money loan disbursement again once they are able to do the disbursement themselves as opposed to through a partner

References

Aker, J. C., Boumnijel, R., Mcclelland, A., and Tierney, N. (2016). Payment Mechanisms and Anti-Poverty Programs : Evidence from a Mobile Money Cash Transfer Experiment in Niger. *Economic Development and Cultural Change*, 65(1):1–37.

Almås, I., Armand, A., Attanasio, O., and Carneiro, P. (2018). Measuring and Changing Control: Women's Empowerment and Targeted Transfers. *Economic Journal*, 128(612):F609–F639.

Andersen, S., Harrison, G. W., Lau, M. I., and Rutström, E. E. (2008). Eliciting risk and time preferences. *Econometrica*, 76(3):583–618.

Anderson, M. L. (2008). Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects. *Journal of the American Statistical Association*, 103(484):1481–1495.

Anderson, S. and Baland, J.-m. (2002). The Economics of ROSCAs and Intrahousehold resource allocation. *The Quarterly Journal of Economics*, 117(3):963–995.

Ashraf, N. (2009). Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines. *American Economic Review*, 99(4):1245–1277.

Ashraf, N., Karlan, D., and Yin, W. (2006). Tying odysseus to the mast: Evidence from a commitment saving product in the Philippines. *Quarterly Journal of Economics*, 121(2):635–672.

Ashraf, N., Karlan, D., and Yin, W. (2010). Female Empowerment: Impact of a Commitment Savings Product in the Philippines. *World Development*, 38(3):333–344.

Attanasio, O. P. and Lechene, V. (2014). Efficient Responses to Targeted Cash Transfers. *Journal of Political Economy*, 122(1):178–222.

Baland, J.-M., Guirkinger, C., and Mali, C. (2011). Pretending to Be Poor : Borrowing to Escape Forced Solidarity in Cameroon. *Economic Development and Cultural Change*, 60(1):1–17.

Banerjee, A., Karlan, D., and Zinman, J. (2015). Six randomized evaluations of microcredit: Introduction and further steps. *American Economic Journal: Applied Economics*, 7(1):1–21.

Bastian, G., Bianchi, I., Goldstein, M., and Montalvao, J. (2018). Short-Term Impacts of Improved Access to Mobile Savings, With and Without Business Training: Experimental Evidence from Tanzania. *Center for global development working paper*, 476(March):1–24.

Batista, C. and Vicente, P. C. (2020). Improving Access to Savings through Mobile Money: Experimental Evidence from Smallholder Farmers in Mozambique. *World Development*, 129.

Benjamini, Y., Krieger, A. M., and Yekutieli, D. (2006). Adaptive Linear Step-Up Procedures that Control the False Discovery Rate. *Biometrika*, 93(3):491–507.

Bernhardt, A., Field, E., Pande, R., Nigol, N., Schaner, S., and Troyer-moore, C. (2018). Male Social Status and Women's Work. *AEA Papers and Proceedings*, 108:363–367.

Bernhardt, A., Field, E., Pande, R., and Rigol, N. (2019). Household Matters: Revisiting the Return to Capital among Female Micro-Entrepreneurs. *American Economic Review: Insights*, 1(2):141–160.

Blumenstock, J., Callen, M., and Ghani, T. (2018). Why Do Defaults Affect Behavior? Experimental Evidence from Afghanistan. *American Economic Review*, 108(10):2868–2901.

Bobonis, G. J. (2009). Is the allocation of resources within the household efficient? New evidence from a randomized experiment. *Journal of Political Economy*, 117(3):453–503.

Boltz, M., Marazyan, K., and Villar, P. (2019). Income hiding and informal redistribution: A lab-in-the-field experiment in Senegal. *Journal of Development Economics*, 137:78–92.

Bruhn, M. and McKenzie, D. (2009). In Pursuit of Balance: Randomization in Practice in Development Field Experiments. *American Economic Journal: Applied Economics*, 1(4):200–232.

Bruhn, M. and Mckenzie, D. (2018). In Pursuit of Balance : Randomization in Practice in Development Field Experiments. *American Economic Journal: Applied Economics*, 1(4):200–232.

Brune, L., Chyn, E., and Kerwin, J. T. (2018). Pay Me Later: A Simple Employer-based Saving Scheme.

Brune, L., Gine, X., Goldberg, J., and Yang, D. (2016). Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi. *Economic Development and Cultural Change*, 64(2):197–220.

Brune, L., Giné, X., Goldberg, J., and Yang, D. (2017). Savings Defaults and Payment Delays for Cash Transfers: Field Experimental Evidence from Malawi. *Journal of Development Economics*, 129:1–13.

Buera, F. J., Kaboski, J. P., and Shin, Y. (2020). The Macroeconomics of Microfinanc. *Review of Economic Studies*, 0:1–36.

Castilla, C. (2018). What's Yours is Mine, and What's Mine is Mine: Field Experiment on Income Concealing Between Spouses in India. *Journal of Development Economics*, pages 1–38.

Castilla, C. (2019). What's yours is mine, and what's mine is mine: Field experiment on income concealing between spouses in India. *Journal of Development Economics*, 137(November 2018):125–140.

Chetty, R., Friedman, J., Leth-petersen, S., Heien nielsen, T., and Olsen, T. (2014). Active vs. Passive Decions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark. *The Quarterly Journal of Economics*, 129(3):1141–1219.

Choi, J. J., Laibson, D., Madrian, B. C., and Metrick, A. (2004). For Better or for Worse: Default Effects and 401(k) Savings Behavior. In David Wise, editor, *Perspectives in the Economics of Aging*, pages 81–121. University of Chicago Press.

Convergences (2019). Microfinance Barometer 2019. Technical report.

De Mel, S., Mcintosh, C., Sheth, K., and Woodruff, C. (2018). Can Mobile-Linked Bank Accounts Bolster Savings? Evidence from a Randomized Controlled Trial in Sri Lanka. *NBER working paper series*.

De Mel, S., Mckenzie, D., and Woodruff, C. (2008). Returns to capital in microenterprises: evidence from a field experiment. *The Quarterly Journal of Economics*, 123(4):1329–1372.

De Mel, S., Mckenzie, D., and Woodruff, C. (2009). Are Women More Credit Constrained? Experimental Evidence on Gender and Microenterprise Returns †. *American Economic Journal: Applied Economics*, 1:3–4.

de Quidt, J., Haushofer, J., and Roth, C. (2018). Measuring and Bounding Experimenter Demand. *American Economic Review*, 108(11):3266–3302.

Demirguc-kunt, A., Klapper, L., Singer, D., Ansar, S., and Hess, J. (2017). *The global Findex database*.

Dizon, F. (2017). Information constraints , peer effects , and the adoption of a savings account in Kenya.

Duflo, E. and Udry, C. (2004). Intrahousehold Resource Allocation in Cˆ ote d ' Ivoire : Social Norms , Separate Accounts and Consumption Choices .

Economides, N. and Jeziorski, P. (2017). Mobile Money in Tanzania. *Marketing Science*, 36(6).

Fafchamps, M., Mckenzie, D., Quinn, S., and Woodruff, C. (2014). Microenterprise growth and the flypaper effect: Evidence from a randomized experiment in Ghana. *Journal of Development Economics*, 106:211–226.

Fiala, N. (2017). Business is tough, but family is worse: Household bargaining and investment in microenterprises in Uganda. *Working papers 2017-05, University of Connecticut, Department of Economics.*

Field, E., Pande, R., Rigol, N., Schaner, S., and Moore, C. (2020). On Her Own Account: How Strengthening Women's Financial Control Impacts Labor Supply and Gender Norms.

Goldberg, J. (2017). The Effect of Social Pressure on Expenditures in Malawi. *Journal of Economic Behavior and Organization*, 143(C):173–185.

Habyarimana, J. and Jack, W. (2018). High Hopes: Experimental Evidence on Saving and the Transition to High School in Kenya.

Harrison, G. W., Lau, I., Morten, M., and Williams, B. (2002). Estimating Individual Discount Rates in Denmark: A Field Experiment. *American Economic Review*, 92(5).

Intermedia (2016). Uganda financial inclusion insights survey. Technical report.

International Labour Organisation (2020). ILOSTAT database. Technical report.

Jack, W. and Suri, T. (2011). Mobile Money: The Economics of M-PESA. *NBER Working Paper Series.*

Jakiela, P. and Ozier, O. (2016). Does Africa Need a Rotten Kin Theorem? Experimental Evidence from Village Economies. *Review of Economic Studies*, 83(1):231–268.

Kremer, M., Lee, J., Robinson, J., and Rostapshova, O. (2016). Rates of Return, Optimization Failures, and Behavioral Biases: Evidence from Kenyan Retail Shops.

LaFave, D. and Thomas, D. (2016). Farms, Families, and Markets: New Evidence on Completeness of Markets in Agricultural Settings. *Econometrica*, 84(5):1917–1960.

Lipscomb, M. and Schechter, L. (2018). Subsidies Versus Mental Accounting Nudges: Harnessing Mobile Payment Systems to Improve Sanitation. *Journal of Development Economics*, 135:235–254.

Mani, A. (2020). Mine, Yours or Ours? The Efficiency of Household Investment Decisions: An Experimental Approach. *The World Bank Economic Review*, (February).

McKenzie, D. (2012). Beyond Baseline and Follow-up: The case for More T in Experiments. *Journal of development Economics*, 99(2):210–221.

O'Donoghue, T. and Rabin, M. (1999). Doing It Now or Later. *American Economic Review*, 89(1):103–124.

Platteau, J.-P. (2000). *Institutions, social norms and economic development*. Harwood Academic.

Schaner, S. (2015). Do Opposites Detract? Intrahousehold Preference Heterogeneity and Inefficient Strategic Savings. *American Economic Journal: Applied Economics*, 7(2):135–174.

Somville, V. and Vandewalle, L. (2018). Saving by Default: Evidence from a Field Experiment in India. *American Economic Journal: Applied Economics*, 10(3):39–66.

Spantig, L. (2019). Cash in Hand and Savings Decisions of the Poor.

Squires, M. (2018). Kinship Taxation as an Impediment to Growth: Experimental Evidence from Kenyan Microenterprises.

Thaler, R. (1985). Mental Accounting and Consumer Choice. *Marketing Science*, 4(3):199–214.

Thaler, R. H. (1999). Mental accounting matters. *Journal of Behavioral Decision Making*, 12(3):183–206.

Udry, C. R. (1996). Gender, agricultural production and the theory of the household. *Journal of Political Economy*, 104(5):1010–46.

Appendix

Figure 3: Frequency of women's business types

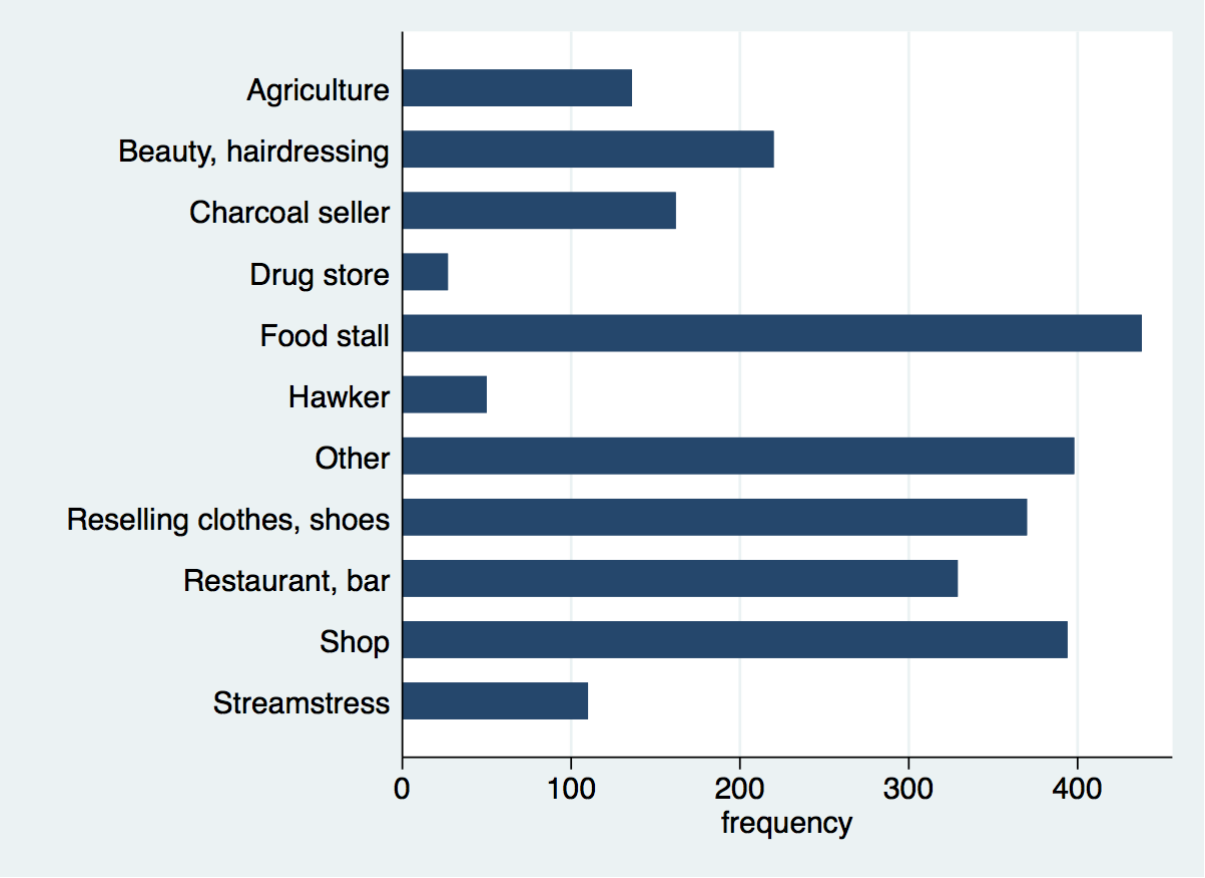


Table A1: Correlates of treatment take up

	(1) Mobile Account	(2) Mobile Disburse
respondent age	-0.002	0.003
	(0.001)	(0.002)
married	0.012	-0.098***
	(0.027)	(0.038)
household size	-0.002	-0.007
	(0.007)	(0.011)
primary school	0.024	0.001
	(0.033)	(0.052)
secondary school	0.024	0.095
	(0.035)	(0.049)
job	0.011	-0.044
	(0.031)	(0.046)
loan amount	-14.55	-24.94
	(0.015)	(0.027)

Continued on next page

Table A1 – *Continued from previous page*

	(1) Mobile Account	(2) Mobile Disburse
weekly profit	8.458	40.247
	(32.779)	(66.55)
high profits	-9.512	-40.819
	(25.131)	(38.195)
Monthly profit	16.478	-65.641
	(21.265)	(57.578)
current client	-4.081	-40.23
	(30.756)	(45.909)
amount saved	13.243	23.423
	(12.260)	(23.449)
mobile money account	-0.01	0.033
	(0.054)	(0.124)
hyperbolic	-0.036	0.016
	(0.031)	(0.042)
impatient	-0.03	0.011
	(0.028)	(0.038)
woman's income share	-0.019	0.048
	(0.044)	(0.058)
household income	7.871	-43.031
	(11.920)	(24.336)
hides money	-0.028	-0.045
	(0.026)	(0.040)
family takes	0.018	-0.029
	(0.026)	(0.040)
spouse business	-0.002	-0.023
	(0.031)	(0.062)
household business	0.009	-0.066
	(0.026)	(0.043)
Index family pressure	0.002	-0.040*
	(0.014)	(0.019)
Index self control	-0.019	0.019
	(0.013)	(0.017)
Switching point	-0.009	0.005
	(0.006)	(0.011)
Own decision	-0.002	0.007
	(0.003)	(0.004)
Business records	0.006	0.05
	(0.029)	(0.041)
Business saving goal	0.015	-0.051
	(0.028)	(0.044)
Empowerment index 1	-0.034	-0.031
	(0.040)	(0.082)
Empowerment index 2	-0.011	0.068
	(0.035)	(0.062)

Continued on next page

Table A1 – *Continued from previous page*

	(1) Mobile Account	(2) Mobile Disburse
Controls money	0.028	0.054
	(0.034)	(0.048)
Observations	984	956
R-squared	0.033	0.029
Mean control	0.946	0.823
F-test p-value	0.83	0.77

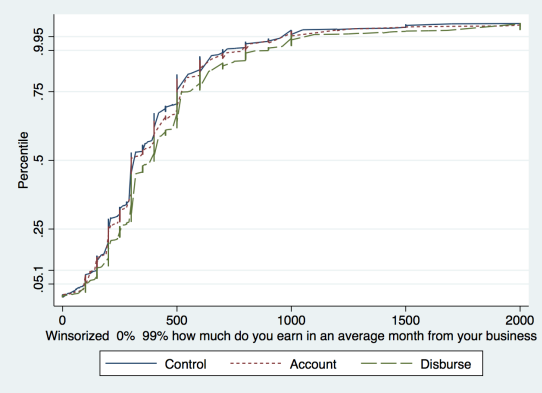
Each row represents a separate OLS regression of whether the individual accepted that treatment on the baseline characteristics specified. All regressions include strata fixed effects. Indexes are defined in section **??**. Monetary values in '000,000,000UGX. I also show a p-value from an F-test of regressing all the characteristics on the take-up dummies. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A2: Correlates of attrition

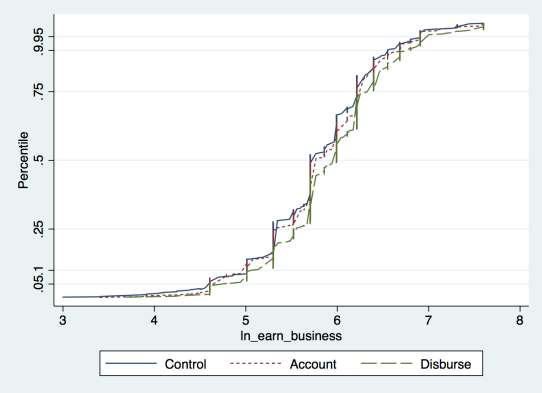
	(1) attrition
respondent age	-0.003***
	(0.001)
married	-0.011
	(0.012)
household size	-0.012***
	(0.003)
primary school	0.017
	(0.014)
secondary school	0.036*
	(0.017)
job	-0.008
	(0.014)
loan amount	-0.000**
	(0.000)
weekly profit	0.000
	(0.000)
high profits	-0.011
	(0.011)
current client	-0.003
	(0.015)
amount saved	-0.000
	(0.000)
mobile money account	0.018
	(0.028)
hyperbolic	-0.006
	(0.014)
impatient	-0.000
	(0.012)
woman's income share	-0.004
	(0.018)
hides money	0.001
	(0.014)
family takes	-0.031*
	(0.012)
Observations	2,959
R-squared	0.017
F-test p-value	0.000

Linear regression of baseline characteristics on a variable equal to one if the woman was not surveyed at endline. Each row represents a separate regression. Monetary amounts in '000 Ugandan Shilling and winsorized at the 99% level. The F-test p-value comes from regressing the attrition variable on all the characteristics and testing if they are jointly zero. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

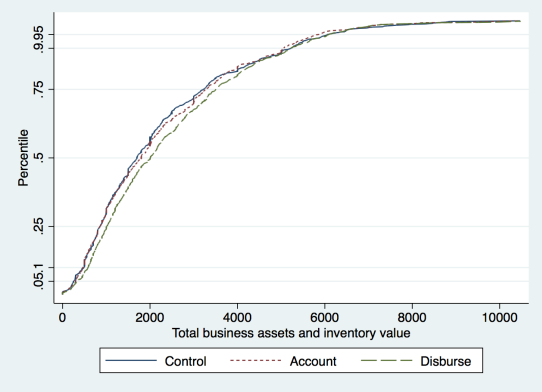
Figure 4: CDFs of primary outcomes in values and logs



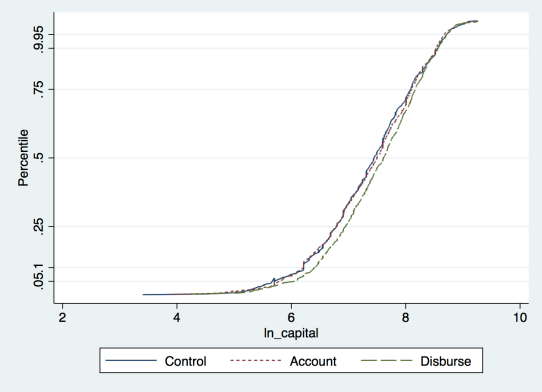
(a) profits '000 UGX



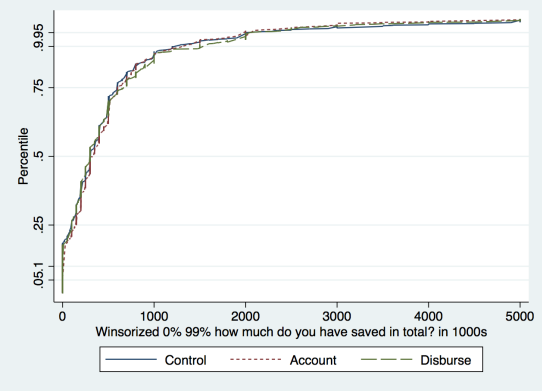
(b) ln profits



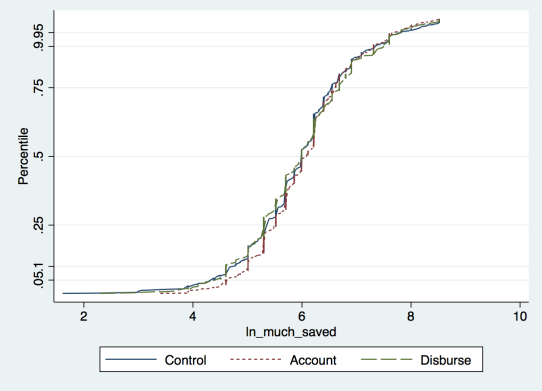
(c) capital '000 UGX



(d) ln capital



(e) savings '000 UGX



(f) ln savings

Table A3: Treatment effects on intermediate usage outcomes

	(1) Ever deposit	(2) Number deposit	(3) Average deposit	(4) Total deposit	(5) Ever withdraw	(6) Number withdrawals	(7) Average withdrawal	(8) Total withdrawals
MD	0.02	0.19	-8.88	5.93	0.71***	2.86***	604.72***	1,076.63***
	(0.02)	(0.18)	(17.36)	(8.37)	(0.02)	(0.33)	(70.32)	(31.90)
Constant	0.13***	0.59***	55.98***	26.25***	0.12***	1.02***	43.99	29.71
	(0.01)	(0.12)	(10.44)	(5.65)	(0.01)	(0.22)	(64.00)	(21.52)
Observations	1,722	1,722	229	1,722	1,722	1,722	795	1,722
R-squared	0.24	0.21	0.75	0.31	0.63	0.35	0.47	0.57
Control mean	0.13	0.61	48.15	26.50	0.12	1.09	42.26	28.85

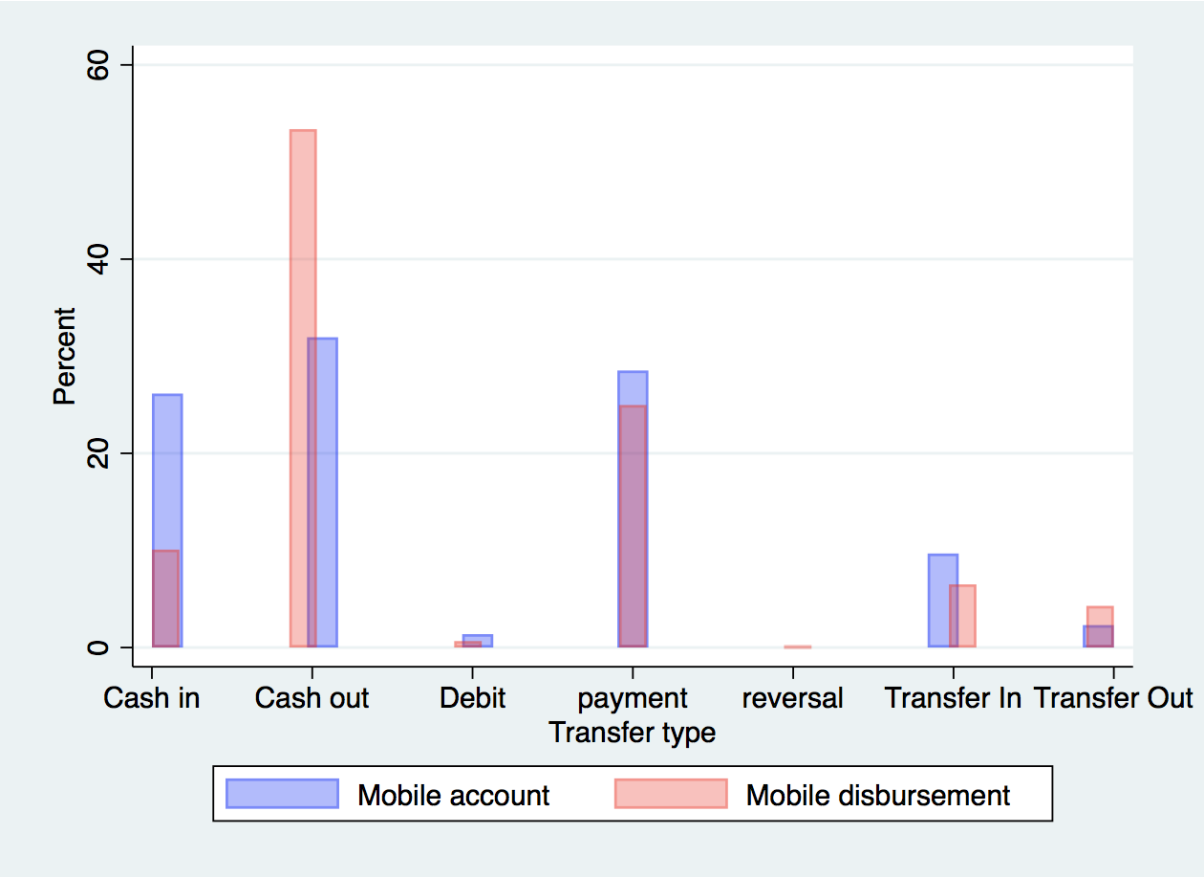
Impacts amongst those who received sim cards. All regressions include strata dummies. Monetary outcomes in '000 Ugandan Shillings. All variables are defined over the first 180days after the account was provided. MD (Mobile Disburse) is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Control mean refers to the mean in the mobile account group. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A4: Treatment effects on intermediate balances outcomes

	(1) Average balance 0-7	(2) Average balance 8-15	(3) Average balance 15-30	(4) Average balance 30-45	(5) Average balance 45-60	(6) Average balance 60-90	(7) Average balance 90-180	(8) Final balance
Mobile disbursement	343.88***	176.22***	54.08***	13.06***	5.43***	3.12***	1.75**	-0.16
	(22.66)	(17.85)	(8.52)	(3.10)	(1.33)	(0.98)	(0.81)	(0.16)
Constant	6.32	3.62	0.33	0.84	0.56	0.85	1.22**	0.23**
	(15.29)	(12.04)	(5.74)	(2.09)	(0.90)	(0.66)	(0.55)	(0.11)
Observations	1,722	1,722	1,722	1,722	1,722	1,722	1,722	1,722
R-squared	0.35	0.29	0.25	0.35	0.17	0.18	0.10	0.16
Control mean	2.877	1.819	0.862	0.768	0.645	0.848	1.148	0.204

Impacts amongst those who received sim cards. Average balance in '000 Ugandan Shillings. All regressions include strata dummies. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Average balance is the average end of day balance on the account the specified number of days after the account was given to the client. Final balance is the balance at the last transaction made within 180 days of account opening. Control mean refers to the mean in the mobile account group. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 5: Transaction types in mobile money data by treatment status.



Cash in refers to depositing cash using a mobile money agent. Cash out is withdrawing cash through a mobile money agent. Debit is a transfer from another mobile money account or bank. Payment is principally buying airtime or data. Reversal means a transaction was in error and reversed. Transfer refers to sending/receiving money to/from another mobile money account or bank account.

Table A5: Transaction value by transaction type and treatment group

	(1) Mobile Account		(2) Mobile Disburse	
	mean	sd	mean	sd
Cash In	45,313	95,266	47,664	146,717
Cash Out	49,512	121,057	441,631	598,736
Debit	395	134	41	92
Payment	1,495	3,112	3,695	34,018
Transfer In	38,947	60,114	33,842	125,186
Transfer Out	30,500	42,388	144,205	363,694
Total	32,568	88,709	250,137	493,372
Observations	1,516		3,780	

Transaction value '000UGX. Excludes loan deposit. Cash in refers to depositing cash using a mobile money agent. Cash out is withdrawing cash through a mobile money agent. Debit is a transfer from another mobile money account or bank. Payment is principally buying airtime or data. Reversal means a transaction was in error and reversed. Transfer refers to sending/receiving money to/from another mobile money account or bank account.

Table A6: Treatment effects on secondary business outcomes

	(1) monthly sales	(2) weekly sales	(3) monthly profit	(4) weekly profit
Mobile account	66.59	20.07	19.98	12.37
	(66.15)	(18.48)	(25.10)	(10.39)
Mobile disburse	211.07***	52.18***	61.83**	26.06**
	(67.80)	(18.52)	(24.10)	(10.72)
Observations	2,606	2,606	2,606	2,606
R-squared	0.34	0.28	0.29	0.17
Control mean endline	1356	351.4	564.5	132.6
Control mean baseline	1399	353.7	607.9	151.4
p-value T1=T2	0.03	0.09	0.13	0.23

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Monthly and weekly profit are calculated by subtracting the corresponding expenditures from sales. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A7: Treatment effects on secondary saving outcomes

	(1) calculated savings	(2) net savings	(3) saves mobile money	(4) amount mobile money	(5) saving goal business
Mobile account	-23.18	-8.48	0.04**	5.89*	0.04*
	(44.34)	(12.57)	(0.02)	(3.08)	(0.02)
Mobile disburse	21.36	-8.48	0.09***	12.08***	0.01
	(47.19)	(8.39)	(0.02)	(3.17)	(0.02)
Observations	2,642	2,642	2,642	2,642	2,642
R-squared	0.16	0.12	0.19	0.25	0.19
Control mean endline	581.15	72.91	0.12	13.34	0.24
p-value T1=T2	0.31	1.00	0.01	0.09	0.11

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. All outcomes reported here were only collected at endline. Calculated savings is the sum of savings in each form of saving. Net savings is additions-withdrawals from savings in the last month. Saves mobile money is a dummy equal to one if the the respondent reported saving on a mobile money account. Amount mobile money is the value of savings on a mobile money account. Saving goal business is a dummy if the reported goal of saving is to use it for the business. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A8: Treatment effects on primary outcomes - permutation test

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	10.41	3.33	38.27
	(13.01)	(34.35)	(76.19)
	[0.99]	[0.99]	[0.99]
	{0.17}	{ 0.82}	{0.93}
Mobile disburse	63.72***	30.44	254.59***
	(12.73)	(36.82)	(74.51)
	[0.00]	[0.74]	[0.01]
	{0.000}	{0.994}	{0.008}
Observations	2,639	2,639	2,639
R-squared	0.44	0.41	0.60
Control mean endline	395.3	559.2	2375
Control mean baseline	419.8	483.6	2297
p-value T1=T2	0.00	0.50	0.00

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006). Permutation p-values are shown in curly brackets. These used the permute command in Stata and 1000 repetitions.
Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A9: Primary outcome results with linear and quadratic time trend of the number of days between loan disbursement and endline

	(1) profit	(2) savings	(3) capital
Mobile account	12.91	1.60	43.87
	(12.99)	(34.30)	(76.39)
	[0.99]	[0.99]	[0.99]
Mobile disburse	61.68***	32.29	248.25***
	(12.76)	(37.04)	(74.88)
	[0.00]	[0.80]	[0.04]
Observations	2,639	2,639	2,639
R-squared	0.44	0.41	0.57
Control mean endline	395.3	559.2	2375
Control mean baseline	419.8	483.6	2297
p-value T1=T2	0.00	0.38	0.00

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006)
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A10: Primary outcome results with winsorizing the top 2%

	(1) profit	(2) savings	(3) capital
Mobile account	9.26	17.03	47.33
	(10.75)	(23.59)	(71.06)
	[0.93]	[0.93]	[0.93]
Mobile disburse	49.13***	30.36	279.27***
	(10.44)	(25.29)	(69.80)
	[0.00]	[0.42]	[0.00]
Observations	2,639	2,639	2,639
R-squared	0.36	0.32	0.53
Control mean endline	382.2	475.8	2311
Control mean baseline	396.6	401.5	2240
p-value T1=T2	0.00	0.58	0.00

Intent-to-treat estimates. Mobile account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. '000 Ugandan Shillings. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. All outcomes are winsorized at the 98% level. All regressions include strata dummies and include the baseline value of the outcome. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A11: Primary outcome results with winsorizing the top 0.5%

	(1) profit	(2) savings	(3) capital
Mobile account	9.47	-4.36	26.04
	(13.93)	(36.39)	(77.40)
	[0.99]	[0.99]	[0.99]
Mobile disburse	75.13***	31.60	249.58***
	(13.84)	(40.01)	(76.08)
	[0.00]	[0.78]	[0.00]
Observations	2,639	2,639	2,639
R-squared	0.46	0.40	0.57
Control mean endline	396.5	570.7	2390
Control mean baseline	421.2	491.3	2307
p-value T1=T2	0.00	0.34	0.00

Intent-to-treat estimates. All outcomes are winsorized at the 99.5% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A12: Treatment effects on primary outcomes - ATT

	(1) profit	(2) savings	(3) capital
Mobile account	11.10	3.547	40.81
	(13.73)	(37.27)	(77.17)
Mobile disburse	88.81***	42.40	354.8***
	(18.01)	(48.96)	(101.3)
Observations	2,610	2,610	2,610
R-squared	0.261	0.221	0.473
Control mean endline	395.3	559.2	2375
Control mean baseline	419.8	483.6	2297
p-value T1=T2	0.00	0.38	0.00

Average treatment on the treated estimates using treatment assignment as an instrument for actual take-up. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome.Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. False discovery rate (FDR) adjusted p-values, also known as q-values, were used to correct for multiple hypothesis testing. They are shown in square brackets. These were calculated following the method of Benjamini et al. (2006). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A13: Robustness of main results to including correlates of takeup

	(1) Profit	(2) Saving	(3) Capital
Mobile account	10.60	5.25	43.97
	(13.03)	(34.19)	(76.30)
Mobile disburse	63.98***	30.68	257.24***
	(12.75)	(36.72)	(74.36)
Observations	2,639	2,639	2,639
R-squared	0.44	0.35	0.52
Control mean	395.3	559.2	2375
Control mean baseline	419.8	483.6	2297
p-value T1=T2	0.000	0.432	0.002

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. In addition, regressions control for whether the respondent was married and an index of family pressure at baseline. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Profits refers to the self-reported monthly business profit. Savings is individual savings held by the woman. Capital is the value of all assets the woman uses in her business plus the value of inventory held for her business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A14: Treatment effects on amount and whether the woman gave money to her spouse and amount received from her spouse

	(1) amount given spouse	(2) dummy gave money to spouse	(3) amount received spouse
Mobile account	-4.19	-0.03	4.15
	(3.83)	(0.03)	(9.63)
Mobile disburse	-10.78***	-0.09***	-1.82
	(3.54)	(0.03)	(9.85)
Observations	1,613	1,613	1,613
R-squared	0.24	0.29	0.27
Control mean endline	21.88	0.297	157.8
Control mean baseline	11.81	0.218	160.1
p-value T1=T2	0.0727	0.0974	0.538

Not in pre-analysis plan. Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Amount give/received spouse is the monthly transfer to/from the spouse.
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A15: Treatment effects on secondary loan use outcomes

	(1) business	(2) sharing	(3) school	(4) home	(5) expenditure	(6) saving	(7) loan
Mobile account	11.88	7.11	4.75	9.44	-0.21	-9.52	-0.00
	(23.76)	(5.12)	(6.67)	(10.60)	(0.32)	(11.58)	(0.32)
Mobile disburse	17.32	-28.76***	-4.67	-29.30***	0.15	44.71***	0.04
	(23.56)	(4.90)	(6.24)	(9.48)	(0.34)	(12.24)	(0.25)
Observations	2,642	2,642	2,642	2,642	2,642	2,642	2,642
R-squared	0.20	0.21	0.17	0.16	0.21	0.16	0.11
Control mean endline	764.39	135.11	111.98	110.89	0.88	153.85	0.43
p-value T1=T2	0.821	0.00	0.14	0.00	0.25	0.00	0.89

Not specified in pre-analysis plan. Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Amount of loan spent on each category 1 week after receiving loan. Business is business inventory and assets, sharing is money given to the spouse, friends or other family members, both at home and elsewhere, school is money spent on school fees and related expenditures, home is money spent on items for the home or home improvements, expenditure is money spent on food, clothes, transport etc. and loan is money spent paying back other loans. Recall 8 months later. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A16: Summary statistics of 4 clusters

	cluster 1 - married joint bus. mean/sd	cluster 2 - married, small bus. mean/sd	cluster 3 - married successful bus. mean/sd	cluster 4 - widows mean/sd
Age	33.38	33.91	36.82	39.95
	8.72	7.69	8.28	9.50
Married	0.98	0.97	0.81	0.07
	0.14	0.17	0.39	0.25
Yrs education	7.58	6.88	8.05	6.50
	2.45	2.07	2.71	2.30
Woman owns bus.	0.00	0.98	0.96	0.98
	0.00	0.13	0.18	0.15
Woman & spouse own bus.	0.99	0.00	0.00	0.00
	0.08	0.00	0.00	0.00
Capital	3560.37	1875.11	3933.94	1874.16
	2251.46	1429.23	2158.87	1479.98
Profit	524.21	347.42	760.50	398.09
	455.75	266.03	628.01	339.66
Sales	461.96	254.29	759.78	298.82
	483.91	220.46	599.31	296.38
Expenditure	225.66	134.83	474.10	161.26
	341.29	157.99	508.73	222.17
No. employeees	0.60	0.13	1.33	0.22
	1.26	0.43	1.54	0.57
Employee hours	25.92	7.22	53.29	11.67
	39.42	22.26	45.69	27.97
Existing BRAC client	0.78	0.80	0.92	0.81
	0.42	0.40	0.28	0.39
HH consumption	943.14	878.24	1214.94	680.99
	472.86	420.24	589.52	363.62
Saves	0.90	0.87	0.94	0.82
	0.30	0.34	0.24	0.38
Amount saves	553.60	353.73	895.79	374.90
	932.17	561.39	1191.61	625.51
Decides how to spend her earned money	0.55	0.78	0.76	0.81
	0.50	0.41	0.43	0.39
Family takes money	0.53	0.31	0.43	0.32
	0.50	0.46	0.50	0.47
Hides money	0.26	0.45	0.37	0.04
	0.44	0.50	0.48	0.20
woman's income share	0.53	0.40	0.58	0.84
	0.26	0.24	0.29	0.25
Other household business	0.60	0.58	0.49	0.19
	0.49	0.49	0.50	0.39
Hyperbolic	0.18	0.19	0.21	0.21
	0.39	0.40	0.41	0.41
Impatient	0.31	0.38	0.35	0.33
	0.46	0.49	0.48	0.47
Saving for business	0.27	0.22	0.22	0.21
	0.44	0.42	0.42	0.41
Spouse wage earning	520.96	606.97	553.77	0.00
	424.18	534.14	711.30	0.00
Own decisions (max 14)	3.46	4.24	5.95	12.37
	3.05	3.11	4.41	2.79
Observations	146	1238	427	807

Table A17: Treatment effects on secondary capital outcomes

	(1) PCA index business assets	(2) value of business assets	(3) unqiue business assets	(4) count business assets	(5) inventory value
Mobile account	0.10	49.75	0.18**	-0.10	-21.83
	(0.07)	(44.92)	(0.08)	(0.90)	(54.35)
Mobile disburse	0.38***	132.73***	0.62***	0.95	119.57**
	(0.07)	(43.49)	(0.08)	(0.81)	(53.56)
Observations	2,642	2,610	2,610	2,610	2,638
R-squared	0.32	0.42	0.35	0.34	0.49
Control mean endline	-0.109	643.7	1.857	9.718	1643
Control mean baseline	0.0541	577.4	2.054	9.428	1722
p-value T1=T2	0.000	0.030	0.000	0.221	0.030

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Principal component analysis of assets used in the business. Higher values mean a larger number of different assets are used in the business. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A18: Treatment effects on secondary labour outcomes

	(1) all hours	(2) woman hours	(3) adult family hours	(4) child family hours	(5) no. employees	(6) employee hours
Mobile account	1.40	0.95	-17.01	-27.90	-0.01	1.43
	(2.45)	(1.08)	(30.60)	(38.35)	(0.05)	(4.44)
Mobile disburse	-1.35	0.62	-38.41	-17.11	-0.07*	0.26
	(2.41)	(1.12)	(36.10)	(23.10)	(0.04)	(3.99)
Observations	2,606	2,606	104	47	2,606	291
R-squared	0.23	0.23	0.83	0.92	0.35	0.59
Control mean endline	98.45	68.06	46.09	27.77	0.471	72.19
Control mean baseline	99.94	74.63	46.85	33.78	0.40	75.76
p-value T1=T2	0.27	0.77	0.32	0.72	0.13	0.79

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. All regressions include strata dummies and include the baseline value of the outcome. All variables refer to hours or employment in the woman's business. All hours is composed of columns (2), (3), (4) and (6). Observations reflect the number of business that have at least one hour of that labour type. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A19: Use of the mobile money account for subsequent loans

	(1) deposit any	(2) deposit amount	(3) deposit share of loan
Mobile disburse	0.008	2.899	-0.001
	(0.743)	(0.695)	(0.878)
Observations	938	818	938
R-squared	0.359	0.509	0.804
Mobile Account mean	0.0977	10.53	0.0134

A subsequent loan is any loan disbursed in 2017 after the loan that disbursement was randomised for in my study. Deposit any means a deposit was made to the mobile money account in the 2 week period after the subsequent loan was disbursed. Deposit amount is the maximum single deposited amount in the 2 weeks after the subsequent loan was disbursed, in '000 UGX. Deposit share of loan is the value of the deposited amount as a share of the subsequent loan amount. Mobile Account mean is the mean value of that outcome in the Mobile Account treatment group. Robust p-value in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A20: Treatment effects on secondary consumption outcomes

	(1) total	(2) food	(3) non-food exl school	(4) school
Mobile account	27.19	9.61	7.87	12.42
	(23.99)	(9.83)	(8.49)	(12.76)
Mobile disburse	50.66**	20.50**	4.87	22.06*
	(24.26)	(10.31)	(8.45)	(12.04)
Observations	2,642	2,642	2,642	2,642
R-squared	0.34	0.24	0.20	0.39
Control mean endline	973.6	406	252.5	300.6
Control mean baseline	886.6	398.3	224.3	252.7
p-value T1=T2	0.334	0.293	0.732	0.433

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. All values are monthly for the entire household. Non-food consumption excludes temptation spending and transfers. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A21: Treatment effects on secondary happiness outcomes

	(1) happiness	(2) life satisfaction	(3) worry money scale	(4) worry money dummy
Mobile account	0.02	0.31	-0.03	-0.00
	(0.05)	(0.27)	(0.06)	(0.02)
Mobile disburse	-0.03	0.05	-0.10*	-0.06**
	(0.05)	(0.29)	(0.06)	(0.02)
Observations	2,636	2,636	2,629	2,642
R-squared	0.24	0.13	0.19	0.20
Control mean endline	3.511	5.998	3.45	0.60
Control mean baseline	3.760	6.446		
p-value T1=T2	0.266	0.213	0.25	0.02

Happiness is a 5 point scale where 5 is very happy and 1 is unhappy. Life satisfaction is a 10 point scale where 1 is completely dissatisfied and 10 is completely satisfied. Worry money scale is a 5 point scale of agreement with "I have worried about money in the past month", where 5 is completely agree. Worry money dummy is a dummy variable if the woman reports 4 or 5 on the worry money scale. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A22: Treatment effects on secondary empowerment outcomes

	(1) Switch to spouse	(2) Decisions alone	(3) Decisions equal	(4) Decides money earned	(5) Remittance share	(6) Income share	(7) Index 1	(8) Index 2
MA	0.05	0.08	-0.03	0.01	-0.02	0.01	0.00	0.01
	(0.18)	(0.19)	(0.19)	(0.02)	(0.03)	(0.01)	(0.01)	(0.02)
MD	0.18	0.39**	-0.03	0.02	0.02	0.01	0.04***	0.05***
	(0.18)	(0.19)	(0.19)	(0.02)	(0.03)	(0.02)	(0.01)	(0.02)
Obs	1,591	2,642	2,642	2,642	1,205	2,617	2,642	2,642
R-squared	0.30	0.41	0.30	0.23	0.33	0.29	0.21	0.26
Control mean endline	5.40	7.59	4.57	0.81	0.75	0.55	-0.01	-0.01
Control mean baseline	5.14	7.02	5.15	0.76	0.79	0.56	0.01	0.00
p-value T1=T2	0.46	0.11	0.99	0.36	0.12	0.63	0.00	0.01

Intent-to-treat estimates. '000 Ugandan Shillings. MA is the treatment where only a mobile money account was provided and the loan was disbursed as cash. MD is the treatment where a mobile money account was provided and the loan also disbursed onto this account. All outcomes are winsorized at the 99% level. All regressions include strata dummies and include the baseline value of the outcome. Switched to spouse refers to what question out of 7 the woman switched to giving money to her spouse. For the decision variables there were 14 decisions. Decides money earned is a dummy equal to one if the woman reports being able to spend her earned income how she chooses. Remittance share is the share of remittances sent to the woman's and spouses family that are sent to the woman's family. Income share is the share of total household income earned by the woman. Index 1 is an index composed of the previous columns calculated using the Anderson (2008) method and Index 2 using Kling et al., (2007). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A23: Treatment effects on secondary remittance outcomes

	(1) amount sent	(2) amount received	(3) net amount received	(4) used mobile money	(5) Received dummy	(6) Sent dummy
Mobile account	11.37*	-5.29	1.71	-0.01	-0.03	0.02
	(6.89)	(10.38)	(6.32)	(0.02)	(0.02)	(0.02)
Mobile disburse	10.37	-3.83	1.39	-0.01	-0.02	0.03
	(6.68)	(10.27)	(5.56)	(0.02)	(0.02)	(0.02)
Observations	2,642	2,642	2,642	2,642	2,639	2,639
R-squared	0.23	0.21	0.14	0.19	0.18	0.21
Control mean endline	58.03	85.86	6.83	0.37	0.34	0.34
p-value T1=T2	0.88	0.89	0.95	0.94	0.53	0.83

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. All outcomes reported here were only collected at endline. Remittances defined as money given to a non-household member. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A24: Treatment effects on secondary wealth outcomes

	(1) Total asset value
Mobile account	134.18
	(151.09)
Mobile disburse	330.11**
	(154.35)
Observations	2,642
R-squared	0.30
Control mean endline	4397
Control mean baseline	3383
p-value T1=T2	0.18

Intent-to-treat estimates. All outcomes are winsorized at the 99% level. '000 Ugandan Shillings. All regressions include strata dummies and include the baseline value of the outcome. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Total asset value includes the value of all household and business assets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A25: Treatment effects on secondary record outcomes

	(1) No records	(2) Electronic records	(3) Written records	(4) Keeps records in head
Mobile Account	0.00	-0.00	-0.01	-0.00
	(0.01)	(0.00)	(0.02)	(0.02)
Mobile Disburse	0.00	-0.00	-0.01	0.00
	(0.01)	(0.00)	(0.02)	(0.02)
Observations	2,642	2,642	2,642	2,642
R-squared	0.17	0.23	0.21	0.23
Control mean endline	0.09	0.01	0.62	0.56
Control mean baseline	0.22	0.00	0.50	0.43
p-value T1=T2	0.89	0.22	0.80	0.82

Dummy variables capturing if that type of records was used. Respondents can select multiple responses. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A26: Treatment effects on number of women in the microfinance group you'd interact with in each of the situations

	(1) talk to at least once a week outside the group	(2) ask for financial help from if you needed money	(3) give financial help to if she needed money
Mobile account	0.14	-0.09	-0.11
	(0.26)	(0.20)	(0.21)
Mobile disburse	0.05	0.09	0.08
	(0.26)	(0.20)	(0.22)
Observations	2,642	2,642	2,642
R-squared	0.18	0.20	0.19
Control mean endline	6.96	3.77	3.90
p-value T1=T2	0.74	0.37	0.39

Intent-to-treat estimates. All regressions include strata dummies. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Outcomes only measured at endline. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A27: Treatment effects on loan repayment

	(1) missed payment	(2) missed days	(3) principal outstanding	(4) interest outstanding	(5) savings amt	(6) overdue amount
Mobile account	0.002	-0.067	14.859	0.306	4.409	-1.891
	(0.004)	(0.296)	(34.815)	(0.456)	(4.914)	(3.384)
Mobile disburse	0.004	-0.166	11.260	0.138	4.935	-2.662
	(0.003)	(0.247)	(34.204)	(0.318)	(4.851)	(3.013)
Observations	2,642	2,085	2,085	2,085	2,085	2,085
R-squared	0.135	0.218	0.235	0.242	0.236	0.112
Control mean	0.002	0.257	838	5.21	138	3.15
p-value T1=T2	0.661	0.592	0.915	0.707	0.915	0.637

Data from BRAC administrative records. Intent-to-treat estimates. All regressions include strata dummies. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mo-bile money account was provided and the loan also disbursed onto this account. Missed payment means a payment was not made the week it was due. Missed days is the number of days a payment is overdue. Principal outstanding is the amount of loan still remaining to be paid, interest outstanding is the amount of interest remaining to be paid. Saving amount is the saving balance held by brac. Overdue amount is the amount due if a payment is overdue. Columns (3)-(6) are in '000 UGX. No winsorizing is applied to this data. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A28: Treatment effects on business type

	(1) Agricul-ture	(2) Beauty & Hairdressing	(3) Boda Boda	(4) Brick laying	(5) Charcoal seller	(6) Cook	(7) Food stall	(8) Hawker	(9) Land-lord	(10) Mobile money agent	(11) Other	(12) Restau-rant/bar	(13) Shop	(14) Seam-stress	(15) Laun-dry	(16) clothes resale	(17) drug store	(18) change business
Mobile account	0.00	-0.00	0.00	-0.00	0.00	-0.00	-0.01	-0.01	-0.01	-0.00	-0.01	0.03***	0.00	0.00	0.00	0.01	-0.00	-0.02
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)
Mobile disburse	0.00	-0.02**	0.00**	-0.00	-0.01	0.01	0.00	-0.00	-0.01	-0.00	0.00	0.01	0.02*	0.01	-0.01	-0.01	0.00	0.01
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)
Observations	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,642
R-squared	0.39	0.72	0.45	0.44	0.53	0.19	0.40	0.15	0.20	0.27	0.24	0.45	0.46	0.44	0.33	0.49	0.79	0.15
Control mean	0.054	0.082	0.001	0.003	0.065	0.035	0.224	0.011	0.008	0.006	0.032	0.126	0.151	0.042	0.013	0.142	0.007	0.203
Control mean baseline	0.065	0.086	0.001	0.004	0.068	0.006	0.202	0.018	0.002	0.007	0.041	0.128	0.189	0.050	0.003	0.124	0.007	
p-value T1=T2	0.637	0.115	0.0324	0.352	0.251	0.545	0.552	0.539	0.885	0.815	0.115	0.112	0.144	0.455	0.187	0.303	0.391	0.154

Intention-to-treat estimates. Each column shows a dummy variable for whether the woman reported that industry as a her primary business at endline. All regressions control for whether the woman was also doing that business at baseline, as well as strata dummies. Change business is a dummay variable capturing if the business is different at endline than baseline. Mobile Account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Control mean endline is the mean value of the outcome in the control group at endline. Control mean baseline is the mean value of the outcome in the control group at baseline. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A29: Heterogeneous treatment effects on business profit

	(1) high profits	(2) hide money	(3) high inventory	(4) current loan	(5) hyper - bolic	(6) impa- tient	(7) high risk taking	(8) high saving	(9) high asset	(10) mar- ried	(11) high empower	(12) sent family	(13) family takes	(14) saving goal bus	(15) spouse bus	(16) hh bus
MA*interaction	-23.33	0.721	-25.79	17.28	-5.133	-20.03	74.98***	-16.62	-2.489	-8.792	-7.011	26.75	19.37	-46.96	35.76	19.54
	(27.81)	(26.46)	(28.23)	(29.76)	(32.14)	(30.21)	(28.88)	(28.04)	(27.93)	(30.51)	(28.21)	(29.24)	(30.23)	(36.02)	(41.10)	(28.61)
MD*interaction	90.03***	81.84***	27.76	21.13	25.14	44.35	14.10	23.11	22.60	66.58**	17.27	-20.57	80.82***	-33.52	53.30	33.90
	(27.57)	(26.56)	(27.24)	(29.56)	(30.03)	(29.65)	(27.62)	(26.91)	(26.81)	(28.63)	(27.54)	(28.61)	(28.28)	(34.33)	(37.81)	(27.85)
Mobile account	21.77	10.18	23.92	-3.947	12.16	17.47	-37.17*	18.75	12.10	16.15	13.91	-6.653	1.985	20.80	-17.69	1.362
	(15.08)	(18.05)	(17.12)	(26.12)	(14.65)	(16.16)	(21.95)	(17.77)	(18.29)	(24.72)	(18.70)	(22.92)	(16.08)	(14.87)	(31.36)	(18.63)
Mobile disburse	21.13	30.01*	50.60***	46.58*	58.75***	45.07***	54.76***	52.17***	53.03***	19.77	54.81***	76.82***	35.05**	71.27***	31.20	48.85***
	(16.29)	(17.59)	(17.15)	(25.67)	(14.56)	(15.96)	(20.26)	(17.01)	(17.67)	(22.71)	(18.37)	(22.95)	(15.59)	(14.56)	(29.89)	(18.36)
Observations	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	1,752	2,639
R-squared	0.444	0.442	0.442	0.440	0.439	0.442	0.441	0.442	0.440	0.441	0.439	0.440	0.442	0.440	0.520	0.440
Control mean	482.2	386.2	441.2	404.4	373.8	408.5	393.4	442.4	409.1	390.8	404.5	397.4	395.6	419.9	377.1	375
Control mean baseline	657.9	412.9	492.8	436.6	381.1	438.7	432.8	479.8	428.9	417.2	436	410.7	466.5	387.2	397.8	391.3
Interaction mean	0.481	0.417	0.496	0.821	0.203	0.354	0.623	0.494	0.477	0.664	0.507	0.636	0.343	0.224	0.578	0.446
p-value for testing																
T1=T2	0.966	0.265	0.087	0.034	0.002	0.086	0.000	0.049	0.021	0.873	0.030	0.002	0.034	0.001	0.073	0.008
T1=T2 interaction	0.000	0.000	0.000	0.000	0.004	0.000	0.077	0.000	0.001	0.000	0.0005	0.028	0.001	0.024	0.005	0.003

Intent-to-treat estimates. Self-reported business profits in '000 Ugandan Shillings. Monetary outcomes are winsorized at the 99% level. All regressions include strata dummies. Mobile Account (MA) is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile Disburse (MD) is the treatment where a mobile money account was provided and the loan also disbursed onto this account. Control mean refers to the mean value of the outcome variable for the interaction condition being true in the control group, and control mean base the mean in the control group at baseline when the interaction condition is true. Heterogeneous variables are defined in section 6. Note that hide money and spouse bus are only reported for married women who have a spouse. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A30: Heterogeneous treatment effects on business capital

	(1) high profits	(2) hide money	(3) high inventory	(4) current loan	(5) hyper - bolic	(6) impa- tient	(7) high risk taking	(8) high saving	(9) high asset	(10) mar- ried	(11) high empower	(12) sent family	(13) family takes	(14) saving goal bus	(15) spouse bus	(16) hh bus
MA*interaction	145.4	45.55	133.7	-89.49	-4.743	-58.10	33.34	-39.80	11.64	224.0	76.79	-0.587	-10.60	-50.20	93.47	86.26
	(157.6)	(152.9)	(160.0)	(186.4)	(185.1)	(166.5)	(164.6)	(154.9)	(157.7)	(167.5)	(157.5)	(154.4)	(167.5)	(196.3)	(216.6)	(160.1)
MD*interaction	117.9	252.6	342.3**	109.3	70.97	-16.42	-56.84	233.2	-21.82	395.7**	102.3	-248.2	390.7**	7.849	390.4*	380.3**
	(160.2)	(157.7)	(159.3)	(186.8)	(191.6)	(171.0)	(163.6)	(157.6)	(161.5)	(165.2)	(160.9)	(155.3)	(165.4)	(193.6)	(215.0)	(163.3)
Mobile account	-42.21	10.15	-38.62	100.6	30.33	47.02	5.681	47.32	24.51	- 120.4	-7.884	26.67	25.87	39.96	45.31	- 13.53
	(98.97)	(93.21)	(91.74)	(167.2)	(81.52)	(91.23)	(126.2)	(98.19)	(88.20)	(130.3)	(112.7)	(113.2)	(91.19)	(83.05)	(158.3)	(101.2)
Mobile disburse	214.0**	142.7	73.06	118.9	180.7**	209.4**	325.5***	176.3*	230.0**	- 2.564	175.7	396.3***	117.4	219.1***	133.9	73.18
	(97.29)	(89.50)	(87.91)	(158.4)	(80.30)	(92.52)	(121.8)	(96.84)	(89.57)	(126.6)	(112.6)	(110.1)	(88.61)	(81.10)	(150.1)	(98.43)
Observations	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	1,752	2,639
R-squared	0.512	0.513	0.513	0.512	0.512	0.513	0.512	0.512	0.512	0.514	0.514	0.514	0.513	0.512	0.567	0.516
Control mean	2511	2413	3043	2361	2279	2286	2282	2674	2844	2355	2086	2424	2343	2321	2414	2403
Control mean baseline	2722	2416	3508	2404	2384	2223	2279	2837	3069	2410	2210	2379	2463	2194	2500	2405
Interaction mean	0.481	0.417	0.496	0.821	0.203	0.354	0.623	0.494	0.477	0.664	0.507	0.636	0.343	0.224	0.578	0.446
P-value for testing																
T1=T2	0.004	0.119	0.175	0.898	0.050	0.071	0.005	0.179	0.015	0.289	0.090	0.001	0.267	0.020	0.540	0.350
T1=T2 interaction	0.231	0.011	0.014	0.002	0.014	0.031	0.166	0.009	0.106	0.007	0.018	0.268	0.001	0.109	0.003	0.001

Intent-to-treat estimates. Monetary outcomes are winsorized at the 99% level and in '000 USH. All regressions include strata dummies. Mobile Account (MA) refers to the treatment where women got a mobile money account and their loan as cash. Mobile Disburse (MD) refers to the treatment where women got a mobile money account and the loan disbursed onto the account. Business capital is composed of business assets and inventories. Heterogeneous variables are defined in section 6. Note that hide money and spouse bus are only reported for married women who have a spouse. Control mean refers to the mean value of the outcome variable for the interaction condition being true in the control group, and control mean base the mean in the control group at baseline when the interaction condition is true. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A31: Heterogeneous treatment effects on saving

	(1) high profits	(2) hide money	(3) high inventory	(4) current loan	(5) hyper - bolic	(6) impa- tient	(7) high risk taking	(8) high saving	(9) high asset	(10) mar- ried	(11) high empower	(12) sent family	(13) family takes	(14) saving goal bus	(15) spouse bus	(16) hh bus
MA*interaction	1.364	7.455	16.31	100.8	11.41	18.54	29.98	62.26	-27.62	-40.27	61.58	37.83	-93.21	-13.53	-74.81	13.54
	(74.48)	(71.89)	(73.48)	(71.64)	(99.44)	(71.15)	(82.73)	(74.07)	(75.50)	(79.15)	(75.21)	(72.98)	(87.42)	(96.09)	(99.88)	(75.33)
MD*interaction	-86.03	-30.17	-157.0**	26.47	-19.21	59.73	-25.20	-75.63	-105.5	-142.5*	-23.95	-159.8*	-11.80	-117.7	-251.0**	-180.1**
	(80.26)	(78.96)	(79.16)	(77.46)	(99.40)	(75.29)	(87.02)	(77.58)	(82.34)	(85.93)	(78.44)	(83.24)	(90.25)	(95.34)	(107.7)	(81.13)
Mobile account	1.883	1.042	-2.633	-80.82	-1.039	-2.185	-15.41	-27.95	18.06	32.06	-26.56	-21.24	35.99	7.470	39.16	-2.584
	(46.24)	(44.89)	(41.20)	(59.00)	(36.31)	(47.12)	(69.00)	(31.47)	(38.85)	(63.95)	(56.20)	(53.89)	(38.60)	(38.55)	(67.22)	(47.40)
Mobile disburse	71.19	43.46	109.1**	8.384	33.07	13.21	45.36	66.52*	81.49*	126.5*	44.26	132.5**	32.84	57.93	145.0*	110.3**
	(51.23)	(48.81)	(45.44)	(63.57)	(40.95)	(52.18)	(72.49)	(38.97)	(45.94)	(67.87)	(61.89)	(64.29)	(41.43)	(42.72)	(78.00)	(52.62)
Observations	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	2,639	1,752	2,639
R-squared	0.347	0.347	0.350	0.349	0.347	0.348	0.347	0.348	0.349	0.348	0.349	0.348	0.348	0.347	0.436	0.349
Control mean	669.4	591.2	698.7	591.2	625.1	442.4	529.9	787.1	704.3	596.7	461.8	573.4	684	600.1	633.9	610
Control mean baseline	629.8	522.5	648.8	529	500.3	390	458.3	896.4	632	497.7	424.1	504.1	606.4	482.2	485.1	480.2
Interaction mean	0.481	0.417	0.496	0.821	0.203	0.354	0.623	0.494	0.477	0.664	0.507	0.636	0.343	0.224	0.578	0.446
P-values for testing																
T1=T2	0.118	0.365	0.015	0.010	0.375	0.743	0.383	0.001	0.159	0.165	0.197	0.011	0.936	0.208	0.097	0.021
T1=T2 interaction	0.748	0.927	0.271	0.712	0.964	0.280	0.886	0.483	0.801	0.850	0.747	0.316	0.278	0.507	0.263	0.135

Intent-to-treat estimates. Amount saved in '000 Ugandan Shillings. Monetary outcomes are winsorized at the 99% level. All regressions include strata dummies. Mobile account is the treatment where only a mobile money account was provided and the loan was disbursed as cash. Mobile disburse is the treatment where a mobile money account was provided and the loan also disbursed onto this account. MA refers to the treatment where women got a mobile money account and their loan as cash. MD refers to the treatment where women got a mobile money account and the loan disbursed onto the account. Control mean refers to the mean value of the outcome variable for the interaction condition being true in the control group, and control mean base the mean in the control group at baseline when the interaction condition is true. Heterogeneous variables are defined in section 6. Note that hide money and spouse bus are only reported for married women who have a spouse. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1