

Hiding loans in the household using mobile money: Experimental evidence on microenterprise investment in Uganda

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Abstract

I examine whether changing the way microfinance loans are disbursed to utilise widespread mobile money services impacts the businesses of female microfinance borrowers. Using a field experiment of 3,000 borrowers of BRAC 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 15% higher business profits and 11% higher levels of business capital. 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 private account gives women more control over how the loan is used.

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1 Introduction

Microfinance loans are extremely popular in developing countries, with an estimated 140 million clients worldwide, two-thirds of whom are women, and had client growth of 6% a year in 2017. This strong growth in borrowers is despite recent evidence showing that microfinance loans have not led to improvements in business profits, or wider improvements in household outcomes, particularly for women's businesses (Banerjee et al., 2015, De Mel et al., 2008). However, under certain conditions women's businesses can benefit from microfinance loans and grants (Bernhardt et al., 2017, Blattman et al., 2014, Fafchamps et al., 2014, Fiala, 2017, Field et al., 2013). This suggests that finding ways to help female entrepreneurs overcome key constraints to investing the loan in their business could improve business performance.

In this paper I examine how providing microfinance loans using a widespread financial service, mobile money accounts, impact women's businesses. I use a Randomised Controlled Trial of 3,000 female microfinance clients in Kampala, Uganda. Existing and new clients of BRAC Uganda who applied for a new loan for their business were individually randomised into two treatments.

Treatment One - Mobile Account: A mobile money account explicitly designated for the woman's business was provided to the woman, but the default method of disbursing the microfinance loan as cash was retained.

Treatment Two - Mobile Disbursement: The same mobile money account as Treatment One was provided to the woman, but the microfinance loan was disbursed 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 mobile money account. This sample already had very high (97%) rates of mobile money account usage, so these treatments principally look at the impact of designating a mobile money account for business use and the payment of a microfinance loan onto this account, rather than studying any impacts of the initial take-up of mobile money.

This study takes advantage of several features of mobile money accounts which facilitate secure saving, earmarking, and keep money safe from others: mobile money accounts enable separate accounts to be opened for different uses, are provided in an individual's name, can only be accessed or the balance checked by the individual and require the small barrier of going to an agent to withdraw money.

My research design allows me to examine two research questions. Firstly, how does the business-designated mobile money account, and obtaining the loan directly onto the mobile money account, impact women's savings and businesses? Secondly, do women with certain characteristics, such as low self-control or higher pressure to share money with spouse and family, benefit more from the mobile money account and disbursement of the loan onto the account?

I find that 8 months after providing the microfinance loan on a business-designated mobile money account (the Mobile Disbursement treatment) there is a 15% increase in business profits and an 11% increase in the value of business capital compared to providing the loan as cash. These findings are robust to multiple testing corrections and alternative specifications. I do not find that the Mobile Disbursement treatment has any impact on savings by the time of the endline survey, a result that is corroborated by transaction records, which show the balances on the accounts had fallen to near zero by 6 months after the loan disbursement.

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 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 17% 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 less 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 hidden from family in a safe format.

I examine a number of different alternative hypothesis to explain the impact of the Mobile Disbursement treatment. Firstly, I look at whether the increase in profits is just a redistribution of income within the household, with other household businesses losing out. Secondly, I look at whether the mobile money account, which is designed for sending money, changes remittances flows. Thirdly, I examine experimenter demand effects and whether the Mobile Disbursement treatment led to misreporting of business outcomes. Fourthly, I look at measurement error and whether the Mobile Disbursement treatment increased the accuracy of business accounts. Lastly, I look at social network changes and whether the women saw a reduction in risk sharing as a result of the treatments. I do not find compelling evidence for any of these potential explanations.

Using transaction records provided by the telecoms operator, I see that the Mobile Disbursement treatment group did not seem to use the accounts for regular deposits of their own money: only 13% ever make a single deposit of their own onto the account, and these are for very small amounts (median 20,000 USH (\$5.33)). This suggests that receiving the loan on a mobile money account did not cause women to learn about the benefits of putting money onto the account themselves. This fits with other research studies that have found that just depositing money into an account does not necessarily cause people to use it more (Field et al., 2016, Somville and Vandewalle, 2018).

Instead, 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 100,000 USH (\$27), equal to 7% of the loan value, on the account during the first 30 days of account ownership¹. The Mobile Disburse-

¹I 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 30 days would be zero.

ment group appear to retain some of the loan on the mobile money account and draw this down over a 6 month period by making multiple withdrawals. By the end of 6 months, balances are, on average, a very low 190 USH (\$0.05). This suggest, since deposits are so small, that those assigned to the Mobile Disbursement treatment retained some of the loan on the mobile money account after it was first disbursed and used the mobile money account as a way to safely and privately store the loan and draw on it as needed.

I do not find any effects just from getting a business-designated mobile money account, the Mobile Account treatment. Only 13% of the Mobile Account group also ever deposited money onto the account, and the amounts deposited are equally small as for the Mobile Disbursement group (median 27,000 USH (\$7,20)). The lack of use may be because 97% of the sample had already used a mobile money account before at baseline and so simply designating an account for their businesses did not have a material impact. This is despite other studies finding large impacts on saving from similar treatments through mental accounting effects, although these studies offered additional incentives to save such as removing fees or paying interest (Dizon et al., 2017, Habyarimana and Jack, 2018). However, my results fit with another study that found that facilitating mobile money transfers into bank accounts did not lead to more deposits for most people (De Mel et al., 2018).

This paper adds to the literature in four broad areas: returns to women from investment in microenterprises; social pressure for women to share money; the uses and benefits of mobile money services; and default effects in payment and saving mechanisms.

While a large body of the microfinance literature has found low returns to business investment by female entrepreneurs (Banerjee et al., 2015, De Mel et al., 2008), a subset has found that the returns can be high (Blattman et al., 2014, Field et al., 2013). If women with already profitable businesses receive in-kind grants instead of cash they see a rise in their business profits (Fafchamps et al., 2014). Likewise, if women are able to hide money from their spouse, or live in households with no other members who have businesses, they also see profit gains from business

loans and grants (Bernhardt et al., 2017, Fiala, 2017). These papers suggest² providing loans or grants to women in a manner that's harder for other household members to dip into allows the money to be used for the woman's business and hence leads to investment and profit growth. This paper adds to that subset by showing that if female entrepreneurs are given their loan in a manner that is easy to conceal, secure and private, on a mobile money account, they can experience high returns on their business investment.

This paper also adds to the literature looking at family pressure to share money by highlighting that it is through reducing this pressure that the mobile money accounts enable microfinance loans to be invested in the women's businesses. Women have frequently demonstrated a willingness to hide money from their spouse and family even if costly to do so (Almas et al., 2015, Boltz et al., 2017, Castilla, 2018, Jakiela and Ozler, 2015). Women may also 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). Women also use strategies to try to retain control over their money and reduce spousal access to it. When given the opportunity, women will choose to have an individual saving account over a joint account if they are not well matched on saving preference with their spouse, even if they give up interest as a result (Schaner, 2015). Women may also stop using bank accounts if access to the account by their spouse is made easier (Schaner, 2017).

These strategies benefit women by moving outcomes towards their preferences: evidence shows that there are improvements in female-decision-making power in the household when women are given access to their own saving accounts (Ashraf, 2009) and that providing money in a way women can control gives them more say over how the money is used (Aker et al., 2016, Attanasio and Lechene, 2002, Field et al., 2016). This study adds to this literature by showing that if microfinance loans are given in a way that takes into account the social constraints women face and facilitates hiding of money from the spouse, they gain more control over the use of these funds.

²Note that Fafchamps et al. (2014) found evidence it was actually self-control not family pressure that was the mechanism by which the in-kind grant resulted in higher business investment.

This research builds upon the early work on mobile money services (Jack and Suri, 2014) and examines how their integration into financial products can make these products better meet the needs of the poor. While mobile money accounts were discussed as a storage device from the earliest research studies, until recently there was limited evidence on their potential to act as saving devices (Jack and Suri, 2011, Mbiti and Weil, 2011, Morawczynski, 2010). A series of recent RCTs have changed this by exogenously providing mobile money accounts labelled for specific uses along with varying interest rate incentives or automatic payment mechanisms (Bastian et al., 2018, Batista and Vicente, 2017, Blumenstock et al., 2018, Dizon et al., 2017, Habyarimana and Jack, 2018, Lipscomb and Schechter, 2018). This literature has found mobile money accounts to be an effective way to save for business expenditures, school fees, health expenses, agricultural inputs and unexpected shocks. However, my paper conflicts with these results by finding no impact of a labelled mobile money saving account.

Studies have also looked at whether integrating mobile money accounts into cash transfer and wage payment mechanisms changes how these income sources are used (Aker et al., 2016, Blumenstock et al., 2015). My study extends this literature by examining whether changing the payment mechanism of microfinance loans to take advantage of the saving features of mobile money accounts changes how the loans are used. To my knowledge, this is the first experiment looking at the impact of integrating a formal financial instrument of any kind into a microfinance loan product.

Lastly, my paper shows that the default choice matters: even small costs of switching prevent the Mobile Account treatment group from imitating the Mobile Disbursement group by depositing the loan onto the mobile money account provided to them. The default for the Mobile Disbursement group of keeping the loan on the mobile money account has large follow-on impacts by ensuring left-over funds remain on the account as savings, and also reducing the trickle of money from the account into other uses and other people's hands. A growing literature in developing countries has shown that defaulting savings into saving accounts or

similar formal financial devices results in higher savings (Blumenstock et al., 2018, Brune et al., 2017, 2016, Somville and Vandewalle, 2018) and higher control of the money for women (Field et al., 2016). My research suggests that formal bank accounts or saving devices with restrictive commitment 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 just needs to be that the loan is kept as savings unless proactively spent.

The rest of this paper is organised as follows: Section 2 discusses the interventions and experiment design. Section 3 goes over the data used in this study. Section 4 contains the empirical specification and section 5 the results. Section 6 discusses mechanisms and section 7 alternative explanations for my results. Section 8 concludes.

2 Background and experiment Design

2.1 Background

Mobile money services began in Kenya in 2007, and rapidly spread in East Africa. 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 in bank account offerings and the mobile money operators themselves are increasingly offering services ranging from bill payment to providing short term loans.

2.2 Setting

The study location is Kampala, Uganda, chosen as it has both a high prevalence of microfinance borrowing and high mobile money penetration, with 83% of the population owning a mobile mobile account (Mayanja Lwanga, 2016). The study took place in 6 of the 14 microfinance branches of BRAC Uganda, chosen as they had a existing bank account with Stanbic bank, whose online banking platform had pre-existing mobile money transfer integration which was utilised to make the mobile money disbursements directly from the branch bank account.

BRAC Uganda is one of the largest providers of financial services to the poor in Uganda. It offer 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 pre-requisite 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. 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. The mobile phone requirement was not binding in this urban sample, and only 6 women were excluded from taking part in this study because they did not have their own mobile phone. This sample of women is therefore highly representative of female microfinance clients throughout Kampala, and likely similar to other urban populations of microentrepreneurs.

2.3 The intervention

The study involved two interventions:

Intervention One - Mobile Account

Women seeking 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 but no formal restrictions were placed on how they use the account nor money paid into the account. Women in this group receive their microfinance loan as cash.

Intervention Two - Mobile Disbursement

Women seeking a loan from BRAC were offered the same business mobile money account 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 way³. This was fully explained so as to maximize take-up.

2.3.1 Features of the treatments

The treatments could have a number of different impacts both on how the loan is utilised and on savings. I classify these effects broadly as flexible saving device, mental accounting, commitment, and default effects.

Flexible saving device The mobile money account may provide a flexible and safe storage device for savings and so negate the need to hold savings as cash. This may decrease unplanned expenditures on personal items or pressure to give money to others. The latter has been shown to be particularly important for women, who are prepared to give up significant amounts of resources to keep money hidden rather than have to give it to family and friends (Boltz et al., 2017, Castilla, 2018, Goldberg, 2017, Jakiela and Ozler, 2015).

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. It therefore may function more like a debit card does in developed countries, keeping money out of view but providing easy access when needed.

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 et al., 2017, Habyarimana and Jack, 2018, Lipscomb and Schechter, 2018). Money in this saving account is viewed as being unavailable for

³This amount would cover 5 withdrawals of approximately one-fifth of the loan.

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.

The evidence on whether commitment is needed over just a safe place to store money is mixed. Individuals have been shown to have a demand for commitment, although strong take up alone doesn't mean savings will be large (Ashraf et al., 2006). Many papers are now showing that simply providing a safe storage device is enough to increase savings and have beneficial effects on downstream outcomes, including microenterprise growth, and commitment does not increase savings further (Blumenstock et al., 2018, Brune et al., 2016, Dupas and Robinson, 2013a,b, Habyarimana and Jack, 2018, Kast and Pomeranz, 2014, Lipscomb and Schechter, 2018, Prina, 2015, Schaner, 2018).

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. Prior literature has shown default effects about whether money is given as cash or into a saving account to be an important predictor of savings (Blumenstock et al., 2018, Brune et al., 2017, Somville and Vandewalle, 2018).

2.4 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 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 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. This continued for approximately 5 months until the sample size of 3,000 was achieved.

The randomisation was done in Stata. It was stratified by 5 variables: present bias, behaviour in a willingness-to-pay-to-hide-money game (see Section 3.1), first time borrower with BRAC, microfinance branch and also by business profits at baseline. The first two variables were chosen 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 account was framed as for her business, but without any constraints on how it was actually used. Women were free to refuse the account if they wanted.

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. She could refuse either the disbursement and/or the sim card, permitting partial compliance if she wanted the sim card but not the disbursement. The additional amount to cover fees was explained to the woman and the same training and framing as in as for the Mobile Account treatment given.

Although the treatments were offered to individuals as they applied for a new loan, it remained the case that women met in groups to repay their loans. 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.

3 Data

I have four sources of data for the analysis. Firstly, a baseline survey was conducted on all women applying for a new loan at the 6 BRAC microfinance branches. Baseline surveys were conducted between January and June 2017 before randomisation and assignment to treatment group occurred. Approximately 1 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 5 month period were part of the study.

Secondly, an endline survey was completed. The endline survey began in October 2017 and ran until January 2018. This is approximately 8 months after the loan disbursement, and was chosen so that those women who had 40 week loans⁴ 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 3 different microfinance groups during September 2018. There were 8 women from the Mobile Disbursement treatment, 5 from the Mobile Account treatment and 3 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

⁴BRAC 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

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.

3.1 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 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 (Almas et al., 2015, Fiala, 2017, Mani, 2011). Here I expand upon the version used in Fiala (2017) by conducting a variant of the (Almas et al., 2015) 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.

3.2 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 (Almas et al., 2015, Fiala, 2017)

Moving onto demographics; the sample was well educated with 80% of women completing primary school and 15% completing 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. Their business capital was predominantly in inventory, which made up 80% of the total. Married women 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

Table 1: Summary statistics and balance test

	Mobile disburse			Mobile account			Control			p
	mean	sd	obs	mean	sd	obs	mean	sd	obs	
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	634	729	980	633	750	992	612	644	980	0.73
monthly profit (self-report)	436	406	980	443	425	992	422	378	980	0.49
business asset value	550	890	984	577	890	993	568	880	982	0.80
inventory value	1971	2098	980	2002	2178	992	1978	2007	980	0.94
weekly hours business	96.21	46.89	984	98.82	47.28	993	99.53	47.77	982	0.26
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)	4.46	5.68	984	4.43	6.06	993	4.70	5.60	982	0.56
household income	1042	887	984	1040	804	993	1037	829	982	0.99
household asset value	3371	2631	984	3440	2786	993	3351	2476	982	0.73
household consumption	917	510	984	906	495	993	922	492	982	0.75

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

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.

3.3 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 (Treatment One) 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.

Table 2: Treatment compliance

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

I look at correlates with treatment take-up, and find only one variable predicts take-up. 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, the only variable that predicts take-up is the hiding game: women who always hid money from their spouse are 5 percentage

points less likely to accept the sim card. The reason for this is unclear, but could be random given the number of variables I look at. The only factor that predicts take-up of the Mobile Disbursement treatment, and only at the 10% significance level, is completing secondary school, which could indicate more educated women are more comfortable with technology. Below each table, 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.

3.4 Attrition

The survey team made a great 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.

4 Empirical strategy

McKenzie (2012) showed that in the case of a single baseline and follow-up with an autocorrelation 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.

4.1 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:

$$Y_i = \alpha_0 + \alpha_2 T_{2i} + \alpha_X X_i + \epsilon_i \quad (2)$$

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.

4.2 Impacts on 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 690 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 4. The first thing to note is the ever deposit variable. This 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 50), 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 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 time⁵. For the Mobile Account group withdrawals are similar to deposits at 12% ever making one.

⁵This 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 3.3)

Additionally the number of withdrawals is much higher for the Mobile Disbursement group. This is interesting, 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. 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.

I examine the outcomes summarised in Table 4 as well as the balances held on the accounts over time, using regression analysis in Figure 1 and Table 5 below.

Table 4: 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	894	0.13	0.33	1.00	0.00	0.00	828	0.14	0.35	1.00	0.00	0.00
number deposit	894	0.61	2.86	47.00	0.00	0.00	828	0.78	3.88	63.00	0.00	0.00
deposit amount (USH)	112	48.15	84.03	635.00	1.00	26.90	119	53.78	120.01	1002.75	0.30	20.20
total deposits (USH)	894	26.44	136.37	1687.00	0.00	0.00	828	32.37	204.80	4011.00	0.00	0.00
ever withdrawal	894	0.12	0.33	1.00	0.00	0.00	828	0.83	0.38	1.00	0.00	1.00
number	894	1.09	6.11	103.00	0.00	0.00	828	3.82	7.45	101.00	0.00	2.00
withdrawal amount (USH)	108	43.25	128.09	1250	0.50	16.78	686	647.99	600.64	3484.80	1.00	502.68
total withdrawals (USH)	894	29.29	172.98	3326.00	0.00	0.00	828	1107.04	894.00	7631.00	0.00	966.01

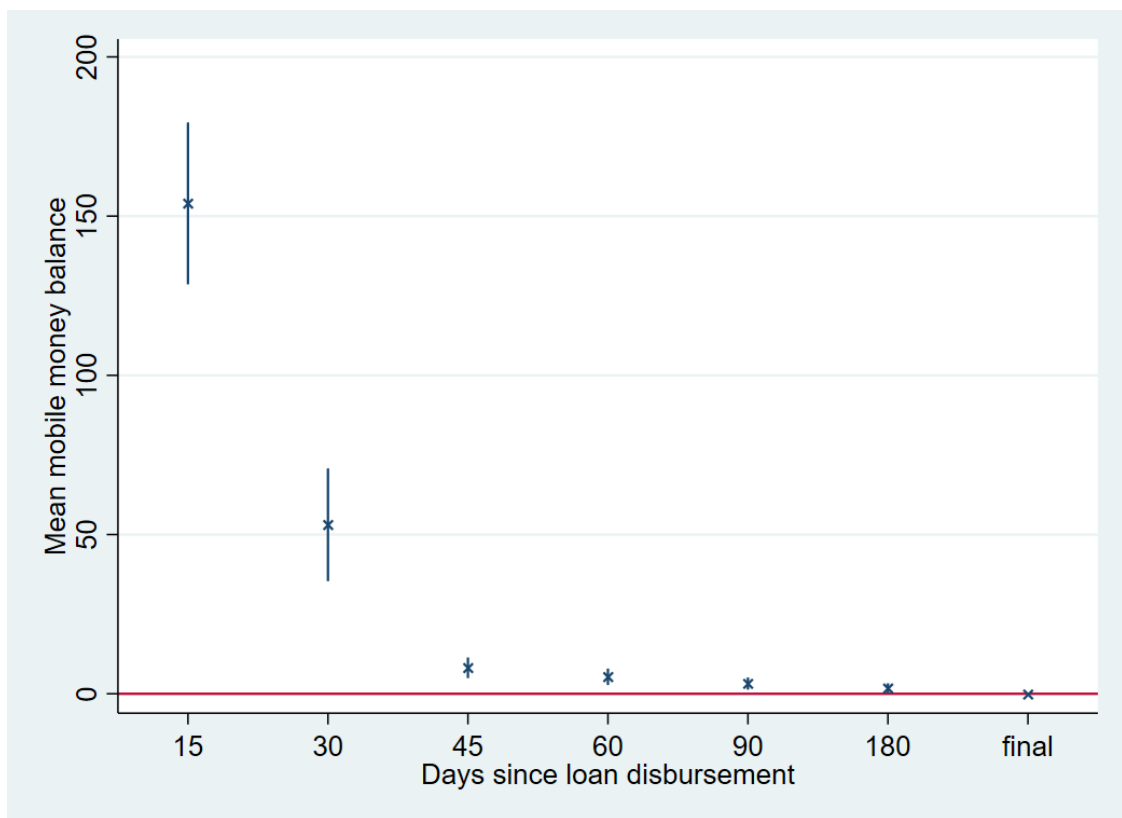
Monetary outcomes are in '000 Ugandan Shillings. All variables are defined over the first 180 days after the account was provided. I cap transactions at 180 since the last mobile money accounts were given out in June 2017 and the administrative data ends in January 2018. Deposits always excludes the loan disbursement for the mobile disbursement treatment group. Deposit amount and withdrawal amount summarises cumulative deposits/withdrawals to the account. 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. Total deposits and withdrawals are cumulative transactions on an account.

In Figure 1, I show the average balance on the mobile money account for various time periods along with the 95% confidence interval. The periods are the first 15 days, 15-30days, 30-45days, 45-60days, 60-90days and 90-180days. I also show the final balance from the last transaction before the 180 day cut-off.

Figure 1 clearly shows that the average balance on the mobile money account for the Mobile Disbursement treatment is large and statistically significant compared to

the Mobile Account treatment. The Mobile Account group hold almost zero average balances throughout the period. The average balance for the Mobile Disbursement treatment also declines over time, though remains significantly different than the Mobile Account treatment until the final balance. During the first 15 days after loan disbursement, women in the Mobile Account group are typically holding 150,000 USH (\$40) on the account, approximately 10% of the loan value or 34% of the mean household saving at baseline. Between 15 and 30 days this falls to 50,000 USH (\$14). This indicates that microfinance clients treated with Mobile 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.

Figure 1: Treatment effects of Mobile Disbursement on average balances in mobile money account



Turning to Table 5, I show a series of variables capturing whether the mobile

money account was used and how intensely, split into transactions relating to depositing and withdrawing money. Table 5 shows that it is only for withdrawals that there are significant differences between the Mobile Account and Mobile Disbursement treatments. Mobile disbursement treated women are 70 percentage points more likely to make a withdrawal than the Mobile Account treatment. This seems reasonable considering they needed to withdraw the loan and 70% of them took-up the treatment according to the survey data. On average, Mobile Disbursement treated clients make 4 withdrawals, significantly different from the Mobile Account mean of 1 withdrawal. The fact that withdrawals for the Mobile Disbursement group are greater than 1 corroborate the finding that clients are leaving a balance on the accounts which they are slowly drawing down over time.

Table 5: 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 with- drawals
MD	0.02 (0.02)	0.21 (0.18)	-13.54 (17.20)	6.46 (8.36)	0.70*** (0.02)	2.86*** (0.33)	598.57*** (69.93)	1,074*** (31.92)
Constant	0.12*** (0.01)	0.59*** (0.12)	58.02*** (10.44)	26.12*** (5.64)	0.12*** (0.01)	1.02*** (0.22)	48.71 (63.59)	30.44 (21.52)
Obs.	1,722	1,722	231	1,722	1,722	1,722	794	1,722
R-squared	0.24	0.22	0.74	0.31	0.63	0.35	0.47	0.57
Control mean	0.13	0.61	48.15	26.47	0.12	1.09	43.25	29.32

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

Finally, looking at the value of withdrawals. Average withdrawal is the value of the average withdrawal made to the account. This is shown only for the sample of women who made any withdrawals. The total withdrawals are the total value of all withdrawals to the accounts over the first 180 days of account ownership⁶. The typical withdrawal is 600,000 USH (\$160) for the Mobile Disbursement treatment compared to only 40,000 USH (\$11) for the Mobile Account treatment group who

⁶I look only at the first 180 days of account ownership since the last disbursements of the loans for study women were in June 2017 and the administrative data only goes until January 2018

made any withdrawals. Total withdrawals for the Mobile Disbursement group are 1.1mn USH (\$290), 300,000 USH (\$80) less than the average loan size⁷.

This is also backed-up by examining the average percentage of the loan withdrawn on the same day as it was deposited. 71% of the Mobile Disbursement group withdrew some of the loan on the day it was disbursed and the average withdrawal amongst this group was 54% of the loan value. Focus groups validated that this was not due to liquidity constraints among agents: women who did encounter an agent with insufficient float could easily go to one of the many other agents concentrated around Kampala. Most women are therefore leaving some balance on the accounts beyond the disbursement day and making multiple withdrawals over time.

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 et al. (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 (2017) who find a mobile money linked saving account increased savings in Mozambique⁸. 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 5.4.

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 may be most similar to De Mel et al. (2018) in that women already had access to other forms of saving such as bank accounts

⁷This will not add up to the balance on the accounts due to fees paid on transactions

⁸Again, bonus interest rates were offered to induce savings in this study

at relatively high levels (38% already used a bank account at baseline). Also being in an urban setting means women are extremely close 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. This is similar to the findings of Somville and Vandewalle (2018) and Field et al. (2016) who also both compare in different contexts paying money as cash versus into a saving account. They both find that the saving account payment results in higher levels of savings from retaining some of the money paid into the account, but no increases in own payments into the account.

4.3 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 6. 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.

There are no effects of the Mobile Disbursement treatment on the amount of saving and 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. These results are consistent with the fact that by 6 months after the loan disbursement, neither treatment group

Table 6: Treatment effects on primary outcomes

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	10.41 (13.01) [0.99]	3.33 (33.98) [0.99]	-30.40 (86.65) [0.99]
Mobile disburse	63.72*** (12.73) [0.00]	30.44 (36.82) [0.74]	213.08*** (82.92) [0.03]
Observations	2,639	2,639	2,639
R-squared	0.44	0.41	0.60
Control mean endline	395.3	559.2	2473
Control mean baseline	419.8	483.6	2488
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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

was holding significant balances on the mobile money account, and in the case of the Mobile Account treatment they never deposited money onto the account. Hence it is unsurprising that by 8 months there is no saving impact for the Mobile Disbursement group, and, since they didn't use the accounts, I find no impact for the Mobile Account group.

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

all treatment groups, savings increase by 100,000 USH (\$25), 21%, and in the control group there is no change in business capital. Later results will show that the control group appear to use the loan mainly to buy household assets and pay for school fees, hence why no overall business impacts are seen.

4.4 Impacts on secondary outcomes

I pre-defined additional outcomes for each of my three primary outcome families. These additional and secondary outcomes shine light on why the primary outcomes are affected by the treatments. I do not multiple-hypothesis correct the secondary outcomes.

4.4.1 Business outcomes

I examine 4 additional business outcomes in Table 7: monthly and weekly sales and calculated monthly and weekly profits. These are alternative outcomes of business performance to supplement the self-reported profit measure used as the primary outcome. I see large significant effects of the Mobile Disbursement treatment on all these outcomes. Sales are approximately 15% higher for the Mobile Disbursement group both weekly and monthly. Similarly profits in the Mobile Disbursement group are 10% higher than the control group, a similar increase as the self-reported profit measure.

I see no significant impacts from the Mobile Account treatment, but I cannot reject that the treatments had equal effects for the two alternative measures of profits.

4.4.2 Savings

Secondary savings outcomes are reported in Table 8. I look at saving specifically with mobile money, to see if the treatment caused a shift in savings from other forms to saving on mobile money account. I look at whether the woman saves at all with mobile money and, if so, the amount she saves with mobile money. Since the mobile money account was framed as an account for the business I also look at whether when are more likely to report that they are saving for their business. As

Table 7: Treatment effects on secondary business outcomes

	(1)	(2)	(3)	(4)
	monthly	weekly	monthly	weekly
	sales	sales	profit	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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

robustness checks, I also look at the calculated value of savings in each form and net savings over the last 30 days.

I see no effects on calculated savings or net savings in the last 30 days, in the same way as I didn't on self-reported savings. The calculated saving variable is very similar to self-reported total savings and they in fact have a high correlation (0.75), showing that women do have a good idea of their savings. On reporting that their main saving goal is for the business, I see an effect from the Mobile Account treatment but not the Mobile Disbursement treatment, but this is only significant at the 10% level and I can't reject equality of the treatment effects.

I see effects for both treatments on whether a woman reports saving with mobile money and the amount of savings held on the mobile money account. Those given the Mobile Account treatment are 4 percentage points more likely to report using mobile money to save, while those given the mobile money disbursement treatment are 9 percentage points more likely. This is from a control mean of only 12%, meaning the Mobile Disbursement treatment almost doubled savings on mobile

Table 8: Treatment effects on secondary saving outcomes

	(1) calcu- lated savings	(2) net sav- ings	(3) saves mobile money	(4) amount mobile money	(5) saving goal business
Mobile account	-23.18 (44.34)	-8.48 (12.57)	0.04** (0.02)	5.89* (3.08)	0.04* (0.02)
Mobile disburse	21.36 (47.19)	-8.48 (8.39)	0.09*** (0.02)	12.08*** (3.17)	0.01 (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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

money and the Mobile Account treatment increased them by one-third. This is from an extremely low value though: saving on a mobile money account were only 13,000 USH (\$3.5) in the control group, less than 2% of all savings by value. The two treatments only increase this to 18,000 (\$4.8) and 25,000 USH (\$6.7)⁹ in the Mobile Account group and Mobile Disbursement group respectively, still less than 5% of total savings. The impacts are therefore significant statistically but of low economic significance.

These impacts suggest both treatments induced a shift towards use of mobile

⁹The balances saved in mobile money are larger when self-reported compared to the administrative data. This could be because the majority of the women already had mobile money accounts but I only have records for those accounts given out as part of the study. These records will therefore always undervalue total mobile money balances, assuming the women continue to also use their private accounts.

money for savings. The fact that there are no overall effects on savings suggests that this is a reallocation of savings between forms rather than higher savings. However the coefficients for both calculated and self-reported savings are of a positive magnitude for the Mobile Disbursement treatment and so there could be a small increase in savings I am unable to detect¹⁰.

4.4.3 Business assets

I examine an index of business assets formed by taking the first principal component of a series of dummy variables for whether or not an asset is used in the business. This measure enables me to capture changes in the number of different assets used in the business, rather than just changes in the value of assets used.

Looking at Table 9, I find a significant positive effect of the Mobile Disbursement treatment on the asset index, 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 soon as possible. I find no significant impact of the Mobile Account treatment on the business asset index.

I also examine the value of a 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 alone, of 120,000 USH (\$32). This shows that women treated with Mobile Disbursement invest in more business assets and higher value assets, as well as greater inventory.

¹⁰I am only powered to detect 0.1 standard deviations. Since the variance of savings is very high this is 80,000 USH

Table 9: Treatment effects on secondary business asset outcomes

	(1) PCA of business assets	(2) value of business assets	(3) inventory value
Mobile account	0.10 (0.07)	49.75 (44.92)	-82.79 (69.96)
Mobile disburse	0.38*** (0.07)	132.73*** (43.49)	122.41* (62.75)
Observations	2,642	2,610	2,606
R-squared	0.32	0.42	0.62
Control mean endline	-0.109	643.7	1887
Control mean baseline	0.0541	577.4	1968
p-value T1=T2	0.00	0.03	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. 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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4.5 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 A3 underneath the robust p-values and q-values. 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 results¹¹, as seen in appendix Table A4.

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 A5 and A6.

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 A7. Since my take-up was relatively high at 71%, these are approximately one-quarter larger than the estimates in Table 6.

¹¹The mean (and median) number of days between loan disbursement and the endline survey was 200 days, or 7 months

5 Mechanisms: Internal or external constraints to microenterprise investment?

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 hidden money from family and so given the woman more control over the loan.

5.1 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 safely 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. Self-reported savings with mobile money, while significantly different for both treatments from the control group, are of economically tiny magnitudes (See Table 8 - 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.

5.2 Self-control

To examine if self-control difficulties are a key channel through which the accounts had an impact, I look at heterogeneity by an index of self-control difficulties at

baseline. I construct this index in a standard fashion¹² using the method of Anderson (2008). 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 10. I see large heterogeneous effects by the index of prior self-control difficulties for the Mobile Disbursement treatment on profits. However, this does not survive a multiple testing correction (q value 0.103). The results for business capital are more noisy, and I only find a significant overall impact of the Mobile disbursement treatment for those who had self-control difficulties at baseline. Overall, while there seems to be some evidence that those women with self-control difficulties at baseline benefited more from the Mobile Disbursement treatment, the effects are not strong enough to explain all my results. This contrasts with Somville and Vandewalle (2018) who argue self-control difficulties explain their findings well.

5.3 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 difficulty of hiding a large amount of cash in small denomination bills. The women discussed the many strategies they employ to hide all or part of the loan when they first receive it.

Hiding the loan when its disbursed onto a mobile money account is likely to be considerably easier than hiding large amounts of cash in hand. 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

¹²e.g. see Fafchamps et al. (2014)

Table 10: Heterogeneous treatment effects by baseline self control index

	(1)	(2)	(3)
	business profit	total savings	business capital
MA*self control	-5.24 (28.97) [0.99]	2.72 (73.91) [0.99]	77.62 (183.20) [0.99]
MD*self control	63.17** (27.65) [0.12]	26.04 (76.73) [0.99]	180.92 (176.28) [0.84]
Mobile account	12.88 (16.95) [0.99]	4.44 (45.66) [0.99]	-24.04 (108.75) [0.99]
Mobile disburse	38.39** (16.19) [0.10]	22.86 (50.36) [0.99]	144.67 (106.59) [0.48]
Observations	2,639	2,639	2,639
R-squared	0.44	0.35	0.56
Control mean	387.2	510.0	2366
Control mean baseline	425.2	445.4	2499
<i>Overall effects</i>			
mobile account	7.64 (22.27)	7.16 (55.31)	53.59 (143.4)
mobile disburse	101.6*** (21.69)	48.89 (55.48)	325.6** (136.9)
T1=T2	0.12	0.69	0.10
T1=T2 interaction	0.00	0.44	0.03

Intent-to-treat estimates. Monetary outcomes are winsorized at the 99% level and reported in '000 Ugandan Shilling. 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 5. The interaction is for someone who is above the median in the index. Profit is self-reported monthly profit. Capital is composed of business assets and inventories. Control mean refers to the mean value of the outcome variable for the interaction condition being true in the control group, and control mean baseline the mean in the control group at baseline when the interaction condition is true. The panel labelled overall effects gives the total impact of each treatment for someone who is above the median in the index variable. 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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

compared to taking cash out of a pocket. 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 hide business profits by making deposits to the account.

To examine whether facilitating hiding of money was a key channel 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). The index is composed of the following components at baseline¹³: whether they always preferred to receive the money themselves on the hiding game (stratified); whether they were married; whether they scored below the median in an index of decision making; whether they reported that when they have money on hand their spouse and family takes it; and whether their spouse or another household member had a business at baseline. Heterogeneous effects by this index are shown in Table 11.

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 74,000 USH (\$20) from getting the Mobile Disbursement treatment, or approximately 17% of profits in the control group. There is still a small impact of the Mobile Disbursement treatment for those who didn't experience above median pressure to share with family at baseline, but this is only significant at the 10% level and doesn't survive multiple test correcting.

Looking at the overall effect, those who at baseline experienced high family pressure to share money see a 100,000 USH (\$27) increase in their business profits from treatment with Mobile Disbursement, or a 25% increase compared to those

¹³A component of the family pressure index was used to stratify the original randomisation

Table 11: Heterogeneous treatment effects by baseline family pressure index

	(1)	(2)	(3)
	business profit	total savings	business capital
MA*family pressure	7.09 (28.09) [0.99]	-33.41 (77.41) [0.99]	100.60 (186.16) [0.99]
MD*family pressure	74.53*** (27.17) [0.03]	22.33 (82.57) [0.99]	451.46** (178.34) [0.03]
Mobile account	6.77 (18.58) [0.99]	19.32 (44.42) [0.99]	-43.10 (113.89) [0.99]
Mobile disburse	29.80* (17.49) [0.49]	20.34 (44.57) [0.99]	7.93 (111.58) [0.99]
Observations	2,639	2,639	2,639
R-squared	0.44	0.35	0.57
Control mean	386.7	659.5	2657
Control mean baseline	423.4	546.1	2639
<i>Overall effects</i>			
mobile account	13.85 (19.69)	-14.09 (59.08)	57.49 (138.7)
mobile disburse	104.3*** (19.76)	42.67 (65.50)	459.4*** (131.5)
T1=T2	0.19	0.98	0.61
T1=T2 interaction	0.00	0.34	0.00

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 5. The interaction is for someone who is above the median in the index. Profit is self-reported monthly profit. Capital is composed of business assets and inventories. Control mean refers to the mean value of the outcome variable for the interaction condition being true in the control group, and control mean baseline the mean in the control group at baseline when the interaction condition is true. The panel labelled overall effects gives the total impact of each treatment for someone who is above the median in the index variable. 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

in the control group who experience high family pressure at baseline. The control mean actually shows that those who experienced strong family pressure to share money at baseline see a decline in their business profits between baseline and endline, from 423,000 USH (\$110) to 386,000 USH (\$103). Treatment with Mobile Disbursement is therefore not only mitigating an otherwise decline in profits but actually leading to an increase.

I likewise see similar heterogeneity for business capital by family pressure at baseline for the Mobile Disbursement treatment. Overall, those who experience family pressure to share at baseline see their business capital increase by 460,000 USH (\$123), or 17%, 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.

5.3.1 Expenditure patterns

If the Mobile Disbursement treatment helped women to resist family pressure to share money then this should appear in the expenditure data¹⁴. 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 spouse¹⁵ This is shown in Table 12.

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

¹⁴these outcomes were not pre-specified and are exploratory only

¹⁵This was no pre-specified as an outcome

Table 12: 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 (3.83)	-0.03 (0.03)	4.15 (9.63)
Mobile disburse	-10.78*** (3.54)	-0.09*** (0.03)	-1.82 (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 win-sorized 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.

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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.

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 12. 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 disbursement¹⁶. 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 Table 13. 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 (\$30) on school fees (8%) and 110,000 USH 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.

¹⁶this outcome was not pre-specified in the pre-analysis plan

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.

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 know¹⁷’. 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. I discuss social norms in section 6, but I do not find any evidence that treatment affected women’s place in or amount of support from social networks.

¹⁷BRAC 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

Table 13: Treatment effects on secondary loan use outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	busi- ness	sharing	school	home	expen- diture	sav- ing	loan
Mobile account	11.88 (23.76)	7.11 (5.12)	4.75 (6.67)	9.44 (10.60)	-0.21 (0.32)	-9.52 (11.58)	-0.00 (0.32)
Mobile disburse	17.32 (23.56)	-28.76*** (4.90)	-4.67 (6.24)	-29.30*** (9.48)	0.15 (0.34)	44.71*** (12.24)	0.04 (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

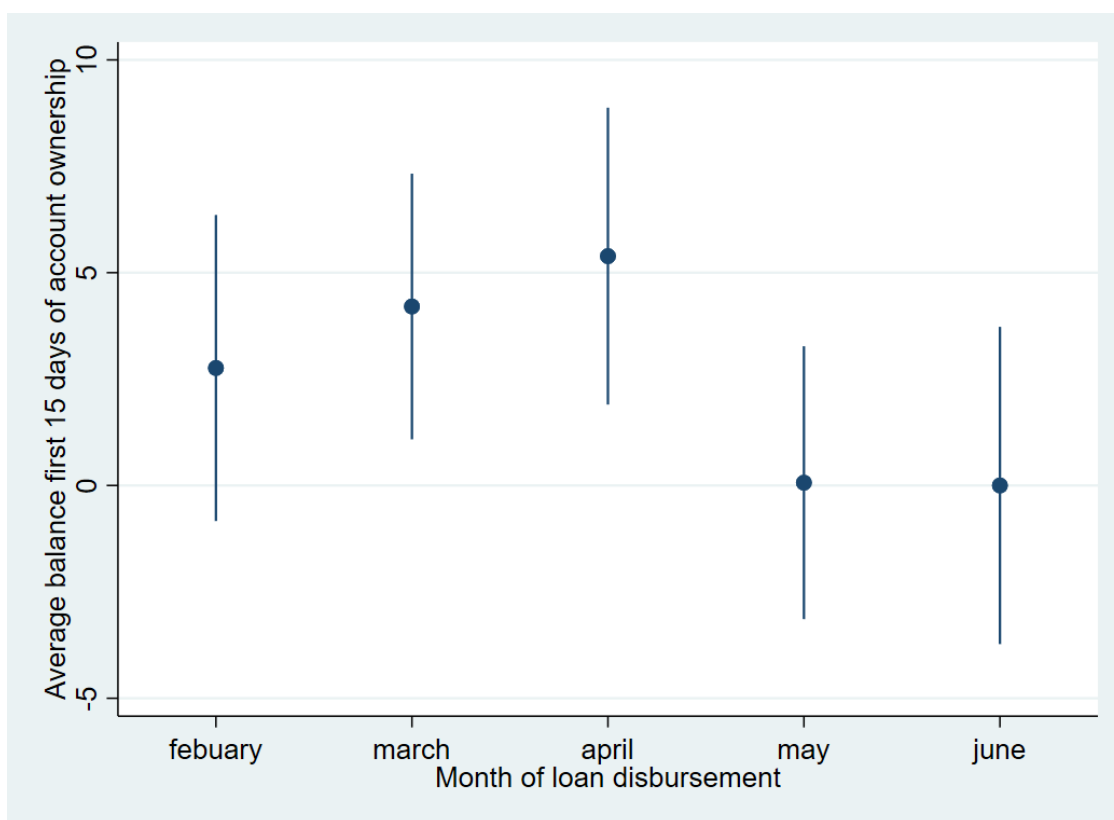
5.4 Why didn't the Mobile Account treatment imitate the Mobile Disbursement treatment?

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?

There are a number of possible reasons why the control and Mobile Account groups might not have imitated the Mobile Disbursement. Firstly, as already discussed saving via mobile money was not very popular with less than 20% of the sample doing this. 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. 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 examine this by regressing the average balance on the mobile money account over the first 15 days 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 fact, less than 10% of the Mobile Account group have a positive balance during the first 15 days after the loan is disbursed, and so a small number

Figure 2: Average account balance Mobile Account group over time '000 USH



of people depositing relatively large amounts (300,000 USH (\$80)) are skewing the numbers in the early part of the year. 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.

Secondly, a key benefit of receiving the loan on the mobile money account is the hiding of money. It is possible that going to an agent yourself and deposit some of the loan still makes the loan more visible than BRAC depositing the money for you. While this could be a concern in village communities where the mobile money agent knows everyone, it is unlikely to be the case in Kampala where the woman could go to any number of agents and presumably could easily find one with no connection to her.

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% of the sample have hyperbolic preferences and 34% are defined as impatient, I cannot rule out that small time costs combined with some amount of procrastination could explain why the Mobile Account group does not imitate the Mobile Disbursement group.

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). The reason for this is argued to be default effects, since the cost of transacting in this setting is so small. 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 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.

6 Alternative explanations

I examine a number of different potential reasons for the results I find. Firstly, the results may be simply a reallocation within the household that may actually leave the household worse off. Secondly, 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. Thirdly, 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. Fourthly, 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. Lastly, if women give less to their social networks, they may receive less in return, damaging their ability to withstand shocks.

6.1 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., 2018). I therefore examine whether the income of other household members changed as a result of the treatments, as well as household consumption.

Looking at Table 14, 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. An important point

Table 14: Treatment effects on secondary income outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	total household income	woman's wage earnings	spouse wage earnings	spouse business earnings	other hh wage earnings	other hh business earnings	spouse all earnings	other hh all earnings
Mobile account	10.04 (35.66)	-7.86* (4.18)	-11.52 (18.67)	10.30 (7.83)	11.83 (24.81)	-2.57 (7.08)	1.05 (27.93)	9.02 (11.70)
Mobile disburse	87.14** (36.48)	-2.39 (4.49)	11.03 (19.16)	12.99 (8.07)	-2.35 (24.78)	-3.95 (7.04)	18.67 (28.83)	10.31 (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. 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

to note here is 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 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 sample¹⁸, 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 5 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 predict 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 consumption¹⁹. Looking at consumption in Table 15, I see significant increases in overall consumption for the Mobile Disbursement treatment.

¹⁸55% of the sample would be willing to give up \$7 to retain control of money over giving it to their spouse

¹⁹since I find no increase in saving, this additional income must appear in consumption, remittances or as assets

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.

Table 15: Treatment effects on secondary consumption outcomes

	(1) total	(2) food	(3) non-food exl school	(4) school
Mobile account	27.19 (23.99)	9.61 (9.83)	7.87 (8.49)	12.42 (12.76)
Mobile disburse	50.66** (24.26)	20.50** (10.31)	4.87 (8.45)	22.06* (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

Anecdotally, women described school expenditures as one of the easiest ways to hide excess income, as they are a large and variable expenditure once costs of schools supplies are included and the spouse has little idea of the true cost. I do indeed see that women treated with the Mobile Disbursement spend more on their children's schooling in Table 15.

6.2 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 Table 16, 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.

This mitigates concerns about the treatments that any beneficial effect of receiving the loan on a secure mobile money account might be outweighed by the fact that the mobile money account makes it easier to send money to others. 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.

6.3 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,

Table 16: Treatment effects on secondary remittance outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	amount sent	amount received	net amount received	used mobile money	Re- ceived dummy	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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

they are unlikely to also over report improvements in other household outcomes not linked to the business.

While it is possible that the Mobile Disbursement treatment made it more salient to households that they should be investing in their business and so caused them to report more of their household assets as used for the business, they are unlikely to also over inflate their household assets. In that case I would see a rise in business asset for the Mobile Disbursement group without any overall increase in 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.

I test this by seeing if there is an overall increase in assets regardless of how they are used. In Table 17, I see that the Mobile Disbursement treatment led to a significant increase in overall asset levels of 340,000 USH (\$90) compared to control. Since household assets by definition includes those used in the business, this measure confirms an increase in businesses assets. In Table 9, 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 improve 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 too.

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.

Table 17: Treatment effects on secondary wealth outcomes

	(1)
	Total asset value
Mobile account	137.97 (151.95)
Mobile disburse	342.67** (154.94)
Observations	2,642
R-squared	0.30
Control mean endline	4398
Control mean baseline	3384
p-value T1=T2	0.18

Intent-to-treat estimates. All outcomes are win-sorized 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

6.4 Measurement error

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. They 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, 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.

Overall, this suggests that the idea that the mobile money accounts corrected measurement error in the tracking of business outcomes seems unlikely as an explanation for the impacts I see.

6.5 Social networks

I argue that the Mobile Disbursement treatment helped women resist pressure to give money to others. 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.

Firstly, I do not see any changes for either treatment group in the amount of remittances either given by or received from others, see Table 16, 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 18. 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.

Table 18: Treatment effects on number of women in the microfinance group you'd interact with in each of the situations

	(1)	(2)	(3)
	talk to at least once a week outside the group	ask for financial help from if you needed money	give financial help to if she needed money
Mobile account	0.14 (0.26)	-0.09 (0.20)	-0.11 (0.21)
Mobile disburse	0.05 (0.26)	0.09 (0.20)	0.08 (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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

7 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 7% of the loan value or 22% 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 safe and private way to store the loan, saving it 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.

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 money²⁰. Even if BRAC had continued with Mobile Disbursement, it is entirely possible that over time a

²⁰BRAC 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

woman's family would learn about the mobile money disbursement and find more effective means of gaining access to the funds there. 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 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.

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Appendix

Table A1: Correlates of treatment take up

	(1) Mobile Account	(2) Mobile Disburse
respondent age	-0.001 (0.001)	-0.002 (0.001)
married	0.021 (0.015)	-0.046 (0.026)
household size	-0.003 (0.005)	-0.007 (0.007)
primary school	0.011 (0.018)	0.011 (0.031)
secondary school	0.01 (0.023)	0.084* (0.035)
job	0.000 (0.018)	-0.059 (0.03)
loan amount	0.000 (0.000)	0.000 (0.000)
weekly profit	0.000 (0.000)	0.000 (0.000)
high profits	-0.002 (0.014)	-0.035 (0.025)
current client	-0.016 (0.019)	-0.045 (0.032)
amount saved	0.000 (0.000)	0.000 (0.000)
mobile money account	-0.020 (0.031)	0.017 (0.070)
hyperbolic	-0.034 (0.017)	0.024 (0.031)
impatient	-0.025 (0.015)	0.018 (0.025)
woman's income share	-0.01 (0.023)	-0.032 (0.039)
hides money	-0.047** (0.017)	0.047 (0.033)
family takes	0.022 (0.015)	-0.026 (0.026)
spouse business	-0.026 (0.019)	-0.01 (0.035)
household business	-0.004 (0.016)	-0.043 (0.027)
Observations	984	956
R-squared	0.033	0.029
Mean control	0.946	0.823
F-test p-value	0.50	0.66

Each row represents a separate OLS regression of whether the individual accepted that treatment on the baseline characteristics specified. I also include a p-value from an F-test of regressing all the characteristics on the take-up dummies. I count as those who consented to the Mobile Disbursement treatment both those who got it (71%) and the 10% who consented but couldn't receive treatment due to random technical errors. 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

Table A3: Treatment effects on primary outcomes - permutation test

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	10.41 (0.42) [0.99] {0.17}	3.33 (0.92) [0.99] { 0.82}	-30.40 (0.98) [0.99] {0.93}
Mobile disburse	63.72*** (0.00) [0.00] {0.00}	26.66 (0.47) [0.86] {0.95}	213.08*** (0.01) [0.03] {0.03}
Observations	2,639	2,639	2,639
R-squared	0.44	0.41	0.60
Control mean endline	395.3	580.6	2473
Control mean baseline	419.8	483.6	2488
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 A4: Primary outcome results with linear and quadratic time trend of the number of days between loan disbursement and endline

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	12.91 (12.99) [0.99]	0.80 (33.91) [0.99]	13.37 (85.26) [0.99]
Mobile disburse	61.69*** (12.76) [0.00]	28.99 (37.24) [0.80]	202.34** (83.06) [0.04]
Observations	2,639	2,639	2,639
R-squared	0.44	0.41	0.57
Control mean endline	395.3	580.6	2473
Control mean baseline	419.8	483.6	2488
p-value T1=T2	0.00	0.42	0.02
p-value T1=T2=0	0.00	0.67	0.02

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 A5: Primary outcome results with winsorizing the top 2%

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	8.50 (12.22) [0.99]	9.93 (32.28) [0.99]	22.41 (80.85) [0.99]
Mobile disburse	54.39*** (11.93) [0.00]	25.26 (34.33) [0.85]	223.22*** (78.19) [0.01]
Observations	2,639	2,639	2,639
R-squared	0.41	0.38	0.55
Control mean endline	393.4	559.5	2420
Control mean baseline	415.4	441.8	2443
p-value T1=T2	0.00	0.64	0.01
p-value T1=T2=0	0.00	0.76	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 A6: Primary outcome results with winsorizing the top 0.5%

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	9.47 (13.93) [0.99]	-6.65 (36.66) [0.99]	-17.91 (86.19) [0.99]
Mobile disburse	75.13*** (13.84) [0.00]	29.46 (41.43) [0.88]	196.06** (84.50) [0.06]
Observations	2,639	2,639	2,639
R-squared	0.46	0.40	0.57
Control mean endline	396.5	597.2	2488
Control mean baseline	421.2	491.3	2522
p-value T1=T2	0.00	0.34	0.01
p-value T1=T2=0	0.00	0.63	0.01

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 A7: Treatment effects on primary outcomes - ATT

	(1)	(2)	(3)
	profit	savings	capital
Mobile account	11.07 (13.70)	3.54 (37.21)	2.29 (85.89)
Mobile disburse	88.94*** (18.04)	42.47 (49.04)	297.6*** (113.2)
Observations	2,610	2,610	2,610
R-squared	0.261	0.221	0.473
Control mean endline	395.3	559.2	2473
Control mean baseline	419.8	483.6	2488
p-value T1=T2	0.000	0.383	0.004

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 A8: Heterogeneous treatment effects on business profit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	high profits	hide money	current loan	hyper - bolic	impa- tient	high saving	high asset	mar- ried	high empower	sent family	family takes	saving goal bus	spouse bus	hh bus
MA*interaction	-33.76 (27.65)	11.67 (38.40)	5.53 (29.83)	11.87 (32.16)	1.30 (29.90)	-14.21 (28.13)	-4.48 (27.84)	5.80 (30.39)	-18.84 (28.23)	29.09 (28.96)	-1.12 (30.15)	-45.11 (36.22)	26.77 (41.02)	25.69 (28.61)
MD*interaction	109.73*** (27.17)	76.04** (35.56)	21.74 (29.55)	36.14 (30.22)	55.39* (29.29)	29.90 (26.78)	28.50 (26.53)	66.83** (28.51)	4.68 (27.54)	-27.75 (28.19)	70.03** (28.27)	-31.84 (34.35)	74.51** (37.84)	56.31** (27.63)
Mobile account	18.70 (15.00)	-12.70 (32.89)	-2.80 (26.23)	0.49 (14.68)	1.79 (16.32)	9.16 (17.75)	4.61 (18.15)	-2.11 (24.56)	11.27 (18.56)	-16.59 (22.43)	0.32 (16.24)	12.02 (14.78)	-18.69 (31.12)	-9.97 (18.46)
Mobile disburse	18.33 (15.84)	34.14 (29.20)	52.50** (25.73)	63.13*** (14.39)	47.51*** (15.88)	55.32*** (16.91)	56.54*** (17.27)	25.73 (22.53)	67.37*** (18.05)	87.65*** (22.40)	45.07*** (15.47)	77.26*** (14.36)	28.69 (29.88)	45.00** (17.95)
Observations	2,606	1,726	2,606	2,606	2,606	2,606	2,606	2,606	2,606	2,606	2,606	2,606	1,738	2,606
R-squared	0.42	0.51	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.50	0.42
Control mean	469.88	380.94	401.98	362.34	399.47	434.58	409.64	387.26	406.18	397.79	396.38	419.80	368.71	367.20
Control mean base	657.95	412.95	437.77	381.10	438.72	480.86	430.95	417.21	436.01	410.68	467.98	389.12	397.75	392.29
Interaction mean	0.48	0.63	0.82	0.20	0.35	0.49	0.48	0.66	0.51	0.64	0.34	0.22	0.58	0.45
<i>Overall effects</i>														
mobile account	-15.06 (22.35)	-1.04 (19.87)	2.73 (14.65)	12.35 (28.42)	3.09 (23.89)	-5.05 (20.48)	0.14 (19.95)	3.68 (16.12)	-7.57 (19.82)	12.50 (16.82)	-0.80 (24.19)	-33.09 (31.85)	8.09 (23.28)	15.72 (20.24)
mobile disburse	128.06*** (20.89)	110.18*** (20.00)	74.24*** (14.38)	99.27*** (26.44)	102.90*** (23.33)	85.22*** (19.76)	85.04*** (19.34)	92.56*** (16.02)	72.05*** (19.30)	59.90*** (15.89)	115.10*** (22.95)	45.42 (30.15)	103.20*** (21.65)	101.30*** (19.50)
<i>p-value for testing</i>														
T1=T2	0.98	0.15	0.02	0.00	0.00	0.01	0.00	0.22	0.00	0.00	0.00	0.00	0.08	0.00
T1=T2 interaction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00

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 5. Note that hide money and spouse bus are only reported for married women who have a spouse. The panel labelled overall effects gives the total impact of each treatment for someone who is the interaction term is true for. The panel labelled overall effects gives the total impact of each treatment for someone who is the interaction term is true for. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A9: Heterogeneous treatment effects on business capital

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	high profits	hide money	current loan	hyper - bolic	impa- tient	high saving	high asset	mar- ried	high empower	sent family	family takes	saving goal bus	spouse bus	hh bus
MA*interaction	26.17 (184.37)	-158.87 (240.43)	-81.66 (213.46)	102.55 (217.42)	-171.49 (196.33)	-125.30 (183.54)	-142.47 (185.91)	130.03 (192.13)	21.76 (185.18)	36.80 (180.63)	43.81 (196.29)	-13.66 (230.42)	88.81 (249.81)	26.16 (186.71)
MD*interaction	143.50 (176.97)	131.33 (206.91)	192.57 (209.72)	6.45 (203.59)	14.19 (185.98)	171.84 (174.32)	-34.40 (176.47)	403.09** (179.57)	148.09 (174.84)	-291.01* (167.52)	400.97** (176.69)	-8.05 (213.78)	395.11* (223.48)	367.86** (174.48)
Mobile account	-41.47 (114.17)	129.35 (189.68)	37.07 (191.70)	-51.46 (96.79)	27.49 (106.94)	32.75 (110.65)	40.22 (101.38)	-115.35 (148.02)	-35.40 (137.09)	-53.54 (132.39)	-50.84 (106.89)	-24.54 (98.23)	-14.39 (180.20)	-43.57 (116.24)
Mobile disburse	191.51* (108.22)	308.67** (147.33)	104.97 (191.46)	260.25*** (90.37)	241.06** (101.15)	175.89* (106.77)	277.93*** (99.23)	-5.33 (142.62)	191.35 (126.66)	445.00*** (120.45)	116.48 (100.62)	261.95*** (90.40)	182.23 (164.58)	102.99 (111.62)
Observations	2,606	1,726	2,606	2,606	2,606	2,606	2,606	2,606	2,606	2,606	2,606	2,606	1,738	2,606
R-squared	0.61	0.64	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.67	0.61
Control mean	2766	2711	2649	2520	2589	3004	3225	2622	2311	2660	2496	2593	2671	2661
Control mean base	3020	2717	2702	2610	2476	3175	3446	2689	2437	2607	2625	2471	2768	2653
Interaction mean	0.48	0.63	0.82	0.20	0.35	0.49	0.48	0.66	0.51	0.64	0.34	0.22	0.58	0.45
<i>Overall effects</i>														
mobile account	-15.30 (138.4)	-29.52 (153.3)	-44.59 (96.53)	51.09 (195.7)	-144.00 (159.6)	-92.55 (140.6)	-102.20 (150.3)	14.68 (112.6)	-13.64 (115.7)	-16.73 (117)	-7.03 (159.8)	-38.20 (203.3)	74.42 (162.1)	-17.41 (139)
mobile disburse	335** (131.3)	440** (146.3)	297.5*** (88.38)	266.7 (182.6)	255.2* (149.1)	347.7*** (129.8)	243.5* (138.3)	397.8*** (101.6)	339.4*** (111)	154 (110.4)	517.4*** (141.7)	253.9 (190.3)	577.3*** (144.8)	470.9*** (126)
<i>P-value for testing</i>														
T1=T2	0.02	0.30	0.70	0.00	0.03	0.18	0.01	0.38	0.07	0.00	0.07	0.00	0.22	0.17
T1=T2 interaction	0.00	0.00	0.00	0.15	0.00	0.00	0.01	0.00	0.00	0.08	0.00	0.09	0.00	0.00

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 5. 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 A10: Heterogeneous treatment effects on saving

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	high profits	hide money	current loan	hyper-bolic	impatient	high saving	high asset	married	high empower	sent family	family takes	saving goal bus	spouse bus	hh bus
MA*interaction	24.05 (73.62)	22.20 (93.71)	78.99 (70.99)	-23.92 (96.05)	40.37 (70.83)	58.49 (73.55)	15.45 (74.76)	-13.82 (78.56)	41.84 (74.25)	72.71 (70.89)	-71.81 (86.48)	-54.14 (93.95)	-30.60 (97.50)	25.30 (74.53)
MD*interaction	-84.38	32.13	-12.76	-68.02	55.31	-72.43	-70.40	-	-51.04	-95.67	-4.55	-113.17	-175.68*	-
	(80.49)	(101.01)	(76.77)	(95.37)	(74.94)	(78.04)	(82.21)	160.41*	(78.95)	(82.25)	(89.96)	(97.77)	(103.37)	159.84**
Mobile account	-8.83 (45.48)	-26.61 (73.04)	-62.83 (58.67)	5.43 (36.21)	-9.62 (46.46)	-25.38 (31.98)	-2.46 (38.53)	14.50 (63.69)	-16.55 (54.90)	-43.08 (51.46)	28.37 (38.10)	16.10 (38.38)	16.62 (65.82)	-7.94 (47.46)
Mobile disburse	66.33 (50.97)	-48.34 (79.95)	36.62 (62.78)	38.80 (41.82)	10.81 (52.42)	62.49 (38.76)	60.87 (45.98)	134.36*	54.26 (62.09)	87.92 (62.64)	26.93 (41.37)	52.85 (42.48)	92.58 (72.62)	97.51* (52.92)
Observations	2,639	1,744	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	0.41	0.48	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.51	0.41
Control mean	691.37	627.95	617.38	680.81	460.23	829.50	726.99	619.70	483.33	591.45	699.47	622.30	635.16	622.38
Control mean base	629.78	522.50	529.01	500.33	390.03	896.39	631.98	497.71	424.08	504.08	606.39	482.22	485.06	480.19
Interaction mean	0.48	0.63	0.82	0.20	0.35	0.49	0.48	0.66	0.51	0.64	0.34	0.22	0.58	0.45
<i>Overall effects</i>														
mobile account	15.22 (54.46)	-4.42 (56.42)	16.16 (39.41)	-18.48 (89.00)	30.75 (49.79)	33.11 (63.69)	12.98 (60.87)	0.68 (41.78)	25.29 (45.23)	29.63 (46.21)	-43.43 (74.32)	-38.05 (83.15)	-13.98 (63.19)	17.36 (53.48)
mobile disburse	-18.06 (58.47)	-16.21 (61.51)	23.87 (43.27)	-29.22 (84.96)	66.12 (50.05)	-9.94 (65.61)	-9.53 (63.77)	-26.05 (45.99)	3.22 (44.74)	-7.74 (48.77)	22.39 (77.07)	-60.32 (85.25)	-83.10 (67.88)	-62.33 (56.75)
<i>P-values for testing</i>														
T1=T2	0.09	0.77	0.07	0.39	0.67	0.02	0.16	0.09	0.20	0.03	0.97	0.36	0.23	0.04
T1=T2 interaction	0.56	0.83	0.85	0.89	0.50	0.49	0.70	0.52	0.63	0.40	0.37	0.79	0.28	0.14

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 5. Note that hide money and spouse bus are only reported for married women who have a spouse. The panel labelled overall effects gives the total impact of each treatment for someone who is the interaction term is true for. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1