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How Cutting the Cost of Using a Bank Affects Household's Behavior of Remittance Transfers: Evidence From a Field Experiment in Rural Malawi

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Claremont McKenna College

**HOW CUTTING THE COST OF USING A BANK AFFECTS HOUSEHOLD'S
BEHAVIOR OF REMITTANCE TRANSFERS:
EVIDENCE FROM A FIELD EXPERIMENT IN RURAL MALAWI**

SUBMITTED TO

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BY

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FOR

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Abstract

Using a randomized experiment in rural Malawi, this paper finds that providing information on mobile bank buses' services leads to a higher probability of adopting savings accounts in the treatment group. Households in the treated villages are 3.06 percentage points more likely to adopt savings accounts than households in the control group. Second, the information treatment leads to an increase of in the probability of households receiving remittances in the treated villages, as well as an increase in the amount of remittances received. In particular, the effect is strongest for households that lived at least three kilometers away from the trade centers, which suggests that the main cost of transferring remittance is the cost of traveling to a bank. Third, the 2SLS regression provides suggestive evidence that adopting savings accounts leads to an increase in households' remittance activities. The 63.3 percentage points increase in the possibility of households receiving remittances after adopting savings accounts suggests that there previously exist high costs associated with the informal channels of transferring remittances.

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I. Introduction

Access to formal savings is restricted in developing countries (Chaia et al., 2009, Kendall et al., 2010). For instance, in sub-Saharan Africa, only 15 percentage points of people have a bank account (Aggarwal et al., 2011). An increasing amount of evidence shows that the poor are willing and able to save. However, due to lack of access to formal savings, the poor use informal mechanisms such as lending to a friend or relative, putting money under the mattress, investing in livestock and jewelry, and depositing daily income with money collectors or in savings clubs. These informal channels are risky and inefficient. Consequently, they limit the scope of savings.

As a result, providing access to formal modes of saving greatly encourages the poor to save and improve household welfare in a number of dimensions. First, it helps smooth household consumption during a period of negative shocks by utilizing savings in durables and non-financial assets (Deaton, 1992). Second, it saves a significant amount of interests paid on borrowing, as the yearly interest rate in the informal money market can range from 40% to 200%. (Banerjee and Duflo, 2005).¹ Third, it provides capital for investments, such as on children's education, small business ventures, health and so on, which potentially provides a path out of poverty for the poor (Prina, 2012; Ashraf, 2006; Aportela, 1999; Dupas and Robinson, 2009). Lastly, households increase work on the wage market when savings options improve, which results in a more efficient labor allocation (Callen et al. 2014).²

The motivating question of this study is whether facilitating formal savings can promote money flows between migrant workers and their families – formally defined as “remittances.”

Remittances are seen as an important source of income for millions of families in developing

¹ Aleem 1990 finds the average annual interest rate charged by the money lenders in Pakistan was 78.5 percentage points.

² Aghion and Bolton (1997), Banerjee and Newman (1993), and Banerjee (2004) identify different mechanisms through which access to savings facilities can enable individuals to change their production and employment choices, and thereby exit poverty.

countries. Balde (2010) shows that the remittance flows to sub-Saharan Africa have a direct poverty mitigating effect and promoted financial development.³

This paper uses a study conducted by the IRIS (Institutional Reform and the Informal Sector) Center at the University of Maryland, and examines if having access to formal savings accounts will change people's behavior of sending and receiving remittances. The experiment took place in 2008 when there was an expansion of formal savings access through mobile bank buses in Malawi. The expansion rolled out from the capital city of Malawi and headed to two different directions. The buses made regular stops at six different trading centers to provide basic savings accounts to people.

The experiment was an information intervention, which changed the amount of information people received in the treatment group. In one set of villages that received the "information treatment," trained assistants walked to households and provided information on buses' stops and hours. In the control villages, households did not receive visits from the trained assistants; but, they were at liberty to find out the information on buses' services on their own.

First, this paper finds that providing information on mobile bank buses' services leads to a higher probability of adopting savings accounts in the treatment group. Households in the treated villages are 3.06 percentage points more likely to adopt savings accounts than households in the control group. Second, the information treatment leads to an increase of in the probability of households receiving remittances in the treated villages, as well as an increase in the amount of remittances received. In particular, the effect is strongest for households that lived at least three kilometers away from the trade centers, which suggests that the main cost of transferring remittance is the cost of traveling to a bank. Third, the 2SLS regression provides suggestive

³ Balde (2010) investigates the impact of remittances on savings and investment in sub-Saharan Africa. He finds that remittances are not entirely spent in basic consumption needs. Compared to foreign aid, Balde finds that remittances have more positive impact on savings and investment.

evidence that adopting savings accounts leads to an increase in households' remittance activities. The 63.3 percentage points increase in the possibility of households receiving remittances after adopting savings accounts suggests that there previously exist high costs associated with the informal channels of transferring remittances.

The majority of the households reported that the informal channel used for transferring remittance is through a friend. Asking a friend to transfer remittance contains the risk of losing some or all of the remittances (e.g. the friend gets robbed or the money is stole on the way); it involves asking a favor from the friend, which may require future actions to repay the favor; and, it consists of a delay of receiving remittances since traveling could take several days in Malawi. Since the traditional informal channel consists of many risks, the bank channel is more favorable to the households. When the costs of using the formal channel dropped due to the expansion of financial access, households chose to use transfer more frequently and in larger amounts.

Remittances are believed to be an important source of income for many families in developing countries. They are sent by family members, not by international development organizations or donors, so they allow households to spend on things they desire most. Additionally, they are effective in helping households cope with unexpected natural disasters and tragedies. Studies have shown that remittances are not only used by households in meeting consumption needs, but are also used for savings and investments.⁴ Unlike foreign aid, remittances are directly received by families in need, and would serve more household's interests and be more effective in fostering economic development.

The rest of the paper is organized as follows. Section II provides a brief overview of remittance. Section III describes the randomized experiment and data. Section IV presents the

⁴ Woodruff and Zenteno (2001) examines the sources of investment capital in Mexico. They find that almost more than a third of the capital invested in microenterprises is associated with remittances in ten of the Mexican states with the highest rate of migration to the United States.

empirical specification. Section V shows the effect of receiving information treatment and adopting formal savings on remittances transfers respectively. Section VI concludes.

II. Background & Overview of Remittances

a. Background and Sampling

Malawi is among the poorest countries in the world. According to the United Nations Human Development Index (HDI), which measures health, education, and standard of living, Malawi had an HDI value of 0.445 in 2014. This places the country as the 173rd poorest nation out of 187. In 2014, 61.64% of the population lived on under \$1.25 a day and 89.3% were living on under \$2 a day.

The dataset was collected in 2008 (baseline) and in 2010 (post-experiment) through a 30-page structured household survey, which was translated into the Malawian local language and then translated back into English after completion. The survey team consisted of university-educated locals, who were trained to conduct the interview. Each interview lasted between 1.5 and 2.5 hours. The households received neither monetary rewards nor cash gifts for completing the interview; despite this, since the interview was conducted at a time when labor demand was low, 97% of the households agreed to participate in the interview. In 2008, households were randomly chosen to be interviewed⁵; in 2010, researchers tried to interview the same set of households, with the exception of those that had moved over time and could not be located. The

⁵ In order to generate a truly random sample, the random walk approach was used. It was implemented in the following way. First, the total number of households in the village was divided by the total number of samples needed from the village to obtain a sampling interval. For example, if a village has 100 households and the team needs to sample 10 teams from the village, the sampling interval X will be 10. Second, the team would start at the center of the village, with each interviewer facing a different direction. For each interviewer, a number n was randomly selected from 1 to X . The interviewer would then walk in that direction and stop in front of the N th household he or she encountered. When the interview was completed, the interviewer then continued in the same direction until he or she reached the X th next household.

total number of households that were dropped out of the dataset due to attrition was 343. In addition, due to unforeseen sampling issues and management problems, four pairs of villages had to be dropped. The remaining dataset contained 56 pairs, 112 clusters, from about 325 villages, with a total of 2,118 households.

The survey designed for this experiment looked at a wide range of household characteristics such as savings, loans, income to food security, and others. Specific sections in the survey that is pertinent to this paper are section M and section O, which asked households about savings and remittances respectively. In Section M, the questions can be divided into two categories: one tried to uncover why people have savings accounts, while the other looked at reasons that could potentially deter people from opening up savings accounts.

b. Descriptive Statistics and Balance Check

Table 1 reports the summary statistics of selected household characteristics in the baseline sample. Column 1 reports the sample mean and standard deviation of each variable. Column 2 reports the estimates of the coefficient and the standard errors of the difference between the means in the treatment and control groups in the baseline sample. Standard errors are clustered since errors may not be independent on the village level.

The majority of the households (85%) are male-headed, on average forty-one years old, and roughly one-third of them had primary school education. The average size of a household is just over five people. The majority of people works in agriculture, with the exception of about 27% of the households own and operate a non-agricultural business and 16% have a job that pays salary.

Access to a formal savings account is limited to the households in the baseline sample. Only 12% of the sample report having a savings account. Since access to savings is generally a criterion when applying for loans, only 6% in the sample report having formal loans. The average total balance of a household's formal and informal savings is MWK 2,949 (USD 23.59). The average value of physical assets is MWK 27,595 (USD 220.76). The average distance from the bank stop is roughly 8km.

Since there are 341 households dropped out of the endline sample because of attrition, I run a regression of attrition on the treatment dummy to test if households that dropped out of the study are different from households that did not. Since the regression shows that attrition has no predictable power for the treatment dummy, it shows that attrition is not a problem here.

Column 2 reports the estimates of the demographic characteristics on the treated and control groups. It shows that the information treatment is as good as randomly assigned. None of the demographic characteristics, except the size of household (which is significant at 5 percent significance level), has explanatory power over assignment into the treatment group. Because of the "random walk" sampling, the coefficient of the household size, despite being statistically significant, should not suggest that larger households are more likely to be included in the treatment group.

In conclusion, the estimates of the means in the treatment and control groups, as well as the simple regression coefficients, suggest that the treatment group is not different from the control group.

c. Overview of Remittance In The Context of Malawi

Why does a household have a savings account?

The questionnaire seeks to identify the primary, secondary, and tertiary reasons that a household holds a savings account. The most popular responses to the primary reason of holding a savings account were emergency fund for unexpected shocks (21.9%), other (21%)⁶, spouses, household members, relatives, friends may take or ask for money (20%), required to get a loan (15%).

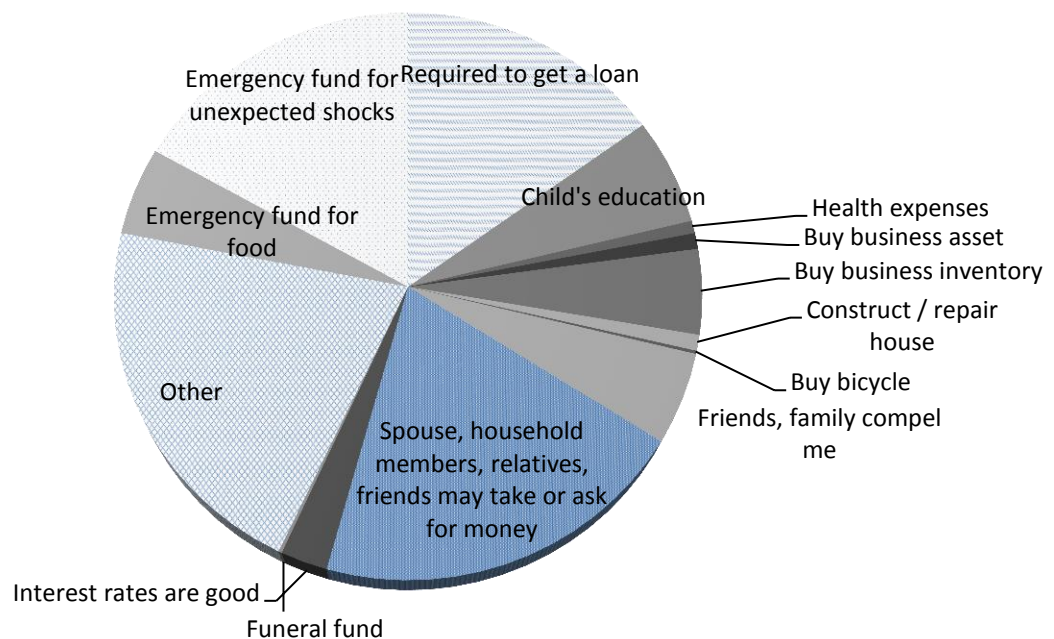


Figure 1.1 Pie Chart Illustrating the Responses to the Primary Reasons for Opening Savings Accounts

⁶ In the sample, 117 households responded that they opened a savings account for “other” reasons that are not listed in the questionnaire. Out of these 117 responses, the most common reason was to “buy agricultural inputs”, which accounted for around 15percentage points of this sub-sample of 177 households. Other reasons included depositing proceeds from tobacco sales (as the tobacco industry is Malawi’s largest source of income), avoiding unnecessary spending, receiving or sending out money, and using as protection from thieves and fire.

Figure 1.2 shows the secondary reasons that households hold savings accounts. Most people indicated that they had no more than one reason to hold a savings account, so they have exhausted their answers at this stage. The remaining sample of the households confirmed that they had other reasons besides their primary reason to hold savings accounts. For households in this category, the most common response is “emergency fund for unexpected shocks.” Shocks refer to unexpected tragedies a family may encounter, such as the death of a family member, death of livestock, natural disasters and others. Tertiary reason for holding a savings account reveals the same findings.

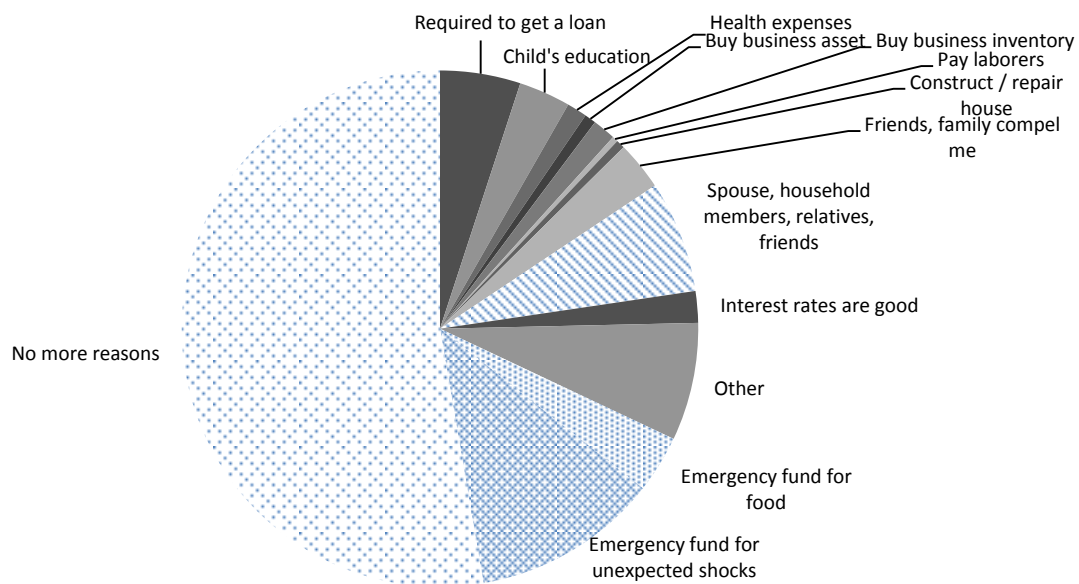


Figure 1.2 Pie Chart Illustrating the Responses to the Secondary Reasons for Opening Savings Accounts

These responses support the proposition that access to formal savings is a pathway out of poverty as it protects the poor against shocks; it promotes asset accumulation, and relaxes credit constraints. Besides the conventional wisdom that access to savings accounts will help the poor save, Ashraf et al. (2006) suggests that savings products with certain withdraw restrictions could help the poor overcome temptation problems and save more. As shocks arrive in lump-sum but

income comes in small installments for the poor, the poor could benefit from “saving for a rainy day.” In addition, keeping money away from family members, relatives, and friends will facilitate asset accumulation. For example, women are generally more concerned about saving than men. Many of the women would try to save on their own but they often face the pressure from their spouses to share their savings. Dupas and Robinson (2009) offer a savings account with negative interest rate to market women in Kenya but still observed high frequent, voluntary account usage among them, which suggested that these women generally faced negative private returns on the money they save informally. Finally, having savings accounts is sometimes a prerequisite to get a loan. As many of the poor is currently borrowing from the moneylenders at a rate of 40 -200%, enabling them to borrow from the formal credit market cuts the cost of borrowing significantly. Hence, opening savings accounts relax the credit constraint the poor faces.

What prevents households from opening a savings account?

The second set of the questions looks at factors that negatively incentivize people from opening up a savings account. Some potential candidates are: minimum opening balance requirement, application fee, identity proof required to open an account, number of times a person needs to travel to open an account, time spent on traveling to the bank, and cost of transportation, lodging and food. First, let us examine the issue of minimum opening balance. Minimum opening balance varies significantly among banks. Some banks do not have any balance requirement while others set theirs variously from 500 Malawi Kwacha (\$0.85) to 1500 Malawi Kwacha (\$2.55). On a first glimpse, it is hard to tell if the minimum amount money needed in a bank account is a significant hurdle for many rural Malawians. Since 89.3

percentage of the Malawians were living under \$2 a day, it is not clear whether households had the capacity to set aside up to \$2.55 in a bank account if they want to open an account. However, table 3 reveals that the average savings balance among households that adopted savings accounts was MWK 6927 (USD 55.42), which is significantly higher than the minimum opening balance. Therefore, it suggests the minimum opening balance was not an important hurdle. Most banks do not charge an application fee for opening up an account, which suggests that application fees should not be considered as an obstacle. For the identity proof question, most of the interviewees reported that banks require either none or easily obtainable forms of ID, which suggest that an ID is not a serious problem for residents who want to open an account.

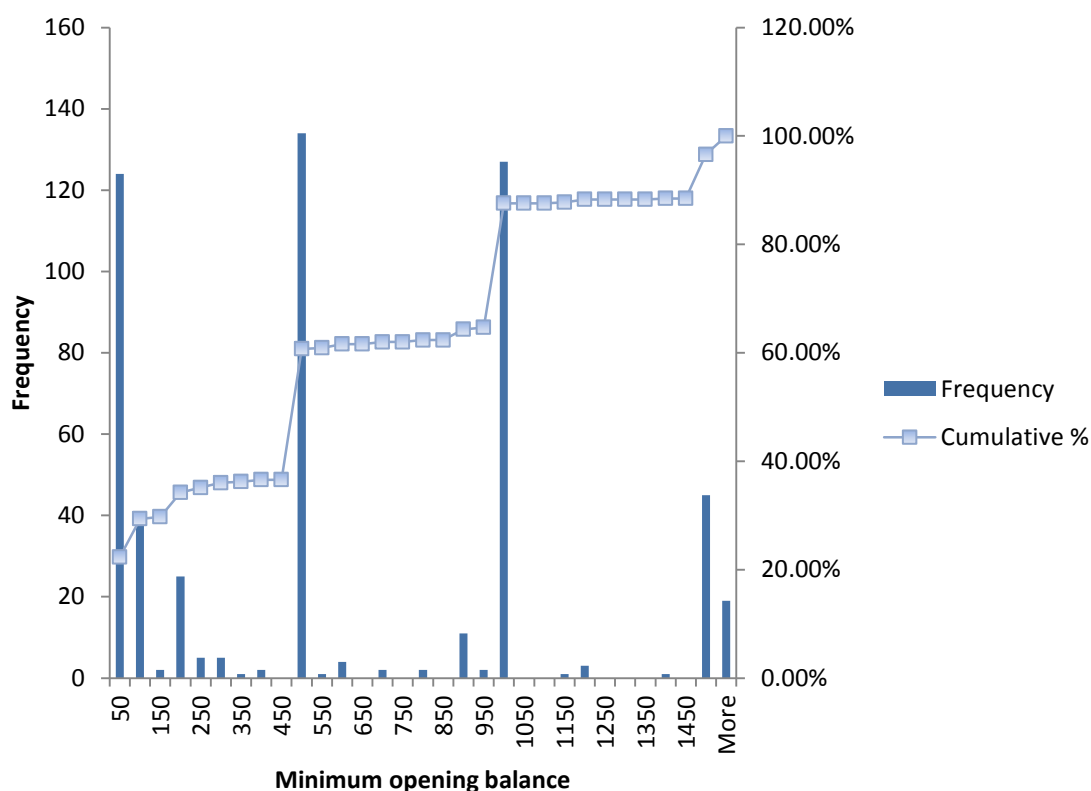


Figure 1.3 Histogram Illustrating the Minimum Opening Balance for Households with Saving Accounts

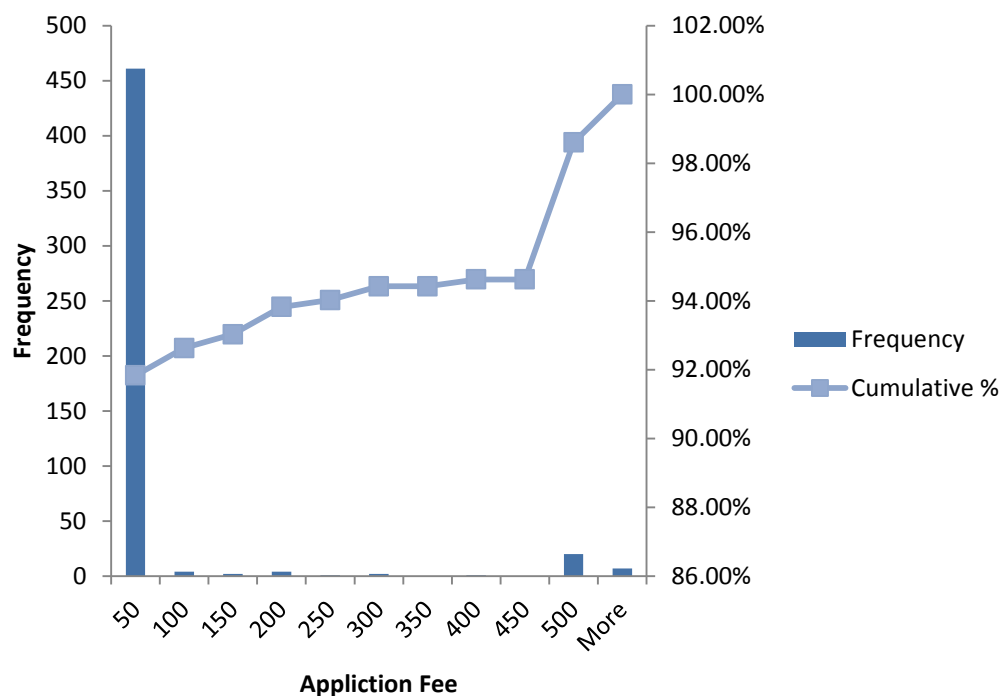


Figure 1.4 Histogram Illustrating the Application Fee

The data suggests that the main obstacle to opening a savings account is travel-related costs. On average, people were able to open a bank account after taking two or fewer trips to the bank. However, the time cost of making one trip to the bank each time is often great. 4 percentage of the interviewees reported that they spent less than 5 hours on each trip to the bank; 103 people said they spent 10 hours on travelling; 93 people reported 20 hours; another 80 people reported 30 hours; 77 reported 40 hours; while 45 people reported 50 hours. The 88th percentile of travel time is two days, which means each time a Malawian wants to conduct a transaction in the bank, he or she needs to spend a day traveling to the bank, and another day traveling back.⁷ The costs incurred from traveling not only include direct transportation, lodging and food costs, but also implicit costs such as foregone wages. For Malawians who lived on minimum resources, it is easy to imagine how difficult it was for a household member to give up

⁷ The question is phrased in the following way, “Each time, on average, how long did it take you to travel each time you went to open the account?” So I assume it means time took to make a round-trip.

two days of labor and spend extra money to travel to a bank just to open a savings account. Since the costs of traveling to a bank were so great, costs of opening up a savings account declined dramatically when the NGO sent out “mobile bank” buses to village centers, which shortened the distances between individuals and a bank significantly.

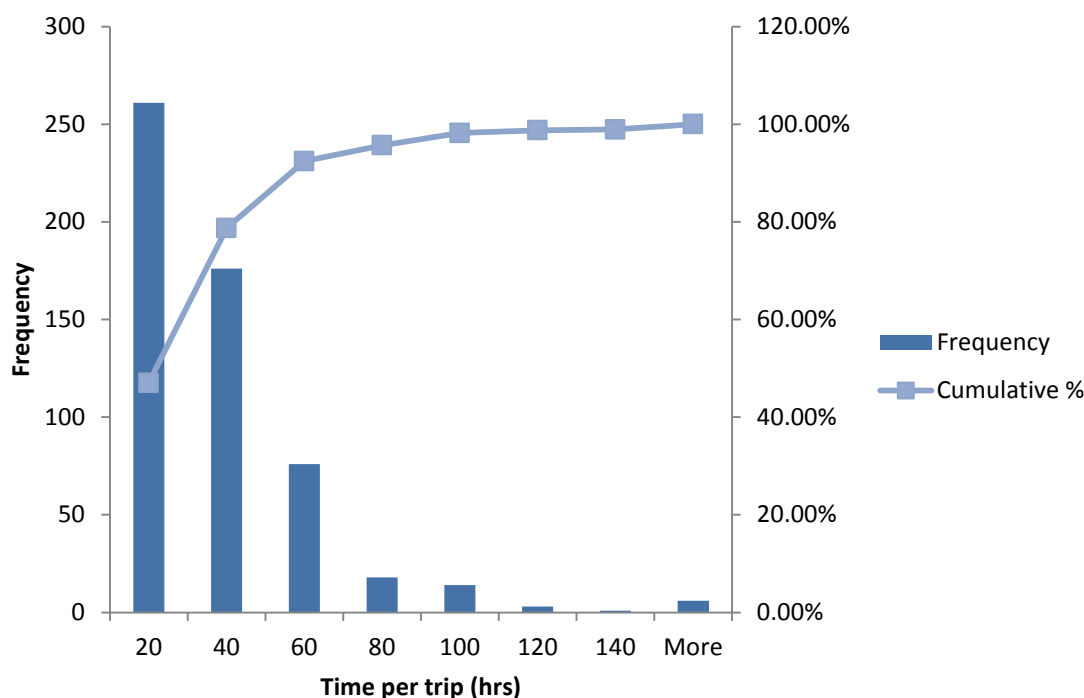


Figure 1.4 Histogram Illustrating the Time Spent Per Trip

III. Experiment Design and Data

Among the many barriers that stand between the poor and a formal savings account, distance is one crucial factor that is often overlooked. As the previous section demonstrates, the most important barrier that prevents the poor in rural Malawi from opening a bank account is distance from a bank. 88 percentage of the sampled interviewees reported that they spent up to

two days traveling to a local bank branch to open an account. The implicit time costs, represented by the foregone wages, on top of the direct transportation, lodging, and food costs are too dear of expenditure for the poor in rural Malawi.

In late 2007, in order to promote greater access of the poor to savings accounts, a local microfinance institute – Opportunity International Bank of Malawi (OIBM) – began expanding formal savings access through mobile bank buses to rural areas. The expansion rolled out in the three largest districts of central Malawi: Lilongwe, Mchinji, and Dedza. The mobile bank buses drove out from the capital Lilongwe and made six stops on a regular basis on two routes. To the west, the van stopped at the trading centers of Nsundwe and Kamwendo, as well as the town of Mchinji (about 110km west of Lilongwe). To the south, it stopped in the town of Nkhoma, Chimbiya, and ended in Dedza (about 90km southeast of Lilongwe).

The buses stopped at each of these trading centers on the same day every week – usually on the market day, in order to catch the buyers and sellers in the marketplace, who had cash on hand and most likely wanted to make a deposit into the savings accounts.

The Information Treatment

The information treatment consisted of sending extension workers to visit each community periodically. Extension workers (such as agricultural officers and health workers) traveled to treated villages by foot or bicycle, and brought information on bank buses' services and hours. This practice is designed to fit with Malawian locals' instinct of trust. Researchers conducted half a dozen focus group discussions and identified the extension worker practice as a way to bring information to local communities in a trustworthy way. The rest of the paper is

devoted to analyze the effect of information treatment on account adoption and remittances transfers.

The data collection process lasted for two periods. The baseline data was collected between February to April of 2008, during the pre-harvest “hungry” season, and before any significant take-up of mobile bank’s services occurred.⁸ The mobile bank first began its operations in August of 2007. However, the awareness for OIBM’s mobile bank service was still low at the end the experiment happened, as confirmed by focus group discussions in 2008. The endline data was taken around the same time in 2010 in four geographically diverse sites for the purpose of accounting for the diversity of the areas around the van stops and eliminate selection bias.

Villages were first grouped into three different categories according to their distances to the bus stop: (i) within 5km, (ii) 5-10km;(iii) more than 10km. They were then further divided into either high or low population groups to form six population-distance clusters. From these clusters, two villages were randomly selected to form a pair. Within each pair, only one of the clusters was randomly selected to receive the treatment. Within one village, 6-10 households were randomly selected for surveying. Initially, 60 pairs (120 clusters) were sampled. Nevertheless, due to data loss and unforeseen complications, four pairs had to be dropped. The final panel contains 56 pairs, or 112 village clusters (about 325 villages), with a total of 2,461 households.⁹

⁸ In Malawi, most of the households earn their incomes during one harvest, which lasts from late April to June in Central Malawi.

⁹ In some of the large villages, the EA may consist of only one village whilst in some of the smaller ones, the EA might include more villages.

IV. Empirical Specification

Using a randomized field experiment, I estimate the effects of supplying information on mobile bank buses' operations on the following aspects of households' behavior: 1) received any remittances 2) the total amount of remittances received 3) sent any remittances 4) the total amount of remittances sent.¹⁰ One and three represent binary variables, which equal 1 if a household received or sent remittances in the past 12 months. Two and four are continuous variables which equal monetary value in Malawian Kwacha.

I present two regression specifications. The first regression is a simple Ordinary Least Square (OLS) regression of the information treatment on dependent variables of interest. It represents the *Intention to Treat* effects of information treatment on dependent variables of interest. The most basic regression specification is represented by equation 1. Fixed effects are used in equation 2 and 4 as the experiment was randomized on the village level. Standard errors are clustered at the village level, since outcomes for households in a given village may not be independent.

Non-fixed effect, no controls:

$$Y_{ij} = \delta + \alpha I_{ij} + \varepsilon_{ij} \quad (1)$$

Fixed effects, no controls:

$$Y_{ijk} = \delta_k + \alpha I_{ijk} + \varepsilon_{ijk} \quad (2)$$

Non-fixed effect, with controls:

$$Y_{ij} = \delta + \alpha I_{ij} + \beta' X_{ij} + \varepsilon_{ij} \quad (3)$$

¹⁰ These variables are coded as following in the question: 1) Has the households received any remittances in the past 12 months? 2) What was the total amount of remittances received in the past 12 months? 3) Has the households sent any remittances in the past 12 months? 4) What was the total amount of remittances sent in the past 12 months?

Fixed effects, with controls:

$$Y_{ijk} = \delta_k + \alpha I_{ij} + \beta' X_{ijk} + \varepsilon_{ijk} \quad (4)$$

Y_{ij} is the dependent variable of interest for household i in cluster j . I_{ij} is an indicator of whether the household receives information treatment. The coefficient α measures the effect of receiving information treatment on the dependent variable of interest. ε_{ij} is a mean-zero error term. The subscript k indicates the EA pair. X_{ij} is a vector that includes control variables. Controls include i) the total value of physical assets the household owned in 2008 (excluding land, livestock, and buildings), measured in tens of thousands of kwacha; (ii) if the household had a cell phone in 2008; (iii) if someone in the household can write in Chichewa; (iv) whether the household received one or more cash gifts from another household during the pre-harvest period in 2010.



The second set of regressions use a two-stage least square approach to study the effect of adopting savings accounts on remittance transfers, i.e. the *Treatment on the Treated* effect. It is represented by the following equations:

Non-fixed effects, no controls:

$$Y_{ij} = \delta + \gamma \widehat{S}_{ij} + \varepsilon_{ij} \quad (5)$$

Fixed effects, no controls:

$$Y_{ijk} = \delta_k + \gamma \widehat{S_{ij}} + \varepsilon_{ijk} \quad (6)$$

Non-fixed effects, with controls:

$$Y_{ij} = \delta + \gamma \widehat{S_{ij}} + \beta' X_{ij} + \varepsilon_{ij} \quad (7)$$

Fixed effects, with controls:

$$Y_{ijk} = \delta_k + \gamma \widehat{S_{ijk}} + \beta' X_{ijk} + \varepsilon_{ijk} \quad (8)$$

$\widehat{S_{ij}}$ is the fitted values of the saving dummy variable. X_{ij} is the same set of controls that are introduced in the previous paragraph in this section.

If assuming that the information treatment does not affect the household's behavior related to remittance transfers other than through encouraging the households opening up a savings account, it is possible to estimate the effect of adopting savings accounts on remittance transfers by dividing the *Intention to Treat* effect (represented by equation 1) by the first stage effect ($\frac{\alpha}{\theta}$).

The first stage of regression is represented as:

$$S_{ij} = \delta + \theta I_{ij} + \varepsilon_{ij} \quad (9)$$

S_{ij} represents a dummy variable which indicates if the household owns any formal savings accounts in 2010. The sample is restricted to a subset of households who do not own any formal savings accounts in 2008. Since this paper investigates the effect of adopting savings accounts, it is justifiable to only look at households which adopt formal savings accounts between 2008 and 2010. I_{ij} represents a binary variable, indicating if the household receives any information treatment. ε_{ij} is a mean-zero error term.

V. Results

a. Effect on ever receiving remittances

Table 4 estimates the effect of the information treatment on a household's possibility of receiving remittances. Panel A represents non-attrition households and excludes four pairs of EA whose data is possibly contaminated due to complications happened in the data collection process.¹¹ In order to test the effect of receiving information on households' behavior of adopting savings accounts, I look at a subset of samples whose are supposed to be more sensitive to the information treatment. Panel B restricts the sample to households which were located three or more kilometers away from the nearest bus stop. Intuitively, households which were living further away from the trade centers were less likely to receive information on mobile bank buses' services and hence, they were more likely to react to the information brought to them by the extension workers. Therefore, if the results show that the subsample with greater distance are more likely to change their behaviors related to remittances transfers along with the expansion, it indicates that the traveling costs to a bank was previously a constraint to households that lived further away. Since the expansion of financial services alleviated the travel costs to a bank, households that lived further away experienced a fall in the cost of using a bank, which encouraged them to engage more with remittance transfers.

The result confirms this hypothesis. In Panel A (Column 1), receiving the information treatment is shown to increase the probability for a household to receive remittances by an estimated 2.5 percentage points (p-value, 0.142). It represents a 33 percentage points increase in the likelihood of receiving remittances, given the average percentage of households receiving

¹¹ I also ran the regression with only excluding attrition households. However, the inclusion of these four pairs of EAs does not change the results significantly. In addition, when I repeat this exercise for households who are living further than 3km away from the bus stops, including these four pairs of EAs does not change the results significantly neither. The results are available upon request.

remittances in the sample is 7.5 percentage points ($p\text{-value} = 0.000$). The effect gets even stronger when I restrict the sample to communities that live at least three kilometers away from the nearest bus stop. Panel B (Column 1) shows that the information treatment leads to an estimated 60percentage points increase in the possibility of households that are living further away to receive remittances. This suggests that households which live further away from the trade centers are more information sensitive than households which live closer.

Information treatment has a bigger effect on households which live further away perhaps because households who live closer to the town centers could have already received the information on bus stops and bank services via other channels. It could also be due to the fact that the mobile bank services are a greater convenience to households which are further away since it cuts their costs of traveling to a bank branch more dramatically than for households which are close to bank branches. This finding has an important policy implication: it suggests to policy makers and leaders at non-profit organizations that, to achieve the greatest effect of a program, it is best to start with households which live furthest away from the public infrastructure.

Column 2 reports the effect of the information treatment with fixed effects. Fixed effects regression has the attraction of making it possible to control for variables that have not or cannot be measured. The idea of fixed effects regression is to use each village as its own control, in order to take account for the unobserved individual characteristics. For example, if in some villages, there had been a long, established tradition of having young people leave and working as migrant workers, the households in these villages had a higher probability of receiving remittances. Because it is impossible to measure differences such as in the social network of each village, using fixed effects is a clever approach to account for such differences. The fixed effects

regression can account for both observed differences, such as village's distance to the trade center, and unobserved differences, such as the social network of villages, among villages. If the question of interest is to know whether receiving the information treatment affects the probability of a household received remittance, assuming that nothing else had changed over the period of the experiment, the difference in the rate of receiving remittance between 2008 and 2010 is the result of the information intervention. If those differences are averaged across all groups in the sample, the average of these estimates will be called the "treatment effect." With the fixed effects approach, this estimate controls for all the stable characteristics of the household, including both the easily measurable variables such as the ownership of a cellphone, as well as variables that are more difficult to measure, such as the information network. While it does not control for time-varying variables such as wealth, these could be handled by measuring them and including them in the regression model.

Since the randomization is done at the village level, including fixed effects removes the between-village variations and only focuses on the within village variations. Since each village is at different distance to the trade centers and it is reasonable to believe that distance affects the number of people who left the village and worked as migrant workers who supplied remittances, the average percentage of households who receive remittances in each village should be different. Using fixed effect allows each clustered pair of villages to have its own estimated average percentage of remittances received. Given each pair differs in characteristics, including fixed effects reports a more accurate result.

The disadvantage of the fixed effects approach is that it generally has larger standard errors than the estimates from the random effects model. The reason is that the random effects use both the variations between and within groups while the fixed effects use only the within

group variations. Therefore, the fixed effects model generally discards information about difference among groups. Nevertheless, the fixed effects approach delivers a more accurate estimate. In social science studies, the tradeoff of precision for accuracy is valuable.

This paper reports regression results using clustered standard errors in all tables. It is crucial to report the clustered standard error because standard error at the village level may not be independent, since it is reasonable to believe that shocks are at village level. For instance, natural disasters such as floods affect the entire village, and consequently, affect the income of all households in the village at a given year. In this case, it is important to use the clustered standard error to account for the dependency between households in the same village.

Columns 3 – 4 report the results with controls. The control variables I included are 1) the total value of physical assets the household owned (excluding land, livestock, and buildings) in 2008 2) ownership of a cell phone in 2008 3) if someone in the household can write in Chichewa 4) if the household received one or more cash gifts from another household during the pre-harvest period in 2010. Appendix A.1 reports the effect of the control variables on a household's possibility of receiving a remittance. The coefficients of all the control variables are significant, which indicate that these variables affect the household's probability of receiving a remittance.

Consequently, failure to include them in the OLS equation would lead to the omitted variable bias, and lead to an incorrect estimate of the effect of the information treatment. A simple regression of information treatment on receiving a remittance explicitly assumes that there is no other channel, other than the information treatment channel, that affects the variation in household's probability of receiving a remittance. However, if other variables also affect the household's probability of receiving a remittance at the same time when the amount of information a household received changed, the simple OLS regression would incorrectly

attribute the change of the possibility of receiving remittances as a result of the changes in other variables as the result of the information treatment. If changes in other variables positively affect the probability of a household receiving a remittance, the OLS regression without controls would overstate the effect of the information treatment on receiving a remittance.

The result in Appendix A.1 suggests that the simple OLS regression without controls likely overstates the effect of information treatment. Column 4 (Panel C) shows the effect of the information treatment on receiving remittances drops to 3.08 percentage (p-value = 0.018) when controls are added. As the previous paragraph analyzes, the drop in the magnitude of coefficients suggests the overall effect of the omitted variables on receiving remittances is positive. Appendix A.1 provides more insights on this discussion.

The OLS regression presented in Table 4 is the reduced form effect of the information treatment on the possibility of receiving remittances. This assumes that the information treatment only affects the possibility of receiving remittances through the channel of adopting a savings account. The following sections will examine this in more details.

b. Effect on the amount of remittances received

Columns 5 – 8 report the effect of the information treatment on the amount of remittances a household received in the past twelve months. Column 5 (Panel A) reveals that the average amount of remittances households in the treated villages received in one year is MWK 1,133 (USD 9.06)¹² (p-value = 0.001) . Receiving the information treatment increases the amount of remittances received by MWK 262.7 (USD 2.10) (p-value = 0.575), which represents a 23 percentage points increase.

¹² Exchange rate between MWK and USD in 2008 is roughly 1MWK = 0.008USD.

Panel B reveals that the effect of the information treatment is stronger for households which live further away from the nearest bus stop. Column 5 (Panel B) shows that the mean of the amount of remittances received by households that lived further away in the treated villages was MWK 737.5 (USD 5.9). In addition, the information treatment raised the amount of remittances received by these households by MWK 688 (USD 5.5) (p-value = 0.152). By summing up these two numbers, I conclude that the households that lived further away in the treated villages received a total amount of remittances MWK 1426.1 (USD 11.4). The average of the total amount of remittances received by all households in the treated villages was MWK 1395.7 (USD 11.2). It shows that, given the same level of access to banks, households that lived further away also received similar amount of remittances as households that lived closer (since the mean of the sample with only households lived further away and the mean of the sample with all households are close, the mean of the sample with only households lived close should not be drastically different from the mean of the group with only >3km households). More importantly, it suggests that, in the absence of the information intervention, households that lived further away received less remittance than households that lived close not because they had fewer numbers of relatives working in other parts of the country who supplied the remittance.

The analysis suggests that there were previously high costs associated with receiving remittances for households that lived further away from the trade centers. Therefore, when the expansion via mobile bank buses greatly reduced the distance between households to a bank and the associated cost of using a bank, households are more likely to receive remittance transfers and receive great amounts of remittances.

c. Effect on ever sending remittances

Table 7 examines the effect of the information treatment on the likelihood a household sent remittance. Column 1 (Panel A) shows receiving the information treatment increases the probability of sending remittances by 1.53 percentage points (p-value = 0.10). Since only 3.8 percentage of households in the sample had ever sent a remittance, a 1.53 percentage point increase represents a 40 percentage points increase of the likelihood of adoption in the control group. The effect of the information treatment becomes more significant when the sample is restricted to households that lived further away from the nearest bus stop. Column 1 (Panel B) shows the information treatment leads to an increase of 1.91 percentage points (p-value = 0.038) of the probability of sending a remittance, which is equivalent to a 65 percentage points increase in relative terms. The result shown by Table 7 is in line with the result shown by Table 4, which suggests that households which lived further away from the trade centers faced higher costs of using bank services.

Columns 2 and 4 show the results with fixed effects and clustered standard error. The coefficients decrease slightly compares to Column 1 but remain significant. In Columns 2 and 4, the coefficient of the constant term is shown as negative, which leads to an odd interpretation. It seems to suggest that the households in the control group had a negative probability of sending a remittance, which was wrong since the probability is bounded between 0 and 1. However, the negative coefficient of the constant is not problematic in this case, since Column 2 reports the results with the fixed effects and Column 4 reports the results with controls. In both cases, the coefficient of the constant term merely reflects an estimate of the probability of households in the control villages sending a remittance.

The negative coefficient of the constant term in the fixed effects regression is not problematic because it does not provide an accurate reflection of the mean of the dataset. The fixed effects regression only looks at the within group variations in terms of the possibility of sending remittances. Each clustered pair has its own intercept with the y-axis (the possibility of sending a remittance). Some of the intercepts are positive; some are negative. Therefore, the coefficient of the constant term is just an average of these constants.

Similarly, the coefficient of the constant term in regressions with controls also appears as negative but is not problematic, since it is unlikely that the values of all predictors will be zero at the same time and yield a negative value for the dependent variable. The control variables include the total value of assets the household owned in 2008, cell phone ownership, ability to write in Chichewa, and whether a household received one or more cash gifts from another household. It is not likely that all these variables equal to zero for any household. In fact, in the dataset, the minimum value of assets the household owned in MWK 10. Therefore, the value of the control variables will not be zero at the same time for any of the households in the sample. Consequently, the negative coefficient just reflects an estimate of the possibility of sending a remittance for households in the control villages (it suggests that, in the control villages, the probability of a household had sent a remittance was close to zero).

The regression result with controls is reported in Column 4. It suggests that the probability of a household in the treated group has sent remittance was 1.5 percentage points higher than that in the control group. Comparing to the effect of the information treatment on the probability of receiving remittance, the effect of the information treatment on sending remittance is much smaller. The reason is that the majority of the remittances flow from the migrant

workers to their families that live in the rural area. Therefore, rural households were much more likely to receive remittance than to send remittance.

d. Effect on amount of remittances sent

Columns 5 – 8 in Table 7 report the effect of receiving the information treatment on the amount of remittances sent by a household. Column 5 (Panel A) in Table 7 shows that receiving the information treatment increases the amount of remittances sent by a household by MWK 876 (USD 7.01) (p-value, 0.077). The average remittances sent by the households in Panel A are MWK 182 (USD 1.46) (p-value, 0.604), suggesting that the information treatment leads to a dramatic increase (a five-fold increase) of the amount of remittances sent by a household.

It is plausible to conceive that the households previously relied on informal channels to send remittances to the family members, such as through post office or friends, who travel, experienced a dramatic decrease in the costs of using a bank when the expansion occurred. In the treatment group, the mobile bank service replaced the traditional, informal channels of sending remittances so the costs of sending remittance dropped for households when the buses arrived. Consequently, it encouraged the households to send larger amounts of money to families.

The alternative reason is an increase in household savings, which enable households to send more remittances to relatives who lived away. Table 3 shows that the information treatment has a positive effect on the balances in the current accounts, which suggests that an increase in the amount of remittance sent could potentially be a result of the wealth effect. The effect is not statistically significant yet the regression shows that receiving the information treatment leads to an increase of MWK 544 (USD 3.8) in the current account balance. Since the survey does not

providence evidence on why households sent out remittances, I cannot rule separately analyze the two different channels and test which channel dominates.

e. Effect of adopting savings accounts on remittances

To estimate the effect of adopting savings accounts on household's behavior related to remittances, I deploy the instrumental variable approach. The instrumental variable approach establishes causality between the independent variable and the dependent variable by creating changes in an instrument variable, which only affects the outcome of the dependent variable through affecting the independent variable. Therefore, if it is correct that the instrument only affects the dependent variable through the dependent variable channel, it is reasonable to conclude that all variations in Y are caused by variations in Xs. Before I present the results of the instrumental variable approach, the next section discusses some of the fatal disadvantages of an OLS approach.

f. Pitfalls of OLS

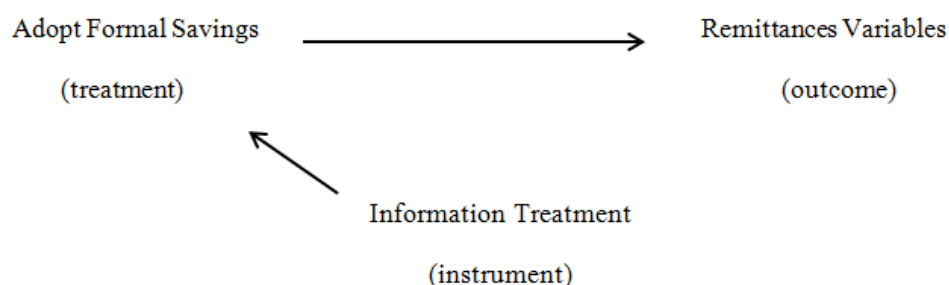
A simple OLS regression of the indicator variable of adopting formal savings on remittance variables is problematic because of the omitted variable bias. Column 2 in Appendix Table A.2 shows that the adoption of formal savings accounts leads to an increase of MWK 3,455 (USD 276.4) of the amount of remittances a household received. The coefficient is significant at the 5 percentage significance level. Nevertheless, the 2SLS regression reveals a much more modest increase. Column 6 shows that the adoption of formal savings accounts leads to only an increase of MWK 2,329 (USD 18.63). The drop in the estimate suggests that the OLS regression overstates the effect of adopting savings accounts. It suggests that, in the absence of

control variables, the omitted variables lead to an increase in the amount of remittance a household received. One of the omitted variables could be income. Suppose the average household income increases between 2008 and 2010. As a result, due to the wealth effect, the amount of remittance a household receives would increase even in the absence of the adoption of savings accounts. Therefore, the OLS regression of the adoption of savings accounts incorrectly contributes the effect of the increase in household income as the effect of the adoption.

In contrast, the simple OLS regression seems to understate the effect of adoption on the possibility of receiving and sending remittances. Column 1 reports that the effect of adopting savings accounts increases a household's possibility of receiving remittances by 3.65 percentage points while Column 5, under the instrumental variable approach, suggests that the effect is much greater (a 58.6 percentage points increase). Column 3 shows that adoption leads to an increase of 6.25 percentage points of the probability of a household sending remittance. However, Column 7 shows the effect is a 27.3 percentage points increase under the 2SLS approach. It suggests that the overall effects of the omitted variables on dependent variables of interest are negative. Hence, without controlling them in the regression, the effect of adoption appears to be smaller than its true effect.

g. Two Stage Least Square

The Instrumental Variable (IV) approach is a regression technique used to solve the omitted variable problem. The IV chain in this paper is:



A good instrument should satisfy 1) random assignment 2) relevance – have an effect on the regressor 3) the exclusion restriction. The instrument chosen in this experiment is the information treatment. It satisfies the first restriction since the information treatment is randomly assigned (the method is discussed in section II). In addition, Table 5 shows the first stage effect of the information treatment on adoption. Columns 1 – 4 show that the information treatment increases the likelihood of households adopting a savings account by 3 percentage points; the coefficients are significant under 5 percentage significance level. Since 6% to 9 % of the households in the sample have formal savings accounts, a 3% increase in the likelihood of adopting a formal savings account due to information treatment is equivalent to a 30 percentage points to 50 percentage points increase on level of adoption in the control group. Since the first stage effect is significant, it shows that the information treatment satisfies the relevance restriction. Finally, it is important to carefully think about the exclusion restriction. The exclusion restriction states that the information treatment should only affect the remittance variables through adoption of savings accounts. In other words, the information treatment should not directly impact the household’s behavior related to remittances.

Though it is impossible to test the exclusion restriction, evidence presented by the reduced form regression provides evidence to support the claim that the instrument does not affect remittance variables directly. In particular, Table 4 shows the heterogeneous effect of the

information treatment on the possibility of receiving remittances for households that lived further away from the trade centers versus that of households that lived closer. The fact that the information treatment has a stronger effect on households which lived further away suggests that the key variable affecting the possibility of receiving remittances is costs associated with receiving remittances – households lived further away has higher costs of receiving remittances since the time and expenditure they spent on traveling to a bank to receive transfers were greater. Therefore, it suggests that things related to the bank service affected the likelihood of receiving remittances – not the information treatment itself. Since all households in the treated villages received the information treatment and only households that lived further away in the treated villages were more responsive to the information treatment, it suggests that the information treatment itself does not affect the possibility of receiving remittance. Intuitively, it is also hard to think of a reason to justify that claim that receiving information on buses' hours and services would increase the chance of a household receiving remittance.

Table 6 shows the 2SLS effects of adoption savings accounts on receiving remittances. Columns 1-4 show the effect of account adoption on the possibility of households receiving remittances. Column 1 (Panel A) shows that adopting formal savings accounts leads to an increase of probability 58.6 percentage points ($p\text{-value} = 0.253$) for households receiving remittances. It suggests that adoption has a huge effect on the probability of households receiving remittances. The large magnitude of the coefficient seems to suggest that, in the absence of owning a savings account, households receive remittances through informal channels which may involve some sort of costs. For instance, in the survey, many households report that they receive remittances through friends. Asking a friend to take back the remittances involve the risk of losing some or all of the remittances (e.g. the friend gets robbed or the money is stolen).

the way); it involves asking a favor from the friend, which may require future actions to repay the favor; and, it consists of a delay of receiving remittances since traveling could take several days in Malawi. Because the traditional informal channel involves many risks, the bank channel, in the context that the costs of traveling to banks drops significantly, becomes more favorable to the households. As a result, as shown in Column 1 (Panel A), adopting formal savings leads to a significant increase in the probability of receiving remittances.

Column 2 (Panel B) in Table 6 shows that adopting savings accounts increases the probability of receiving remittances for households in the treated group by 63.3 percentage points (p-value, 0.096). More importantly, the result is statistically significant. It provides strong evidence that adopting formal savings leads to a significant increase in the probability of receiving remittance, which suggests that the provision of mobile bank services eliminates some of the constraints that had prevented households from receiving remittances.

Section II provides descriptive information sampled from the responses from households, which indicates that the distance to a bank is the greatest factor preventing households from opening a bank account since traveling to a bank took several days in rural Malawi. The 2SLS result shows that, after reducing costs associated with traveling, households were much more likely to receive remittances.

Table 6 also shows that adopting formal savings leads to a dramatic increase in the amount of remittances received. Though none of the coefficients are significant, their magnitudes are significant. However, the magnitude of the coefficients at least provides suggestive evidence that adoption of savings accounts leads to an increase of household's engagement with remittance transfers. For example, in Column 6 (Panel B), it is estimated that adoption leads to an increase of MWK 8,442 (USD 59) (p-value, 0.395) of the amount of remittances a household

received. Even though the coefficient of the remittance variable is statistically insignificant, a large, positive value like MWK 8,4442 suggests that the effect of adopting savings accounts is strongly likely to be positive. Therefore, though the results in the 2SLS are mostly statistically insignificant, they still provide suggestive evidence on the effect of adoption on remittance variables of interest.

In particular, it is worthwhile to examine the possible reasons why adopting savings accounts will lead to an increase in the amount of remittances received by households. One of the possible reasons could be an elimination of household's safety concern over the transferring money. Households may have concerns about the safety of the money when remittances are transported by friends because the money can be stolen or lost. Thus, when the safety concern was erased if the money was transferred through banks, households would welcome their relatives to send back more money through this safe channel.

Table 8 provides suggestive evidence that adoption increases the likelihood of household sending remittances as well. In Column 2 (Panel B), it shows that adoption leads to a 23.5 percentage points increase in the probability of sending remittances for households that lived further away. Potential reasons could be 1) an increase in the savings balance and/or 2) a reduction in the costs of sending remittances. Column 6 (Panel B) shows that adoption leads to an increase of MWK 10,563 (USD 74) (p-value, 0.165) of the amount of remittances sent, which is a significant increase. I suspect that such huge increases are unlikely, given the low level of living in Malawi. The standard errors are large so the lower bound of confidence interval includes magnitudes of increase that are more moderate.

The 2SLS approach provides suggestive evidence that adoption of savings accounts leads to increase in the likelihood of households receiving/sending remittances and the amount of total

transfers. Unfortunately, the estimates of the coefficients are not statistically significant except in one specification (2SLS regression of account adoption on the possibility of receiving remittance with fixed effects, clustered standard error – Column 2 (Panel B)). However, the 2SLS regression at least suggests that the effect of account adoption is likely to be positive on the remittance variables of interests since the coefficients of the variables are exclusively positive.

VI. Conclusion

Using a randomized field experiment in rural Malawi, I looked at the effect of adopting savings accounts on remittances flows among household members. The experiment consisted of an information treatment, which provided information to households in the treated villages on the hours and operations of the mobile bank buses. I first compared the effect of the information treatment on remittance variables of interest for households in the treated versus control villages. I found that the information treatment leads to an increase in the probability of households receiving remittances in the treated villages, as well as an increase in the amount of remittances received. In particular, the effect is strongest for households that lived at least three kilometers away from the trade centers, which suggests that the main cost of transferring remittance is related to distance. Second, the information treatment also leads to an increase in households' possibility of sending remittances, as well as the amount of remittances sent. The effect on sending remittances is not as large as the effect on receiving remittances, which suggests that most of the households received net inflows of transfers from family members who worked or lived in other parts of Malawi.

The 2SLS regression provides suggestive evidence that adopting savings accounts leads to an increase in engaging in remittance activities. The 63.3 percentage increase in the possibility

of households receiving remittances after adopting savings accounts suggests that there previously exist high costs associated with remittance transfers in the absence of mobile bank services. The use of the formal bank channel reduces these costs, and hence, encourages households to use more remittance transfers.

Future research should look at the uses of the remittances (e.g. how the households use the money they receive? Use family transfers to cope with unexpected shocks? Do they spend on consumption? Or do they invest in agricultural inputs?) and analyze the change in welfare as a result of increasing uses of remittance.

Bibliography

Aggarwal, Reena, Asli Demirgüç-Kunt, and Maria Soledad Martínez Pería, "Do remittances promote financial development?." *Journal of Development Economics* 96, no. 2 (2011): 255-264.

Aghion, Philippe, and Patrick Bolton, "A theory of trickle-down growth and development." *The Review of Economic Studies* 64, no. 2 (1997): 151-172.

Aleem, Irfan, "Imperfect information, screening, and the costs of informal lending: a study of a rural credit market in Pakistan." *The World Bank Economic Review* 4, no. 3 (1990): 329-349.

Aportela, Fernando Aportela Rodríguez, "Micro-econometric Studies of how government programs affect labor supply and saving in Mexico." PhD diss., Massachusetts Institute of Technology, 1999.

Ashraf, Nava, Dean Karlan, and Wesley Yin, "Tying Odysseus to the mast: Evidence from a commitment savings product in the Philippines." *The Quarterly Journal of Economics* (2006): 635-672.

Baldé, Yéro, "The impact of remittances and foreign aid on savings/investment in Sub-Saharan Africa*." *African Development Review* 23, no. 2 (2011): 247-262.

Banerjee, Abhijit V., and Andrew F. Newman, "Occupational choice and the process of development." *Journal of political economy* (1993): 274-298.

_____, "Educational Policy and the Economics of the Family." *Journal of Development Economics* 74, no. 1 (2004): 3-32.

Brune, Lasse, Xavier Giné, Jessica Goldberg, and Dean Yang, "Facilitating savings for agriculture: field experimental evidence from Malawi." No. w20946. National Bureau of Economic Research, 2015.

Burgess, Robin, and Rohini Pande, "Do rural banks matter? Evidence from the Indian social banking experiment." *Evidence from the Indian Social Banking Experiment (August 2003)*., Vol (2003).

Callen, Michael, Suresh De Mel, Craig McIntosh, and Christopher Woodruff. "What are the headwaters of formal savings? experimental evidence from Sri Lanka." No. w20736. National Bureau of Economic Research, 2014.

Chaia, Alberto, Aparna Dalal, Tony Goland, Maria Jose Gonzalez, Jonathan Morduch, and Robert Schiff, "2 Half the World Is Unbanked." *Banking the world: empirical foundations of financial inclusion* (2013): 19.

Comola, Margherita, and Silvia Prina, "Intervention-driven changes in social networks and their effects on household outcomes." *Available at: SSRN2250748* (2013).

Deaton, Angus, "Saving and income smoothing in Cote d'Ivoire." *Journal of African economies* 1, no. 1 (1992): 1-24.

Dupas, Pascaline, and Jonathan Robinson, "Savings constraints and microenterprise development: Evidence from a field experiment in Kenya." No. w14693. National Bureau of Economic Research, 2009.

Ferguson, Michael, "Branchless Banking and Rural Outreach in Malawi: Opportunity International Bank of Malawi's Impact on the Market." *Microfinance Opportunities, Mai* (2011).

Flory, Jeffrey A., "Banking the Poor: Evidence from a Savings Field Experiment in Malawi." 2016. Working Paper.

_____, "Formal Savings Spillovers on Microenterprise Growth and Production Decisions Among Non-Savers in Villages: Evidence from a Field Experiment." In *Proceedings of the Annual Meeting, Agricultural and Applied Economics Association*. 2012.

Giné, Xavier, Pamela Jakiela, Dean Karlan, and Jonathan Morduch, "Microfinance games." *American Economic Journal: Applied Economics* 2, no. 3 (2010): 60-95.

Gupta, Sanjeev, Catherine A. Pattillo, and Smita Wagh, "Effect of remittances on poverty and financial development in Sub-Saharan Africa." *World development* 37, no. 1 (2009): 104-115.

Kaboski, Joseph P., and Robert M. Townsend, "The impact of credit on village economies." *American economic journal. Applied economics* 4, no. 2 (2012): 98.

Kendall, Jake, Nataliya Mylenko, and Alejandro Ponce, "Measuring financial access around the world." *World Bank Policy Research Working Paper Series, Vol* (2010).

Prina, Silvia, "Do basic savings accounts help the poor to save? Evidence from a field experiment in Nepal." *Case Western Reserve mimeo* (2012).

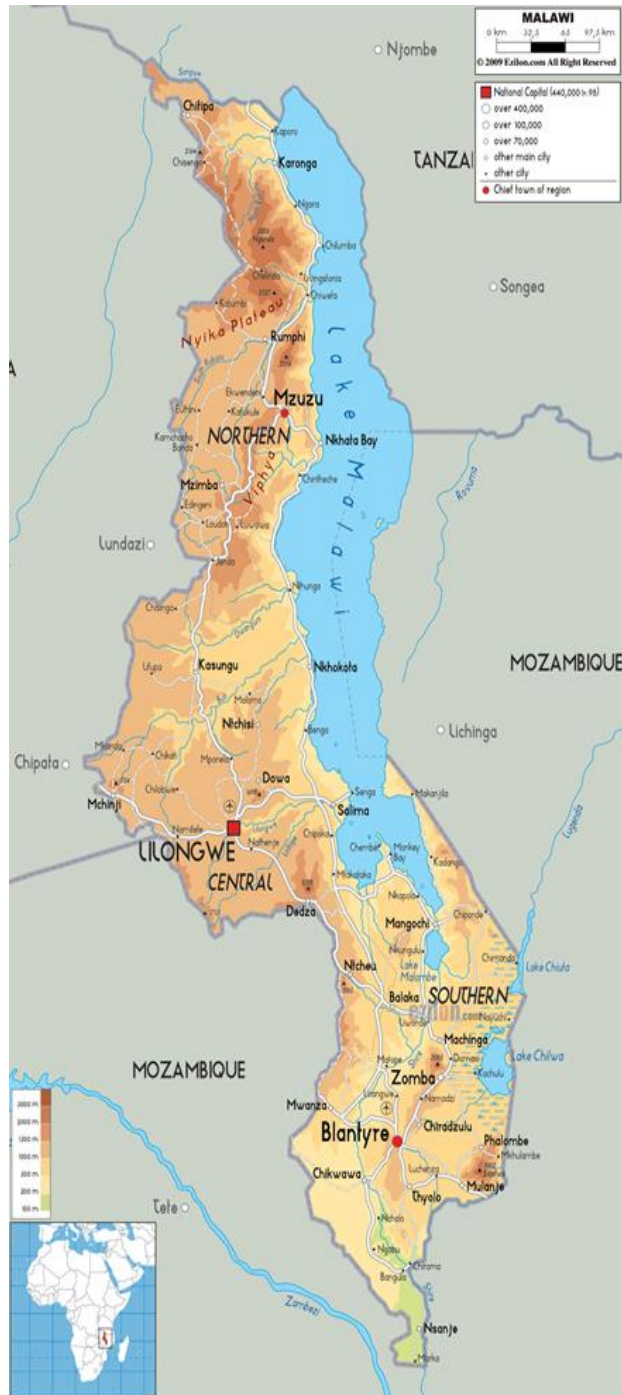
Sharma, Dhiraj and Nagarajan, Geetha, "Rural financial outreach in Central Malawi: Implications for Opportunity International Bank of Malawi," IRIS Center, University of Maryland, (2011)

Udry, Christopher, "Risk and insurance in a rural credit market: An empirical investigation in northern Nigeria." *The Review of Economic Studies* 61, no. 3 (1994): 495-526.

Woodruff, Christopher M., and Rene Zenteno, "Remittances and microenterprises in Mexico." *UCSD, Graduate School of International Relations and Pacific Studies Working Paper* (2001).

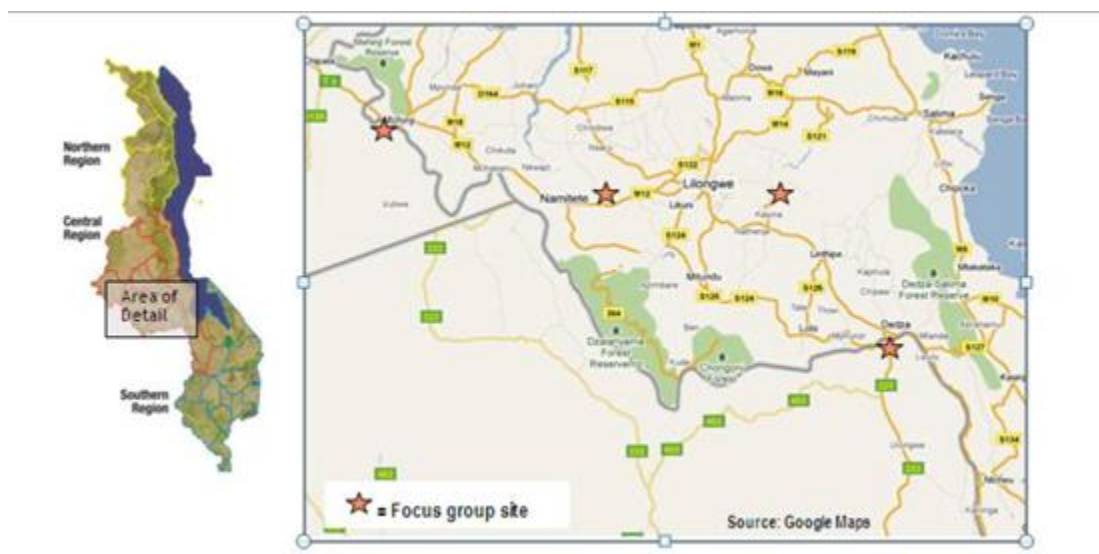
Wouterse, Fleur, "Remittances, poverty, inequality and welfare: Evidence from the Central Plateau of Burkina Faso." *The Journal of Development Studies* 46, no. 4 (2010): 771-789.

Figure 1.1 Map of Malawi



Description: The Physical Map of Malawi showing major geographical features like elevations, mountain ranges, deserts, lakes, plateaus, peninsulas, rivers, plains, landforms and other topographic features of Malawi. Source: Elizon Maps.

Figure 1.2 Map of research sites



Source: Ferguson, Michael, "Branchless Banking and Rural Outreach in Malawi: Opportunity International Bank of Malawi's Impact on the Market." *Microfinance Opportunities*, Mai (2011), p9.

TABLE 1 – SUMMARY STATISTICS AND BALANCE CHECK

<i>Demographic Characteristics</i>	Sample mean (std. deviation)	Coefficients on treatment	Observations
Head of Household is Male	0.85 (0.36)	0.026 (0.018)	2,335
Head Has Primary Education	0.36 (0.48)	0.037 (0.041)	2,337
Head's Age (years)	41.00 (13.84)	-0.000 (0.856)	2,403
Household Size	5.13 (1.98)	0.208** (0.103)	2,335
Bank-Stop Distance (km)	7.92 (3.38)	0.14 (0.64)	2,335
Operate Business	0.27 (0.44)	0.01 (0.03)	2,334
Has Member with Salaried Job	0.16 (0.36)	0.02 (0.03)	2,335
Formal and Informal Account Balances (Kwacha)	2,949 (27,281)	1,337 (1,583)	2,335
Physical Assets (Kwacha)	27,595 (146,818)	4,111 (8,230)	2,335
Has Formal Savings	0.12 (0.32)	0.03 (0.03)	2,329
Has Formal Loans	0.06 (0.24)	0.00 (0.01)	2,332
Attrition	0.14 (0.35)	-0.002 (0.033)	2,335

Notes: Exchange rate was approximately 1MWK = 0.008USD in 2008. This table reports the descriptive statistics for households in 2008. Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

TABLE 2 – INFORMATION EFFECTS ON HOUSEHOLD ADOPTION OF FORMAL SAVINGS

VARIABLES	(1) Adopt formal savings	(2) Adopt formal savings
information	0.0303 (0.0187)	0.0306** (0.0138)
Constant	0.0927*** (0.0117)	0.0645*** (0.0176)
FE		Y
Observations	1,882	1,882
R-squared	0.002	0.062

Notes: The table shows estimates from linear regressions on decision to open a formal savings account. The sample is restricted to those households that did not have any formal savings account in 2008. The response variable is an indicator equal to 1 if a household has a formal savings account in 2010. Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

TABLE 3 – INFORMATION EFFECTS ON SAVINGS BALANCE

VARIABLES	(1) Current Balance
information	544.2 (2,590)
Constant	6,927*** (1,737)
Observations	237
R-squared	0.000

Notes: The table shows estimates from linear regressions on account balances. The sample is restricted to those households that did not have any formal savings account in 2008. The response variable is a continuous variable which shows the current balances of household savings account(s). Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

TABLE 4. OLS - EFFECTS OF INFORMATION TREATMENT ON RECEIVING REMITTANCES

Observations	Dependent variable							
	Possibility of Receiving Remittances				Amount of Remittances Received			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Dropped attrition households and households which data were possibly contaminated								
information	0.0257 (0.0174)	0.0214 (0.0130)	0.0208 (0.0152)	0.0184 (0.0118)	262.7 (530.9)	196.2 (418.9)	89.06 (458.4)	70.58 (366.7)
Constant	0.0772*** (0.0125)	0.103*** (0.0302)	0.00752 (0.0117)	0.0353 (0.0250)	1,133*** (352.2)	643.0 (661.9)	30.86 (236.1)	-590.8 (544.3)
Observations	2,009	2,009	2,009	2,009	2,009	2,009	2,009	2,009
PANEL B: Restrict to Communities >3km from the nearest bus stop								
information	0.0370** (0.0175)	0.0346** (0.0138)	0.0322** (0.0160)	0.0308** (0.0128)	688.0 (524.2)	688.6* (391.1)	498.6 (460.7)	523.4 (341.7)
Constant	0.0623*** (0.0114)	0.0923*** (0.0334)	0.00245 (0.0123)	0.0302 (0.0291)	737.8*** (271.6)	249.1 (754.9)	-147.1 (234.5)	-932.1 (631.8)
Observations	1,769	1,769	1,769	1,769	1,769	1,769	1,769	1,769
Fixed Effects	N	Y	N	Y	N	Y	N	Y
Clustered	Y	Y	Y	Y	Y	Y	Y	Y
Standard Error								
Controls	N	N	Y	Y	N	N	Y	Y

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Panel A dropped attrition households and four pair of EA should potentially be excluded from the dataset due to possible contamination of the data in the information collection process. Panel B dropped attrition households, households with potentially contaminated information, and restrict to household which are located three or more kilometers from the nearest bus stop. Controls include 1) Assets 2008 is the total value of physical assets the household owned in 2008 (excluding land, livestock, and buildings), measured in tens of thousands of kwacha, 2) Cell Phone 20008 is an indicator that takes a value of 1 if the household had a cell phone in 2008, 3) Literate 2008 takes a value of 1 if someone in the household can write in Chichewa, 4) Received Cash Gift 2010 is an indicator for whether the household received one or more cash gifts from another household during the pre-harvest period in 2010.

TABLE 5. 2SLS – FIRST STAGE EFFECT OF INFORMATION TREATMENT ON ADOPTION

VARIABLES	(1) Adopt formal savings	(2) Adopt formal savings	(3) Adopt formal savings	(4) Adopt formal savings
information	0.03** (0.0143)	0.03** (0.0147)	0.03** (0.0185)	0.03** (0.014)
Constant	0.0927*** (0.009)	0.064 (0.066)	0.093*** (0.012)	0.064*** (0.0175)
Observations	1,882	1,882	1,882	1,882
R-squared	0.0024	0.062	0.002	0.062
Fixed Effects	N	Y	N	Y
Clustered	N	N	Y	Y
Standard Error				
Controls	N	N	N	N

Notes: The table shows the first stage effect of information treatment on adopting formal savings accounts.
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6. 2SLS - EFFECTS OF ACCOUNT ADOPTION ON RECEIVING REMITTANCES

Observations	Dependent variable							
	Possibility of Receiving Remittances				Amount of Remittances Received			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Dropped attrition households and households which data were possibly contaminated								
Adopt formal savings	0.586 (0.607)	0.376 (0.404)	0.593 (0.737)	0.348 (0.429)	2,329 (15,220)	-840.0 (12,312)	5,854 (14,202)	-1,228 (17,070)
Constant	0.0157 (0.0678)	0.102* (0.0596)	-0.000280 (0.0231)	0.0720* (0.0430)	705.9 (1,622)	985.5 (1,310)	-120.2 (751.9)	67.83 (470.9)
Observations	1,784	1,784	1,784	1,784	1,784	1,784	1,593	1,784
PANEL B: Restrict to Communities >3km from the nearest bus stop								
Adopt formal savings	0.681 (0.500)	0.633* (0.380)	0.711 (0.624)	0.637 (0.446)	8,617 (12,142)	8,442 (9,933)	5,854 (13,636)	5,788 (11,005)
Constant	0.00165 (0.0554)	0.0788 (0.0620)	-0.00545 (0.0235)	0.0743 (0.0538)	-14.36 (1,232)	141.7 (1,239)	-120.2 (433.1)	-500.4 (762.0)
Observations	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593
Fixed Effects	N	Y	N	Y	N	Y	N	Y
Clustered Standard Error	Y	Y	Y	Y	Y	Y	Y	Y
Controls	N	N	Y	Y	N	N	Y	Y

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Panel A dropped attrition households and four pair of EA should potentially be excluded from the dataset due to possible contamination of the data in the information collection process. Panel B dropped attrition households, households with potentially contaminated information, and restrict to household which are located three or more kilometers from the nearest bus stop. Controls include 1) Assets 2008 is the total value of physical assets the household owned in 2008 (excluding land, livestock, and buildings), measured in tens of thousands of kwacha, 2) Cell Phone 2008 is an indicator that takes a value of 1 if the household had a cell phone in 2008, 3) Literate 2008 takes a value of 1 if someone in the household can write in Chichewa, 4) Received Cash Gift 2010 is an indicator for whether the household received one or more cash gifts from another household during the pre-harvest period in 2010.

TABLE 7. OLS - EFFECTS OF INFORMATION TREATMENT ON SENDING REMITTANCES

Observations	Dependent variable							
	Possibility of Sending Remittances				Amount of Remittances Sent			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Dropped attrition households and households which data were possibly contaminated								
information	0.0153 (0.0112)	0.0133* (0.00774)	0.0121 (0.0101)	0.0116 (0.00719)	876.5* (492.2)	956.6** (386.5)	751.2* (424.2)	862.7** (337.6)
Constant	0.0381*** (0.00733)	-0.0107 (0.00693)	0.00898 (0.00885)	-0.0381*** (0.0114)	182.4*** (60.60)	-765.3** (381.3)	-353.5 (220.1)	-1,620*** (602.9)
Observations	2,009	2,009	2,009	2,009	2,009	2,009	2,009	2,009
PANEL B: Restrict to Communities >3km from the nearest bus stop								
information	0.0191* (0.0110)	0.0168** (0.00776)	0.0164 (0.0102)	0.0151** (0.00725)	402.4 (295.2)	420.2* (222.1)	313.9 (230.6)	347.0* (183.5)
Constant	0.0294*** (0.00639)	-0.0134* (0.00734)	0.00887 (0.00945)	-0.0336*** (0.0115)	155.7** (64.15)	-336.1 (203.0)	-125.7 (117.1)	-752.9** (356.6)
Observations	1,769	1,769	1,769	1,769	1,769	1,769	1,769	1,769
Fixed Effects	N	Y	N	Y	N	Y	N	Y
Clustered	Y	Y	Y	Y	Y	Y	Y	Y
Standard Error								
Controls	N	N	Y	Y	N	N	Y	Y

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Panel A dropped attrition households and four pair of EA should potentially be excluded from the dataset due to possible contamination of the data in the information collection process. Panel B dropped attrition households, households with potentially contaminated information, and restrict to household which are located three or more kilometers from the nearest bus stop. Controls include 1) Assets 2008 is the total value of physical assets the household owned in 2008 (excluding land, livestock, and buildings), measured in tens of thousands of kwacha, 2) Cell Phone 2008 is an indicator that takes a value of 1 if the household had a cell phone in 2008, 3) Literate 2008 takes a value of 1 if someone in the household can write in Chichewa, 4) Received Cash Gift 2010 is an indicator for whether the household received one or more cash gifts from another household during the pre-harvest period in 2010.

TABLE 8. 2SLS - EFFECTS OF ACCOUNT ADOPTION ON SENDING REMITTANCES

Observations	Dependent variable							
	Possibility of Sending Remittances				Amount of Remittances Sent			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Dropped attrition households and households which data were possibly contaminated								
Adopt formal savings	0.273 (0.313)	0.261 (0.237)	0.239 (0.383)	0.248 (0.263)	31,399 (27,392)	35,510 (21,864)	32,796 (32,235)	36,560 (24,181)
Constant	0.00965 (0.0332)	-0.0237 (0.0221)	0.00658 (0.0118)	-0.0301** (0.0119)	-2,780 (2,764)	-3,228 (2,093)	-965.9 (917.3)	-1,165 (1,106)
Observations	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784
PANEL B: Restrict to Communities >3km from the nearest bus stop								
Adopt formal savings	0.226 (0.220)	0.235 (0.173)	0.213 (0.268)	0.230 (0.202)	8,652 (8,917)	10,563 (7,600)	7,576 (8,765)	9,886 (7,824)
Constant	0.00882 (0.0221)	-0.0214 (0.0163)	0.00823 (0.0109)	-0.0197* (0.0114)	-589.7 (815.0)	-960.3 (717.8)	-245.2 (288.6)	-662.7 (456.0)
Observations	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593
Fixed Effects	N	Y	N	Y	N	Y	N	Y
Clustered Standard Error	Y	Y	Y	Y	Y	Y	Y	Y
Controls	N	N	Y	Y	N	N	Y	Y

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Panel A dropped attrition households and four pair of EA should potentially be excluded from the dataset due to possible contamination of the data in the information collection process. Panel B dropped attrition households, households with potentially contaminated information, and restrict to household which are located three or more kilometers from the nearest bus stop. Controls include 1) Assets 2008 is the total value of physical assets the household owned in 2008 (excluding land, livestock, and buildings), measured in tens of thousands of kwacha, 2) Cell Phone 20008 is an indicator that takes a value of 1 if the household had a cell phone in 2008, 3) Literate 2008 takes a value of 1 if someone in the household can write in Chichewa, 4) Received Cash Gift 2010 is an indicator for whether the household received one or more cash gifts from another household during the pre-harvest period in 2010.

Appendix

APPEXDIX TABLE A.1
IMPACTS OF CONTROLS ON RECEIVING REMITTANCES

VARIABLES	Possibility of Receiving Remittances			
	(1)	(2)	(3)	(4)
Assets in 2008	1.54e-07*** (5.13e-08)			
Cell phone in 2008		0.168*** (0.0216)		
Household member can write in Chichewa			0.0740*** (0.0209)	
Received cash gifts in 2010				-0.0399* (0.0227)
Constant	0.132*** (0.00748)	0.114*** (0.00780)	0.0730*** (0.0193)	0.138*** (0.00850)
Observations	2,458	2,458	2,458	2,117
R-squared	0.004	0.024	0.005	0.001

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The table shows the effect of control variable on the possibility of a household had received remittances in the past twelve months. Controls include 1) Assets 2008 is the total value of physical assets the household owned in 2008 (excluding land, livestock, and buildings), measured in tens of thousands of kwacha, 2) Cell Phone 2008 is an indicator that takes a value of 1 if the household had a cell phone in 2008, 3) Literate 2008 takes a value of 1 if someone in the household can write in Chichewa, 4) Received Cash Gift 2010 is an indicator for whether the household received one or more cash gifts from another household during the pre-harvest period in 2010.

APPEXDIX TABLE A.2

THE INCORRECT OLS ESTIMATE OF THE EFFECT OF ACCOUNT ADOPTION ON REMITTANCE VARIABLES

VARIABLES	Dependent Variable							
	OLS				2SLS			
	(1) Possibility of receiving remittances	(2) Amount of remittances received	(3) Possibility of sending remittances	(4) Amount of remittances sent	(5) Possibility of receiving remittances	(6) Amount of remittances received	(7) Possibility of sending remittances	(8) Amount of remittances sent
Adopt formal savings	0.0365 (0.0252)	3,455** (1,729)	0.0625*** (0.0207)	4,347 (2,704)	0.586 (0.607)	2,329 (15,220)	0.273 (0.313)	31,399 (27,392)
Constant	0.133*** (0.0394)	595.0 (750.0)	-0.00568*** (0.00216)	-395.2 (256.9)	0.0157 (0.0678)	705.9 (1,622)	0.00965 (0.0332)	-2,780 (2,764)
Observations	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784

Note: The regression output is restricted to the sample with non-attrition households and 56 pairs of EAs (dropped four pairs of EAs whose data could potentially be contaminated). Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

I. Cover Page of the Survey

End line for Malawi - 2010

Ordering of modules (Yes, they are not in alphabetical order!!)

Module order	Module	Module contents
1	Cover page	HH location etc.,
2	B	Roster
3	D	PAT
4	M	Savings
5	N	Loans
6	Y	OIBM membership
7	O	Remittances
8	T	Transfers - Govt, households
9	P	Shocks
10	E	Food Security
11	G/H	Consumer durables - Assets
12	I	Livestock
13	F	Assets - Land and buildings
14	J	Farm income
15	C	Labor income
16	K	Business income
17	Q	Social capital
18	R	Last page (with GPS)

Omitted module: L

Added modules: T and Y

II. Questionnaire used to collect information on remittances received/sent.

O. Remittances RECEIVED

O01A O01. In the past 12 months, did you or any members of your household RECEIVE (in cash) any remittances?

ID	CHANNEL	YES...1 NO...2	NUMBER
1	DIRECT DEPOSIT TO BANK		
2	MONEY ORDER/POST OFFICE		
3	SENT THROUGH FRIENDS OR RELATIVES		
4	CARRIER (BUS/LOBBY DRIVER)		
5	SENT THROUGH REMITTANCE COMPANY		
6	SENT AS A CHECK TO DEPOSIT		
7	MOBILE PHONE		
8	TRANSFER		
9	OTHER (SPECIFY)		

If YES, write the channel and amount received in the space below. If NO, skip O01B and go to O01C.

CODE FOR O08
1. MONEY ORDER/POST OFFICE
2. DIRECT DEPOSIT TO BANK
3. SENT THROUGH FRIENDS OR RELATIVES
4. CARRIER (BUS/LOBBY DRIVER)
5. SENT THROUGH REMITTANCE COMPANY
6. SENT AS A CHECK TO DEPOSIT
7. MOBILE PHONE
8. TRANSFER
9. OTHER (SPECIFY)

ID	CHANNEL NAME	NUMBER	YES...1 NO...2	NUMBER
1	DIRECT DEPOSIT TO BANK			
2	MONEY ORDER/POST OFFICE			
3	SENT THROUGH FRIENDS OR RELATIVES			
4	CARRIER (BUS/LOBBY DRIVER)			
5	SENT THROUGH REMITTANCE COMPANY			
6	SENT AS A CHECK TO DEPOSIT			
7	MOBILE PHONE			
8	TRANSFER			
9	OTHER (SPECIFY)			

Remittances SENT

O13A O01. In the past 12 months, did you or any members of your household RECEIVE (in cash) any remittances?

YES...1
NO...2 » O25

O13B	O13C																				
In the past 12 months, has anyone in your household ever received a remittance through [CHANNEL]?	How many members of your household received remittances through [CHANNEL] in the past 12 months?																				
YES...1 NO...2	NUMBER																				
<table> <tr> <td>ID</td> <td>CHANNEL</td> </tr> <tr> <td>1</td> <td>DIRECT DEPOSIT TO BANK</td> </tr> <tr> <td>2</td> <td>MONEY ORDER/ POST OFFICE</td> </tr> <tr> <td>3</td> <td>SENT AS CASH THROUGH FRIENDS OR RELATIVES</td> </tr> <tr> <td>4</td> <td>SENT THROUGH REMITTANCE CARRIER (BUS/LOBBY DRIVERS)</td> </tr> <tr> <td>5</td> <td>SENT THROUGH REMITTANCE COMPANY (WESTERN UNION)</td> </tr> <tr> <td>6</td> <td>SENT AS A CHECK TO DEPOSIT</td> </tr> <tr> <td>7</td> <td>MOBILE PHONE TRANSFERS</td> </tr> <tr> <td>8</td> <td>AIRTIME MINUTES</td> </tr> <tr> <td>9</td> <td>OTHER (SPECIFY)</td> </tr> </table>		ID	CHANNEL	1	DIRECT DEPOSIT TO BANK	2	MONEY ORDER/ POST OFFICE	3	SENT AS CASH THROUGH FRIENDS OR RELATIVES	4	SENT THROUGH REMITTANCE CARRIER (BUS/LOBBY DRIVERS)	5	SENT THROUGH REMITTANCE COMPANY (WESTERN UNION)	6	SENT AS A CHECK TO DEPOSIT	7	MOBILE PHONE TRANSFERS	8	AIRTIME MINUTES	9	OTHER (SPECIFY)
ID	CHANNEL																				
1	DIRECT DEPOSIT TO BANK																				
2	MONEY ORDER/ POST OFFICE																				
3	SENT AS CASH THROUGH FRIENDS OR RELATIVES																				
4	SENT THROUGH REMITTANCE CARRIER (BUS/LOBBY DRIVERS)																				
5	SENT THROUGH REMITTANCE COMPANY (WESTERN UNION)																				
6	SENT AS A CHECK TO DEPOSIT																				
7	MOBILE PHONE TRANSFERS																				
8	AIRTIME MINUTES																				
9	OTHER (SPECIFY)																				

If YES, write the channel name in column O15A below and then ask O13B about next channel.

If NO, skip O13B about next agent.

CODE FOR O20

MALAWI SAVINGS BANK...1
CIEM...2
NATIONAL BANK (NBU)...3
STANDARD BANK (STB)...4
MALAWI RURAL FINANCE COMPANY (HRFC)...5
POST OFFICE...6
COOPERATIVE...7
FRIENDS/RELATIVES...8
WESTERN UNION...9
OTHER (SPECIFY)...11

A	O13A	O13B	O14	O15	O17	O18	O20	O21	O22	O23	O24
C			To whom has [NAME] mainly sent remittances through [CHANNEL] in the past 12 months? (By "main", we mean "gives amount sent")	Where did [NAME] send most remittances through this channel?	How many months did [NAME] send remittances through [CHANNEL] in the past 12 months?	In the past 12 months, what was the total amount [NAME] sent through this channel?	What is the name of the institution through which [NAME] usually sent remittance via [CHANNEL]?	How far from your home is [AGENT]?	By what means does [NAME] typically travel to this location?	What type of account does [NAME] have for sending remittances via this channel?	When [NAME] sends remittances through this channel, how much is the sending fee that [NAME] usually must pay each time?
D	Channel used	Member who used this channel	MALAWI...1 CIEM...2 NATIONAL BANK...3 STANDARD BANK...4 MALAWI RURAL FINANCE...5 POST OFFICE...6 COOPERATIVE...7 FRIENDS/RELATIVES...8 WESTERN UNION...9 OTHER (SPECIFY)...10 FRIEND...6	MALAWI...1 CIEM...2 NATIONAL BANK...3 STANDARD BANK...4 MALAWI RURAL FINANCE...5 POST OFFICE...6 COOPERATIVE...7 FRIENDS/RELATIVES...8 WESTERN UNION...9 OTHER (SPECIFY)...10 FRIEND...6							
E	Channel name from O01	Member ID			TIME	US\$	CODE FROM O20	KM	MILE		US\$
F											
G											
H											
I											
J											
K											
L											
M											
N											
O											
P											
Q											
R											
S											
T											
U											
V											
W											
X											
Y											
Z											

III. Data Manipulation

a. Variables:

o05 - the number of times a household receives remittances;

o06 - the amount received through each channel;

o17 - the number of times a household sends remittances;

o18 - the amount of remittances sent through each channel

b. In the sample, only 186 households ever received remittances and 95 households ever sent remittances. In order to have a reasonable dataset size to make regression results sensible¹³ and use the data in a form that best reflects the effect of the adoption of a saving account, I did the following transformations.

- i. I recoded all missing values of o05 and o17 to 0. The result is the number of observations (with only attrition households dropped) jumps from 186 and 96 to 2118.
- ii. In the sample, there are households which had received remittances through multiple channels. In the old dataset, these households will have more than one line as each line reflects each distinct channel:

Qno	District	Village	Head	O05	O06	O08	O09a	O09b
1011	Lilongwe	Chimwaye	Handizeni	2	1100	Friends	20	Kilometers
			Kachidede					
1011	Lilongwe	Chimwaye	Handizeni	1	500	friends	30	Kilometers
			Kachidede					

Note: qno is a unique household identification number.

¹³ In statistics, two things - confidence interval and statistical power - are related to sample size. A larger sample size will generate a smaller confidence interval, which improves one's certainty that the true estimate lies within the range given by confidence interval. In addition, a larger sample size reduces the randomness of a sample. In statistics, p-value measures the likelihood that the treatment group is truly different from the control group. Researchers typically reject any p-value that is above 5percentage points, since it means with less than 95percentage points certainty, one can conclude that coefficient of the treated group is truly different from the coefficient of control group.

The explanation for this example household is the same household received 3 remittances of a total of 1600MWK in the past twelve months. The household received 1100MWK through two separate transactions via a friend who lived 20 kilometers away. The remaining 500MWK came through a single transaction from a friend who lived 30 kilometers away.

iii. Since it makes no sense to regress upon remittances received through multiple channels of a single household, I collapsed the dataset so that each variable reflects only the total. For example, after collapse, the example household will only have one line that looks like:

Qno	District	Village	Head	O05	O06
1011	Lilongwe	Chimwaye	Handizeni	3	1600
			Kachidede		

iv. The final transformation I did is to recode o05(number of times a household receives remittances) and o17(number of times a household sends remittances) to a 0/1 dummy variable since I am more interested in examining the effect of adoption on the likelihood of first-time usage of remittances.