Access to Digital Financial Services and Women Empowerment: Evidence from Rural Rwanda

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Abstract

This study investigated the extent to which access to digital financial services empowers women to engage in more high value activities within the household. The study used the 2020 Rwanda FinScope Survey data, a nationally representative data set covering 12,480 individual respondents from all the districts in the country. Using a control function (CF) instrumental variable technique, the study found that mobile money increased women's ability to make decisions about the management of household income on their own or jointly with their partner (agency). The results further indicate that mobile money increased female access to credit. Usage of mobile money had a positive and significant effect on agency for women residing in rural Rwanda. Although females residing in female-headed households experienced an increase in agency and access to credit, the rate of change for females residing in male-headed households were comparatively higher. The results provide evidence of incremental agency benefits that digital financial inclusion has for women whose baseline decision-making power is low, especially in patriarchal societies where women have been historically disenfranchised in household decision-making. Thus, mobile money could be used as a tool for poverty reduction and service providers; can invest in developing services that deepen household savings and credit through mobile money to further contribute to improvement of household welfare.

Keywords: *Digital financial services; Mobile money; Women empowerment; Rwanda*

1. Introduction

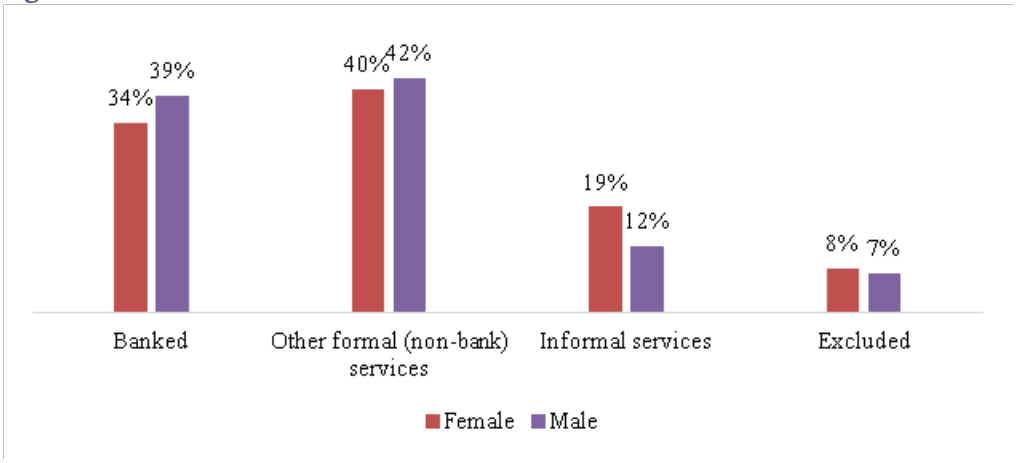
There is a plethora of literature on financial inclusion highlighting its benefits to the populace in both developed and developing countries. At the macro level, fully developed and inclusive financial systems allow countries to benefit from a high capital base available for initiatives that spur economic growth (Pazarbasioglu et al., 2020). At micro level, financial inclusion has proven to be beneficial for poverty reduction and improvements in food security and household welfare (Karlan et al., 2016). This is because it strengthens the availability of financial resources to economic agents while also encouraging a saving culture for low-income households (Schaner, 2016). This, ultimately, strengthens household resilience to shocks and can promote the growth of small enterprises while also facilitating sustainable and equitable development. Digital financial services have so far accelerated growth in financial inclusion as this has allowed people to access financial services on more flexible terms that require lower transaction costs, or fees that are otherwise identified to hinder access to the financial sector. In most developing countries, mobile money normally provided by mobile phone service providers is by far the fastest growing digital financial service (Fernandes et al., 2021).

Generally, while financial inclusion has grown over time, gender disparities have been observed across countries in the world. By 2017, the percentage of women who had access to financial accounts was 7% less than that of men globally; however, this gender gap was about 11% in sub-Saharan Africa (World Bank, 2021). The fifth Sustainable Development Goal (SDG) identifies the achievement of gender equality and women empowerment as one important pillar in the achievement of sustainable development in the modern age (UN, 2015). Thus, it is important to understand the extent to which women's financial inclusion, through digital financial services, contributes to advance this goal. This understanding also helps in identifying the improvements that can be made to further the SDG agenda and take stock of the progress made so far in women empowerment.

Rwanda is one of the developing countries that have made great strides in financial inclusion. About 93% of adults in the country are financially included when considering both formal and informal financial products or services (NISR, 2020). This represents an increase of 11% from 2016, where 88% of the adult population patronized both formal and informal financial services. Mobile money accounts form the biggest driver of this financial inclusion. Indeed, just as in many other developing countries, mobile money is

the most widely accessed financial service in Rwanda with about 87% of the population having access to it. However, the uptake among women is lower (84%) than that of men (90%), a trend which is also echoed in the uptake of most other financial services in the country. In Rwanda, the introduction of Umurenge savings and credit cooperative organizations (SACCOs) (established in 2008) also significantly contributed to the growth of financial inclusion (Harelimana, 2021; Rwanda Cooperative Agency, 2023), as this led to the establishment of these SACCOs at each administrative sector in the country, giving access to financial services even in rural areas. Figure 1 presents an overview of access to various types of financial services for both men and women in Rwanda. As evidenced, the proportion of females in the formal financial sector was lower than that of men, but higher in informal financial services. Overall, the proportion of women financially excluded was about 4% lower, compared to men. The FinScope 2020 data further show that while the proportion of financially included adults is high, the proportion of financially included women in rural areas is lower (90%) relative to women in urban areas (98%).

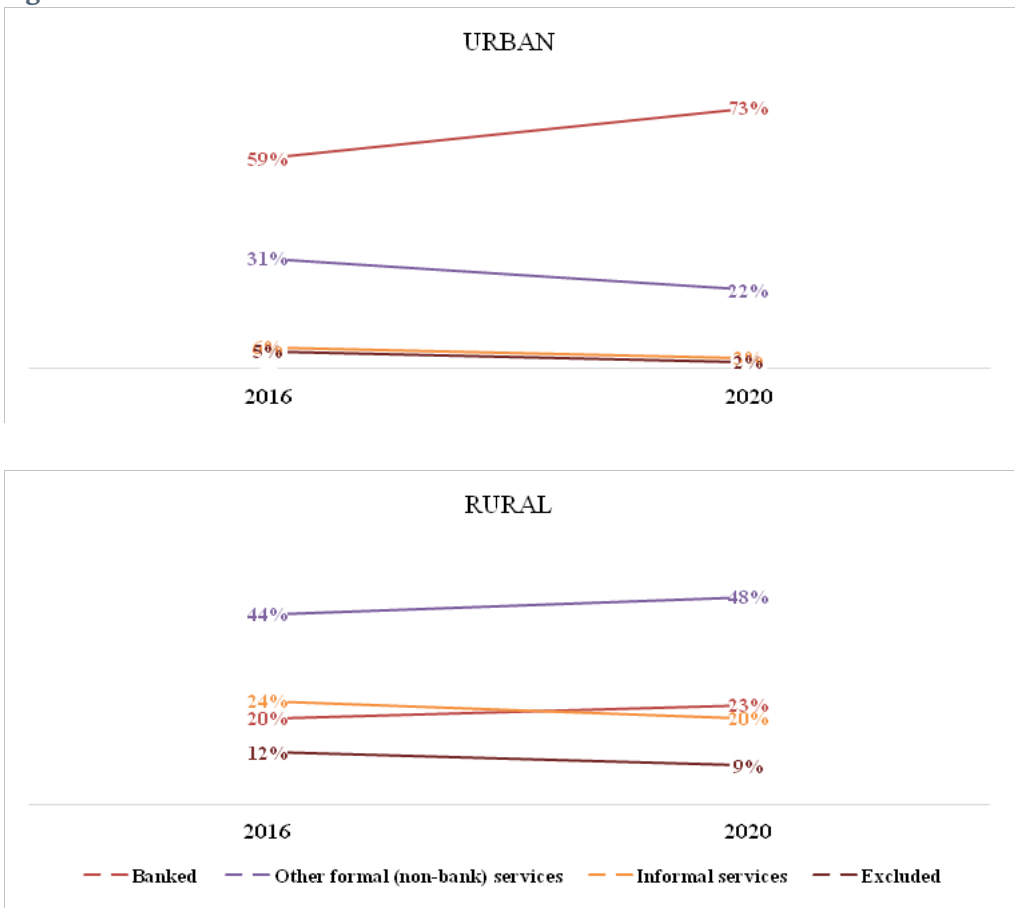
Figure 1: Access to formal and informal financial services



Source: 2020 FinScope Report for Rwanda

While the general percentage of financially included people is high and gender disparities are relatively small, Rwanda is still an interesting case study. It is interesting to understand the extent to which this growth in financial inclusion has led to women's empowerment in general and empowerment of rural women specifically. How has women's ability to take up more active roles in their economic spheres and contribute more meaningfully to the advancement of well-being and development at large due improved due to their financially included status? As mentioned earlier, most of the population that is financially included in Rwanda patronizes other formal non-bank services which comprise mobile money (constituting 80% of the non-bank sector), Umurenge SACCOs[1], insurance and micro- finance institutions (MFIs). When looking at a disaggregated picture between urban and rural areas, most of the rural population (48%), have been patronizing non-bank financial services and the same was true in 2016. Urban areas, have more people (73%) who are banked and about 22% of the population use formal non-bank services.

Figure 2: Access to financial services in urban and rural areas



This study therefore aimed to understand whether the financial inclusion of women leads to the empowerment of women in rural areas by looking at a country that has managed to achieve a high coverage of financial inclusion countrywide. The study focussed on rural areas as mobile money penetration is higher there than in urban areas. In addition, most people in rural areas are more likely to channel their savings and credit decisions through mobile money than in urban areas, where relatively more people have access to savings and credit facilities through the banking sector.

We evaluated the extent to which women's usage of digital financial services (specifically mobile money) influences their ability to access credit and save money which can be instrumental in enabling them to set up self-sustaining small enterprises and reduce their risks to unexpected shocks in their livelihoods (Pereznieto and Taylor, 2014). In addition, we explored the extent to which women's usage of digital financial services influences their decision- making and thereby their bargaining power within households on major household activities such as market participation. Furthermore, we considered the usage of digital financial services and not just awareness of their existence as previous studies have shown that awareness

alone is not sufficient to change behaviours and cultural norms, especially in household decision-making (Churchill et al., 2020). The study disaggregated the assessment of these issues amongst women who are female household heads and those residing in male-headed households to understand the dynamics associated with the two environments.

Study objectives

The underlying objective of the study was to examine the effect of digital financial services on women's empowerment.

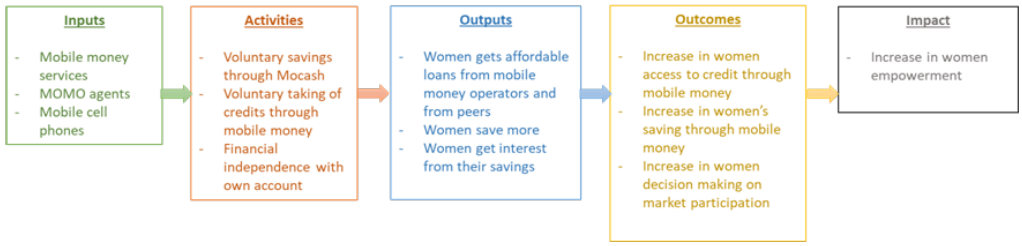
The specific objectives of the study were:

- To estimate the effect of women's access to mobile money on their access to credit and savings.
- To estimate the effect of women's access to mobile money on their decision making in market participation.

Theory of change

This study assessed the effect of access to digital financial services on women's agency. We used mobile money technology as a measure of digital financial services (Naghavi and Scharwatt, 2018). Women's agency is defined as women's autonomy in making decisions on high-value decisions within the household such as agricultural production, market participation and expenditure on proceeds from market sales. Women have typically been underrepresented in decision-making on these aspects and so various authors have used these variables as a measure of agency in economic literature (Kagotho and Vaughn, 2018; Mwale et al., 2021). The study hypothesized that access to mobile money technology influences household savings and access to credit. In addition to this, mobile money is expected to increase women's financial independence as they become owners of their own money account(s). Women's access to credit and savings increases their income or financial position through self-employment and entrepreneurship. Their financial independence is also expected to give them more autonomy in making decisions on entrepreneurship and savings. A new financial position for women would therefore also increase their bargaining power within the household and thereby improve their agency. Figure 3 is a diagrammatic representation of the pathways through which mobile money can lead to improvements in women's agency as discussed.

Figure 3: Study theory of change



2. Data and variable description

Data

The study used data sourced from the FinScope Rwanda survey (National Institute of Statistics Rwanda, 2020) FinScope Rwanda 2020 is representative at the national, urban/rural and district levels. The sample was drawn based on the enumeration areas (EAs) listed in the most recent census, conducted in 2012, in Rwanda. All households in the selected EAs were listed, giving a total of 158,386 households. Within each selected EA, 16 households were randomly selected from the listed. Individual respondents were randomly selected using the automated Kish Grid within the selected households. A total of 12,480 interviews were conducted from September to November 2019 by the Centre for Economic and Social Studies. Of these, 6,529 respondents were from rural areas, representing 52.3% of the total sample, and the urban sample comprised 5,951 respondents (47.7%).

The outcome variables

The study had two outcome variables. The first was women's agency. Agency is defined as the extent to which women can make decisions regarding household activities such as market participation (Malik and Luqman, 2005). Particularly, in our study, we defined agency within the confines of individuals being responsible for household income or money management decisions. Agency is measured as a dummy variable capturing the value 1 if individuals made decision about household money management alone, with their partner or with another member of the family, and 0 if they were not involved or another member of the family made the decision.

The second outcome variable was women's access to credit. This is a binary variable taking the value 1 if an individual took any form of credit and the value 0 otherwise.

The treatment variable

The treatment variable in this study was a binary indicator. This treatment variable is usage of a mobile money account. It was constructed from a composite of statements asking respondents to describe their experience with mobile money. Individuals were

deemed to have used mobile money if they responded that they were registered and had used it before, they used mobile money services but were not registered, and they were registered mobile money users.

Control variables

Table 1 shows the descriptive statistics from the control variables that were used in this study disaggregated by gender (male or female) and residence (rural or urban). We controlled for both individual and household-specific characteristics. We also controlled for individual factors to account for individual differences in agency and access to credit between male and females. The data from our sample shows that while about 66% of the sample owned mobile phone, almost 80% of the sample used mobile phones. However, even though the usage of mobile phones was high, only 60% of the sample had mobile money accounts. The percentage owning a mobile money account was significantly higher for residents in urban areas by almost 27% and also higher for males by about 13%. The data also show that, on average, the sample average household size was 4 children, and the average age of respondents age was 42 years. The women respondents were relatively older in the sample than the men, and rural respondents were older in rural areas than those in urban areas.

Data from our sample also indicated that most (62.7%) respondents were married, about 18% were single and 14% were widowed. Most respondents had primary education but very few had tertiary education. The differences in education of respondents are significant, with more percentages of rural residents having lower education levels compared to those in urban as would be expected. However, across all levels of education, there are more male respondents compared to female respondents. About 40% of respondents were business persons and 37% were in salaried employment. There was a higher male representation in both business and salaried employment. About 10% of the respondents were unemployed. About 27% of the respondents came from the Southern Province, 23% from Western and 23% from Eastern province There was about 10% representation of respondents from Kigali City, and the remaining 17% were from the Northern Province.

We also controlled for attributes of household heads as they are important contributors to household decision dynamics and resource allocation, which may in turn determine agency and access to credit. Rural household heads were significantly more likely to be unemployed, married, and more likely to have no or primary education than those in urban areas. Most rural participating household heads came from the Southern, Western and Northern provinces. Similarly, female household heads were significantly younger, more likely to be widowed, less likely to employed or have businesses, and less likely to have education than their male counterparts.

Table 1: Sample characteristics by household residence and gender

	Rural	Urban	t-test	Female	Male	t-test	Total
	Mean	Mean	difference	mean	Mean	difference	mean
Mobile money	0.470	0.739	0.269***	0.542	0.676	0.134***	0.598
Phone ownership	0.536	0.792	0.257***	0.595	0.747	0.152***	0.658
Phone usage	0.723	0.878	0.154***	0.761	0.848	0.087***	0.797
Gender (female)	0.589	0.579	-0.011				
Residence(rural)				0.528	0.517	-0.011	0.523
Household size	4.429	4.481	0.052	4.343	4.610	0.267***	4.454
Age of respondent	42.492	40.835	-1.657***	42.289	40.877	-1.412***	41.702
Marital status of respondent							
Married	0.651	0.600	-0.051***	0.548	0.737	0.189***	0.627
Divorced	0.062	0.043	-0.019***	0.051	0.055	0.005	0.053
Single	0.149	0.209	0.060***	0.158	0.205	0.047***	0.178
Widowed	0.150	0.139	-0.011	0.226	0.030	-0.196***	0.144
Education of respondent							
No education	0.264	0.147	-0.116***	0.242	0.160	-0.082***	0.208
Primary	0.589	0.453	-0.136***	0.518	0.534	0.016	0.524
Secondary	0.131	0.280	0.148***	0.189	0.220	0.031***	0.202
Vocational	0.008	0.107	0.099***	0.043	0.073	0.029***	0.055
Tertiary	0.008	0.012	0.005*	0.008	0.013	0.005**	0.010
Occupation of respondent							
Salaried employee	0.372	0.375	0.004	0.360	0.392	0.032***	0.373
Business	0.395	0.408	0.013	0.393	0.413	0.021*	0.401
Unemployed	0.111	0.102	-0.009	0.116	0.093	-0.023***	0.107
Age of head of HH	47.594	48.258	0.663	46.686	54.159	7.473***	47.917
Marital status of household head							
Married	0.346	0.320	-0.026**	0.054	0.726	0.672***	0.334
Divorced	0.033	0.023	-0.010***	0.010	0.053	0.042***	0.028
Widowed	0.147	0.135	-0.012	0.221	0.030	-0.192***	0.142
Single	0.023	0.049	0.026***	0.028	0.046	0.017***	0.035
Education of household head							
No education	0.186	0.106	-0.080***	0.143	0.154	0.010	0.148
Primary	0.315	0.254	-0.061***	0.164	0.456	0.292***	0.286
Secondary	0.051	0.122	0.070***	0.042	0.145	0.103***	0.085
Tertiary	0.005	0.008	0.003	0.003	0.012	0.009***	0.007
Vocational	0.004	0.060	0.056***	0.008	0.062	0.053***	0.031

continued next page

Table 1 Continued

	Rural	Urban	t-test	Female	Male	t-test	Total
	Mean	Mean	difference	mean	Mean	difference	mean
Occupation of head							
Salaried employee	0.207	0.214	0.007	0.121	0.336	0.216***	0.210
Business	0.226	0.237	0.010	0.139	0.360	0.221***	0.231
Unemployed	0.058	0.046	-0.012**	0.045	0.062	0.017***	0.052
Province							
Kigali City	0.044	0.161	0.117***	0.093	0.110	0.016**	0.100
Southern Province	0.297	0.234	-0.063***	0.270	0.261	-0.009	0.267
Western Province	0.260	0.204	-0.055***	0.237	0.228	-0.009	0.233
Northern Province	0.178	0.155	-0.023***	0.167	0.166	-0.001	0.167
Eastern Province	0.222	0.246	0.024**	0.232	0.235	0.003	0.233
Observations	6529	5951	12480	7290	5190	12480	12480

3. Methodology

Estimation technique

To estimate the effects of mobile money technology on women's agency and access to credit, the study built an econometric model as follows:

$$y_{hi} = \beta_1 Mobile\ Money_{hi} + \beta_2 Female * MobileMoney_{hi} + \delta X_{hi} + \varepsilon_{hi} \quad (1)$$

Equation 1 shows the relationship between having access to mobile money technology and the two outcome variables for individual *i* in household *h*. Thus y_{hi} captures two outcomes. The first outcome variable is women's agency and the second is women's access to credit. Both access to credit and women's agency are discrete variables as mentioned in the description of control variables section. We, thus, estimated these initial models using a probit modelling technique. We presented the outcome variables, agency and access to credit, as a function of mobile money, the interaction term between mobile money and the female dummy and other control variables. A positive and significant β_1 indicates that mobile money increases agency and access to credit. The interpretation of the interaction term, however, needs to be handled with caution. The summation $\beta_1 + \beta_2$ is the total effect of females who have access to mobile money on their agency or access to credit compared to females who do not have access to mobile money and males (whether they have access to mobile money or not). Thus, β_1 then can be seen as the total effects of mobile money on males' agency or access to credit. A positive β_2 means that women gain more while a negative β_2 implies that men gain more.

As mentioned earlier, access to mobile money technology is binary. Both women and men can have access to mobile money technology, and as such, we split our sample by gender and estimated Equation 1. To justify fitting two models for rural and urban, and female or male, we conducted a Chow test (Chow, 1960) to test if the sets of coefficients between the two regressions were equal.

X_{hi} is set of independent variables included to reduce the confounding effects around mobile money. include individual controls, household covariates, location or residence characteristics, and province dummies. ε_{hi} are error terms that capture all other factors that might affect our outcomes but are not captured by the controls in the equation. Often, these error terms are assumed to be independently and identically

distributed and unrelated to treatment which, in our case, was mobile money access. However, they could be dependent on the treatment and thus confound the effects of interest. Formally, the error terms could be correlated with agency or credit and bias, β1. A natural solution to this potential endogenous relationship between mobile money and our outcomes is the use of a randomized control trial (RCT) that distributes the treatment and control observations in an unbiased manner. In the absence of RCT, as was the case in this study, other methods can be used to attempt to reduce the estimation bias, as explained in the following sub-section.

Identification

Estimating the effects of mobile money on women's agency and access to credit without understanding the issues of endogeneity may lead to major estimation biases. This is particularly the case because access to mobile money is non-random. Often, individuals with relatively better access to credit and strong agency are able to meet the capital requirements and have the freedom to open an account. For example, mobile money requires owning a phone. Individuals, particularly women with less agency, are less likely to demand a personal mobile phone as they tend their husband's phone. This is mostly the case in poor households, whose expenditure on such items is deemed a luxury. Therefore, owning mobile money technology is likely to be related to other factors unobserved to a researcher, which could lead to a reverse relationship from agency and credit to mobile money account holding.

This study, therefore, used an instrumental variable (IV) to identify the unbiased effects of mobile money on our outcomes. Our chosen instrument was usage of mobile phone. If individuals do not use mobile phones, they will not have phone services. They will, in turn, not open mobile money accounts not because they do not have agency or credit and cannot afford to do so, but because they do not have a mobile phone on which to use the accounts. This settles the potential reverse causality—a relationship from agency and access to credit to owning a mobile money account. Hence, the validity of our instrument is justified. However, an instrument must also satisfy relevance assumptions. Thus, it should significantly change the endogenous treatment (in this case mobile money) in the anticipated direction. We tested the relevance of the instrument using the data and checked the F statistic at both first and second stage of estimation. In all our models, the F-statistic was above the threshold of 10, which is required for the IV assumption to be relevant.

Because all our outcomes are not continuous, we employed the instrumental variable technique as a control function (CF) (for more details, see Gatzoflias et al., 2021). CF allows estimating non-linear models, which is the case with our discrete outcome, agency and credit. For estimation technique using CF, we followed the proposal of Gatzoflias et al. (2021). First, CF involves estimating the first-stage models, where IV is included, then predicting residuals from the first stage. In this first stage, we included our instrument (phone usage), the variable for female coefficient and the interaction term between female and phone usage. The non-linear interaction term was included

to help clear any effects the non-linear relationship between female and mobile money usage may have on agency and access to credit. We then predicted residuals for each model. The second stage involved estimating the relationship between the outcome variables (agency and access to credit) while including the first-stage residuals as part of control variables but excluding the IV. Residuals ensure that all the variation in the treatment variable (mobile money) that is not caused by exogenous changes of the IV is removed. Hence, the result is a local average treatment effect of mobile money account on agency or credit caused by exogenous differences in access to a mobile network.

Key informant interviews

Another component of the study was to conduct key informant interviews with key stakeholders in the financial inclusion space in Rwanda. These included stakeholders from mobile phone operators, namely MTN and Airtel Rwanda; commercial banks, the National Bank of Rwanda (BNR), Access to Finance Rwanda (AFR) and some World Bank staff in the country. The focus of the discussions was to understand what opportunities could be explored in the space given the results and to determine the practical steps stakeholders could take, given the findings of the study. The key points highlighted in these discussions have been incorporated in the results conclusion and recommendations section to provide actionable steps that can be taken, while considering their perspectives and experiences.

Econometric estimates

Even though the aim of the study was to estimate the effects of mobile money on women agency and credit in rural Rwanda, we began our analysis by considering the different geographies. First, we estimated the effects of mobile money on women's agency and access to credit at the national level. Then we considered a similar analysis for the urban population. Finally, we conducted our analysis on our sample of interest—the rural population[2]. We estimated the models for different subsamples to justify the significant difference that mobile money and financial inclusion may have for the rural population compared with other populations. Moreover, existing literature on financial services has found varying results between urban and rural areas (Jack and Suri, 2011; Lyons et al., 2020). We hypothesized that women living in rural areas have very different characteristics hindering their agency than those that hinder women who reside in urban areas. As such a mobile money interventions may have more significant impacts on changing agency for women in the rural areas compared to those in urban areas.

Results from Table 2 (column 3) show that having and using a mobile money account increased women's agency by 8.2% (0.071+ (-0.012) in the full sample. Thus, women who used mobile money had more agency than women and men who did not and men who did use mobile money. Mobile money allows women to have leverage in agency over men. Similarly, in the full sample (column 6), usage of mobile money led to an increase of 24.3% in the probability of accessing credit of any type for females.

Some interesting results, however, emerged from what is happening within households headed by either females or males. These results show that, not only did women in female-headed households experience an increase in agency (column 1) and access to credit (column 6), but women who reside in male-headed households experienced this increase in agency (column 2) and access to credit (column 5) when they used mobile money. There was a 9-percentage- point increase in women agency and a 26-percentage-point increase in the probability of access to credit for females in male-headed households when they have access and use mobile money.

These results are interesting in that they reveal that women whose baseline decision-making power and access to credit is low, stand to gain more from the intervention. In this sense, women who head their homes already have more freedom on what do with money, compared to those in male-headed households and hence their baseline decision agency is higher. In this case, an intervention, such as usage of a mobile money account, is more likely to have significant marginal increases for women in male-headed households compared to women in female-headed households who perhaps were already making the decisions. Results (Table 2, columns 1 and 4) show that indeed the percentage increase in agency (7.1%) and credit (19.6%) for females in female-headed households was lower than that of females in male-headed households.

Table 2: Effects of usage of mobile money account on agency and credit at national level

	Agency			Credit		
	(1)	(2)	(3)	(4)	(5)	(6)
	Female	Male	Full sample	Female	Male	Full sample
Mobile money	0.186**	0.054***	0.071***	0.429***	0.267***	0.277***
	(0.077)	(0.018)	(0.018)	(0.086)	(0.034)	(0.030)
Female	0.166***	-0.042	0.017	0.047	-0.030	0.007
	(0.062)	(0.037)	(0.018)	(0.063)	(0.040)	(0.025)
Female*mobile	-0.115	0.035*	0.012	-0.233***	-0.007	-0.034
	(0.075)	(0.019)	(0.016)	(0.080)	(0.032)	(0.027)
Residuals female	-0.074**			-0.101*		
	(0.037)			(0.061)		
Residuals male		-0.044**			-0.124***	
		(0.020)			(0.036)	
Residuals all			-0.052***			-0.121***
			(0.018)			(0.031)
Controls	Y	Y	Y	Y	Y	Y
Constant	0.621***	0.499***	0.570***	0.044	0.156**	0.148***
	(0.072)	(0.038)	(0.031)	(0.104)	(0.061)	(0.051)
Observations	3439	8776	12215	3439	8776	12215
p: $\beta_1 + \beta_3 = 0$	0.032	0.000	0.000	0.000	0.000	0.000

Note: Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01

Considering that females living in different areas experience disparities in agency and access to credit that national level results tend to mask, we conducted a sub-sample analysis for rural and urban women. The hypothesis was that urban women are more exposed to different technologies the civil rights movement tend and to have certain characteristics such as higher education which may give them an advantage so much that mobile money account may not significantly improve their agency and access to credit. This would in turn be expected to boost women's agency and mask the effects we expect to see due to mobile money adoption. Thus, conducting a national analysis may mask the areas of need and may not be helpful for targeted interventions. Policy advice from Table 2 may align with encouraging or supporting all women, especially those in male-headed households, to have mobile money accounts, while this may not be the case for women in urban areas. We therefore estimated if it was econometrically justified to conduct a sub-sample estimation instead of a pooled sample estimation with a rural–urban or a female–male dummy. We then conducted a Chow test that showed that the estimated coefficient for regressions of the two sub-populations was significantly different. We were then econometrically justified to conduct this sub-sample estimation.

Results in Table 3 (column 5) support our hypothesis that women in rural areas experience a statistically significant marginal increase in agency by 8.3% (0.083 + 0.00) when they use and access mobile money accounts. For women in urban areas the results (column 6) were not statistically significant at the standard level of significance.

Disaggregating these results to compare females in female and male-headed households, the results showed that indeed, females in female-headed households in rural areas experienced a significant effect of mobile money on agency. However, females in female-headed households in urban areas did not experience any change in agency. This result perhaps explains the differences in the baseline agency levels for women in urban areas compared to those in rural areas. As expected, while the effects of mobile money cannot be felt significantly for women in urban areas, mobile money tends to unlock some barriers in agency for women in rural areas. For women in male-headed households in rural areas (Table 3, column 3), the results indicated that usage of a mobile money account led to an increase in their agency by 10 percentage points. This result confirms the a priori expected results that women in male-headed households in rural areas tend to have low agency and as such mobile money may significantly improve their agency. Women in male-headed households in urban areas did not experience any statistically significant change in agency when they had access to a mobile money account. This may be because women in these urban setting are already exposed to several interventions and have specific characteristics that make their base decision-making higher such that mobile money effects are not that significant.

Table 3: Effects of usage of mobile money account on women's agency in rural and urban areas

	Agency: Female heads		Agency: Male heads		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)
	Rural	Urban	Rural	Urban	Rural	Urban
Mobile money	0.239***	0.098	0.058***	0.002	0.083***	-0.017
	(0.090)	(0.133)	(0.018)	(0.088)	(0.018)	(0.073)
Female	0.188***	0.083	-0.016	-0.113	0.042**	-0.094
	(0.068)	(0.127)	(0.040)	(0.088)	(0.019)	(0.060)
Female*mobile	-0.171*	-0.041	0.028	0.093	0.000	0.102*
	(0.087)	(0.133)	(0.019)	(0.070)	(0.017)	(0.060)
Residuals female rural	-0.077*					
	(0.043)					
Residuals female urban		-0.023				
		(0.056)				
Residuals male rural			-0.032			
			(0.020)			
Residuals male urban				-0.118		
				(0.080)		
Residuals rural					-0.047**	
					(0.019)	
Residuals urban						-0.092
						(0.058)
Controls	Y	Y	Y	Y	Y	Y
Constant	0.608***	0.669***	0.455***	0.471***	0.554***	0.579***
	(0.080)	(0.146)	(0.044)	(0.091)	(0.034)	(0.079)
Observation	1772	1667	4616	4160	6388	5827
p: $\beta_1 + \beta_3 = 0$	0.045	0.287	0.000	0.188	0.000	0.082

Note: Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01

Considering the effects of mobile money accounts on access to credit, Table 4 shows that usage of mobile money has a statistically significant effect on increasing the probability of women to access credit in both rural and urban areas. In the full sample of the rural estimates (column 5), mobile money leads to a 23.9% increase in the probability that women will access any form of credit. For urban areas, the access to mobile money gives them even more access to credit. The results indicate a 26% increase in the probability to access credit when these women have access to mobile money in the urban areas.

For females in female-headed households, there is also an increase in the probability of access to credit when they use mobile money. In fact, the data show that there was a 19.6% and 34.4% increase in the probability of access to mobile money

for women in female-headed households in rural and urban areas respectively. With the hypothesis that women in urban areas have a higher baseline access to credit, mobile money access opens even more opportunities for these women and see their access to credit increase even more compared to women in rural areas.

Table 4: Effect of usage of mobile money on women's access to credit in rural and urban areas

	Credit: Female heads		Credit: Male heads		Credit: Full Sample	
	(1)	(2)	(3)	(4)	(5)	(6)
	Rural	Urban	Rural	Urban	Rural	Urban
Mobile money	0.406***	0.711***	0.254***	0.343***	0.260***	0.410***
	(0.094)	(0.156)	(0.036)	(0.088)	(0.033)	(0.076)
Female	0.006	0.257**	-0.015	0.004	0.015	0.072
	(0.071)	(0.108)	(0.044)	(0.088)	(0.026)	(0.065)
Female*mobile	-0.210**	-0.367***	0.002	-0.117	-0.021	-0.151**
	(0.089)	(0.135)	(0.035)	(0.087)	(0.029)	(0.070)
Residuals Female Rural	-0.088					
	(0.068)					
Residuals Female Urban		-0.353***				
		(0.109)				
Residuals Male Rural			-0.131***			
			(0.039)			
Residuals Male Urban				-0.036		
				(0.086)		
Residuals rural					-0.122***	
					(0.034)	
Residuals Urban						-0.110
						(0.070)
Constant	-0.100	0.022	0.066	0.132	0.058	0.159
	(0.114)	(0.223)	(0.066)	(0.150)	(0.055)	(0.130)
Observation	1772	1667	4616	4160	6388	5827
p: $\beta_1 + \beta_3 = 0$	0.001	0.001	0.000	0.004	0.000	0.000

Note: Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01

For females in male-headed households, mobile money usage also increased their chances of accessing to credit. The results showed that mobile money increases women's probability to access credit by 25.6% in rural areas and 22.6% in urban areas. The change for women in male-headed households in rural areas was much larger than the change in women in female-headed households observed in the previous paragraph. This may signify the differences in the baseline access to credit. In urban settings, the change for women in male-headed households was smaller than that of women in women-headed households in rural areas.

4. Discussion

The study generally highlighted two main findings in the Rwandan context. First, the study established that access to mobile money increased the likelihood of accessing credit for women in both urban and rural areas. The results showed that the likelihood was much higher for women in male-headed households residing in rural areas (25% higher) than for women in urban areas (22%). This result confirms the a priori expectation that the marginal change for women in male-headed households would be higher because they tend to have lower agency than those in female-headed households and as such mobile money may significantly improve their agency.

The study also provided evidence that women in male-headed households and residing in rural areas experienced a statistically significant increase in agency by 8.3% due to their access to mobile money. For women in female-headed households, we also found a similar effect due to mobile money. However, the marginal increase in agency for such women was slightly lower (6.8%) than that for women in male-headed households. However, the same was not the case for women in urban areas where we did not find any statistical evidence for improved agency.

Promotion of women empowerment through several platforms from education, politics and economics has proved to be one the effective policies for improving women's welfare in several countries (Nadim and Nurlukman, 2017; Louis-Weinstein, 2019). More recently, digital technology has gained prominence to support women empowerment through changing the way business is done and creating better employment opportunities (World Bank, 2019). Following success stories of mobile money especially in East Africa (Demirgüç-Kunt et al., 2020), studies have been conducted to estimate its benefits for individuals and households (Ahmad et al. 2020). However, the question remains on the extent to which such mobile money technologies have helped women, in particular, in the context where gender disparities are still notable. In this study, we sought to understand whether financial inclusion, particularly access to a mobile money account, could improve women economic participation, access to credit and ability to make decisions about the income in their households in rural Rwanda.

The results of this paper at the national level show that women in Rwanda experience an increase in their ability to make decisions about household incomes, when they have access to mobile money. Mobile money access tends to make savings easier (see Bastian et al., 2018) making users of mobile money more likely to start

their own businesses and become self-employed through these savings (De Gasperin et al., 2019; Islam and Muzi, 2022). Thus, as women become self-employed and run their own businesses, they tend to make their own money and are more likely to have a larger say in what to do with the income, hence improved agency. Thus, control of economic resources and earning money outside the household influences decision-making (Dunham and Flores-Yeffal, 2019).

Following previous literature finding that financial inclusion provides opportunity to access credit, make investments and build savings (Beck et al., 2009; Ellis and Lemma, 2010; Ghosh and Vinod, 2017), this study also showed that mobile money increases the probability to access credit for women in Rwanda. Mobile money wallets have products that provide access to micro credit and loans cheaper, easier and faster than those from formal or informal institutions in developing countries. Mobile money, hence, provides a platform with reduced transaction costs when accessing loans, especially in Africa (Aker et al., 2013; Jack and Suri 2014), allowing exchanges across individuals to be less costly. Thus, mobile money offers an opportunity to obtain short-term loans at reasonable rates, improving access to credit (Islam and Muzi, 2022).

Estimating the effects of mobile money on women's agency and access to credit tends to mask regional variations in agency and access to credit between different sub-samples of rural and urban women who face different structural impediments. This paper focussed on this aspect by conducting an in-depth estimation for rural Rwandan women. The results from this study showed that, indeed, the national level results on women agency mask the rural–urban differences. The national results are driven by the rural results on women's agency. Thus, women in rural areas who use mobile money tend to experience a significant increase in agency, while this relationship is insignificant for urban women. The implication is that women in rural areas have baseline low agency, with gender norms of male dominance being more pronounced in rural areas. Mobile money, through its various transmission mechanisms of increased savings and investments, tends to untie these binding constraints for rural women. As a result, women will experience a significant increase in agency. The baseline decision-making power for women in urban settings is assumed to be higher such that mobile money usage will have little significant influence on their agency.

The arguments on baseline decision-making may also pertain to women living in female and male-headed households. Women in female-headed households are assumed to be the heads themselves and are likely to be making the decisions, thus they have higher baseline decision-making power. On the contrary, women in male-headed households tend to have low baseline decision-making power as the men tend to make these decisions. Thus, access and usage of mobile money is expected to have a greater impact especially for women whose baseline is lower. Thus, our results showed that indeed women in male-headed households had a higher percentage increase in agency than women in female-headed households in rural Rwanda. The results were insignificant for households in urban Rwanda.

While the results for women's agency were significant only for rural Rwanda, the results for access to credit were significant for both rural and urban areas in the

country. Thus, mobile money improves the probability of women accessing credit in both rural and urban settings. In fact, the results show that the percentage increase was much higher the in urban than in the rural setting. The availability of various sources and forms of credit in urban settings, coupled with availability of business opportunities results in the need for loans and credit being higher in urban areas. However, due to complexities of access to loans from formal financial institutions, women tend to have less access to this credit. Thus, mobile money in the urban setting unties these constraints, allows women to have access to easy, low-cost loans and allows women to maximize their potential.

A similar argument can be given about women in female-headed households who experience a large change compared to females in male-headed households in urban areas. In these urban settings, there is potential to have access to credit, but females in female-headed household tend to have low baseline access to credit as they have lower collateral than women who live with their partners. Thus, mobile money usage removes that binding constraint and allows women to have access to credit.

The results from this study therefore underscore the arguments asserted in the theory of change discussed earlier to be true. This is the case as we find that women accessing mobile money had incrementally more access to credit and ultimately had higher agency than those who did not.

5. Conclusion and recommendations

The study aimed to establish the relationship between financial inclusion, especially usage of mobile money, on women's ability to make decisions about household income and access credit in rural Rwanda. The study found that indeed mobile money has positive and significant effects on agency and access to credit at the national level. However, the effects for women's agency were confined to the rural areas where societal values and gender norms tend to be more enforced. Women, who normally make fewer decisions due to the nature of their household composition (living in male-headed households), tended to experience a larger increase in agency in their household when they use mobile money. The effects of mobile money usage on access to credit were observed for both rural and urban settings. However, women in urban setting experienced a higher percentage increase in the probability of getting credit when mobile money was used compared to women in rural settings. This finding speaks to the findings of Atta-Ankoma (2022), who found that mobile money generally encouraged the application for credit among households with accounts in other financial institutions in Ghana showing that mobile money acts as a pathway to access of credit through other financial services as well. Thus, in the context of our study, mobile money unties the binding constraints for women in urban areas—where credit is available but there are structural barriers that impede women to have such access, including high interest rates and collateral.

The finding that mobile money is key to improving women's agency (empowerment) shows that mobile money is a digital financial tool that could be used to reduce the gender disparities in household decision-making. In addition to this, mobile money could also be used as a tool for poverty reduction and development as women's empowerment is a key pillar in achieving sustainable development. While the coverage and use of mobile money is widespread, other countries could promote the adoption of mobile money to improve women's agency (in contexts that could apply), thus ensuring empowerment that directly feeds into a much larger goal of poverty reduction and prosperity. Given the findings discussed earlier, the study recommends the following for stakeholders:

- The finding that mobile money significantly improves women agency means that its increased usage would be a great tool in further improving agency among women that use it. Thus, directing social protection payments (such as the Vision

2020 Umurenge Programme (VUP)) in Rwanda would increase the usage of mobile money. This would also be a form of digitization of the social transfer payments which, in addition to easing the logistics associated with disbursements of the cash transfers, would also significantly improve the agency of women recipients who would have access to a platform to save some of this income for future use. Thus, donor agencies such as the World Bank and others working on similar programmes could consider directing their social payments through such digitised platforms.

- Mobile money usage is mostly possible with access to mobile phones. Thus, initiatives that increase access to mobile phones would continually increase the adoption of mobile money accounts and improved access as more people access their mobile money accounts on their own phones. Thus, mobile money operators can introduce schemes for making mobile phones more affordable to households especially, in low-income categories. These could come in the form of tax exemptions under certain price points to facilitate phone purchases among poorer households. This can be targeted more towards lower income brackets and women and could increase savings and their access to credit through mobile money.

- Mobile money operators can also consider incentivizing savings and borrowing through mobile money. This could be done through offering desirable interest rates on money saved through mobile money as well as increasing the amount available for borrowing. This could be an improvement of the existing Mokash facility, which provides smaller loan amounts and short-term savings and loans on mobile money. This service could be developed to work at a larger scale, allowing customers to save and borrow for longer periods of time at better interest rates.

- The continual scale-up of agency banking would also be instrumental in increasing agency for women. Agency banking has been an important tool in increasing financial inclusion as it addresses most challenges to formal financial inclusion (distance; high costs) that mobile money also tends to overcome. Thus, the continual scale up with special attention to creating inclusive services for women would be a great tool in improving welfare through improved and increased access to credit, savings and agency for participating stakeholders. While it might not be profitable for commercial banks to scale up in certain locations or introduce inclusive services for women and the vulnerable, commercial banks can introduce these as part of their corporate social responsibility; as a purposeful effort in improving women's access to credit. Such services can be designed in such a way that it addressed women's challenges in accessing finance. This would be more effective if regulators could provide directives on a specific percentage that commercial banks should follow in directing funds to corporate social responsibility for such products to ensure increased compliance.

Notes

1. These are small-scale savings and credit cooperatives created at each administrative sector of the country.

2. Full tables of results presented in this section can be found in the appendix section.

References

Ahmad, H. A., Green, C., & Jiang, F. (2020). Mobile money, financial inclusion and development. *Journal of Economic Surveys*, 34(4), 753–792.

Aker, J. C., Boumnijel, R., McClelland, A., & Tierney, N. (2013). *How do electronic transfers compare? Evidence from a mobile money cash transfer experiment in Niger*. Tufts University Working Paper.

Atta-Nkomah, R. (2022). Credit for households in Ghana: Has mobile money (momo) improved inclusive access? *Scientific African*, 16, e01230.

Bastian, G., Bianchi, I., Goldstein, M., & Montalvao, J. (2018). *Short-term impacts of improved access to mobile savings, with and without business training: Experimental evidence from Tanzania.* Documents de travail.

Beck , T., Demirgüç-Kunt, A., & Honohan, P. (2009). Access to financial services: Measurement, impact and policies. *The World Bank Research Observer*, *24*(1), 119–145.

Chow, G. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica, 28*(3), 591–605.

Churchill, A., Farrell, L., & Marisetty, V. B. (2020). Mobile Money and Women's Decision-Making Power in India. In A. Churchill, *Moving from the Millennium to the Sustainable Development Goals*. Singapore: Palgrave Macmillan.

De Gasperin, C., Valentina, R., & Luca, S. (2019). Mobile money and the labour market: Evidence from developing countries. *University of Milan Bococca Department of Economics, Management and Statistics Working Paper 403*.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2020). The Global FINDEX Database 2017: Measuring financial inclusion and opportunities to expand access to and use of financial services. *World Bank Economic Review, 34*, 52–58.

Dunham, C. C., & Flores-Yeffal, N. (2019). Household Decision-Making Between Older Adult Women and Men in the Western Cape of South Africa. *Gender Issues, 36*(3), 253–268.

Ellis, K., & Lemma, A. (2010). *Financial inclusion, household investment and growth in Kenya and Tanzania*. ODI Project Briefing.

Fernandes, C., Borges, M. R., & Caiado, J. (2021). The contribution of digital financial services to financial inclusion in Mozambique: an ARDL model approach. *Applied Economics*, 53(3), 400–409.

Gatzoflias, S., Kurlansky, P., & George, I. (2021). Rationale for inverse probability treatment weight variables in left-sided infective endocarditis patients treated with primary surgical or medical therapy. *The Annals of thoracic surgery, 112*(3), 1035–1036.

Ghosh, S., & Vinod, D. (2017). What constrains financial inclusion for women? Evidence from Indian micro data. *World Development*, 92, 60–81.

Groupe Speciale Mobile Association. (2017). *Examining the financial inclusion of women – the mobile money gender gap in Rwanda.* GSMA. Retrieved from https://www.gsma.com/mobilefordevelopment/country/rwanda/examining-financial-inclusion-of-women-mobile-money-gender-gap-rwanda/

Harelimana, J. (2021). Impact Umurenge Sacco to Financial Inclusion in Rwanda. *Business and Economics Journal*, 12(2).

Islam, A. M., & Muzi, S. (2022). Does mobile money enable women-owned businesses to invest? Firm-level evidence from sub-Saharan Africa. *Small Business Economics, 59*(3), 1245-1271. doi:https://doi-org.ez.sun.ac.za/10.1007/s11187-021-00562-w

Jack, W., & Suri, T. (2011). Mobile money: the economics of M-PESA. *National Bureau of Economic Research,* NBER Working Paper 16721, 1029–1038.

Jack, W., & Suri, T. (2014). Risk sharing and transaction costs: Evidence from Kenya's mobile money revolution. *American Economic Review, 104*(1), 183–223.

Kagotho, N., & Vaughn, M. G. (2018). Women's agency in household economic decision making in Kenya. *International Social Work, 61*(6), 767–780.

Karlan, D., Kendal, J., Mann, R., Pande, R., Suri, T., & Zinman, J. (2016). Research and Impacts of digital financial services. *NBER Working paper series*.

Louis-Weinstein, F. S. (2019). *Women's empowerment as a policy for poverty reduction*. Haiti: Walden University, Doctoral dissertation.

Lyons, A. C., Kass-Hanna, J., & Greenlee, A. (2020). Impacts of financial and digital inclusion on poverty in South Asia and Sub-Saharan Africa. SSRN. doi:https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3684265

Malik, N. H., & Luqman, M. (2005). Impact of microcredit on women empowerment: A review paper. *Pakistan Journal of Agriculture Science*, 42(3-4), 100–105.

Mwale, L. M., Von Fintel, D., Marchetta, F., Smith, A., & Kamninga, T. (2021). *The Negative Impact of Farm Input Subsidies on Women's Agency in Malawi's Matrilocal Settlements*. PEP Working Paper.

Nadim, S. J., & Nurlukman, A. D. (2017). The impact of women empowerment on poverty reduction in rural area of Bangladesh: Focusing on village development program. *Journal of Government and Civil Society,* 1(2), 135–157.

Naghavi, N., & Scharwatt, C. (2018). *Mobile money: Competing with informal channels to accelerate the digitalization of remittances*. GSMA.

National Institute of Statistics Rwanda. (2020). *Finscope Financial Inclusion Rwanda*. Kigali: National Institute of Statistics Rwanda.

Pazarbasioglu, C., Mora, A. G., Uttamchandani, M., Natarajan, H., Feyen, E., & Saal, M. (2020). *Digital Financial Services*. World Bank.

Pereznieto, P., & Taylor, G. (2014). A review of approaches and methods to measure economic empowerment of women and girls. *Gender and Development, 22*(2), 233–251. Retrieved from https://doi.org/10.1080/13552074.2014.920976

Rwanda Cooperative Agency. (2023, February 25). *Rwanda Cooperative Agency.* Retrieved from https://www.rca.gov.rw/cooperatives/about-saccos#:~:text=Umurenge%20SACCOs%20was%20established%20in,were%20using%20formal%20financial%20institutions.

Schaner, S. (2016). The Cost of Convinience? Transaction Costs, Bargaining Power and Savings Account Use in Kenya. *Journal of Human Resources, 52*(4), 919–945.

United Nations. (2015). *Transforming our World: The 2030 Agenda for Sustainable Development.* Geneva: United Nations.

World Bank. (2019). *World development report 2019: The changing nature of work*. Washington DC: World Bank.

World Bank. (2021, March 18). *The Global Findex Database* . Retrieved from The Global Findex Database : https://globalfindex.worldbank.org/index.php/#data_sec_focus

Appendix

Table A1: The impact of mobile money on agency and credit.

	(1)	(2)	(3)	(4)
	Agency		Credit	
	Female	Male	Female	Male
Mobile Money	0.186**	0.054***	0.429***	0.267***
	(0.077)	(0.018)	(0.086)	(0.034)
Female	0.166***	-0.042	0.047	-0.030
	(0.062)	(0.037)	(0.063)	(0.040)
Female * Mobile Money	-0.115	0.035*	-0.233***	-0.007
	(0.075)	(0.019)	(0.080)	(0.032)
Age of respondent	0.003**	0.004***	0.000	0.000
	(0.002)	(0.001)	(0.002)	(0.001)
Marital status of respondent				
Married	0.233***	0.479***	0.068	0.221***
	(0.055)	(0.039)	(0.109)	(0.045)
Divorced	-0.013	0.508***	0.136	0.413***
	(0.119)	(0.045)	(0.117)	(0.149)
Widowed	0.104	-0.023	0.052	0.302*
	(0.063)	(0.164)	(0.181)	(0.166)
Education of respondent				
Primary	-0.216***	-0.071***	-0.038	0.044
	(0.065)	(0.014)	(0.080)	(0.030)
Secondary	-0.346***	-0.040*	0.011	0.057
	(0.071)	(0.022)	(0.085)	(0.037)
Vocational	-0.313**	0.000	0.016	-0.038
	(0.145)	(0.044)	(0.133)	(0.068)
Tertiary	-0.383*	-0.224***	-0.007	0.380***
	(0.213)	(0.086)	(0.170)	(0.086)

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Table A1 Continued

	(1)	(2)	(3)	(4)
	Agency		Credit	
	Female	Male	Female	Male
Occupation				
Salaried Employment	0.115*	0.113***	0.187***	0.068**
	(0.060)	(0.021)	(0.066)	(0.028)
Business	0.134**	0.100***	0.172***	0.141***
	(0.059)	(0.021)	(0.063)	(0.029)
Age of head	-0.000	-0.000	0.001	-0.002*
	(0.002)	(0.001)	(0.002)	(0.001)
Household size	-0.046***	-0.012***	-0.006	0.007
	(0.014)	(0.004)	(0.018)	(0.006)
Marital status of the head				
Married	-0.166***	-0.179***	-0.075	-0.171***
	(0.056)	(0.039)	(0.115)	(0.054)
Divorced	0.076	-0.228***	-0.072	-0.291*
	(0.118)	(0.048)	(0.127)	(0.173)
Widowed	-0.065	0.292*	-0.041	-0.172
	(0.065)	(0.162)	(0.184)	(0.171)
Education of the head				
Primary	0.185*	0.337**	0.294	-0.023
	(0.102)	(0.148)	(0.186)	(0.144)
Secondary	0.273***	-0.292	0.573***	-0.233
	(0.101)	(0.187)	(0.192)	(0.235)
Vocational	0.200	-0.079	0.633***	-0.292
	(0.157)	(0.103)	(0.241)	(0.200)
Occupation of the head				
Salaried	-0.051	-0.111	-0.313*	0.310
	(0.090)	(0.098)	(0.185)	(0.194)
business	-0.014	-0.510***	-0.266	0.488*
	(0.111)	(0.161)	(0.271)	(0.266)

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Table A1 Continued

	(1)	(2)	(3)	(4)
	Agency		Credit	
	Female	Male	Female	Male
Province controls				
Kigali	-0.012	-0.009	0.064	0.045
	(0.090)	(0.027)	(0.103)	(0.039)
Southern	0.127*	0.023	0.089	0.024
	(0.065)	(0.019)	(0.066)	(0.031)
Western	0.148**	0.021	-0.044	0.025
	(0.063)	(0.019)	(0.065)	(0.028)
Northern	0.134*	0.015	-0.027	-0.032
	(0.068)	(0.022)	(0.069)	(0.032)
Female Residuals	-0.225**		-0.147	
	(0.101)		(0.103)	
Male residuals		-0.074**		-0.124***
		(0.031)		(0.048)
Constant	0.293*	0.180***	-0.108	0.149*
	(0.161)	(0.066)	(0.192)	(0.084)
Observations	881.000	4506.000	881.000	4506.000
Mobile money coefficient	0.092	0.001	0.206	0.000

Note: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Mission

To strengthen local capacity for conducting independent,
rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

Bringing Rigour and Evidence to Economic Policy Making in Africa

- Improve quality.
- Ensure Sustainability.
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