Mobile Money-Driven Financial Inclusion and Financial Resilience in Sub-Saharan Africa: Insights from Cameroon

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Abstract

While there has been increasing interest in the economic effects of mobile money in Sub-Saharan Africa, there is little empirical literature on the role of mobile money in the nexus between financial inclusion and financial resilience. This paper uses the 2017 Global Findex 1,000 representative sample collected in Cameroon to examine how mobile money affects people's ability to face negative shocks by coming up with an emergency fund in due time. Our results indicate that access to this financial inclusion tool increases the average ability of being resilient during an economic emergency, but the magnitude of this effect depends on whether the treatment-effects model implemented controls for the endogeneity of mobile money adoption or not. Whereas the average resilience ability if no one in the treated and the overall population had access to a mobile money account is considerably higher when disregarding endogeneity (0.47 vs. 0.37 and 0.62 vs. 0.09 respectively), our results demonstrate that the increase in financial resilience ability due to mobile money adoption is higher when controlling for endogeneity (0.74 vs. 0.053 and 0.60 vs. 0.07 respectively). Thus, disregarding endogeneity tend to underestimate the positive effect of this digital financial inclusion tool.

Keywords: financial inclusion; financial resilience; mobile money; endogenous treatment.

1. Introduction

The importance of an inclusive financial sector is widely known in the international development community and is perceived with priority in many countries (Belayeth et al., 2019). In one of its communiqué, the G20 agreed to take the financial inclusion agenda forward and to assist countries, policymakers and stakeholders in focusing global efforts on measuring and sustainably tracking progress on access to financial services globally (Allen et al. 2016). Because financial exclusion captures a situation where there are individuals whose marginal benefit from accessing and using financial services exceeds the marginal cost, but who are excluded by barriers, many developing countries have publicly committed to promoting financial inclusion by establishing a National Financial Inclusion Strategy (Tomilova and Myra, 2018). These comprehensive public documents – that present a strategy developed at the national level to systematically accelerate the level of financial inclusion, have gained a great deal of traction in recent years and are becoming an increasingly common policy approach of many developing countries (AFI, 2015).

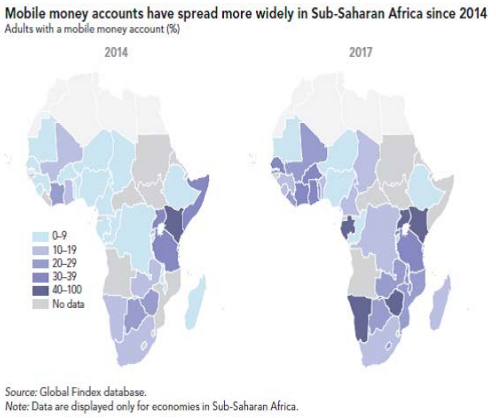
With financial inclusion, policy-makers hope that access to formal financial services will allow poor and low-income households in low and middle-income countries to enhance their welfare, grasp opportunities, mitigate shocks and ultimately escape poverty. In Sub-Saharan Africa (SSA), the advent and rapid adoption of mobile money in both urban and rural areas, as well as the widespread availability of mobile phones[1] among the unbanked make mobile money-driven financial inclusion a significant component of these strategies[2].

The 2017 Global Findex report reveals that Sub-Saharan Africa is the only region in the world where the share of adults with a mobile money account exceeds 10%. According to this report, within this region, the number of adults with a financial institution account has risen by a modest 4 percentage point since 2014, while the share with a mobile money account has grown roughly twice as fast – increasing by 9 percentage point. As highlighted in Figure 1 below, this increase differs widely across countries. In Cameroon for instance, the percentage of adults with a mobile money account has increased by 17.7 percentage point between 2014 and 2017.

[1] According to GSMA (2018), mobile phone adoption in the region has grown rapidly in recent years; overall subscriber penetration reached 44% in 2017, up from just 25% at the start of this decade.

[2] We downloaded the National Financial Inclusion Strategies of some SSA countries from the World Bank's National Financial Inclusion Strategies Resource Center and performed a basic content analysis by highlighting the number of times "mobile money" or related expression was used.

Figure 1: Adults with a mobile money account, SSA



Flood et al. (2013) argue that mobile money services form a crucial link to the formal economy in developing countries for consumers by increasing levels of financial inclusion and overcoming inefficiencies of the financial infrastructure system. But, as the World Bank has noted in its 2014 report on global financial development, financial inclusion does not mean increasing access for the sake of access (World Bank, 2014).

This brings us to the crucial question as to whether financial inclusion promotes people's financial resilience ability. Defined by Global Findex as the ability to come up with an emergency fund of 1/20 of GNI per capita in local currency within a short period to face adverse shocks[3], financial resilience also refers to the ability to maintain spending and living standards during an economic emergency (Klapper, 2019). Consistent with the two previous definitions, Marjolin et al. (2017) go on to argue that financial resilience is ultimately about people's ability to access and draw on internal capabilities and appropriate, acceptable and accessible external resources and supports in times of financial adversity. According to the World Bank, inclusive financial systems provide individuals with greater access to resources to meet their financial needs such as saving for retirement, investing in education, capitalizing on business opportunities or confronting shocks (World Bank, 2014).

While acknowledging its importance, Demirgüç-Kunt et al. (2018) remind us that financial inclusion is not an end in itself but rather a means to an end. These authors argue that when people have a safe place to save money as well as access to credit when needed, they are better able to manage financial risk. Furthermore, Buckland (2018) goes so far as to suggest that finances need to be constructed to build financial resilience, not the other way around. Therefore, mobile money-driven financial inclusion needs to improve people's ability to face adverse shocks significantly. The quantitative empirical work on mobile money-driven financial inclusion falls into two categories. Studies which assess the determinants of mobile money adoption where proxies for financial inclusion via mobile money (account ownership and/or account usage) are the dependent variables (Allen et al., 2016; Wale & Makina, 2017; Chikalipah, 2017) and studies of the effects of mobile money-driven financial inclusion on microeconomic outcomes, where access to and/or usage of mobile money is not the dependent variable. Examples of the latter include whether mobile money promotes improved risk-sharing, food security, consumption, business profitability, saving, effective use of cash transfers, payments and microbusiness investment for low-income people (Apiors & Suzuki, 2018; Jack & Suri, 2014; Riley, 2018; Suri et al., 2012; Blumenstock et al., 2015; Suri & Jack, 2016; Morawczynski, 2009; Morawczynski & Pickens, 2009; Munyegera & Matsumoto; 2016a; Aker et al., 2016).

Previous studies tackling the question of whether mobile money-driven financial inclusion increases financial resilience in SSA, have mostly focused on how mobile money account ownership/use affects people's consumption when they experience a negative income shock and people's response to health shocks. Looking at the impacts of mobile money in Kenya, Jack & Suri (2014) found that households with M-PESA are better able to smooth risks, and their consumption is less sensitive to shocks. In a complementary work, Suri et al. (2012) look specifically at how M-PESA affects people's response to health shocks. They find that M-PESA users are able to spend more on medical expenses in the event of a health shock while also increasing expenses on food and maintaining their education expenditure. Nonuser households or households far from agents are unable to increase expenditure on food after the shock, decrease their nonfood subsistence expenditure, and might pull children out of school to finance health care costs. Riley (2018) examined the impact of mobile money on consumption after a rainfall shock such as flood or

[3] In 2017, Cameroon's GNI per capita in constant LCU was 637252 FCFA. 1/20 of such an amount is therefore 31862 FCFA.

drought in Tanzania and found that after a village-level rainfall shock, it is only users of mobile money who are able to prevent a drop in their consumption.

Despite this growing body of studies, Jana Hamdan's interesting review of the recent literature on the impact of mobile money in developing countries (Hamdan, 2019) reveals that very little is known as to how mobile money affects people's ability to face negative shocks by coming up with an emergency fund. Additionally, previous studies have mostly focused on advanced mobile money markets such as Kenya, Uganda, and Tanzania. Whether mobile money-driven financial inclusion promotes people's financial resilience ability in an emerging mobile money market such as that of Cameroon is not well understood.

Therefore, the objective of this study is to increase our understanding of the role of mobile money in the financial inclusion-financial resilience nexus in Sub-Saharan Africa by focusing on the case of Cameroon. It draws on and extends the financialization of the everyday theory (Roy, 2010; Van der Zwan, 2014), and tries to look at how access to mobile money affects people's ability to face negative shocks by coming up with an emergency fund in due time.

The everyday financialization is an important lens to assess financial inclusion interventions because it focuses on the vulnerabilities of ordinary people, people who only recently have been brought into the financial world (Buckland, 2018). Van der Zwan (2014) argues that the financialization of the everyday has facilitated the decline of the welfare state that previously provided "cradle to grave" services and has linked vulnerable people with capital markets in order to enable them to protect themselves from life's uncertainties. The author also argues that innovation and extension of information technology have enabled finances to reach the everyday level. One of the most exciting innovations in this regard is mobile money technology (Klapper, 2019). The everyday styled financialization, like that associated with Bangladesh-inspired microcredit or more recently with digital loans accessed and delivered through mobile phones, democratizes capital and, by extension, human well-being and development (Roy, 2010). But since financialization of the everyday theory does not provide a framework to assess the impact of the increase of finances in daily life on human well-being, what is needed for this is a theory of human well-being.

Following Buckland (2018), this study extends the everyday financialization theory by drawing on the human capabilities approach of Sen (1999) and Nussbaum (2006). Financialization proponents may argue that more finances in daily life – *through the expanding availability of financial products and the growing demand for them* – is better, but scholars of human well-being understand that financialization is only a means but that the end is human improvement. As Sen (1999) and Nussbaum (2006) go on to argue that improved well-being is about removing obstacles that constrain people from achieving their capabilities, Klapper (2019) reminds us that alongside the global poor is a much larger group of people who are just an emergency away from the poverty line. For them, the importance of an inclusive financial system is closely related to its ability to ensure that they get more of the money that they need when they need it. That is, when they are facing an economic emergency that can push them and their families into destitution.

In terms of political economic theory, this study is rooted in a reform market approach (Buckland 2018). That is to say, given that markets are currently the most prominent way to organize the economy but often fail to deliver on important human outcomes, a strong state and civil society response is needed. Financial exclusion falls within this configuration since it captures a situation where there are individuals whose marginal benefit from accessing and using financial services exceeds the marginal cost, but who are excluded by barriers (Allen et al. 2012). When market failure occurs, governments often step in to directly or indirectly provide services, or to change the behavior of businesses and individuals through regulation. Mobile money-driven financial inclusion interventions can therefore be seen as a reformist process driven primary by the state and inter-state actors that seek to bring financially excluded people into the formal system to foster their financial well-being.

The rest of the paper is structured as follows. In the next section we provide insights on mobile money services and distribution channels in Cameroon. In Section 3, we provide an in depth description of how our two concepts of interest (*financial resilience ability* and *mobile money-driven financial inclusion*) were computed and follow this with a discussion of our empirical framework in Section 4. In Section 5 we present our results, and we conclude in Section 6.

2. Mobile Money Services and Distribution Channels in Cameroon

The mobile money revolution that started in Kenya in 2007 with the launch of M-PESA is now spreading worldwide, and Cameroon is no exception. In December 2009, the country's leading money transfer operator - Express Union, launched the first

mobile money service in the country. About 10 years later, Cameroon has five active mobile money providers who compete nationwide. While banks and some microfinance institutions (MFIs) can directly request an authorization from the central bank authority to issue electronic money via cellphone (mobile money), Telco operators can only offer financial services by partnering with a commercial bank. Telco e-money providers in the CEMAC are therefore required to make reference to the name and logo of their partnering bank in any advertising concerning e-money activities. For instance, Orange must mention the name and logo of BICEC when advertising their mobile money service, while MTN is requested to mention the name and logo of Afriland First Bank.

Like in any other market, money transfer facilities are the most common service offered by mobile money providers alongside airtime pop-up. Coming in various types, these service enable people to transfer resources across a wider and more diverse network within the country and even above. In a typical P2P mobile money transfer, the amount is instantly transferred from the sender's account to the receiver's account and a short SMS is sent to both parties, indicating the amount of money transferred, the transaction reference identity as well as the new balance. In addition to using mobile money account to top up airtime, providers offer a wide range of payment facilities. Account holders can pay utility bills, products and services for selected providers as well as tuition fees. These various payment facilities make life simple as it enables consumers to save time and money.

Table 1: Mobile money providers and services

	Money Transfer	Payment Facilities	Savings Facilities	Insurance Facilities	Credit Facilities	ROSCA Facilities
Orange Money	Yes	Yes	Wealth Storing	Yes	No direct facilities	Orange Tontine; Small business partner
MTN Mobile Money	Yes	Yes	Wealth Storing	No	No direct facilities	No direct facilities
EU Mobile Money	Yes	Yes	Wealth Storing	No	No direct facilities	No direct facilities
YUP	Yes	Yes	Wealth Storing	No	No direct facilities	No direct facilities
Nexttel Possa	Yes	Yes	Wealth Storing	No	No direct facilities	No direct facilities

Despite the fact that mobile money providers in Cameroon are yet to offer interest-earning savings, they do offer a default solution to consumers that consists of storing wealth by depositing money in their mobile money accounts. Defining savings as simply having a balance of funds in one's mobile money account, the large agent network in both urban and rural areas makes it easy for account holders to save at their best convenience and to withdraw their savings whenever needed - provided that the regulatory ceilings are respected.

Some mobile money providers enable account holders to perform insurance-related operations right from their mobile phones. Such operations include insurance subscription, payment of the premium, and perception of damages. Orange Money (OM) account holders even perform their ROSCA/Savings Group activities – provided that the Association is duly registered and has opened and has fulfill Orange Cameroon requirements. Furthermore, customers using OM to manage small lucrative or fundraising activities in their local communities for friendly / family manifestations (event, tontines), can take advantage of Orange's small business partner offer. While with a classic OM account there is a maximum number of transfers and withdrawals per period (5/day; 15/week; 40/month), the small business partner feature makes it possible for account holders to bypass this restriction at a special pricing.

Mobile money rely on widespread availability of mobile phones and networks of agents to allow people to access financial services right from their cellphones. CGAP's CEO Greta Bull reminds us that technology and distribution are one of the four factors that are changing the landscape for financial inclusion. To access digital financial services, access to a mobile connection is important, but it is equally important to be able to convert cash to digital money and, at least for now, back into cash again. So mobile phones have been important in places like Kenya, but the real game changer has been the emergence of large and well-functioning agent networks. Until accounts are more widely available or people are willing to accept the leap into purely digital money, agents will remain a fact of life.

Cameroon has a relative well-functioning agent network made of local shops, MFIs, petrol stations, restaurants, mobile money kiosks and money transfer operators (MTOs). While some MFIs offer their own money transfer service, they have also partnered with mobile money providers to enable people to perform mobile money transactions in their branches. The Case of ACEP Cameroon offering both Orange money and MTN MoMo services is very relevant as this MFI has its own money transfer service – ACEP Cash. The case of Express Union too is of interest as this MTO offers both its mobile money service –EU Mobile Money – as well as that of Société Générale Cameroon–YUP. Other MTOs such as Express Exchange offers both Orange money

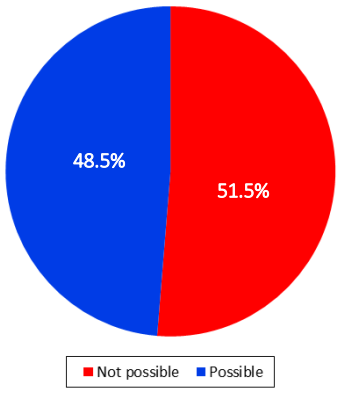
and MTN MoMo services in addition to their own basic services.

These large distribution networks are the backbone of the mobile money technology as agents perform crucial tasks such as onboarding, supporting and educating thousands of customers on a daily basis. They also enable account holders to convert physical cash to digital value (cash-in) and, at least for now, back into cash again (cash-out). During the laps of time separating the cash-in and cash-out phases, the interface customers use to initiate transfers and payments directly on their mobile handsets (also known as the technical access channel), plays a crucial role too (GSMA, 2015). In Cameroon, while for some mobile money providers such as YUP, consumers can only access their services via an interface that displays solely on smartphones, others manage to enable both consumers with basic feature phones and smartphones to access their services.

3. Computing financial resilience ability and mobile money-driven financial inclusion

To better understand how financially resilient people around the world are to unexpected shocks, the 2017 Global Findex survey asked respondents whether or not it would be possible to come up with an amount equal to 1/20 of gross national income (GNI) per capita in local currency within the next month. Thus, to compute financial resilience ability, we use the question: *"Now, imagine that you have an emergency and you need to pay [1/20 of GNI per capita in local currency]. Is it possible or not possible that you could come up with [1/20 of GNI per capita in local currency] within the NEXT MONTH?"* On average, 48.5 percent of adults in the sample reported that it is possible to come up with such an amount in due time.

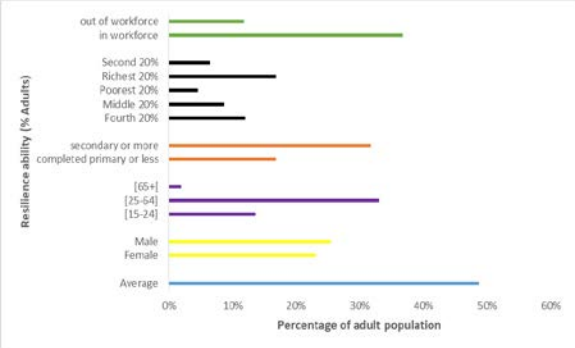
Figure 2: Financial resilience ability, Cameroon



***Source**: Built from the 2017 GWP survey dataset*

Not surprisingly, there is enormous variation in the financial resilience ability between individuals in the highest within-country income quintile (16.8%) and those in the lowest income quintile (4.5%). The ability to face an adverse shocks by coming up with an emergency fund seems to increase sharply with employment status. The share of adults in the workforce who say they could cover an emergency expense (36.8%) is three times higher than the share of those out of workforce who said so (11.7%).

Figure 3: Financial resilience abilities, by individual characteristics



***Source**: Built from the 2017 GWP survey dataset*

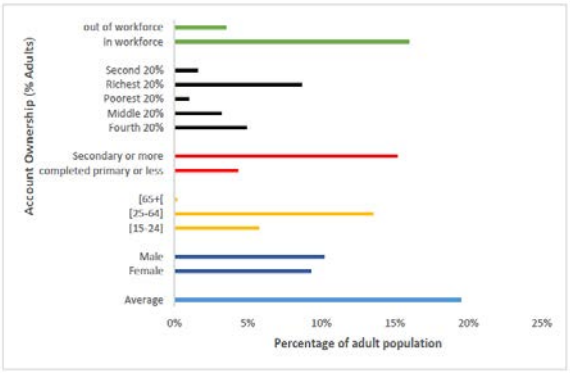
Adults between the ages of 25 and 64 are more likely to report that they could cover an emergency expense in due time. Even though the share of men who say they could come up with an emergency fund is higher than the share of women, the financial resilience gender gap is not that important here as compared to other countries.

In this study, the concept of *mobile money-driven financial inclusion* is used to emphasize the crucial role of mobile money in the process by which financially excluded people in Sub-Saharan Africa become integrated into the mainstream financial system for all of their financial service needs. The importance of mobile money can be captured by simply highlighting the number of times this word appears in the national financial inclusion strategies documents of countries who have established one. It can also be captured by looking at the share of adults with a mobile money account as compared to that of those with a financial institution account. To compute mobile money account ownership, we rely on the question: *"An account can be used to save money, to make or receive payments, or to receive wages or financial help. Do you, either by yourself or together with someone else, currently have an account at a bank or another type of formal financial institution? Yes or no?"*

At the country level, answers to this question where recorded in such a way that one could clearly distinguish mobile money accounts from financial institution accounts. On average, 19.5 percent of adults in our sample report having a mobile money

account and for 9% of the overall sample, mobile money is their only account. Not surprisingly, there is some kind of variation in account penetration between individuals in the high within-country income quintile (8.7%) and those in the lowest income quintile (1%). Mobile money account ownership increases sharply with the employment status. Individuals in the workforce (16%) are almost five times as likely to own a mobile money account as individuals who are out of workforce (3.5%).

Figure 4: Mobile money account ownership, by individual characteristics



***Source**: Built from the 2017 GWP survey dataset*

Furthermore, we find that in our sample, 10.2 percent of men report having a mobile money account, compared with 9.3 percent of women. Adults with a secondary education and more (15.2%) are, on average, almost four time as likely to have a mobile money account as those with a primary education or less (4.4%). Finally, adults between the ages of 25 and 64 are more likely to report having a mobile money account (13.6%) than younger adults (5.8%) and those aged 65 and over (0.2%).

Cameroon therefore offers an interesting opportunity to better understand how this financial inclusion tool which has gained a great deal of traction affects the financial resilience ability of individuals living in emerging mobile money markets.

4. Methods

In this study, we use the 2017 Global Findex survey, and we focus on the 1,000 representative sample randomly collected from the civilian and non-institutionalized population aged 15 and above in Cameroon from February 21 to March 7, 2017. To examine the role of mobile money in the nexus between financial inclusion and financial resilience in Cameroon, we, first of all, rely on the following probit model:

$$\mathbf{Y_i = a + bM_i + cI_i' + dF_i' + u_i}$$

Where: Y_i, a dichotomous outcome variable capturing financial resilience ability as defined earlier in this paper. M_i is a dummy variable indicating whether or not respondent i have a mobile money account. I_i' is a vector representing a set of variables describing each respondent i, precisely his gender, age, educational attainment, employment status, income status and dummy variable that takes the value 1 if the respondent mentioned that he holds a financial institution account (**see annex 1**). F_i' is a vector representing respondents' savings and borrowing behaviors and u_i, the error term which is assumed to follow a Normal distribution.

We examined whether parameter **b** is statistically significantly different from zero. Since individuals may self-select[4] themselves as owning a mobile money account, variable **M** may be endogenous. Account holders may be people who naturally have an affinity toward adopting new products quickly. Furthermore, it may be the case that not all the variables common to both mobile money adoption and financial resilience ability are observables. For example, participants with mobile money account may be people who are more kind to maintaining informal social networks from which they can draw upon during adverse events, or may be more prompt to pledging future labor in return for advance wages when times are tough.

Running an IV regression would have been a good approach to account for the endogeneity of mobile money adoption, but we did not find a good instrument in the Global Findex dataset. As a result, we employed a treatment-effects model that controls for endogeneity using a control-function approach[5] (Wooldridge, 2010). Endogenous treatment-effects models are appropriate whenever the conditional independence assumption is violated – due to the fact that not all variables that affect both treatment assignment and outcomes are observables.

The treatment-effects model adopted in this study is estimated with Stata 15 through ***eteffects*** commands. The "***aequations***" option is included in the *eteffects* syntax to report the coefficients of the treatments and outcome models. Like any other treatment-effects model, estimators implemented in *eteffects* properly deal with the fundamental appraisal problem that arises from the impossibility of observing what

[4] The presence of selec²tion-bias is verified by checking if there is a significant difference between the treated and the controlled groups. Results of the two-sample t-test are presented later on.

[5] This method controls for endogeneity by including the residuals from the treatment-assignment model as a regressor in the models for the potential outcomes.

would have happened to a given person in a situation where they have access to mobile money and in the situation where they do not. But, unlike standard treatment-effects models, *eteffects* regressions control for endogeneity and can thus be used to consistently estimate the average treatment effect (ATE), the average treatment effect on the treated (ATET) as well as the potential-outcome means (POMs) under observable and unobservable selection.

The endogenous treatment-effects model is given by:

$$y_{i0} = E(y_{i0}|X_i) + \varepsilon_{i0} \quad (1)$$

$$y_{i1} = E(y_{i1}|X_i) + \varepsilon_{i1} \quad (2)$$

$$t_i = E(t_i|Z_i) + v_i \quad (3)$$

$$y_i = t_i y_{i1} + (1 - t_i) y_{i0} \quad (4)$$

$$E(\varepsilon_{ij}|x_i, z_i) = E(\varepsilon_{ij}|z_i) = E(\varepsilon_{ij}|x_i) = 0 \quad (5)$$

$$E(\varepsilon_{ij}|t) \neq 0 \quad (6)$$

$$for\ j \in \{0,1\}$$

Where the subscript i denotes the individual level observations, y_{i1} is the potential outcome of receiving the treatment, y_{i0} is the potential outcome when the treatment is not received, t_i is the observed binary treatment, and y_i is the observed outcome. Each one of the potential outcomes is determined by its expected value conditional on a set of regressors X_i and an unobserved random component ε_{ij}, for $j \in \{0,1\}$. Similarly, the treatment is given by its expectation conditional on a set of regressors Z_i, which does not need to differ from X_i and an unobserved component v_i (**see annex 1**).

While equations (1)-(5) describe the parametric treatment-effects model, equation (6) adds endogeneity to the framework. It states that the unobservables in the potential-outcome equations are correlated to treatment status. Equations (3), (5), and (6) are the basis of the control-function estimator implemented by eteffects. Equation (5) states that the unobserved components in the potential outcome are independent of z_i. As a result, the correlation between t_i and the unobserved components must be equivalent to the correlation between ε_{ij} and v_i. Equation (3) is fitted using a probit estimator and $\widehat{v_i}$ is obtained as the difference between the treatment and our estimate of $E(t_i|Z_i)$ and use the statistic to compute an estimate of $E(y_{ij}|x_i, v_i, t_i)$ $for\ j \in \{0,1\}$. Since our outcome model is set to be linear, we can write it as follow:

$$\boldsymbol{E(y_{ij}|x_i, v_i, t_i = j) = x_i'\beta_{1j} + v_i\beta_{2j},\ j \in \{0,1\}} \quad (7)$$

The parameters of equations (3) and (7), and the ATE, ATET are estimated using the generalized method of moments (GMM). The moment equations used in GMM are the sample analogs of $E\{w_i'\epsilon_i(\theta)\} = 0$, where w_i are the instrument, $\epsilon_i(\theta)$ are residuals, and θ the parameters of the model. The moment conditions in the GMM estimation are given by:

$$\frac{1}{n}\sum_{i=1}^{n} x_i'(y_i - x_i'\widehat{\beta_{1j}} + \widehat{v_i}\widehat{\beta_{2j}})t_i = 0 \quad (8)$$

$$\frac{1}{n}\sum_{i=1}^{n} x_i'(y_i - x_i'\widehat{\beta_{1j}} + \widehat{v_i}\widehat{\beta_{2j}})(1 - t_i) = 0 \quad (9)$$

$$\frac{1}{n}\sum_{i=1}^{n} z_i'\left\{t_i\frac{\emptyset(z_i'\hat{\pi})}{\Phi(z_i'\hat{\pi})} - (1 - t_i)\frac{\emptyset(z_i'\hat{\pi})}{1 - \Phi(z_i'\hat{\pi})}\right\} = 0 \quad (10)$$

$$\frac{1}{n}\sum_{i=1}^{n}\{(x_i'\beta_{10} + \widehat{v_i\beta_{20}}) - \widehat{POM0}\} = 0 \quad (11)$$

$$\frac{1}{n}\sum_{i=1}^{n}\{(x_i'\beta_{11} + \widehat{v_i\beta_{21}}) - \widehat{POM0} - \widehat{ATE}\} = 0 \quad (12)$$

$$\frac{1}{n}\sum_{i=1}^{n}\left\{(x_i'\beta_{11} + \widehat{v_i\beta_{21}})\frac{n}{n_t} - \widehat{POM0}\frac{n}{n_t} - \widehat{ATET}\right\} = 0 \quad (13)$$

Where $\widehat{v_i} = t_i - \Phi(z_i'\hat{\pi})$, n, the number of observations, and $\widehat{\beta_{11}}$, $\widehat{\beta_{10}}$, $\widehat{\beta_{21}}$, $\widehat{\beta_{20}}$, $\hat{\pi}$, $\widehat{ATE}$ $\widehat{ATET}$ $\widehat{POM0}$ are the parameters.

5. Results

Before highlighting regression results, we provide some descriptive statistics as well as a comparison of our treatment and control groups in terms of the independent variables used in the econometric analysis.

Table 2: Descriptive statistics

Independent variables	Descriptive statistics (N=1000)	Treatment group (N=195)	Control group N=(805)	p-value (t-test)
Socio-economic characteristics				
Age	Mean: 33.3 SD: 14.46 Min:15 Max:84	Mean: 31.2 SD: 11.69 Min:15 Max:84	Mean:33.7 SD: 15.02 Min:15 Max:83	0.0113
Female	54.3%	47.69%	55.90%	0.0406
Primary educ	45.36%	22.16%	51%	0.0000
Second educ	52.52%	70.62%	48.12%	0.0000
Tertiary educ	2.12%	7.22%	0.88%	0.0010
Poorest 20%	15.1%	5.13%	17.52%	0.0000
Second 20%	18%	8.21%	20.37%	0.0000
Middle 20%	19.5%	16.41%	20.25%	0.2037
Fourth 20%	21.7%	25.13%	20.87%	0.2152
Richest 20%	25.7%	45.13%	20.99	0.0000
Fin_account	29.8%	53.85%	23.98%	0.0000
In workforce	71.2%	82.05%	68.57%	0.0000
Savings and borrowing patterns				
Saved	58.6%	81.54 %	53.04 %	0.0000
Borrowed	52.6%	66.15 %	49.32 %	0.0000

SD = standard deviation.

The two-sample t-test[6] performed on the 2017 Global Findex representative sample collected in Cameroon (N=1000) indicates that our treatment and control groups are significantly different along most indicators, though individuals from both groups who fall in the middle income quintile (16.41% versus 20.25%, p=0.2037) or in the second highest income quintile (25.13% versus 20.87%, p=0.2152) are not significantly different. While this unbalanced nature of the treatment and control groups with regards to the observables calls for the use of treatment-effects techniques, the Pearson chi-squared tests performed on a set of two-way tables to measure the association between the dependent variable (Financial resilience ability) and each independent variable reported in **annex.1** seems to legitimate the use of a logit or probit regression because of their ability to control for many variables simultaneously.

- **Results of the probit regression**

The results from the basic probit regression (which includes mobile money account ownership as the only regressor), as well as those from the full regression (where I' and F' are controlled for), show that the coefficient for mobile money is positive and significant at 1% level (**see annex 2**).

Furthermore, the average marginal effect of mobile money account ownership from the full probit reveals that a 1% increase in mobile money adoption leads to a 16.5 percentage point increase in the likelihood of being financially resilient (p = 0.000, $CI_{95\%}$ = 0.075 to 0.256). The results also demonstrate that better saving patterns indicate more financial resilience as respondents who set aside money in the past were more likely to be financially resilient than those who do not save. Unlike saving patterns, to have borrowed money from any source and for any reason in the past 12 months tend to decrease the likelihood of being financially resilient. Age squared was introduced as an explanatory variable alongside age to capture the effect at differing ages, rather than assuming the impact is linear for all ages. Our results suggest that while the impact of age on the likelihood of being financially resilient is positive and significant, this effect is lessoned as people get older.

Surprisingly, despite the presumption that female respondents would find it more challenging to come up with an emergency fund within a short period, gender has no significant effect on financial resilience ability. Both the regression coefficient and the average marginal effect for this variable are negative, but they are not significant even at 10% level. Our results also show that being in the workforce turn out to reduce the likelihood of being financially resilient by 1.14 percentage point, but this effect is not significant. Since for a given country, the workforce is often defined as the people engaged in or available for work, the negative impact of this variable on the probability of being financially resilient may be due to the preeminence of unemployed people who are actively seeking for a paying work on those who are employed.

- **Results of the treatment-effects regressions**

After conditioning on a set of observable covariates in the models for treatment assignment and the potential outcomes while allowing some remaining unobservable components to affect both the treatment assignment and the potential outcomes following the model specified in the previous section (**see annex 3**), results obtained reveal that when no one in the population has access to mobile money, the average ability of being financially resilient is 0.37.

Table 3: Endogenous treatment-effects estimation

Fin-resilience	Coef.	Robust Std. Err.	[95% Conf. Interval]
ATE mob_account (1 vs. 0)	0.746 **	0.32222	0.11523 1.37831
POmean mob_account (0)	0.372***	0.05408	0.26629 0.47830
ATET mob_account (1 vs. 0)	0.601**	0.26223	0.08746 1.11540
POmean mob_account (0)	0.099	0.26146	-0.41286 0.61205

Note:* = 1%, ** = 5%, * = 10% of significance. Outcome model: Linear. Treatment model: Probit. Number of observations: 992.

This average financial resilience ability (ATE) would have been 0.75 higher if all individuals adopted mobile money than if none of them did. The results also suggest that among mobile money adopters, the average ability of being financially resilient would have been 0.099 if none of these individuals owned a mobile money account. For the population of individuals who have access to mobile money, the average resilience ability is 0.601 higher than if none of these individuals owned a mobile money account.

As highlighted in the previous section, we included the *aequations* option to report the coefficients of the treatment and outcome models. While the TME1 section of the output displays the coefficients for the

[6] The Stata command ttest tests that an independent variable has the same mean within the two groups (in this case our treatment and control groups). diff = mean(**0**) - mean(**1**); if Pr(|T| > |t|) is ≤ 0.05, the null hypothesis (Ho: diff = 0) is rejected leading to the conclusion that there is a difference between sample means of the variable of interest (Ha: diff != 0).

treatment model, the OM0 and OM1 sections display coefficients of the outcome model for the untreated and treated groups respectively (**see annex 3**). The results attest that better saving patterns significantly increase the likelihood of being resilient during an economic emergency for both mobile money account holders and non-holders. Just like with the full probit regression, to have borrowed money from any source and for any reason in the past tend to decrease the likelihood of being financially resilient for both account holders and non-holders. This result can be explained by the fact borrowing to finance current needs or to face current shocks leads to an increase in debt-to-income ratio with detrimental effects on future indebtedness capacity. The coefficient of the outcome model related to gender reveals that in times of financial adversity, women will find it difficult to come up with an emergency fund – even though this coefficient is only significant for those without access to mobile money.

The control-function approach used in this study estimates the correlation between the unobservables of the treatment assignment and potential outcome models. If there is no correlation, then there is no endogeneity and estimating the average treatment-effects using propensity score matching, nearest neighbor matching, or inverse probability weighted regression adjustment would have been more accurate. We therefore perform a Wald test to determine whether the estimated relationship between treatment-assignment and the potential outcome models are different from zero using Stata *estat endogenous* post-estimation command. Result reveals that the unobservable factors that affect mobile money adoption also mediate financial resilience ability.

[chi2 (2) = 6.17; Prob > chi2 = 0.0458]

We then compared the endogenous treatment-effects with those obtained if we ignore the endogeneity of mobile money adoption. Despite the fact that different techniques were used – Propensity score matching (PSM), Nearest neighbor matching (NNM), and Inverse probability weighted regression adjustment (IPWRA) –, below we only highlight the ATE and ATET obtained using the IPWRA estimator[7]. Results of the other techniques are displayed in **annex 3**.

As shown in Table 4, the average treatment-effects obtained after conditioning on a set of observable covariates in the models for treatment assignment and the potential outcomes, while ignoring the endogeneity of the mobile money adoption assignment differ considerably from those reported in Table 3.

Table 4: teffects ipwra estimation

Fin-resilience	Coef.	Robust Std. Err.	[95% Conf. Interval]
ATE mob_account (1 vs. 0)	0.053	0.04012	-0.02467 0.13260
POmean mob_account (0)	0.475***	0.01765	0.44039 0.50957
ATET mob_account (1 vs. 0)	0.076*	0.04102	-0.00377 0.15705
POmean mob_account (0)	0.624***	0.02796	0.56958 0.67920

Note:* = 1%, ** = 5%, * = 10% of significance. Outcome model: Linear. Treatment model: Probit. Number of observations: 992.

Comparing results reported in these two tables, one can notice that both the average resilience ability when no one in the population have access to mobile money and the average resilience ability of the treated individuals if none of them owned a mobile money account are considerably higher when ignoring the presence of unobservables factors (0.47 vs. 0.37 and 0.62 vs. 0.09 respectively).

The comparison also reveals that the increase in the resilience ability due to mobile money adoption in the overall population as well as in the treated population is significantly higher when controlling for endogeneity (0.74 vs. 0.053 and 0.60 vs. 0.07 respectively). Thus, disregarding the endogeneity of mobile money adoption by ignoring the presence of unobservables tend to underestimate the positive effect of this digital financial inclusion tool.

6. Discussion and Concluding Remarks

The importance of financial inclusion is widely known in the international development community and is perceived with priority in many countries. In SSA countries, the advent and rapid adoption of mobile money, as well as the widespread availability of mobile phones among the unbanked, make mobile money-driven financial inclusion a significant component of National Financial Inclusion Strategies. While several studies have focused on mobile money in recent years, very few have examined the role of mobile money in the nexus

[7] The IPWRA estimator is a doubly robust estimator that combines the outcome modeling strategy of the regression adjustment (RA) estimator and the treatment modeling strategy of the inverse probability weighted (IPW) estimator. Although IPWRA requires us to build two models, this estimator has a remarkable property as the researcher only needs to specify one of the two models correctly.

between financial inclusion and financial resilience. Consequently, this study aimed to test the hypothesis according to which access to mobile money increases the likelihood of being resilient during an economic emergency.

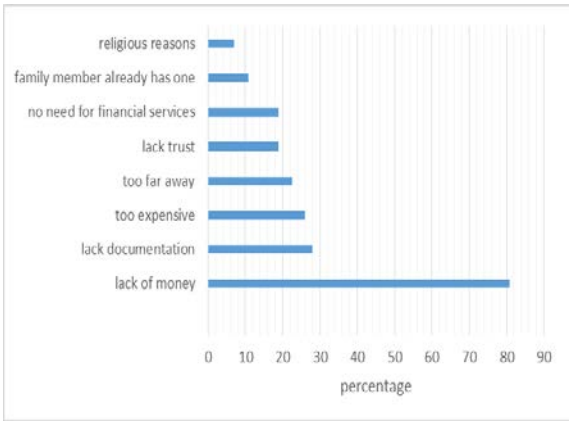
In summary, results from our econometric analyses show that access to mobile money increases the average ability of being financially resilient – that is the ability to maintain spending and living standard during an economic emergency (Klapper, 2019). This positive effect of mobile money is even higher when controlling for unobservable factors that jointly affect mobile money adoption and financial resilience ability.

These results are in line with some studies demonstrating that financial inclusion increases financial resilience (Belayeth et al, 2019; Buckland, 2018; Riley, 2018; Suri et al., 2012; Ramji, 2009; Jack and Suri, 2014). For instance, Suri et al. (2012) looked at how mobile money affects people's response to health shocks in Kenya and found that M-PESA users are able to spend more on medical expenses in the event of a health shock while also increasing expenses on food and maintaining their education expenditure. Nonuser households or households far from agents are unable to increase expenditure on food after the shock and decrease their nonfood subsistence expenditure. Jack and Suri (2014) found that non-M-PESA users see a 7-10 percent reduction in consumption in the event of a negative shock, while M-PESA users see a smaller reduction in consumption that is statistically indistinguishable from zero. They concluded that households with M-PESA are better able to smooth risks, and their consumption is less sensitive to shocks.

Our results also support the view of some scholars arguing that savings helps to decrease vulnerability through a protective function (accumulating savings to use in the event of a shock) and a promotive function (accumulating assets to reduce the likelihood that a shock will take place). In their paper "assessing the insurance role of micro-savings" Hulme et al. (2009) reported that those who save with formal or informal savings mechanisms are more likely to rely on savings in the event of an income shock, rather than reducing consumption, selling assets, borrowing, or increasing employment. Over half of adults in Sub-Saharan Africa save money but relatively few use formal methods such as banks or microfinance institutions to do so. In Cameroon for instance, far more adults use rotating savings and credit associations as well as what Global Findex categorizes as "other methods" which may entail saving cash at home, or buying livestock, jewelry, or real estate (Klapper et al., 2019). According to the 2017 Finscope consumer survey, some mobile money adopters often rely on their account to put aside money on a regular basis. Formal financial inclusion starts with having a bank or mobile money account. This foundation of financial inclusion is crucial as it may lead to noteworthy increases in savings and financial resilience.

Based on these results and the widespread availability of mobile phones among the unbanked in Cameroon - both in urban and rural areas-, we recommend that appropriate policies should be designed in other to reduce barriers to mobile money adoption. Computed data from the 2017 Global Findex reveals several barriers to having a mobile money or a bank account in Cameroon such as lack of documentation, distance, or lack of trust. Amongst the unbanked, about 80% reported that they perceive not having enough money as a barrier to having an account.

Figure 5: Barriers to financial inclusion, Cameroon



***Source**: Built from the 2017 GWP survey dataset*

As Allen et al. (2016) put it eloquently, it might be the case that these respondents don't have enough money to use what banking and mobile money services are currently offering - or what the respondents perceive to be available. Therefore, government policies to promote financial inclusion via mobile money should be related to a higher likelihood that individuals perceive that these financial services are within their reach.

Policy-makers should also concentrate on the importance of financial resilience for sustainable development and the ways that inclusive financial technology – such as mobile money – can get families more of the money that they need and when they need it. By significantly lowering the cost of moving money through social networks, the mobile

money technology is showing the way. As results reveal that better saving patterns lead to an increase in the likelihood of being resilient in times of financial adversity, policymakers and mobile money providers in Cameroon should focus on developing interest-earning mobile money based savings products – like MoKash in Uganda that allows users to save as little as UGX 50 (about 10 FCFA) and enables them to schedule savings to happen automatically on a daily, weekly or monthly basis.

Although our results provide some evidence in favor of mobile money-driven financial inclusion interventions in Cameroon with regards to their effects on people's financial resilience, this study presents some limits. First of all, we did not control for inactive mobile money accounts since we had no available data to capture account dormancy. This could have been another factor influencing people's ability to face adverse shocks by coming up with an appropriate emergency fund within a short period. While the section related to MOBILE and INTERNET of the 2017 Global Findex questionnaire – more precisely the question labeled as Fin13 – asked respondents about their mobile money accounts usage patterns, data related to this question where not reported in the individual-level dataset for Cameroon.

Focusing on mobile money access rather than usage may be an unpopular position as account dormancy is today's bogeyman of financial inclusion. While everyone knows the limits of looking only at access as a measure of financial inclusion (Soursourian, 2019), access remains an essential part of the financial inclusion equation as well as usage. Following Soursourian (2019), one could argue that the role of financial inclusion should be to expand the set of options available to people, so they are better positioned to achieve their goals. One such goal may be the willingness of staying out of poverty by relying on a mobile money account to access and draw on acceptable and accessible external resources and support in times of financial adversity.

It should have been important to also run an IV regression to account for the endogeneity of mobile money adoption and compare the results with those obtained by running an endogenous treatment effects model, but no valid instrument variable was found in the Global Findex dataset.

The study did not look at resilience strategies. Shifting the discussion from whether people are financially resilient to how they manage to achieve it may be an interesting starting point for future research. As the 2017 Findex pointed out, people use a wide range of strategies to come up with an emergency fund in due time. This includes self-resilience strategies (savings, money from working and sale of assets) but also resilience strategies that involve relying on others (family or friends, and borrowing). Understanding how access to mobile money affects the choice of these financial resilience strategies is critical to designing effective public policies and appropriate mobile money products that offer a wide range of accurate facilities to consumers.

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ANNEXES

Annex 1: Dependent and independent variables

Variables	Description	chi2 value (p-value)
Dependent variable		
Financial resilience	Dummy equal 1 if the respondent is able to come up with an emergency fund of 1/20 of GNI per capita in local currency within the next month.	-
Independent variables : Socio-economic characteristics		
Mob_ account	Dummy equal 1 if respondent reported to currently have a mobile money account	42.9713 (**0.000**)
Female	Dummy that takes the value 1 if the respondent is female and 0 otherwise	15.6509 (**0.000**)
Age	Age of the respondent in years	-
Age square	Age of the respondent in years, squared	-
Poorest 20%	Dummy that takes the value 1 if the respondent falls in the lowest income quintile and 0 otherwise. Income quintiles are based on the incomes of the respondents in a country.	26.7784 (**0.000**)
Second 20%	Dummy that takes the value 1 if the respondent falls in the second lowest income quintile and 0 otherwise.	11.4586 (**0.001**)
Middle 20%	Dummy that takes the value 1 if the respondent falls in the middle income quintile and 0 otherwise.	1.2276 (**0.268**)
Fourth 20%	Dummy that takes the value 1 if the respondent falls in the second highest income quintile and 0 otherwise.	5.4663 (**0.019**)
Richest 20%	Dummy that takes the value 1 if the respondent falls in the highest income quintile and 0 otherwise.	36.1840 (**0.000**)
Emp_in	Dummy that takes the value 1 if the respondent is in the workforce and 0 otherwise.	8.3574 (**0.004**)
Independent variables : Individuals' Socio-economic characteristics		
Primary educ	Dummy that takes the value 1 if the respondent completed elementary education or less and 0 otherwise.	44.7976 (**0.000**)
Secondary educ	Dummy that takes the value 1 if the respondent completed secondary education and some education beyond secondary education and 0 otherwise.	32.3977 (**0.000**)
Tertiary educ	Dummy that takes the value 1 if the respondent completed years of education beyond secondary school and 0 otherwise.	11.5774 (**0.001**)
Fin_ Account	Dummy equal to 1 if respondent reported to currently have a bank account at a formal financial institution-a bank, credit union, cooperative, post office, or microfinance institution.	54.5055 (**0.000**)
Independent variables : Savings and Credit patterns		
Saved	Dummy equal to 1 if respondent reported to have saved or set aside money in the past 12 months using a formal/informal financial method and 0 otherwise.	77.8099 (**0.000**)
Borrowed	Dummy equal to 1 if respondent reported to have borrowed money alone or together with someone else, from any source for any reason in the past 12 months and 0 otherwise.	2.0159 (**0.156**)

Note: The Pearson's chi-squared tests performed on a set of two-way tables in order to measure association between the dependent variable and each independent variable are reported in the last column. The results of the chi-squared tests seems to legitimate the use of a probit regression technique because of their ability to control for many variables simultaneously.

Annex 2: Probit regression outcome: --financial resilience ability

	Basic regression (mob_account ownership)	Basic regression + Financial institution account control	Basic regression + Fin_account + Individual characteristics	Basic regression + Fin_account + Financial behavior controls	Basic regression + Fin_account + indiv. characteristics + Financial behavior
Mob_account	0.2634834	0.2461506	0.1961862	0.2151827	0.1659531
	(0.02806)***	(0.03301)***	(0.04331)***	(0.03884)***	(0.04611)***
Other Financial inclusion variable					
Fin_account		0.1159214	0.0460892	0.0517315	-0.0071122
		(0.04239)***	(0.04447)	(0.04463)	(0.04378)
Individual characteristics variables					
Female			-0.0510816		-0.0534343
			(0.03608)		(0.03517)
Age			0.0182789		0.0160738
			(0.00622)***		(0.00622)***
Age squared			-0.0002103		-0.0001831
			(0.000076)***		(0.000077)**
Primary educ			-0.2758911		-0.2975064
			(0.12031)**		(0.11731)**
Second educ			-0.1632527		-0.1955951
			(0.10190)		(0.08854)**
Tertiary educ					
Poorest 20%			-0.07701		-0.1041789
			(0.05815)		(0.05468)*
Second 20%			-0.0271852		-0.0401796
			(0.05701)		(0.05583)
Middle 20%					
Fourth 20%			0.0514182		0.0275984
			(0.05611)		(0.05544)
Richest 20%			0.146019		0.1184212
			(0.05419)***		(0.05566)**
Emp_in			-0.0114198		-0.0474452
			(0.04076)		(0.04001)
Financial behavior variables					
Saved				0.2213851	0.2083274
				(0.04163)***	(0.04238)***
Borrowed				-0.0644657	-0.048382
				(0.03738)*	(0.03710)
Constant	0.4653774	0.4653606	0.4605294	0.4656437	0.4608576
	(0.01850)***	(0.01852)***	(0.01795)***	(0.01813)***	(0.01758)***
N	1000	1000	992	1000	992
Wald chi2	36.73 (1)	42.94 (2)	87.77 (12)	66.78 (4)	106.20 (14)
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0340	0.0417	0.0858	0.0704	0.1107

Note: Probit regressions. Standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10%. Dependent variable is a dummy equal to 1 if the respondent reported that he/she was able to come up with an emergency fund of 1/20 of GNI per capita in local currency within the next month. Coefficients are average marginal effects (dy/dx) and indicate the increase or decrease in percentage points of the likelihood of being financially resilient. The numbers in the parentheses in the Wald chi2 row indicate the degree of freedom of the Chi-square distribution.

Annex 3: Full treatment-effects model estimations

Endogenous treatment-effects estimation Number of obs = 992
Outcome model : linear
Treatment model: probit

Fin_resilience	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
mob_account (1 vs 0)	.74677	.3222202	2.32	0.020	.1152301	1.37831
POmean						
mob_account 0	.3722998	.0540862	6.88	0.000	.2662928	.4783068
TME1						
fin_account	.5437075	.1098537	4.95	0.000	.3283981	.7590168
Female	-.0373748	.1009062	-0.37	0.711	-.2351473	.1603976
Age	.0104457	.0227772	0.46	0.647	-.0341968	.0550882
Age2	-.0002541	.0002957	-0.86	0.390	-.0008337	.0003255
Primaryeduc	-1.127696	.3072798	-3.67	0.000	-1.729953	-.5254386
Secondaryeduc	-.7348193	.2971163	-2.47	0.013	-1.317157	-.1524821
inc_qpoorest20	-.78145	.1915412	-4.08	0.000	-1.156864	-.4060361
inc_qsecond20	-.7041397	.163347	-4.31	0.000	-1.024294	-.3839855
inc_qmiddle20	-.3754598	.1418847	-2.65	0.008	-.6535486	-.0973709
inc_qfourth20	-.2212174	.1316388	-1.68	0.093	-.4792247	.0367899
emp_in	.2711629	.1226619	2.21	0.027	.03075	.5115759
_cons	-.0853115	.4822846	-0.18	0.860	-1.030572	.8599489
OME0						
Female	-.088472	.0361337	-2.45	0.014	-.1592927	-.0176512
Age	.0142019	.005981	2.37	0.018	.0024795	.0259244
Age2	-.0001517	.0000733	-2.07	0.039	-.0002953	-7.98e-06
Primaryeduc	-.3172076	.1497062	-2.12	0.034	-.6106264	-.0237889
Secondaryeduc	-.2846867	.1280638	-2.22	0.026	-.5356872	-.0336862
inc_qpoorest20	-.1670002	.0740695	-2.25	0.024	-.3121736	-.0218267
inc_qsecond20	-.0811092	.0733205	-1.11	0.269	-.2248146	.0625963
inc_qmiddle20	-.0603555	.0646153	-0.93	0.350	-.186999	.0662881
inc_qfourth20	-.0709653	.0606978	-1.17	0.242	-.1899308	.0480001
emp_in	-.0681676	.0415785	-1.64	0.101	-.14966	.0133248
Saved	.2020317	.0372048	5.43	0.000	.1291115	.2749518
Borrowed	-.0586626	.0347051	-1.69	0.091	-.1266833	.0093582
_cons	.4689074	.2082574	2.25	0.024	.0607304	.8770844
OME1						
Female	-.0057213	.06371	-0.09	0.928	-.1305907	.119148
Age	-.021035	.0112013	-1.88	0.060	-.0429891	.0009192
Age2	.0003111	.0001324	2.35	0.019	.0000516	.0005706
Primaryeduc	.0527144	.230218	0.23	0.819	-.3985046	.5039333
Secondaryeduc	.1896068	.175939	1.08	0.281	-.1552273	.5344409
inc_qpoorest20	.3660789	.1610275	2.27	0.023	.0504709	.6816869
inc_qsecond20	-.0291098	.1593322	-0.18	0.855	-.3413952	.2831755
inc_qmiddle20	.0201786	.1158632	0.17	0.862	-.2069091	.2472663
inc_qfourth20	.2424776	.0948211	2.56	0.011	.0566317	.4283236
emp_in	.1744464	.0970947	1.80	0.072	-.0158557	.3647485
Saved	.1880788	.0877284	2.14	0.032	.0161343	.3600234
Borrowed	-.0004064	.0656991	-0.01	0.995	-.1291743	.1283615
_cons	.9480331	.3048443	3.11	0.002	.3505493	1.545517
TEOM0						
_cons	-.5301472	.2672609	-1.98	0.047	-1.053969	-.0063255
TEOM1						
_cons	-.6744041	.3922489	-1.72	0.086	-1.443198	.0943896

Endogenous treatment-effects estimation Number of obs = 992
Outcome model : linear
Treatment model: probit

Fin_resilience	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
mob_account (1 vs 0)	.6014361	.2622351	2.29	0.022	.0874648	1.115407
POmean						
mob_account 0	.0995949	.2614649	0.38	0.703	-.4128668	.6120566
TME1						
fin_account	.5437075	.1098537	4.95	0.000	.3283981	.7590168
Female	-.0373748	.1009062	-0.37	0.711	-.2351473	.1603976
Age	.0104457	.0227772	0.46	0.647	-.0341968	.0550882
Age2	-.0002541	.0002957	-0.86	0.390	-.0008337	.0003255
Primaryeduc	-1.127696	.3072798	-3.67	0.000	-1.729953	-.5254386
Secondaryeduc	-.7348193	.2971163	-2.47	0.013	-1.317157	-.1524821
inc_qpoorest20	-.78145	.1915412	-4.08	0.000	-1.156864	-.4060361
inc_qsecond20	-.7041397	.163347	-4.31	0.000	-1.024294	-.3839855
inc_qmiddle20	-.3754598	.1418847	-2.65	0.008	-.6535486	-.0973709
inc_qfourth20	-.2212174	.1316388	-1.68	0.093	-.4792247	.0367899
emp_in	.2711629	.1226619	2.21	0.027	.03075	.5115759
_cons	-.0853115	.4822846	-0.18	0.860	-1.030572	.8599489
OME0						
Female	-.088472	.0361337	-2.45	0.014	-.1592927	-.0176512
Age	.0142019	.005981	2.37	0.018	.0024795	.0259244
Age2	-.0001517	.0000733	-2.07	0.039	-.0002953	-7.98e-06
Primaryeduc	-.3172076	.1497062	-2.12	0.034	-.6106264	-.0237889
Secondaryeduc	-.2846867	.1280638	-2.22	0.026	-.5356872	-.0336862
inc_qpoorest20	-.1670002	.0740695	-2.25	0.024	-.3121736	-.0218267
inc_qsecond20	-.0811092	.0733205	-1.11	0.269	-.2248146	.0625963
inc_qmiddle20	-.0603555	.0646153	-0.93	0.350	-.186999	.0662881
inc_qfourth20	-.0709653	.0606978	-1.17	0.242	-.1899308	.0480001
emp_in	-.0681676	.0415785	-1.64	0.101	-.14966	.0133248
Saved	.2020317	.0372048	5.43	0.000	.1291115	.2749518
Borrowed	-.0586626	.0347051	-1.69	0.091	-.1266833	.0093582
_cons	.4689074	.2082574	2.25	0.024	.0607304	.8770844
OME1						
Female	-.0057213	.06371	-0.09	0.928	-.1305907	.119148
Age	-.021035	.0112013	-1.88	0.060	-.0429891	.0009192
Age2	.0003111	.0001324	2.35	0.019	.0000516	.0005706
Primaryeduc	.0527144	.230218	0.23	0.819	-.3985046	.5039333
Secondaryeduc	.1896068	.175939	1.08	0.281	-.1552273	.5344409
inc_qpoorest20	.3660789	.1610275	2.27	0.023	.0504709	.6816869
inc_qsecond20	-.0291098	.1593322	-0.18	0.855	-.3413952	.2831755
inc_qmiddle20	.0201786	.1158632	0.17	0.862	-.2069091	.2472663
inc_qfourth20	.2424776	.0948211	2.56	0.011	.0566317	.4283236
emp_in	.1744464	.0970947	1.80	0.072	-.0158557	.3647485
Saved	.1880788	.0877284	2.14	0.032	.0161343	.3600234
Borrowed	-.0004064	.0656991	-0.01	0.995	-.1291743	.1283615
_cons	.9480331	.3048443	3.11	0.002	.3505493	1.545517
TEOM0						
_cons	-.5301472	.2672609	-1.98	0.047	-1.053969	-.0063255
TEOM1						
_cons	-.6744041	.3922489	-1.72	0.086	-1.443198	.0943896

Treatment-effects estimation Number of obs = 992
Estimator : IPW regression adjustment
Outcome model : linear
Treatment model: probit

Fin_resilience	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
mob_account (1 vs 0)	.0539656	.0401243	1.34	0.179	-.0246766	.1326078
POmean						
mob_account 0	.4749867	.0176491	26.91	0.000	.4403951	.5095782
OME0						
Female	-.088017	.0340465	-2.59	0.010	-.154747	-.021287
Age	.0169213	.0055647	3.04	0.002	.0060147	.0278279
Age2	-.0001892	.000067	-2.83	0.005	-.0003204	-.000058
Primaryeduc	-.516796	.079281	-6.52	0.000	-.6721839	-.3614081
Secondaryeduc	-.4234786	.0784536	-5.40	0.000	-.5772449	-.2697124
inc_qpoorest20	-.2715565	.0523583	-5.19	0.000	-.3741769	-.1689361
inc_qsecond20	-.1819381	.0515445	-3.53	0.000	-.2829634	-.0809127
inc_qmiddle20	-.1279494	.0529116	-2.42	0.016	-.2316543	-.0242445
inc_qfourth20	-.127503	.0514093	-2.48	0.013	-.2282633	-.0267427
emp_in	-.0298792	.0370069	-0.81	0.419	-.1024114	.042653
Saved	.2124484	.0365469	5.81	0.000	.1408177	.2840791
Borrowed	-.0512937	.034677	-1.48	0.139	-.1192594	.0166721
_cons	.716207	.1320894	5.42	0.000	.4573166	.9750975
OME1						
Female	.0127843	.0683377	0.19	0.852	-.1211551	.1467237
Age	-.0129267	.0090533	-1.43	0.153	-.0306709	.0048174
Age2	.000199	.0000847	2.35	0.019	.0000329	.000365
Primaryeduc	-.2029434	.1271135	-1.60	0.110	-.4520812	.0461944
Secondaryeduc	-.0479109	.1077918	-0.44	0.657	-.2591789	.1633571
inc_qpoorest20	.1983621	.1246992	1.59	0.112	-.0460439	.442768
inc_qsecond20	-.2849596	.1295284	-2.20	0.028	-.5388306	-.0310887
inc_qmiddle20	-.1433364	.0965358	-1.48	0.138	-.332543	.0458702
inc_qfourth20	.1949797	.0929102	2.10	0.036	.0128792	.3770803
emp_in	.1194064	.0928364	1.29	0.198	-.0625497	.3013624
Saved	.358421	.085604	4.19	0.000	.1906403	.5262017
Borrowed	.1211812	.0661061	1.83	0.067	-.0083843	.2507468
_cons	.455478	.2535745	1.80	0.072	-.0415189	.9524749
TME1						
fin_account	.5437075	.1098537	4.95	0.000	.3283981	.7590168
Female	-.0373748	.1009062	-0.37	0.711	-.2351473	.1603976
Age	.0104457	.0227772	0.46	0.647	-.0341968	.0550882
Age2	-.0002541	.0002957	-0.86	0.390	-.0008337	.0003255
Primaryeduc	-1.127696	.3072798	-3.67	0.000	-1.729953	-.5254386
Secondaryeduc	-.7348193	.2971163	-2.47	0.013	-1.317157	-.1524821
inc_qpoorest20	-.78145	.1915412	-4.08	0.000	-1.156864	-.4060361
inc_qsecond20	-.7041397	.163347	-4.31	0.000	-1.024294	-.3839855
inc_qmiddle20	-.3754598	.1418847	-2.65	0.008	-.6535486	-.0973709
inc_qfourth20	-.2212174	.1316388	-1.68	0.093	-.4792247	.0367899
emp_in	.2711629	.1226619	2.21	0.027	.03075	.5115759
_cons	-.0853115	.4822846	-0.18	0.860	-1.030572	.8599489

Treatment-effects estimation Number of obs = 992
Estimator : IPW regression adjustment
Outcome model : linear
Treatment model: probit

Fin_resilience	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
mob_account (1 vs 0)	.0766374	.0410288	1.87	0.062	-.0037775	.1570523
POmean						
mob_account 0	.6243935	.0279646	22.33	0.000	.5695839	.6792031
OME0						
Female	-.0497418	.043242	-1.15	0.250	-.1344947	.035011
Age	.0194513	.0077326	2.52	0.012	.0042956	.0346069
Age2	-.0002097	.0000923	-2.27	0.023	-.0003907	-.0000288
Primaryeduc	-.5179118	.094102	-5.50	0.000	-.7023483	-.3334754
Secondaryeduc	-.393206	.0919321	-4.28	0.000	-.5733896	-.2130224
inc_qpoorest20	-.2768183	.064821	-4.27	0.000	-.4038651	-.1497714
inc_qsecond20	-.1705618	.0612489	-2.78	0.005	-.2906073	-.0505162
inc_qmiddle20	-.1539911	.062244	-2.47	0.013	-.2759871	-.0319952
inc_qfourth20	-.1639151	.0603976	-2.71	0.007	-.2822921	-.045538
emp_in	.0026708	.0493596	0.05	0.957	-.0940721	.0994138
Saved	.1900394	.0478215	3.97	0.000	.096311	.2837679
Borrowed	-.0386668	.0441908	-0.87	0.382	-.1252791	.0479455
_cons	.6293553	.1732645	3.63	0.000	.2897631	.9689475
OME1						
Female	-.0193832	.0593239	-0.33	0.744	-.1356558	.0968895
Age	-.0174157	.0101391	-1.72	0.086	-.0372879	.0024564
Age2	.0002553	.0001181	2.16	0.031	.0000238	.0004868
Primaryeduc	-.2545477	.1220842	-2.09	0.037	-.4938283	-.0152671
Secondaryeduc	-.0256645	.098377	-0.26	0.794	-.2184798	.1671508
inc_qpoorest20	.2113003	.1293511	1.63	0.102	-.0422232	.4648238
inc_qsecond20	-.18038	.13527	-1.33	0.182	-.4455043	.0847443
inc_qmiddle20	-.083183	.0907516	-0.92	0.359	-.2610529	.0946869
inc_qfourth20	.171657	.0700075	2.45	0.014	.0344448	.3088692
emp_in	.219968	.0910365	2.42	0.016	.0415398	.3983962
Saved	.2055404	.0890222	2.31	0.021	.0310601	.3800207
Borrowed	.0158698	.0640043	0.25	0.804	-.1095764	.141316
_cons	.6612398	.2464507	2.68	0.007	.1782053	1.144274
TME1						
fin_account	.5437075	.1098537	4.95	0.000	.3283981	.7590168
Female	-.0373748	.1009062	-0.37	0.711	-.2351473	.1603976
Age	.0104457	.0227772	0.46	0.647	-.0341968	.0550882
Age2	-.0002541	.0002957	-0.86	0.390	-.0008337	.0003255
Primaryeduc	-1.127696	.3072798	-3.67	0.000	-1.729953	-.5254386
Secondaryeduc	-.7348193	.2971163	-2.47	0.013	-1.317157	-.1524821
inc_qpoorest20	-.78145	.1915412	-4.08	0.000	-1.156864	-.4060361
inc_qsecond20	-.7041397	.163347	-4.31	0.000	-1.024294	-.3839855
inc_qmiddle20	-.3754598	.1418847	-2.65	0.008	-.6535486	-.0973709
inc_qfourth20	-.2212174	.1316388	-1.68	0.093	-.4792247	.0367899
emp_in	.2711629	.1226619	2.21	0.027	.03075	.5115759
_cons	-.0853115	.4822846	-0.18	0.860	-1.030572	.8599489

```
Treatment-effects estimation                    Number of obs      =        992
Estimator      : nearest-neighbor matching      Matches: requested =          1
Outcome model  : matching                                  min =          1
Distance metric: Mahalanobis                               max =          4
```

Fin_resili-e	AI Robust Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
mob_account						
(1 vs 0)	.0967742	.0479678	2.02	0.044	.002759	.1907894

```
Treatment-effects estimation                    Number of obs      =        992
Estimator      : nearest-neighbor matching      Matches: requested =          1
Outcome model  : matching                                  min =          1
Distance metric: Mahalanobis                               max =          4
```

Fin_resili-e	AI Robust Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
mob_account						
(1 vs 0)	.064433	.051618	1.25	0.212	-.0367364	.1656024

Notes: NNM does not use a formal model for either the outcome or the treatment status, but this flexibility comes at a price. When matching on more than one continuous covariate, the NNM estimator must be augmented with a bias-correction term.

```
Treatment-effects estimation                    Number of obs      =        992
Estimator      : propensity-score matching      Matches: requested =          1
Outcome model  : matching                                  min =          1
Treatment model: probit                                    max =          4
```

Fin_resili-e	AI Robust Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
mob_account						
(1 vs 0)	.1484375	.047597	3.12	0.002	.0551492	.2417258

```
Treatment-effects estimation                    Number of obs      =        992
Estimator      : propensity-score matching      Matches: requested =          1
Outcome model  : matching                                  min =          1
Treatment model: probit                                    max =          4
```

Fin_resili-e	AI Robust Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
mob_account						
(1 vs 0)	.0902062	.0511702	1.76	0.078	-.0100855	.1904979

Notes: PSM does not require bias correction, because it uses a model for the treatment. If the treatment model is reasonably well specified, PSM will perform at least as well as NNM.