Impact of mobile money on the economic empowerment of women in Benin

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ABSTRACT

The objective of this work is to analyze the impact of mobile money on the economic empowerment of women in Benin. To achieve this objective, we used data from FineScope (2018) on 3687 women in Benin. Descriptive statistics and a two-step Heckman model were used to first identify the determinants of mobile money adoption by women in Benin. Thus, the determinants of mobile money adoption are: age, having an account in a microfinance institution, level of education and area of residence. The second part of our work will show the effect of mobile money on women's empowerment in Benin. The results of this model reveal that the use of mobile money, income level and age increase the likelihood that women undertake an activity.

Furthermore, we used an instrumental variable model to correct for endogeneity and the results obtained are identical to the Heckman model.

The results of our estimates suggest making information technology infrastructure available to ensure network coverage and encourage women to adopt mobile money more.

1. Introduction

Mobile money is considered a mobile payment method that is nowadays an innovation in the fight against financial exclusion in developing countries, most of which are made up of a majority of rural populations. Through a mobile phone or smartphone, the individual can automatically make a purchase of goods and/or services, send or receive money or pay bills via the same channel and this without the requirement of a guarantee or formality to be completed (Nonvide & Alinsato, 2023). Mobile money refers to a means of exchange and savings through the use of mobile accounts[1].

By facilitating financial inclusion in West Africa, the number of registered accounts has increased by 27 % reaching 290 million in 2022 (Group Special Mobile Association, 2023). Furthermore, the value of mobile money transactions in West Africa is $11.49 billion in 2020 compared to $22.53 billion in 2021, an increase of 96 % between June 2020 and December 2021 (GSMA, 2022) .[2]

For reliable and equitable access to the use of financial services, information technologies have accelerated the use of these services in countries by facilitating financial inclusion (Abor et al., 2018; Ahmad et al., 2020; Ahmed & Cowan, 2021; Avom et al., 2023; Faton & Chabossou, 2021b, 2022; Ozili, 2018; Sanga & Aziakpono, 2022).

In Africa, mobile money has now become an important component of mainstream financial services in many countries. The number of registered accounts has increased from 350 million to 400 million in 2022 (GSMA, 2023). This increase in the number of mobile money accounts demonstrates the importance users place on having a mobile money account in carrying out many payment services. In sub-Saharan Africa, for example, data showed a 36 % increase in bill payments in 2022, according to the same source. The contribution of mobile money to the GDP of sub-Saharan African countries is 3.7 %, up from previous years, reaching more than $7 billion in 2023 (GSMA, 2024). The advent of mobile money has allowed more women to hold accounts, which contributes to reducing gender inequality in financial services. Thus, on average, women are as likely as men to use only a mobile money account in sub-Saharan Africa, while men are 12 % more likely than women to use a bank account or an account with another financial institution (GSMA, 2023). In East Africa, specifically in Kenya, mobile money services have experienced spectacular progress since 2007 with the advent of M-PESA, which has enabled the creation of a money account for more than 1.1 million Kenyans who use M-PESA services, and eight months after its creation, more than $8 million have been transferred (Safaricom, 2007).

In Benin, the number of mobile money accounts in 2015 was approximately 300,000, which increased to 8.5 million active mobile money accounts in 2022 (FAS, 2022) .[3] These statistics show that between 2015 and 2022 the number of mobile money accounts increased by more than 2000 %. This made it possible to reach a large number of people who do not have access to traditional financial services and to combat inequalities in access to the financial market in order to promote self-employment for women (Byukusenge et al., 2024).

Mobile money remains a key driver in achieving the United Nations Sustainable Development Goals (SDGs), particularly SDG 5, which is the promotion of gender equality (GSMA, 2023). Faced with this high rate of connection in the population, gender inequality and poverty remain a challenge for developing countries in order to achieve inclusive development. Indeed, gender inequality in Africa is 51.29 % in 2015 and 54.37 % in 2022; a gap of more than 6 % between 2015 and 2022 (UNDP, 2023) .[4] These statistics show the importance for African countries to integrate policies to reduce gender inequalities into the objectives.

In Benin, data shows that the gender inequality index is on average 65 % between 2015 and 2022 (UNDP, 2023) which shows a strong disparity between men and women in all sectors. On this basis, the literature has emphasized mobile money as a factor in reducing gender inequalities in general and in particular the promotion of self-employment of women in the countries (GSMA, 2023) and this by promoting gender financial inclusion. Furthermore, mobile can reduce gender inequalities by reducing poverty (Djahini-Afawoubo et al., 2023; Islam et al., 2022; Suri & Jack, 2016). Mobile money can also reduce gender inequality by facilitating financial inclusion (Asongu et al., 2024; Demirgüç-kunt et al., 2020; Kim, 2022). By promoting women's empowerment, mobile money reduces inequality within society (Byukusenge et al., 2024; Faton et al., 2025; Hossain & Samad, 2021).

Empirical evidence has shown the role of mobile money in sustainable development (Nonvide, Faton, & Marlyse, 2025). Thus, mobile money is a channel for poverty reduction (Faton & Chabossou, 2024b; Islam et al., 2022; Jiang et al., 2021) by also increasing household consumption (Faton & Chabossou, 2024a). By facilitating financial inclusion, mobile money can help promote entrepreneurship, especially among women, which is a source of self-employment (Byukusenge et al., 2024; Hossain & Samad, 2021). These different effects can contribute to reducing inequalities in society by promoting women's empowerment. The work showing the role of mobile money in women's empowerment is new in the literature.

To this end, our work contributes to the growing literature on the effect of mobile money adoption on reducing gender inequalities through women's empowerment in developing countries. As we do not have a significant literature on how mobile money will reduce inequalities, the case of Benin is special for us to carry out additional work. Our work represents the very first in Benin and differs from the work of Dorfleitner and Nguyen (2024) who did the same work but with a panel of countries ignoring the effect at the level of each country or the countries in the sample are not from the same area. Our work stands out from the literature because the majority of work on women's empowerment and mobile money focuses most on improving women's financial management (Amoah et al., 2020; Kim, 2022; Myeni et al., 2020) which is not the only indicator of empowerment. We are building a composite index to capture women's empowerment.

Methodologically, our research will demonstrate the impact of mobile money on promoting self-employment in Benin. To do this, we estimated a Heckman model to capture the socioeconomic variables that contribute to the adoption of mobile money in Benin. Second, we used the instrumental variable model to correct the endogeneity of the mobile money variable to estimate the impact of mobile money on reducing inequality through self-employment in Benin.

The remainder of this work is organized as follows: section 2 presents the literature review, section 3 the conceptual framework, section 4 the methodology, the presentation and discussion of the results in section 5 and finally the conclusion.

2. Literature review

Empirical work on the role of digital financial inclusion in reducing gender inequality has mostly been based on women's empowerment. Arshad (2023) in his study on women's empowerment in developing countries concluded that the more access women have to financial inclusion, the more entrepreneurial they become. He goes further by showing that gender inequality negatively affects women's empowerment in developing countries. As for Mabrouk et al. (2023) financial inclusion through financial technology (FiTech) is a source of women's empowerment and therefore contributes to reducing gender inequality in Saudi Arabia. Equitable access to financial services increases women's capacity in decision-making on poverty reduction (Chiapa et al., 2016; Moghadam &

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[3] https://data.imf.org/en/datasets/IMF.STA:FAS.
[4] https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index#/indicies/GII.
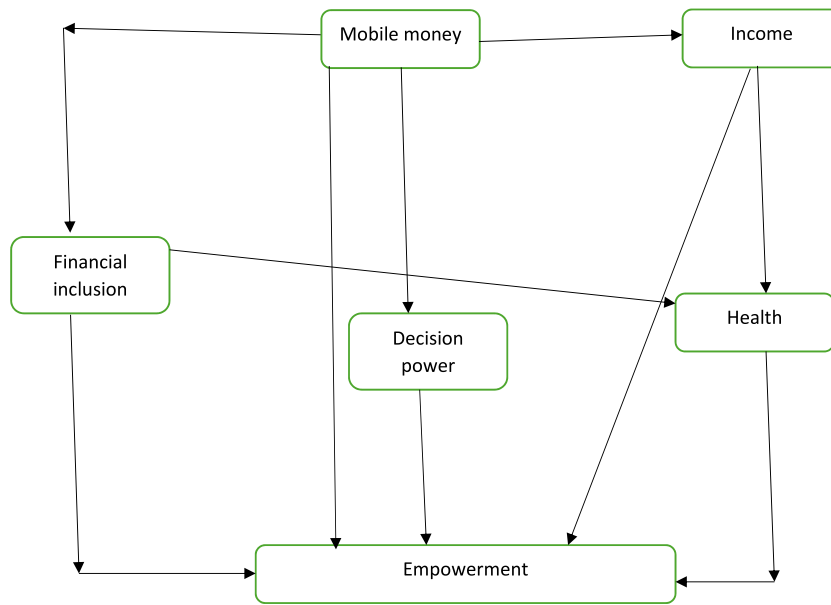
Fig. 1. Mobile transmission mechanism.
Source: Authors

Hadi Karami, 2023) also increases women's participation in economic activities (Aker et al., 2016; Emara & Mohieldin, 2020).

Addressing gender inequalities, the results of Ghosh and Vinod (2017) on households in India reveal that female heads of households are less likely to benefit from financing than male heads of households. Furthermore, households headed by a female head of household use 20 % less loans than those headed by a male head of household, this demonstrates the difficulties that women have in benefiting from equitable financial services. Continuing in the same direction as the previous ones, Showkat et al. (2024) showed that digital financial inclusion reduces gender inequalities by facilitating financial inclusion. This makes it possible to achieve the SDGs, particularly pillar 5. We note from the work of Showkat et al. (2024) that digital financial inclusion is a source of empowerment for women in India and therefore reduces their financial dependence. In their work, the data used come from a survey conducted among 426 women in North India. A well-functioning financial system, serving all members of a community, is a source of new business creation and the growth of existing businesses (Demirgüçc-Kunt et al., 2009). In the same vein, Siddik (2017) asserts that a fair and inclusive financial system strengthens the empowerment and active participation of women, youth, and other previously marginalized vulnerable groups. The results of Koomson et al. (2020) show that basic financial inclusion reduces poverty in Ghanaian households. Further, the authors stated that when households are included, the future effect on poverty is greater when the household head is a woman than when he or she is a man. In developing economies, the results of Balasubramanian et al. (2018) show that women's land ownership status changes following an improvement in the demand for and use of basic financial services. Financial inclusion therefore increases women's ownership of land for personal and entrepreneurial purposes. The role of financial inclusion in promoting gender equality and women's empowerment has also been shown in the work of Hendriks (2019).

From all the above, the literature confirms the role of financial inclusion in promoting gender equality, but the studies are fewer in number and those addressing digital financial inclusion are very new. This lack of studies justifies the importance of our research especially in this era of information technology where almost everyone has a mobile money account.

3. Conceptual framework

Mobile money today is the most used means for non-holders of an account in traditional banks to benefit from financial services and thus constitutes a factor in reducing inequalities in access to financial services. Empirical results have shown the mechanisms by which mobile money can lead to the reduction of inequalities in the literature. To this end, mobile money by improving well-being through improving the level of household income, reducing poverty can promote SDG5 which is gender equality (Kikulwe et al., 2014; Munyegera & Matsumoto, 2016; Sekabira & Qaim, 2017). By facilitating financial inclusion, mobile money contributes to increasing the level of income in households and reducing gender inequalities in finance (Avom et al., 2023; Myeni & Makate, 2020; Reynolds et al., 2023). The Fig. 1 below show the chanel of transmission

By improving health, mobile money is a means of reducing women's dependency by giving them autonomy in managing their finances (Asongu et al., 2023; Egami & Matsumoto, 2020). By strengthening decision-making power, mobile money contributes to the empowerment of women (Awaworyi Churchill et al., 2020; Kusimba et al., 2016; Gichuki & Mulu-Mutuku, 2018). The decision-making power of women allows them not to be forced to want to undertake any action that can contribute to their

development, which increases their empowerment.

4. Methodology and data

Gender inequality is defined as the imbalance between men and women in terms of individual achievement (UNDP, 2010). According to UNDP, three dimensions are retained in the calculation of gender inequality indices, namely: reproductive health in women, women's empowerment and the labor market. For this reason, taking into account the information available in the FinScope, 2018 database on Benin, we retain empowerment as the empowerment of women, the ability of the latter to make decisions and apply them on their own account (own income, participation in the labor market, ability to have one's own house, ability to buy one's own plot, and membership in a cooperative). In our work, we chose as a variable of women's empowerment a composite index obtained by the ACM which takes into account the participation of women in the labor market (self-employment), the ability to buy their own plot (possession of property documents), participation in a cooperative and the ability to build a house and live in it (ownership of the house). A woman who is self-employed has an income and is financially independent (Adera & Abdisa, 2023; Tripathi & Rajeev, 2023). Moreover, a woman who has the ability to purchase plots in her own name and also has access to build and integrate and goes out to participate in cooperative meetings is autonomous. Thus, our dependent variable (empowerment) is therefore represented by the composite index obtained from the three variables mentioned above taking into account the information available in Finscope.

The data used in this work come from a survey conducted by FinScope in 2018 on households in Benin. 6948 households were surveyed, including 3827 women. These data are collected on women aged at least 15 years old and living in urban and rural areas of the country (FinScope, 2018). This information constitutes our database, the size of which is 3827 given the objective of our study. Furthermore, our study seeks to determine the impact of the adoption of mobile money on the income of women in Benin. Among the women we have two groups: those who have adopted the mobile money account and those who have not.

The mobile money adoption program in this study is not randomized, so our estimation technique is limited to a population in which all women have the opportunity to adopt mobile money but some women have decided not to adopt it. This is therefore not a randomization study. The non-randomization of a program is a source of selection bias and endogeneity problems associated with the adoption of mobile money (Akotey & Adjasi, 2016).

In our work, we make the estimation taking into account the selection bias and endogeneity problem using the following technique: Heckman sample selection method, effects treatment model and instrumental variable modeling.

4.1. Heckman selection model

The Heckman (1974; 1978; 1979) sample selection technique is a two-step method for evaluating non-randomized programs. Its purpose is to correct for selection bias. The first step involves estimating a probit function of the determinants of mobile money adoption. The probit model for mobile money adoption is a binary variable taking the value 1 if the woman adopts mobile money and 0 otherwise. This is described by the following relationship:

$$MM_i = \begin{cases} 1 \ \textit{if the woman adopts mobile money} \\ \quad 0 \ \textit{otherwise} \end{cases} \tag{1}$$

The above model can be like this:

$$MM_i = z_i\delta + \mu_i \tag{2}$$

$$\text{So}, Prob(MM_i = 1 \ / \ z_i) = \Phi(z_i\delta) \text{and} Prob(MM_i = 0 \ / \ z_i) = 1 - \Phi(z_i\delta) \tag{3}$$

Where z_i is a vector of exogenous variables determining the treatment (mobile money adoption) and $\Phi(.)$ is the distribution function of the normal distribution. The parameters of the probit function are used to calculate the inverse Mills ratio, which is then included in the outcome equation as an additional independent variable (Janzen & Carter, 2016; Lin, 2007). The inverse Mills ratio accounts for possible selection bias and variables omitted or unexplained by the error term and is given by:

$$\lambda_i = \frac{\Phi(z_i\delta)}{(\Phi(z_i\delta))'} \text{ And } \gamma_i = \frac{1}{\lambda_i} \tag{4}$$

Or λ_i is the Mills ratio, γ_i is the inverse of the Mills ratio, $\Phi(z_i\delta)$ is the distribution function of the normal distribution and $(\Phi(z_i\delta))'$ the density function of the probit function. The equation of the second phase of Heckman (i.e. the impact of mobile money on women empowerment) is however estimated with the inverse of the Mills ratio and is presented as follows:

$$Y_i = \beta_0 + \beta_1 MM_i + \beta_2\gamma_i + X_i + \varepsilon_i \tag{5}$$

Where Yi is the variable capturing women's empowerment in the sample (a composite index obtained from women's self-employment, ability to buy land in their names; being a member of a cooperative and ability to build their own house and live in it). It varies between

0 and 1 and Xi represents the vector of household characteristics as well as institutional variables if any; MM_i a binary variable for the adoption of mobile money in credit operations with the value 1 if the woman adopts mobile money and 0 otherwise; β_i denotes a vector of coefficients; and (ε_i , μ_i) is the error term.

4.2. Treatment effect model

The treatment effect model estimates the participants and non-participants in the program simultaneously for both groups. The selection and outcome equations are identical as in cases 6 and 7 below:

$$MM_i = 1 \ \ si \ MM_i > 0 \ et \ MM_i = 0 \ sin\text{have thus,} \ MM_i = z_i\delta + \mu_i \tag{6}$$

$$Y_i = \alpha MM_i + \beta X_i + \varepsilon_i \tag{7}$$

Where μ_i and ε_i are the IID error terms. Since MM_i is binary and endogenous, the treatment effect model uses the observed characteristics of participants and non-participants to estimate the parameter β and also controls for selection bias due to non-negligible variables in mobile money service use. Substituting equation (6) into 7 we have:

$$\text{When } MM_i > 0, MM_i = 1 : Y_i = \alpha(z_i\delta + \mu_i) + \beta X_i + \varepsilon_i \tag{8}$$

$$\text{And when } MM_i = 0, Y_i = \beta X_i + \varepsilon_i \tag{9}$$

Where $Y_i = \alpha(z_i\delta + \mu_i) + \beta X_i + \varepsilon_i$ represents the outcome model for participants while

$Y_i = \beta X_i + \varepsilon_i$ is the outcome model for non-participants. It should be noted that the Heckman model does not resolve the endogeneity problem, which leads us to create an instrumental variable model for robustness.

4.3. Robustness: instrumental variable model

In this research, the instrumental variable model is used to capture some unobserved effects such as the distance to go to a mobile money agent, the spouse's decision (Husband), religion which will not be captured by the Heckman model or by the treatment effect model. The instrumental variable model controls the endogeneity associated with the mobile money adoption variable (MM) and allows for robust results (Akotey and Adjasi, 2016). The use of the IV model assumes that it has a variable correlated with the mobile money adoption variable and not with the error term as shown by Khandker et al., (2010). Thus we have: $Cov(z; MM) \neq 0$ $et \ Cov(z, \varepsilon) = 0$ where z is the chosen instrument. We identified as the instrument the distance between the woman's house and a mobile money point (Nonvide, 2024).

Following the approaches of Janzen and Carter (2013) and Khandker et al. (2010), Heckman 's first step takes the following form:

$$MM_i = \alpha Z_i + \phi X_i + \mu_i \tag{10}$$

Where MM_i a binary variable for the adoption of mobile money in credit transactions with the value 1 if the woman adopts mobile money and 0 otherwise, Z_i the selected instruments, X_i vector of variables that affect the woman's decision to adopt mobile money and μ_i is the error term.

For the real instrument in our work, the distance for a woman to put money on her mobile account would be better. Unfortunately in our database we only have "the time spent by women to reach a mobile money point". This is the variable that will be used as an instrument in our work. It is given in several modalities which are: 1 (Less than 10 min), 2 (10–20 min), 3 (21–30 min), 4 (31–60 min), 5 (61 min - 2 h) and 6 (More than 2 h). This variable was used by Djahini-Afawoubo and Couchoro, (2023) as an instrument.

The second step is to predict the adoption of mobile money ($\widehat{MM_i}$) and substitute it into equation (11) to obtain the result equation (Khandker et al., 2010):

$$Y_i = \gamma X_i + \beta MM_i + \varepsilon_i \tag{11}$$

$$Y_i = \gamma X_i + \beta(\widehat{\alpha}Z_i + \widehat{\phi}X_i + \mu_i) + \varepsilon_i \tag{12}$$

Where $\widehat{\alpha}Z_i + \widehat{\phi}X_i + \mu_i$ is the predicted probability of getting the treatment (Mobile money). Under IV, the impact of mobile money adoption on women's empowerment is $\widehat{\beta_{iv}}$.

5. Presentation of results

5.1. Descriptive analysis of variables (Table 1)

Source: Authors

Descriptive statistics reveal that the average income of women is 30,470.78 FCFA compared to 54,287.79 for men. This shows that men have more income than women in Benin. In addition, the maximum amount women receive is 875,000 FCFA. In addition, statistics reveal an average of 84.6 % of women who are self-employed. 71.1 % of respondents use mobile money for transactions. Among

Table 1

Variables	Obs	mean	Min	Max
Empowerment (compsite Index)	3827	0.767	0	1
Mobile money usage (yes = 1)	3273	0.711	0	1
House ownership capacity	3827	0.514	0	1
Ownership official document capacity	3827	0.035	0	1
Self-employment	3827	0.612	0	1
Cooperative member (Yes = 1)	3827	0.20	0	1
General education (yes = 1)	3827	0.361	0	1
Technical/Professional education (yes = 1)	3827	0.010	0	1
Married (yes = 1)	3827	0.674	0	1
Financial Inclusion (yes = 1)	3273	0.725	0	1
Bank account (yes = 1)	3208	0.039	0	1
Microfinance account (yes = 1)	3273	0.086	0	1
Rural zone (yes = 1)	3827	0.541	0	1
Age (in years)	3827	37.2	15	95
Time spent to reach mobile money agent (in min)	3273	3025	0	8
Income/Woman (FCFA)	3513	30470.78	0	875000

Table 2
Reasons for adopting mobile money among women.

Reasons	Frequency	Percentage	Ranking
It's the only one accessible in my community	233	17.57	3
It's not expensive	287	21.64	2
It is the most convenient (takes less time)	512	38.61	1
Convenient for paying bills	25	1.89	6
It's trust that means	138	10.41	4
It helps me keep money	115	8.67	5
I don't know	16	1.21	7
Total	1326	100	–

Source: Authors

these women, 67.4 % are homemakers and the rest are either single or divorced. 88.6 % of these women are aged between 15 and 60. This will allow us to know whether the women surveyed are active or not. Regarding the level of education of these women, the majority have received general education, a proportion of 36.1 % which is not even significant because more than 60 % have no level of general education. On the other hand, in technical and vocational education, the number of women who have a basis in technical education is very low, at a rate of 1 % among respondents. It should also be noted that the majority of respondents are in rural areas of Benin where financial agencies are less concentrated. They therefore generally resort to mobile money and MFIs for financial services.

Furthermore, descriptive statistics show that 71.1 % of women use mobile money services. Several reasons push them to adopt these mobile money services. To this end, 17.57 % use mobile money services because in their communities it is the only accessible financial service. 21.64 % use mobile money because according to them mobile money services are cheaper compared to 38.61 women who use mobile money because they consider it to be the most convenient and fastest. 1.89 % of women use mobile money services because according to them these services help them pay bills and 10.41 % of women use mobile money because it gives them confidence. Similarly, 8.21 % of women use mobile money services because these services allow them to keep money as shown in Table 2 below.

As for the mean comparison test between adopters and non-adopters of mobile money, the following Table 3 presents the results.

Table 3
Socio-economic characteristics of female respondents.

Variables	Mobile money users	Non-mobile money users	Difference test (Ttest -values)
Sel-employment (Yes = 1)	0.70	0.73	1.52*
General education (yes = 1)	0.79	0.67	−7.22
Married (yes = 1)	0.69	0.75	3.15***
Bank account (yes = 1)	0.76	0.71	−1.13
Microfinance account (yes = 1)	0.89	0.69	−7.16
Rural zone (yes = 1)	0.62	0.82	12.89***
Age (in years)	37.32	36.96	−0.55

Source: Authors (*; * *; *** significance at 10 %; 5 % and 1 %)

Table 4
Presentation of model results.

	Selection equation	Effects Marginals	Response equation	Effects Marginals
Mobile money			0.007*** (4.17)	0.12
SFD account	0.66*** (5.47)	0.057	0.032** (1.78)	0.01
Bank account	−0.14 (−0.98)		0.02 (0.61)	0.002
Age	0.28*** (3.06)	0.0056	0.032*** (15.90)	0.01
Age ^{2}	−0.018** (−2.20)	−0.005	−0.000 8*** (-6.81)	−0.0001
Matrimonial status	−0.04** (−2.38)	−0.013	−0.001 (−0.06)	−0.0004
Education	0.03*** (4.75)	0.025	−0.60** (−2.55)	−0.01
Area	−0.18*** (−8.36)	−0.058	−0.95*** (−4.21)	−0.02
Log(Income)	−0.21 (−0.47)	−0.0001	0.33** (2.52)	0.008
constant	0.75*** (10.87)		0.11 (0.52)	
IMIR			0.42*** (5.23)	
Observation	2528		2562	
P-value (Chi-2)	0.000		0.000	

Source: Authors (*; * *; *** significance at 10 %; 5 % and 1 %)

5.2. Presentation of estimation results

Heckman model first show the determinants of mobile money adoption in Benin. These results reveal that having an account in a microfinance institution, age, level of education and area of residence of women are the main determinants of mobile money adoption by women in Benin. Regarding having an account in a financial institution, the results of our model show that this variable positively affects the probability of adopting mobile money. This result suggests that women who have an account in MFIs are already used to making financial transactions which does not hinder them from adopting mobile money which is a transaction tool. This result is in the same direction as those obtained by Nonvide and Alinsato (2023). With mobile money these women can make loan repayments without traveling, which constitutes a gain for them in terms of cost and time. For age, our results show that age positively and significantly affects the probability of women adopting mobile money but this chance of adoption when age evolves. This result shows that age remains a determining factor in the adoption of mobile money by women in Benin with the different advantages that this platform offers today in terms of financial management without intermediary. This result is similar to those obtained by Nonvide (2024). The following present the Heckman results of the impact of mobile money on women empowerment. Table 4.

The level of education as shown in our results on the adoption of mobile money remains a key factor in facilitating manipulation in order to manage the different operations via mobile money. Thus, our results show that women with a level of education are more likely to adopt mobile money than those who do not. Women with a higher education have a better understanding of new technologies and would be less wary of using phones to carry out financial transactions, which could impact their adoption of the technology. These results are in line with those found by Afawubo et al. (2020) where knowing how to read and write positively affects the probability of adopting mobile money in Togo.

As for women's area of residence, our results suggest that women located in rural areas are less likely to adopt mobile money than those in urban areas. This result could be justified by the fact that in rural areas, insufficient mobile technology infrastructure could limit the availability of network coverage to facilitate transactions. Moreover, in some rural areas generally and in Benin in particular, women have less control over their financial and economic resources, which could negatively impact their likelihood of adoption. Nonvide and Alinsato (2023) obtained the same result on data from Côte d'Ivoire.

Finally, women living with a man are less likely to adopt mobile money. This result reinforces that of the women's area of residence where women do not have autonomy over the control of their assets. This lack of autonomy in the management of their finances would be conditioned by the decision of their husband or the husband's family which forces them to submit everything to the man. This result corroborates with those obtained by Nonvide and Alinsato (2023).

The results of the response equation reveal that mobile money positively affects the empowerment of Beninese women. Indeed, women who use mobile money have a 10 % chance of undertaking an income-generating activity than those who do not. This result shows that the use of mobile money is a source of female entrepreneurship as supported by the work of Hossain and Samad (2021); Baig et al. (2018); Noor and Hoque (2021); Islam et al. (2022) and Faton and Chabossou (2022). The use of mobile money nowadays allows women to save more securely and without intermediaries, which could allow them to access financing such as microcredits, money transfers, digital tontines. These practices, thanks to mobile money, could lead women to invest in income-generating activities and thus strengthen their autonomy within their homes. In rural areas where economic decisions are generally controlled by men, the use of mobile money strengthens women's participation in economic decisions because they are now managers of their finances. This allows women to receive and send money directly to manage their activities without the intermediation of their husband or family. The use of mobile money could allow women to reduce travel and also remove barriers between rural and urban areas in terms of lower-cost financial services.

As for holding an account in a microfinance institution, our results suggest that women who have an account in microfinance institutions are more likely to undertake an activity than those who do not. This result shows that women with an account in microfinance institutions will have ease in accessing credits which could impact their entrepreneurial decision. This result is supported by the work of Afawubo et al. (2020) where mobile money makes it possible to cope with climate shocks in Togo.

Table 5
Results of the instrumental variable model.

	Instrumental model	Marginal effects
Mobile money	0.049*** (5.25)	0.05
SFD account	0.43** (2.80)	0.004
Bank account	0.03 (1.29)	0.021
Age	0.02 (0.25)	0.06
Age ^{2}	−0.057** (−2.54)	−0.0007
Matrimonial status	0.52 (0.31)	0.091
Education	−0.51** (−2.68)	0.042
Area	−0.64* (1.75)	−0.02
Log(Income)	0.35** (2.90)	0.003
constant	0.85*** (7.86)	–
Observation	2294	–
P-value (Chi-2)	0.000	

Source: Authors (*; * *; *** significance at 10 %; 5 % and 1 %)

Age remains a variable that facilitates decision-making in a household. Based on our estimates, our results suggest that older women are more likely to be self-employed compared to younger women. Note that this effect is not linear; it admits a threshold from which age negatively affects the probability of making a self-employment decision. Age affects the decision to self-employ because an older woman has experience and analytical skills given the situation she is experiencing and the objective she has set for herself. These factors force her to undertake an activity to self-employ herself in order to be autonomous in certain decisions in the household. This result is in the same direction as those obtained by Nonvide and Alinsato (2023).

A woman's income is one of the variables that increases the likelihood of women becoming self-employed according to our results. A woman who has an income does not necessarily need a loan from financial institutions or from a family to start a business, this is what our results show. On the other hand, the area of residence decreases the likelihood of women becoming self-employed according to our results. This result could be explained by the fact that in urban areas, population density creates a stronger demand for various goods and services, which encourages individuals to undertake as shown by Nonvide (2024).

5.3. Robustness test

To correct the endogeneity problem due to the Heckman model, we estimated an instrumental variable model. The results of this model are consistent with those obtained with the Heckman model as shown in the following Table 5.

6. Conclusion and recommendation of economic policies

At the end of this study, which first analyzes the determinants of the adoption of mobile money and secondly the effect of mobile money on the empowerment of women in Benin. It used data from FineScope (2018). We used a two-step Heckman model to correct for selection bias. Our results reveal that age, education, holding an account in a microfinance institution and area of residence are the main determinants of the adoption of mobile money by women in Benin. Furthermore, the results of the response model reveal that mobile money is a means that increases the probability of women to be self-employed in Benin. To correct the endogeneity left by the Heckman model, we estimated an instrumental variable model which reveals the same results as the Heckman model.

In light of all this, we suggest that the authorities in charge of Benin focus on mobile money so that women can understand its usefulness in their financial management. This policy aims to strengthen the adoption of mobile money by women by showing them concretely how this tool can facilitate the management of their resources. This will be possible through the implementation of targeted awareness programs, the adaptation of mobile services to local realities (language) and inclusive communication on women who have succeeded thanks to mobile money. Increase financial education in rural areas to facilitate the use of mobile money for women: this policy aims to train women in basic concepts such as budgeting, savings, credit management and the use of digital financial services which could promote the adoption of mobile money. Make available information technology infrastructure to ensure network coverage and encourage women to adopt mobile money more. This policy requires public and private investments to expand network coverage, install relay antennas and improve mobile and internet connectivity as argued by Nonvide et al., (2025) and FATON and CHABOSSOU (2021a).

Finally, this study focused on a 2018 database. We would have liked to have a more recent database, but we are limited by what is available. To this end, other studies can reflect on the same theme if a new database is available.

CRediT authorship contribution statement

Charles Yédéhou Faton: Writing – original draft, Methodology, Conceptualization. **Djohodo Inès Monwanou:** Validation, Formal analysis.

Ethical approval

Not Applicable

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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