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# Financial Inclusion in Sub-Saharan Africa: The Case of Mobile Money

**Etian Boress Kemgou Voptia**
Transport and Telecommunications Institute, Latvia
Email: St82950@students.tsi.lv
ORCID: https://orcid.org/0000-0002-2660-49752

**Yulia Stukalina**
Transport and Telecommunications Institute, Latvia
Stukalina.J@tsi.lv
ORCID: https://orcid.org/0000-0002-2660-49752

**Abstract.** Financial inclusion is a mechanism that provide accessibility and application of formal financial system at an affordable cost. Mobile money as a financial service allows value to be exchanged and stored in mobile money accounts as this facilitates economic development, expand investment opportunities, increase consumer spending, encourage entrepreneurship, and boost economic growth. Mobile money appears to be a good solution for accelerating financial inclusion.

**Research objective:** This research aims to assess how mobile money can improve financial inclusion in Sub-Saharan Africa.

**Design/Methodology/Approach**: This study utilizes secondary data from international organizations, specifically the IMF Financial Access Survey (FAS) and World Development Indicators by the World Bank. The sample consists of 17 Sub-Saharan African countries from 2010 to 2021. Financial inclusion is measured using an index developed, with data sourced from the FAS (2019) database, while mobile money usage data is also derived from the same database. To evaluate the impact of mobile money on financial inclusion, a dynamic panel model is utilized, estimated using the systemic generalized method of moments (Sys-GMM), drawing on methodology's framework for robust estimation.

**Results**: The results confirm the central hypothesis, according to which the use of mobile money improves financial inclusion in Sub-Saharan Africa. It is therefore up to States and mobile network operators to intensify the use of mobile money. This intensification would be possible thanks to the development of mobile money, the regulation and security of mobile money services.

**Originality / Value / Practical implications**: This research contributes novel insights into the role of mobile money as a transformative tool for financial inclusion in Sub-Saharan Africa. It distinguishes between registered and active mobile money accounts, assessing their effectiveness in facilitating access to traditional banking services such as loans, bill payments, savings, and overdrafts. By understanding user behaviors and engagement, this study provides a nuanced perspective on the impact of mobile money on the financial landscape of the region.

**Implication**: The results enable the formulation of strategic recommendations for policy-makers aimed at advancing economic policies that foster the growth and utilization of mobile money services. These policies may include fostering partnerships between governments and mobile operators, enhancing digital literacy programs for users, and implementing regulatory frameworks that protect user interests while promoting innovation within the mobile money sector.

**Keywords**: digital economy, inclusive economic development, financial inclusion, mobile money accounts, Sys-GMM

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## Introduction

Financial inclusion has gained significant attention in both academic and policy-making circles as a pivotal factor for economic growth and poverty alleviation. Defined as the provision of accessible, affordable, and appropriate financial services to all segments of society, financial inclusion aims to empower individuals by integrating them into the formal financial system (Demirgüç-Kunt et al., 2018). The creation of microfinance establishments is aimed at providing better access to financial services to people mostly those excluded from the traditional financial sector. In this article, the issue of financial inclusion and its indicator is discussed and understood in the sense of Sama and Pais (2011) as a mechanism that promotes access, use and availability of financial services. The metric and indicators commonly used to measure financial inclusion, such as the number of adults with bank accounts, enables researchers and policy-makers to gauge the health of financial systems and the progress of initiatives aimed at reducing exclusion (Global Findex, 2021).

Although access to banking facilities has improved over the years, reports indicate that only about 24% of adults in Sub-Saharan Africa hold an account at a formal financial institution, contrasting sharply with over 90% in developed regions (World Bank, 2021). The pronounced gap highlights the urgent need for innovative financial solutions that can bridge this divide and promote inclusive economic growth. The issue of financial inclusion is very vital in Sub-Saharan Africa financial service, as majority of the population in Sub-Saharan Africa remain largely excluded from the traditional banking sector. The share of the population over 15 years old having opened a bank account in a formal financial institution in Sub-Saharan Africa amounts to 24% and it remains less than 10% in the franc zone (Guérineau and Jacolin, 2014). Central Africa has a rate of 28.4% of the population aged over 15 having opened an account in a formal financial institution, as this act as an indicator of the value of mobile money on economic growth and development. This proportion is 32.5% in West Africa and 34.3% in East Africa, on the other hand in Europe more than 90% of the population aged over 15 has an account with a formal financial institution (Global Findex 2020). Furthermore, SME loans provided by commercial banks represent only 2.9% of GDP and deposits 4.6% of GDP (European Investment Bank, 2020). Additionally, 15% of the population aged over 15 report having saved and 7% report having borrowed from a formal financial institution in Sub-Saharan Africa (Global Findex, 2017).

In terms of infrastructure, the banking system in Sub-Saharan Africa is very underdeveloped compared to other regions. In the CEMAC zone, for example, the banking system is made up of 54 banks, with an average distribution of two bank branches per 1000 km2 and three branches per 100,000 adults. In the UEMOA subregion, the banking system is made up of 128 commercial banks, or 1.75 branches per 1000 km2 and four branches per 100,000 adults. In East Africa, the banking system is made up of 217 commercial banks, or 4 bank branches per 1,000 km2 and four branches per 100,000 adults (FAS 2019). Furthermore, banks are concentrated in large urban centres to the detriment of rural areas which are more like banking deserts (Avom and Eyeffa Ekomo, 2007). This makes

financial inclusion very necessary via mobile money. It is therefore clear that the banking system alone cannot offer financial services to poor populations and those in remote areas. This situation is different in western countries (i.e. in Europe, America and Asia) where banking system and financial institution as a whole, including mobile money is far more advanced, made available and have been in use for many years now.

The advent of mobile telephony offers another dimension of financial innovation in Africa namely electronic money. The first modality of electronic money, mobile banking, is a real innovation in the financial sector, but it does not solve the problem of financial inclusion to the extent that one may not require having a bank account.

In recent years, mobile money has emerged as a transformative force in enhancing financial inclusion across developing nations, particularly within Africa. Mobile money services allow users to perform various financial transactions via mobile devices without the necessity of a traditional bank account, effectively breaking down barriers to entry for populations residing in remote or underserved areas (Mbiti & Weil, 2013). It is therefore a social innovation ensuring the expansion of financial services that give opportunity for financial inclusion to those excluded from the traditional banking system (Saifullahi and Harunan, 2020). The arrival of mobile money in Sub-Saharan Africa dates back to 2007 in Kenya under the name M-Pesa. It quickly spread to become, in 2010, the first successful mobile financial service in developing countries. After Kenya, other dynamic hubs have developed, notably in Tanzania, Uganda, Ghana, Rwanda, Zimbabwe, Nigeria (GSMA, 2019). By 2014, there were already 255 mobile money services around the world, 55% of which were in Sub-Saharan Africa. As of early 2019, there were 395.7 million active mobile money accounts in Sub-Saharan Africa, increasing drastically the level of financial inclusion in the region. In fact, this region has almost half of the world's total mobile money accounts (GSMA, 2019). This surge in mobile money usage has facilitated a notable increase in the financial inclusion index, demonstrating its effectiveness in fostering economic empowerment among previously unbanked populations.

The economic literature indicates that mobile money significantly contributes to financial inclusion by offering low-cost and accessible alternatives to conventional banking practices (Jack & Suri, 2011). As an important factor in improving financial inclusion, notably through the work of: Hasan, Fakhrul (2020), Joseph, Anna (2021), Ahmad, Hassan (2020), Kimaro, Albert (2021), Monne, Jerome (2021), Nzie et al. (2018), Okello et al. (2018), Fox and Van Droogenbroeck (2017), Ahmad et al. (2020), Aron (2018), Katusiime, Lorna (2021), Ranjan, Harshali (2021), Mushtaq and Bruneau (2019), George, Babu and Ebong (2021), Francky Ngono (2020). Another stream of literature tends to show that mobile money contributes to reducing the cost of access to financial services (Enock 2022, Apeti and Ablam 2022, Edoh et al. 2023 and Amegbe, Hayford 2022).

This article is intended to be an additional information to the works cited above, and unlike this work which considers mobile money as an overall indicator, not distinguishing registered mobile money accounts from active accounts, or not considering the effectiveness of the use of mobile money services, **this article addresses these gaps related to the main research question: "How do the number of active mobile money**

**accounts and the volume of mobile money transactions determine financial inclusion in Sub-Saharan Africa?"**

The objective of this research aims to study how mobile money can improve financial inclusion in Sub-Saharan Africa.

### *Theoretical Framework and Hypotheses*

The theoretical underpinning of this study is anchored in the premise that mobile money can ameliorate financial inclusion. To reach this goal, based on prior literature, two key hypotheses have been formulated:

***$H_1$: An increase in the value of mobile money transactions improves financial inclusion.***

***$H_2$: An increase in the number of active mobile money accounts improves financial inclusion.***

To achieve these goals, this study uses secondary data from the IMF's Financial Access Survey database and data from the World Bank's World Development Indicators. The sample of this study focuses on 17 Sub-Saharan African countries over the period 2010–2021. The variable of interest, namely financial inclusion, is captured by the index developed by Sarma (2008) and the data for its calculation is extracted from the FAS (2019) database. Data on the exogenous variable, namely mobile money, also come from the FAS database (2019).

The effect of mobile money use on financial inclusion is highlighted through a dynamic panel model inspired by Uddin et al. (2017) and estimated by the systemic generalized method of moments (Sys-GMM) as initially developed by Arellano-Bover ( 1995)/ Blundell-Bond (1998). This research seeks to quantify the impact of mobile money on financial inclusion, contributing to the broader discourse on economic development strategies in the region.

## Literature Review

Several authors have devoted studies to financial inclusion around the world. Since the advent of mobile money in the 2000s, much research has focused on studying the contribution of mobile money to financial inclusion. Part of the literature analyzes the determinants of mobile money adoption. It is interesting to give a brief overview of this literature here before showing how mobile money influences financial inclusion.

Several theories have been used to address the determinants of adoption and use of mobile money, namely: acceptance theory and diffusion theory. It was first developed by Davis (1989), aimed at predicting the acceptance and use of any information technology for mobile money. The second which is the theory of diffusion of innovations proposed by Rogers (1995) which advances the communication and adoption of new ideas and technologies, the unified theory of acceptance and use of technologies (UTAUT) of Venkatesh

et al. (2003) seek to explain users' intentions to adopt an information system and their subsequent usage behaviors. Generally speaking, these theories retain socio-economic, cultural factors and product attributes (Lai, 2016) as explanatory factors for adoption and use. Several studies have been carried out in this direction.

Ngono (2020) carried out an empirical study on countries in Africa. It focuses on the financial inclusion index by introducing mobile money into the calculation of this index. It appears that mobile money has a significant effect on the financial inclusion index. However, he notes that his study is limited by the absence of data on certain indicators of this index. Ngono's claim for the absence of data is that Africa is just a newcomer in this financial service, so getting data is a near impossibility. Unlike Europe and the Americas that for decades now enjoyed various financial services including mobile money, this makes it easier to gather data for research. In the same vein, Amegnaglo and Zounmenou (2020) carried out a study on financial inclusion promoted by mobile money in southern Benin. Using primary and secondary data, they reached the conclusion that the use of electronic money account services especially mobile money contributes to financial inclusion.

Tatsing (2024) studies in the CEMAC zone (Economic and Monetary Community of Central Africa) the role of mobile money in financial inclusion, based on panel data over the period of 2011–2020, and reveals that if mobile money promotes financial inclusion, then women remain the most excluded from the financial system.

Fall and Birba (2019) show in their study that gender, education level, employment, literacy and opening a bank account increase the probability of mobile money adoption. Mbiti and Weil (2011) show that age, education level and social status significantly influence the adoption of M-Pesa in Kenya. Bankolé et al. (2011) use culture as a factor in mobile money adoption in Nigeria. Bidiasse and Mvogo (2019) study the determinants of mobile money adoption in Cameroon, they generally believe that the benefits offered, the information available on how mobile money works, and the proximity of the service are significant variables in the adoption and use of mobile money.

Narteh et al. (2017), in a study conducted in Ghana, found that mobile money services are mainly used to limit waiting time and receive money transfers. Paying your bills and managing your savings are used less often. For Aker and Wilson (2013), the decision to use mobile money depends on its use by members of the immediate entourage. Mbiti and Weil (2011), in a study conducted in Kenya, identify age, education level, standard of living and area of residence as determinants of mobile money adoption. The study by Sayid, Echchabi and Abdul Aziz (2012)in Somalia shows that mobile money adoption is strongly influenced by communication, testability, risk perception, ease of use, usefulness, security and social factors.

Timite and Skalli (2023) studied the financial inclusion strategy of West Africa (UEMOA). In this study, the authors constructed a financial inclusion index using the principal component analysis (PCA) method and estimated a dynamic panel model. The results show that the financial inclusion strategy of this region is effective for financial inclusion. In addition, the mobile money variables introduced in the financial inclusion index are also likely to promote financial inclusion in this region.

Ndouma and Nanfosso (2023) conducted a very interesting study on the effect of financial inclusion on the formality of small and medium-sized businesses in Cameroon. This study is all the more interesting given the economic weight of SMEs in Cameroon and the level of informality of these companies. The authors demonstrate that financial inclusion measured by access to bank credit and the creation of bank accounts lead to the formalization of SMEs, they nevertheless find that mobile money does not promote this formality. This simply mean mobile money is very instrumental in SME in Cameroon.

The article by Kounouwewa and Hounkou (2024) is on the impact of mobile payment on the financial inclusion of unbanked population. In this regard, a survey was carried out among 240 people through a questionnaire using the convenience method. The data thus collected was analyzed using the Smart PLS 4 software. The results of this study highlight several important points. First, it reveals that individual differences as well as system characteristics have a positive and significant impact on mobile payment usage. Additionally, the study highlights that certain factor such as innovation and knowledge in mobile payment, as well as system characteristics such as mobility, ease of access, compatibility and convenience, play a role in determining the ability of individuals to adopt this payment method and adapt to it

As for the contribution of mobile money to financial inclusion, several studies have looked into it. Mobile money is designed to provide unbanked population with easy access to financial services, particularly population in emerging and developing countries whose banking infrastructure in terms of accessibility remains poor (Maurer, 2012). The main objective of mobile money is the financial inclusion of people excluded from basic banking services. Mobile money is based on offering simple financial services to customers. Mobile money gives customers the ability to access e-money accounts where they can deposit money up to a certain limit, withdraw money and make e-money transfers. Access and subscription to these accounts and associated services are generally made possible by possession of a national identity card. Opening, crediting and managing accounts are free (only money transfers are taxed). Mobile money services allow subscribers to send or receive money from/to subscribers using the same service, or banked customers (domestic and/or international transfers) and/or enable bill payment. Users of mobile money services can count on a growing network of service provider employees and retail business partners, who enable them to deposit and withdraw money.

Mfossa's (2019) study show that although there has been some level of growing interest in the economic effects of mobile money in Sub-Saharan Africa, there is little empirical literature on the role of mobile money and the link between financial inclusion and financial resilience. This article uses the 2017 Global index in which a representative sample of 1,000 was collected in Cameroon to examine how mobile money affects people's ability to cope with negative shocks by creating an emergency fund in a timely manner. The results show that access to this financial inclusion tool increases the average capacity for resilience in the event of an economic emergency, but the magnitude of this effect depends on whether the treatment effects model is implemented to control for the endogeneity of mobile money adoption.

Many lives, especially those of poor rural households, have been transformed by the mobile phone revolution, which has enabled not only communication but also access to basic financial services through the transfer and storage of money through telephone (Donner and Tellez 2008). Demombynes and Thegeya (2012) seized the opportunity offered by mobile phones to develop mobile money services. Medhi et al. (2009) showed in their work that the total number of mobile phone users is greater than the total number of people owning a mobile phone.

However, from the review it is clear that mobile money is a key driver of financial inclusion in Sub-Saharan Africa. Some major factors such as culture, ease of accessibility and use, compatibility, convenience, risk perception, testability, security, age, education, proximity, and a host of others, greatly influence the acceptance and use of mobile money as a means of financial inclusion in Sub-Saharan Africa.

In conclusion, the literature underscores mobile money's pivotal role as a driver of financial inclusion in Sub-Saharan Africa, facilitating access to financial services for populations traditionally excluded from formal banking systems. It highlights the innovative capacity of mobile money to adapt to the socio-economic conditions of the region, but also points to the importance of addressing persistent gender disparities and ensuring equitable access for all demographics. Despite its benefits, there are calls for further research to explore the potential negative implications of mobile money use. Overall, mobile money is recognized as a key driver of financial inclusion, essential for economic development in the region.

## Research Methodology

The research method applied in this article covers research design, area of study, population of the study and the sampling size. In this article, the work of Sarma (2008) is used to capture financial inclusion in Sub-Saharan Africa which is the area of this study. Thus:

- The number of loan accounts with commercial banks per 1,000 adults is less than 20 percent.
- The number of commercial bank branches per 100,000 adults is below 30 percent.
- The number of ATMs per 100,000 adults is below 35 percent.
- Outstanding deposits with commercial banks (as a % of GDP).
- Outstanding commercial bank loans (as a % of GDP).

In the same way that financial inclusion is captured using certain dimensions, mobile money measurement can be analyzed using three dimensions: accessibility, availability and use, as follows.

- **The accessibility dimension,** cited here without being exhaustive:
  - The number of mobile money accounts opened per 1,000 adults.
  - The number of mobile money accounts opened for populations aged over 15.
  - The number of active mobile money accounts.
- **The availability dimension,** in this dimension also we can cite without exhaustiveness:
  - The number of registered mobile money agents per 100,000 adults.

- The number of active mobile money agents per 100,000 adults.
- The number of mobile money agents per 1,000 km2.

• **The use dimension** which includes:

- The number of mobile money transactions.
- The value of mobile money transactions as a percentage of GDP.
- The number of mobile money transactions.

Several empirical studies have used these variables for discourse on mobile money. Sekantsi and Motelle (2016) conducted a study in Lesotho to see if mobile money is a solution to financial inclusion. Ngono (2020) assesses the role of mobile money in financing women's entrepreneurship in Sub-Saharan Africa. It captures mobile money across nine variables, including number of active mobile money accounts per 1,000 adults, active mobile money account balances as a percentage of GDP, mobile money transaction volume as a percentage of GDP and the number of transactions per 1,000 adults. This article also makes use of **Control variables.** The use of mobile money is not the only factor explaining financial inclusion. In the article, several control variables commonly used in the literature are retained: the real interest rate, education spending, unemployment, GDP per capita, inflation, gender and age represented here by the variables women aged 30 to 34, men aged 30 to 34 years old, women 40 to 44 years old and men 40 to 44 years old. Data are obtained from the IMF Access to Financial Services Survey (2019) and World Bank World Development Indicators (2020). A sample of 17 Sub-Saharan African countries is used, with the same region being the area of focus for the study. Meanwhile, this article is also arranged in **Model** for more understanding. The empirical model defined below is inspired by the work of Ajim Uddin and Mohammad Ashraful (2017) on the determinants of financial inclusion.

$$IF_{i,t} = n_i + \beta_0 IIF_{i,t-1} + \beta_1 NAA_{i,t} + \beta_2 Ntran_{i,t} + \beta_3 Vtran_{i,t} + \beta_4 Ir_{i,t} + \beta_5 Edu_{i,t} + \beta_6 Une_{i,t} + \beta_7 GDP_{i,t} + \beta_8 Inf_{i,t} + \beta 9W30 - 34y_{i,t} + \beta_{10} M30 - 34y_{i,t} + \beta_{11} W40 - 44y_{i,t} + \beta_{12} M40 - 44y_{i,t} + n_{it} + \varepsilon_{i,t} \quad (1)$$

with $i = 1,\ldots,17$ and $t = 2010,\ldots,2021$; $n_t$ denotes time fixed effects, $n_i$ individual fixed effects and $\varepsilon_{i,t}$ the error term.

IIF is the financial inclusion index from the work of Sama (2008); NAA is the number of active mobile money accounts; Ntran is the number of mobile money transactions; Vtran is the value of mobile money transactions; IR: real interest rate; EDU represents education expenditure; UNE is the unemployment rate; GDP is GDP per capita; INF is the inflation rate, and W: Woman, M: Man; W30-34, M30-34, W40-44, M40-44: Demographic variables.

## Research Results and Recommendations

Applying GMM to equation (1) provides the results recorded in Tables 1, 2 and 3 below. Overall, it appears that these estimates are interesting from a statistical point of view. Indeed, all models provide an overall causality test that is significant at the 5% thresh-

old. The reason for this is because each explanatory variable has a fixed intercept on the regression line. Models 1–4 are used in this article mainly because the author wants to find out which model can best represent the observation, and the sense in these models is that the models are explanatory variables showing financial inclusiveness in Sub-Saharan Africa via mobile money. The explanation/discussion of the tables can be seen below it.

**Table 1.** Result of estimation on education (source: Construction by the authors, using STATA software)

| | **MODEL1** | **MODEL 2** | **MODEL 3** |
|---|---|---|---|
| Financial inclusion | 0.958***<br>(0.0385) | 0.906***<br>(0.0903) | 0.984***<br>(0.0481) |
| Education spending | 0.0102*<br>(0.00544) | 0.00738<br>(0.00753) | 0.0172**<br>(0.00605) |
| Unemployment | -0.00290*<br>(0.00158) | -0.000685<br>(0.00126) | -0.00205<br>(0.00201) |
| Value of transactions via mobile money | 0.000902***<br>(0.000272) | | |
| Value of transactions via mobile money | | 0.00142<br>(0.00445) | |
| Active mobile money accounts | | | 1.82e-06***<br>(1.37e-07) |
| AGAINST | 0.0249) | -0.0155<br>(0.0683) | -0.0735**<br>(0.0248) |
| comments | 26 | 25 | 25 |
| Country | 11 | 11 | 11 |
| Fisherman | 0.000 | 0.000 | 0.000 |
| AR( 1) | 0.031 | 0.09 | 0.027 |
| AR( 2) | 0.248 | 0.261 | 0.288 |
| Sargan | 0.251 | 0.147 | 0.520 |
| Hansen | 0.275 | 0.254 | 0.322 |
| AR( 2) | 0.248 | 0.261 | 0.288 |
| GMM instruments for levels | | | |
| Hansen test outside group | 0.199 | 0.798 | 0.226 |
| Difference (zero H = exogenous) | 0.321 | 0.164 | 0.358 |
| iv (year, eq(diff) | | | |
| Hansen test outside group | 0.414 | 0.163 | 0.403 |
| Difference (zero H = exogenous) | 0.122 | 0.829 | 0.178 |
| Instruments | ten | ten | ten |

*Notes: Estimated standard deviations in parentheses. ***p<0.01; **p<0.05; *p<0.1.*

Table 1 presents the results of a dynamic panel model examining the impact of education spending on the Financial Inclusion Index. It includes coefficients for various models that assess the relationship between education and financial inclusion, as well as control variables like unemployment and the value of mobile money transactions. The value of mobile money transactions and education level are positively and significantly related to financial inclusion.

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**Table 2.** Estimation result on the economic situation (source: Construction by the authors, using STATA software)

| | MODEL 1 | MODEL 2 | MODEL 3 | MODEL 4 | MODEL 5 | MODEL6 | MODEL 7 | MODEL 8 | MODEL 9 |
|---|---|---|---|---|---|---|---|---|---|
| Financial inclusion | 1,227*** (0.0820) | 1,238*** (0.0660) | 1,320*** (0.0684) | 0.900*** (0.0396) | 0.939*** (0.0772) | 0.933*** (0.0214) | 0.999*** (0.0597) | 1,006*** (0.0189) | 0.975*** (0.0316) |
| VTRAN | 6.48e-06 (0.000463) | 0.00115 (0.000838) | 0.000942* (0.000459) | | | | | | |
| Unemployment | -0.0261*** (0.00571) | -0.00760*** (0.00188) | -0.00879*** (0.00249) | -0.00529** (0.00220) | -0.000586 (0.00253) | 0.000417 (0.00101) | 0.0138 (0.00805) | -0.00277*** (0.000164) | 0.00296 (0.00289 |
| GDP per capita | 0.116** (0.0439) | | | 0.0373** (0.0126) | | | -0.0782 (0.0794) | | |
| Inflation | | 0.00110 (0.00137) | | | -0.00325*** (0.00104) | | | | |
| Real interest rate | | | 0.00299 (0.00201) | | | 0.00198* (0.00107) | | 0.00169 (0.00116) | 0.00376* (0.00197) |
| NTRAN | | | | -0.00169 (0.00250) | -0.000488 (0.00399) | -0.00224 (0.00169) | | | |
| ACCOUNTS | | | | | | | 0.000172** (5.91e-05) | -1.06e-05 (4.22e-05) | 4.23e-05 (3.95e-05) |
| AGAINST | -0.704** (0.276) | -0.0234 (0.0357) | -0.0461* (0.0226) | -0.185** (0.0746) | 0.0322 (0.0543) | 0.0214 (0.0203) | 0.441 (0.497) | 0.0162 (0.0157) | -0.0367 (0.0296) |
| comments | 40 | 39 | 37 | 39 | 38 | 36 | 34 | 31 | 31 |
| Country | 14 | 13 | 13 | 14 | 13 | 13 | 12 | 11 | 11 |
| Fisherman | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| AR( 1) | 0.026 | 0.024 | 0.019 | 0.023 | 0.014 | 0.045 | 0.009 | 0.054 | 0.008 |
| AR( 2) | 0.961 | 0.305 | 0.469 | 0.299 | 0.601 | 0.337 | 0.290 | 0.837 | 0.373 |
| Sargan | 0.328 | 0.185 | 0.449 | 0.014 | 0.116 | 0.018 | 0.980 | 0.004 | 0.030 |
| Hansen | 0.591 | 0.389 | 0.532 | 0.0297 | 0.328 | 0.706 | 0.974 | 0.298 | 0.561 |
| Country | 14 | 13 | 13 | 14 | 13 | 13 | 12 | 11 | 11 |
| GMM instruments for levels | | | | | | | | | |
| Hansen test outside group | 0.158 | 0.375 | 0.522 | 0.167 | 0.203 | 0.432 | 0.761 | 0.140 | 0.481 |
| Difference (zero H = exogenous) | 0.787 | 0.350 | 0.447 | 0.381 | 0.384 | 0.797 | 0.944 | 0.506 | 0.492 |
| Iv( year, eq (diff) | | | | | | | | | |
| outside the group | 0.792 | 0.267 | 0.395 | 0.241 | 0.247 | 0.603 | 0.986 | 0.153 | 0.318 |
| Difference (zero H = exogenous) | 0.155 | 0.881 | 0.844 | 0.436 | 0.546 | 0.954 | 0.479 | 0.757 | 0.924 |
| Instruments | ten | ten | ten | ten | ten | 13 | ten | 11 | 11 |

*Notes: Estimated standard deviations in parentheses. ***p<0.01; **p<0.05; *p<0.1. VTRAN = value of mobile money transactions as a percentage of GDP; NTRAN = mumber of transactions via mobile money; ACCOUNTS = number of active accounts per 1,000 adults.* Table 2 details the estimation results across several models to examine how different economic indicators affect financial inclusion, incorporating variables such as GDP per capita, inflation rate, and employment. GDP per capita is positively and significantly linked to financial inclusion whereas unemployment and inflation are negatively and significantly linked to financial inclusion, which would mean that when the inflation rate increases, financial inclusion decreases

**Table 3.** Estimation results on age and gender (sources: authors' construction, using STATA software)

| | MODEL 1 | MODEL2 | MODEL3 | MODEL4 |
|---|---|---|---|---|
| Financial inclusion | 1,018*** (0.0346) | 0.970*** (0.0415) | 0.836*** (0.0689) | 0.930*** (0.0220 |
| Women 30–34 years old | -0.00175 (0.00910) | -0.0437* (0.0211) | | -0.00941*** (0.00279) |
| Women 40–44 years old | 0.00943 (0.0185) | 0.0556* (0.0258) | | 0.0560*** (0.00854) |
| Men 30–34 years old | 0.00445 (0.00919) | 0.00987 (0.0218) | 0.0563** (0.0252) | |
| Men 40–44 years old | -0.0189 (0.0256) | 0.000506 (0.0250) | -0.0238 (0.0226) | |
| Active mobile money accounts | | | | 1.82e-06*** (1.37e-07) |
| Value of transactions via mobile money | 0.000457** (0.000200) | -0.0155 (0.0683) | | 0.000422*** (0.000133) |
| Number of transactions via mobile money | | 0.0108*** (0.00317) | -1.50e-05 (0.00175) | |
| AGAINST | 0.0157 (0.0146) | -0.0760 (0.0610) | -0.235** (0.104) | -0.158*** (0.0401) |
| comments | 40 | 39 | 39 | 40 |
| Country | 14 | 14 | 14 | 14 |
| Fisherman | 0.000 | 0.000 | 0.000 | 0.000 |
| AR(1) | 0.024 | 0.022 | 0.007 | 0.022 |
| AR(2) | 0.220 | 0.212 | 0.459 | 0.250 |
| Sargan | 0.019 | 0.329 | 0.051 | 0.127 |
| Hansen | 0.192 | 0.562 | 0.218 | 0.575 |
| GMM instruments for levels | | | | |
| Hansen test outside group | 0.453 | 0.135 | 0.434 | 0.341 |
| Difference(zeroH=exogenous) | 0.154 | 0.734 | 0.170 | 0.748 |
| iv (year, eq(diff) | | | | |
| Hansen test outside group | 0.127 | 0.449 | 0.134 | 0.477 |
| Difference(zeroH=exogenous) | 0.976 | 0.845 | 0.975 | 0.855 |
| Instruments | 14 | 14 | Ten | 14 |

*Notes:* Estimated standard deviations in parentheses. ***p<0.01; **p<0.05; *p<0.1.

Table 3 evaluates the influence of demographic factors, specifically age and gender, on the Financial Inclusion Index, presenting separate models for active mobile money accounts and other relevant financial behaviors. The number of active mobile money accounts is positively and significantly related to financial inclusion. The variable woman aged 30–34 years old is negatively and significantly linked to financial inclusion whereas the variable woman aged 40 to 44 is positive and significantly related to financial inclusion.

The analysis in the tables detail the regressions, confirming the positive and significant impact of mobile money transactions and active accounts on financial inclusion. Education, GDP per capita, and demographic factors also positively correlate with financial inclusion, while unemployment and inflation have negative effects. That is, an increase in the value

of mobile money transactions improves financial inclusion, so the first hypothesis cannot be rejected. Furthermore, these tables also show that the number of active mobile money accounts is positively and significantly related to financial inclusion. This would mean that an increase in the number of active mobile money accounts would lead to an increase in financial inclusion. The second hypothesis cannot therefore be rejected.

Table 1 shows that education level is positive and significantly related to financial inclusion. Therefore, an increase in education level improves financial inclusion, as education is a considerable factor in the acceptance and use of mobile money in Sub-Saharan Africa.

The economic situation analysis in Table 2 show that unemployment is negatively and significantly linked to financial inclusion. Which means that an increase in the rate unemployment increases financial exclusion. Furthermore, with regard to the income captured by GDP per capita, the estimation results show that the latter is positively and significantly linked to financial inclusion. This means that an upward trend in GDP per capita leads to an increase in the level of financial inclusion. Concerning inflation, it appears that inflation is negative and very significant, which would mean that when the inflation rate increases, financial inclusion decreases. As for the interest rate, it is positive and very weakly significant. This means that an increase in the interest rate leads to a slight increase in financial inclusion.

Concerning the gender and age factors from Table3, we can note that the variable woman aged 30–34 years old is negatively and significantly linked to financial inclusion. This means that an increase in the number of women aged 30 to 34 reduces financial inclusion. In contrast, the variable woman aged 40 to 44 is positive and significantly related to financial inclusion, thus an increase in the number of women aged 40 to 44 leads to an increase in financial inclusion. The same result appears for men in the same age group.

Given that the econometric validity is satisfied, the estimation results show that the coefficients associated with the variables of interest (number of mobile money transactions and number of active mobile money accounts) are all significant with a positive sign. These results reflect the fact that an increase in the value of mobile money transactions as well as an increase in the number of active mobile money accounts contributes to improving the level of financial inclusion in Sub-Saharan Africa. This result confirms the central hypothesis according to which the use of mobile money improves financial inclusion in Sub-Saharan Africa.

The following recommendations were made by the authors, taking into account the analysis carried out about.

**The development of mobile money.** An increase in the value of mobile money transactions improves financial inclusion, therefore mobile money players must carry out operations to widen network coverage of mobile operators, better customer education improving financial inclusion, and the proliferation of partnerships between mobile network operators (MNOs) and commercial banks and even other financial institutions with the aim of strengthening interoperability.

**Democratize and popularize mobile money services.** An increase in the number of active mobile money accounts would lead to an increase in financial inclusion. The ob-

jective here is to give citizens the opportunity to carry out the majority of their financial transactions via mobile money. That is by allowing students to pay their university fees via mobile money, to encourage various payments/spending via mobile money and lift restrictions on monthly transaction quotas.

**Regulate and secure mobile money services.** Governments should put in place legislation to protect users of mobile money services. Indeed, it very often happens that during a transaction the initiator has the wrong recipient. The law should allow mobile money users to get back money they send by mistake.

Regulatory authorities across Sub-Saharan African states should ensure that transaction fees are set at an affordable price to encourage populations initially excluded from basic financial services to use mobile money services.

## Conclusion

The issues of cybersecurity and consumer protection are similarly prominent in both contexts. In Sub-Saharan Africa, there is an urgent need to establish robust regulatory frameworks to tackle fraud and build consumer confidence in mobile money systems (Aker & Mbiti, 2010). In Lithuania and the EU, efforts are concentrated on enhancing data security and implementing stringent regulations to protect consumers from data breaches and scams, showcasing a proactive approach to mitigating risks associated with digital finance.

This article aims to show the role of mobile money on financial inclusion. In other words, the question is whether the innovation of mobile money resulting from the development of mobile telephony promoted wider access to financial services in Sub-Saharan Africa. The results of econometric estimations show that in general, the value of mobile money transactions and the number of active mobile accounts are determining factors that improve financial inclusion. This has led to the acceptance of the central hypothesis that the use of mobile money promotes financial inclusion in Sub-Saharan Africa. The integration of mobile money into financial systems represents a critical advancement for promoting financial inclusion. In Sub-Saharan Africa, mobile money solutions have gained prominence as a means to democratize access to financial services for underserved populations, in contrast, the discourse surrounding financial inclusion in Lithuania and the broader European Union (EU) reflects a different set of priorities and established frameworks. Studies have consistently shown that the introduction and expansion of mobile money platforms significantly enhance financial inclusion by allowing users to perform transactions, save, and access credit without needing a traditional bank account (Mas & Radcliffe, 2010). This situation highlights how mobile money can bridge the financial gap in areas with limited banking infrastructure and foster economic participation.

Research published in the *Ekonomika* journal indicates that while access to financial services is already high in Lithuania and the EU at large, the focus has shifted toward enhancing the quality and security of financial services offered through digital platforms. For example, Krištopaitis & Žukauskaitė (2022) emphasize the importance of financial literacy in promoting effective use of mobile and digital financial services. Their findings

indicate that improving financial literacy among users can lead to better engagement with available financial tools, thus maximizing the benefits of existing systems.

Additionally, the EU's broader regulatory focus aims to ensure a secure and inclusive digital financial landscape. The EU has implemented various directives aimed at improving consumer protection and fostering digital finance adoption, ensuring that all citizens can benefit from advancements in financial technologies (European Commission, 2020). Kvedaras & Rupeikytė (2021) illustrate how these regulatory frameworks are essential in developing trust in digital financial services, which is crucial for increasing user adoption and engagement in member states like Lithuania.

In addition, other factors were found to be very important in explaining financial inclusion. Education level has positive effects on financial inclusion, consistent with the findings of Demirgüc - Kunt et al. (2013), Allen et al. (2016). Age and gender were also positively related to financial inclusion, as evidenced by men using financial services more than women and older people using financial services less than younger people. Unemployment and inflation have had negative and significant effects on financial inclusion. Interest rates in Sub-Saharan Africa are not very attractive when it comes to deposits with banking institutions. In view of these results, it is recommended that States and mobile telephone operators continue to develop mobile money. Also, much research has been carried out on the use and importance (significance) of mobile money in Sub-Saharan Africa.

In summary, while mobile money serves as a transformative tool for financial inclusion in Sub-Saharan Africa, Lithuania and the EU are more focused on refining existing financial infrastructures, enhancing digital literacy, and ensuring robust consumer protections. This divergence reflects the differing stages of financial inclusion and the unique challenges each region faces, as highlighted in recent *Ekonomika* publications. However, very little has been done in terms of research on the negative aspects of mobile money use as a means of financial inclusion in Sub-Saharan Africa, as further research should be targeted towards this socio-economic area and possibly political effects of mobile money on Sub-Saharan Africa.

**References**

Abel, S., Mutandwa, L. and Le Roux, P. (2018). International Journal of Economics and Financial Issues An examination of the determinants of financial inclusion. International journal of economics and *financial issues*, *8* (3), 1–8.

Ahmad, A.H., Green, C., & Jiang, F. (2020). *Mobile* money, financial inclusion and development: a review referring to the African experience. *Journal of Economic Studies*, *34* (4), 753-792.

Ahmad, Ahmad Hassan (2020). Mobile money, financial inclusion and development: A review with reference to African experience. Journal of Economic Surveys , 24(3), 207-232.

Aker, J. C., & Mbiti, I. M. (2010). Mobile Phones and Economic Development in Africa. Journal of Economic Perspectives, 24(3), 207-232.

Aker, J.C. and Wilson, K. (2013). Can mobile money be used to promote savings? Evidence from northern Ghana. *SSRN Electronic Journal*.

Akturan, U. and Tezcan, N. (2012). Adoption of mobile banking services by the youth market: perceptions and intentions. *Marketing intelligence and planning*, *30* (4), 444-459.

Allen et al. (2012) Closing the financial development gap in Africa: cross-country comparisons and Kenya country study. NBER Working Paper, No. 18013.

Allen, F., Demirguc - Kunt, A., Klapper, L., and Martinez Peria, MS (2016). The foundations of financial inclusion: Understanding the ownership and use of formal accounts. In *Journal of Financial Intermediation* (Vol. 27, December issue).

Amegnaglo, CJ, & Zounmenou, AY (2020). Exploratory analysis of the effect of the emergence of electronic money account services (Mobile Money) on financial inclusion in southern Benin. *Journal of Theoretical and Applied Economics ISSN*, *1840*, 7277.

Ambrosius, C. and Cuecuecha, A. (2016). Remittances and use of formal and informal financial services. *Global development*, *7*, 80–98.

Amidzic G., Massara A. and Mialou A., (2014), "Assessing Countries' Financial Inclusion Standing—A New Composite Index", IMF working paper WP/14/36.

Anzoategui D., Démirguc-kunt A. and Martinez Peria MS, (2014) "Remittances and Financial Inclusion: Evidence from El Salvador" *World Development* Flight. 54, p. 338-349, 2014.

Arellano, M. and S. Bond (1991), "Some specifications for panel data: Monte Carlo evidence and application to employment equations" *Review of Economic Studies*, 58, 277-97.

Asongu, Simplice (2020). *Enhancing ICT for productivity in Sub Saharan Africa: Thresholds for complimentary Policies; Research Africa network working papers.*

Avom, D. and Eyeffa Ekomo, SM-L. (2007). Fifteen years of banking restructuring in CEMAC: what lessons? *Journal of Financial Economics*, *89* (3), 183-205.

Bangake, C. and Eggoh, J. (2020). Do migrant remittances improve financial inclusion in recipient countries? *Region and Development*, *51*, 115-132.

Bankole, F.O., Bankole , O.O., & Brown, I. (2011). Adoption of mobile banking services in Nigeria. *The Electronic Journal of Information Systems in Developing Countries*, *47* (1), 1–23.

Baumol, W. (1952). The demand for liquidity for transactions. In *Quarterly Journal of Economics,* (Vol. 67, Issue 4, pp. 545-556).

Beck T. and De la Torre A., (2006), "Basic Analyzes of Access to Financial Services", *World Bank Policy Research Working Paper* 4026, 57p.

Beck, T., Demirgüç - Kunt, A. and Peria , MSM (2008). Banking services for everyone? Barriers to accessing and using banking services around the world. *World Bank Economic Review*. https://doi.org/10.1093/wber/lhn020

Bidiasse , H., & Mvogo, GP (2019). The determinants of mobile money adoption: the importance of specific factors in Cameroon. *Industrial Economics Revie.*

Chamberlain D. and Walker R., (2005), "Measuring access to transactional banking services in the Southern Customs Union - an index approach", version 3.0, Genesis, Johannesburg, South Africa, 41p.

Chithra, N. and Selvam, M. (2013). Determinants of financial inclusion: An empirical study on inter-state variations in India. *SSRN Electronic Journal*, 1–15. https://doi.org/10.2139/ssrn.2296096

Chong, A. and Gradstein, M. (2007). Inequalities and institutions. *The journal of economics and statistics*, *89* (3), 454-465.

Cobla, GM, Osei - Assibey, E., 2018. Mobile money adoption and spending behaviour: the case of students in Ghana. Int. J.Soc. Econ. 45, 29-42. https://doi.org/10.1108/IJSE-11-2016-0302.

Demirgüçkunt, A. and Klapper, L. (2012). Financial inclusion in Africa

European Commission. (2020). Digital Finance Package.

Hans, Fakhrul (2020). Internet adoption and financial development in sub-Saharan Africa. Journal of Economic Survey

Kounouwewa, J., & Hounkou, CE (2024). Impact of mobile payment on the financial inclusion of unbanked populations in Benin. *International Review of Management Sciences*, *7* (2).

Krištopaitis, A., & Žukauskaitė, M. (2022). The Role of Financial Literacy in the Use of Digital Financial Services. Ekonomika, 101(2).

Kvedaras, A., & Rupeikytė, A. (2021). Enhancing Consumer Protection in Digital Finance: Lessons for the EU from Lithuania. Ekonomika, 100(1).

Mas, I., & Radcliffe, D. (2010). WPT Mobile Money: A New Tool for Financial Inclusion. CGAP Focus Note, 69.

Ngono, Jean Francky Landry, L'Index d'Inclusion Financière À L'Heure Du Mobile Money (The Index of Financial Inclusion at Time of Mobile Money) (June 30, 2020). Journal of Academic Finance, Vol. 11, No. 1, pp. 33-44, 2020, Available at SSRN: https://ssrn.com/abstract=3679498 or http://dx.doi.org/10.2139/ssrn.3679498

Patrick-Hervé Mbouombouo Mfossa, (2019). " Financial inclusion and financial resilience through mobile money in sub-Saharan Africa: perspectives from Cameroon [Financial inclusion through mobile money and financial resilience in Sub-Saharan Africa ," Postprint hal-03622403, HAL.

Tatsing, PDM (2024). Financial Inclusion in CEMAC: An Explanation by Mobile Money. Journal of Economics, Finance and Management (JEFM), 3(2), 346-365. DOI: https://doi.org/10.5281/zenodo.10902463

Timite, B.K., & Skalli, L. (2023). Evaluation of the Regional Financial Inclusion Strategy in UEMOA. Journal of Integrated Studies in Economics, Law, Technical Sciences & Communication, 1(2).

Timite, B.K., & Skalli, L. (2023). Evaluation of the Regional Financial Inclusion Strategy in UEMOA. Journal of Integrated Studies in Economics, Law, Technical Sciences & Communication, 1(2). https://doi.org/10.1080/08276331.2021.1980679