

Does the Cashless Payment Instrument Impact Utility Payment, Saving, and Borrowing in Emerging and Developing Economies

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Abstract

The study examines the impact of cashless payment instruments (mobile money, debit card, credit card) on utility payment, saving and borrowing behaviour of the households in developing and emerging economies. Using household-level survey data from world bank global finindex dataset for the period of 2017-2024, we employed multivariate probit accounting for year and country fixed to test our hypothesis. Our findings reveal that cashless payment instruments (mobile money account, debit card, credit card) have more likelihood of improving the household's utility payment, saving and borrowing behavior in developing countries. However, the effect of mobile money adoption on utility payment, saving and borrowing behaviour of the households is more pronounced, large and significant compared to debit card and credit card effect. Our heterogeneity analysis suggest that there is a gender gap decrease in the use of a cashless payment instrument to pay bills, while the gender gap persisted when it comes to savings and borrowing, although there is significant improvement in terms of access and usage of financial services by women . We also found a significant variation on the effect of cashless instruments across years and regions. We therefore, recommend that authorities especially in countries where financial infrastructure remains underdeveloped consider promoting cashless payments instruments as a means to enhance payments system, savings and borrowing and overall financial inclusion.

Keywords: • Cashless payments • savings • borrowings • • utility payments • credit/debit cards • mobile money • emerging • developing economies

JEL Classification:

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1 Introduction

Payment instruments/system are at the core of a country's economic activity and its financial sector. Improvements in national payments systems (NPSs) lead to overall savings for the economy and strengthen securities management and transaction processing. Payment services are also a critical enabler of financial inclusion through transaction accounts that allow people to make and receive payments in a secure and cost-efficient way, to safely store value, and to enable access to and usage of broader financial services [WGPSS \(2023\)](#). Thus, the use of non-cash payment Instruments (credit or debit cards, mobile money, internet banking, CBDC, and other digital payment) is increasing globally particularly after COVID-19 in developing and emerging market¹. This is because it is seen as a safer, more efficient, and more inclusive payment system. The annual number of cashless transactions per person globally rose sharply from 91 to 135 between 2017 and 2020. This increase where double in low and middle-income economies (LMICs) [WGPSS \(2023\)](#).

Indeed, cashless payment instruments such as mobile money service , debit and credit cards are now perceived as the easiest and alternative mode of savings, borrowings and utility payments for millions of households in developing and emerging economies [Klapper et al. \(2025\)](#). Non cash based payment instrument, such as debit and credit card, has the potential to improve the economic growth of countries by providing easy access to formal financial service, improves savings , access to credit, transactional efficiency and consumption growth which in turn stimulate investment, aggregate demand, a greater financial inclusion and economic growth [Wasiaturrahma et al. \(2021\)](#); [Mashabi and Wasiaturrahma \(2021\)](#); [Galbraith and Tkacz \(2007\)](#). Cashless payment instrument such as debit card reduce transaction cost and enable poor households to save more [Bachas et al. \(2021\)](#). Mobile money is one of the cashless payment instrument that revolutionize the payment system by improving savings, borrowing, remittances and utility payment in developing countries [Ismailov et al. \(2019\)](#); [OCHIENG \(2023\)](#); [Demombynes and Thegeya \(2012\)](#).

Moreover, evidence from literature further documented the significance of adopting and usage of cashless payment instruments. [Allen et al. \(2016\)](#) argue that mobile money account ownership can accelerate savings and financial inclusion in developing countries. [Ouma et al. \(2017\)](#) show the evidence of usage of mobile phone to provide financial service and promote the likelihood of savings by the households. [Ismailov et al. \(2019\)](#) also provide evidence on how mobile money improve savings and borrowing behaviour of the households in Tanzania. On the other hand, number of studies shows the usefulness of

¹The ownership of mobile money account for adult age 15+ increase from 13% in 2021 to 18% and debit card ownership increase from 43% to 52% in 2024, while credit card ownership increase from 16% to 20% in 2024.(source: world bank global finindex)

credit card, debit cards and other non-cash based payment instrument on GDP, savings, borrowings and utility payment, see for instance [Wasiaturrahma et al. \(2021\)](#); [Mashabi and Wasiaturrahma \(2021\)](#); [Bachas et al. \(2021\)](#); [Galbraith and Tkacz \(2007\)](#). However, the existing literature are generally limited in scope (single year, country, region), or focus on a single aspect of cashless payment instruments which gives room for further study. To complement and contribute to the body of literature we therefore, in our study propose an empirical analysis to test how the cashless payment instruments (mobile money, credit card, debit cards) impact the utility payment, saving, and borrowing behaviour of the households in developing and emerging economies. We also examine the gender gap gender and regional heterogeneity in terms of cashless instrument adoption and usage.

Indeed, to test our hypothesis we employed Multivariate probit model to estimate the likelihood of using cashless payment instruments (mobile money account, debit card, credit, card) to make utility payment, saving and borrowing. The choice of the model is based on the intuition that the dependent variables (utility payment, saving and borrowing) are interrelated and interaction in possible between. Unlike standard probit or logit, Multivariate probit estimate several binary outcomes that are correlated or interacting by allowing the error terms to be correlated and captures the several binary decisions that may be influenced by common unobserved factors since saving, borrowing, and bill payment may be jointly determined To address the issue of endogeneity in our model we employed control function approach and conditional mixed process (CMP) estimation. To address this puzzle question raised, we leverage on household-level survey data from world bank global finindex dataset which has been the definitive source of data on the ways in which adults around the world access and use financial services, from payments, digital payments, to savings and borrowing, and manage financial events such as a major expense or a loss of income for 69 emerging and developing countries.

We found that cashless payment instruments (mobile money account, debit card, credit, card) are associated with utility payment, savings and borrowing behaviour of the households. Implying that cashless payment instruments has more likelihood of improving savings, borrowing and utility payment of behaviour of the household in developing countries. Indeed, the effect of mobile money adoption on utility payment, savings and borrowing behaviour of the households is more pronounce, large and significant compared to debit and credit card impact. Our findings are supported and corroborate with the literature [Ismailov et al. \(2019\)](#); [Ouyang \(2021\)](#); [Awel and Yitbarek \(2022\)](#); [Demombynes and Thegeya \(2012\)](#); [Jack et al. \(2013\)](#); [OCHIENG \(2023\)](#); [Galbraith and Tkacz \(2007\)](#); [Mashabi and Wasiaturrahma \(2021\)](#); [Bachas et al. \(2021\)](#) that shows the usefulness of cashless payment instruments on utility payment, savings and borrowing behaviour of the households. Although, we take holistic approach with the most recent data to simultane-

ously analyse the effect of cashless payment instrument on utility payment, savings and borrowing behaviour of the households.

Our heterogeneity analysis suggest that there is a gender gap decrease in the use of a cashless payment instrument to pay bills, while the gender gap persisted when it comes to savings and borrowing, although there is significant improvement in terms of access and usage of financial services by women for the period reviewed in developing countries. We also found a significant variation between years and regions of emerging and developing countries.

The contributions and originality of this article are as follows: We explicitly study the impact of cashless payment instruments (mobile money account, debit card, credit, card) on how households make utility payments, savings, and borrowings by taking into account of recent and a larger set of Individual household-level survey data from the world bank global finindex dataset for 69 emerging and developing countries than in previous studies. We also contributed on the methodological approach by using multivariate probit in this kind of study which has not being done before on similar study to the best of our knowledge.

Moreover, our results have some potential implications that could inform and interest policymakers /government, payments service providers, industries, entrepreneurs in the financial sector to ensure a reliable and continuous payment system innovation in the financial sector. The findings also showcase the importance of cashless payment instruments in order to accelerate digital inclusion and payment system landscape.

Section 2 reviews the literature. Section 3 presents the methodology. Section 4 describes the details of empirical strategy and the testable hypothesis and section 5 presents the results. Section 6 concludes.

2 Literature review

2.1 Cashless Payment Instrument, Savings, Borrowings and Utility payment

Empirical literature on payment instrument adoption and usage has evolved in recent time alongside the theoretical literature. The early contributions on payment instrument adoption and usage mostly used the household survey data to analyse the extent to which payment instrument adoption and usage influence household's savings, borrowings and utility payment in developing and emerging economies. Thus, to study the impact of cashless payment instruments adoption on savings, borrowings and utility payment in developing and emerging countries, a pool of emperical literature has been reviewed which

serves as a building block for our study.

[Ouyang \(2021\)](#) investigates how cashless payment affects credit access for the under privileged using Alipay, a BigTech platform that offers various financial services to over 1 billion users and find that cashless payment adoption increases credit access by 56.3% and a 1% rise in payment flow increases credit line by 0.41%. These effects are stronger for the less educated and the older.

[Mashabi and Wasiaturrahma \(2021\)](#) analyze the effect of electronic payment systems based on credit cards, debit cards, and electronic money, as well as macroeconomic variables and reveals that debit card and electronic money-based transactions has a significant positive effect on economic growth in Indonesia in the long run. [Aprigliano et al. \(2017\)](#) forecast Italian GDP using Payment systems data and mixed frequency factor model and found that payment system flows stand out when compared to other standard business cycle indicators in boosting Italian GDP.

In another study, [Galbraith and Tkacz \(2007\)](#) explore the usefulness of electronic transactions as real-time indicators of economic activity, using Canadian debit card data and found that household transactions vary greatly according to the day of the week, debit card data can help lower consensus forecast errors for GDP and consumption growth as well debit card transactions are correlated with Statistics Canada's revisions to GDP. Similarly, A study by [Ghana \(2017\)](#) argue that improvement in the mobile money sub sector leads to development of the payment ecosystem, deepening of financial inclusion and promotion of cash-lite economy. In the same vain, [Dias and McKee \(2010\)](#) found that mobile subscribers in Kenya and South Africa who do not have bank accounts are now using mobile money for banking-related transactions such as bill payment, payroll deposits, international remittances, loan receipts and payments, airtime purchases, groceries, bus tickets and a whole range of other financial services. [Forgor and Julie \(2020\)](#) found that mobile services and payments system have significant positive effects on economic growth, and is critical aspect of financial inter-mediation in sub-Saharan Africa which offers them means through which both the banked, under banked and unbanked populations could be attracted into the formal financial system, thus capable of facilitating innovative economic growth in the region. [Carlsen and Storgaard \(2010\)](#) examines whether electronic payments by card provides a useful indicator for retail sales in Denmark and reveals that electronic payment card data is of great importance in predicting retail sales in Denmark. Also, [Ajefu and Ogebe \(2019\)](#) believe that the receipt of remittances increases the probability of using formal financial services, such as deposit accounts and Internet/ mobile banking in Nigeria.

[Bezovski \(2016\)](#) reveals that customers are increasingly using mobile payment methods for their routine online purchases and for their on-site purchases as well. consumers have

developed their trust and habits on using mobile payment systems that supports mobile transactions and makes them transparent and more convenient. [Tut \(2023\)](#) investigates the effects of COVID-19 pandemic on financial institutions and consumers' adoption of Financial Technology (FinTech) for payments and found that COVID-19 pandemic accelerated the adoption and increased the digital payment system in Kenya. Using a panel sample of listed banks from 84 countries, [Fung et al. \(2020\)](#) examine the heterogeneous effect of FinTech on the fragility of financial institutions and reveals that a shock to FinTech innovations has no net effect on the fragility of financial institutions, when ignore market characteristics and promoting FinTech decreases and increases the fragility of financial institutions in emerging and developed financial markets. [Crowe et al. \(2015\)](#) Argue that breadth and depth of mobile banking offerings as well as customer adoption rise with an institution's comfort level and experience with mobile technologies and also younger generations are adopting mobile banking and other digital platforms at a much higher rate.

Using firm-level data from the World Bank Enterprise Survey across 14 sub-Saharan African countries, [Konte and Tetteh \(2023\)](#) investigate the effects of mobile money use and access to traditional financial services on labour productivity and found a significant effect of access to traditional financial services on firm labour productivity but no robust significant direct effect of mobile money use on labour productivity. the evidence also suggests that mobile money can heighten the effects of traditional finance, as a result of reduction in transaction cost. Similarly, [Talom and Tengeh \(2019\)](#) confirm a positive relationship between the use of mobile money services and the financial performance of businesses in Cameroon. On the contrary, [Waweru and Kamau \(2017\)](#) reported that the practice of storing wealth in non-monetary forms was unaffected by the introduction of mobile money in rural areas and other methods of money transfer experienced a significant decrease in usage amongst low-income earners after the introduction of mobile money.

[Wasiaturrahma et al. \(2021\)](#) investigate the effect of non-cash payment transactions on economic growth in Indonesia and the results show that the payment instrument affects economic growth, especially the Card-Based Payment Instrument (CBPI). Using administrative account data and household surveys, [Bachas et al. \(2021\)](#) also shows how debit cards enable the poor to save More. their findings reveals that beneficiaries accumulated a savings stock equal to 2% of annual income after two years with the card. The increase in formal savings represents an increase in overall savings, financed by a reduction in current consumption. They believe there are two mechanisms. First, debit cards reduce transaction costs of accessing money. Second, they reduce monitoring costs, which led beneficiaries to check their account balances frequently and build trust in the bank. [Ngaruiya et al. \(2014\)](#) analyse Effects of mobile money transactions on financial

performance of small and medium enterprises in Nakuru central business district. The findings of the study reveal that, the proportion of SMEs using mobile money transaction was significant compared to those which did not. the study established that the frequency by which SMEs use of mobile money transaction was statistically significant. The study also established that SMEs after adopting the use mobile money, performed better than they used to. [Kipyegon \(2022\)](#) analysis The Role of Mobile Money in International Remittances: Evidence from Sub-Saharan Africa. The findings shows that the use of mobile money in international remittances for corridors that share a common border is twice that of corridors that do not share a common border. Thus, a reduction in remittance transfer costs can be achieved by improving cross border mobile money services interoperability - linking mobile money service providers in different countries.

[Ouma et al. \(2017\)](#) showed that availability and usage of mobile phones to provide financial services promotes the likelihood of saving at the household level. Not only does access to mobile financial services boost the likelihood to save, but also has a significant impact on the amounts saved. [Demombynes and Thegeya \(2012\)](#) Examine mobile savings phenomenon in Kenya and argue that the usage of bank integrated mobile savings products remain limited and largely restricted to the wealthy group while In the rural areas male and married are more likely save and that majority of the population use mobile phones as a depository for funds especially among those who are unlikely to save using formal channels. Their study also reveals that MPESA accounts users were 32% more likely to have some savings. In similar study, [OCHIENG \(2023\)](#) explores how mobile money influences savings behavior paying attention to the financially disadvantaged group in Kenya, the youth. He found that there is 0.56 times likelihood that users of Mobile Money have a savings product compared to non-users. Mobile Money users are also more inclined to savings in informal savings platforms compared to formal platforms.

[Ismailov et al. \(2019\)](#) estimate the causal effect of the use of mobile money on borrowing, saving, and receiving remittances in Tanzania, by applying a two-stage least squares estimation. They argue that when a household experiences a negative shock, mobile money non-users increase borrowing, while mobile money users do not. The use of mobile money increases the probability of saving in mobile money savings accounts and receiving remittances, while it decreases the probability of saving in less liquid assets such as livestock. On the other hand, They found that the effect of the use of mobile money on receiving remittances is the same for those who experience a negative shock and those who do not and a household that uses mobile money does not need to increase borrowing in the face of a negative shock.

Having reviewed the previous studies on similar topic [Allen et al. \(2016\)](#); [Ouma et al. \(2017\)](#); [Ismailov et al. \(2019\)](#); [OCHIENG \(2023\)](#); [Wasiaturrahma et al. \(2021\)](#); [Mashabi](#)

and Wasiaturrahma (2021); Bachas et al. (2021); Galbraith and Tkacz (2007), the studies are generally limited in scope (single year, country, region), or focus on a single aspect of cashless payment instruments which gives room for further study. To complement and contribute to the body of literature we therefore, in our study propose an empirical analysis to test how the cashless payment instruments (mobile money, credit card, debit cards) impact the utility payment, saving, and borrowing behaviour of the households in developing and emerging economies.

2.2 Stylized fact and concept clarification

Generally, people often mistake the payment instrument for real money (legal tender). However, payment instruments are not money (legal tender) but rather electronic payment instrument that store monetary value on a technical device (Mobile phone) or electronic chip or card (debit or credit card) which acts as a prepaid bearer instrument involving bank account (traditional banking) or which does not necessarily involves bank accounts in transactions (mobile money service).

Thus, our study is design to mainly focus on the adoption and usage of cashless payment instruments (mobile money, debit card, credit card) that are evolving in developing and emerging countries. By definition mobile money has to do with transferring money and making or receiving payments using the mobile phone which is design and available to the banked and unbanked (people who do not have access to a formal account at a financial institution) (GSMA, 2023). Indeed, mobile money services must offer a network of physical transaction points which can include agents outside bank branches and ATMs, making the service widely accessible to everyone, and Payment services related to a traditional banking product or credit card, such as Apple Pay and Google Wallet, are not included (GSMA, 2023). On the other hand, debit card and credit cards are electronic card that are directly link to bank account which the bearer can used to make payment and withdrawals. While debit card is link to bank account which allows a customer to make payment digitally or withdraw cash at ATM gallery, Credit card are also electronic cards that are link to bank account which allow a bank customer to access extra fund via credit, make payment on special arrangement to payback later, although it comes with pre-arranged limit in which exceeding it will attract extra fees or charges.

In this regards, when studying cashless payment instrument one need to acknowledge their evolution and growth in developing countries. Theoretically, the ownership of the mobile money Account credit and debit card enhances the payment system, increases financial inclusion, and sustains economic development. Indeed, Mobile money provide opportunity to poor and vulnerable to have access to finance, pay bills, make deposits as well received payments like blink of an eye through branchless banking (mobile money

agent outlet) and mobile phones. Moreover, the rationale behind mobile money evolution was to harness the extremely high penetration rates of cell phone ownership among the poor in order to provide them with banking services ([Aggarwal and Klapper, 2013](#)).

However, Figure 1 Depict the evolution of mobile money account and account at financial institution and credit and debit cards ownership, between 2014-2024 . Virtually across all time frame developing countries of East Asia and pacific and Europe and central Asia maintain a high rate of account ownership at financial institutions than other regions and this may likely be as a result of availability of financial infrastructure such as commercial bank branch and literacy rate. However, in terms of mobile money account which evolve as a result of fin-tech sub-Sahara Africa and Latin America and Caribbean record the highest rate of mobile money account ownership this because of rapid adoption of mobile money service which serves as a substitute to the traditional banking system which requires physical banking infrastructure in both the rural and urban areas . Indeed, the growth can also be attributed to increase in mobile phone ownership and FIN-TECH which give birth to Mobile Money services (MPESA, Money point, Orange money etc.) in developing countries. This revolution in financial system aid people to have more access to finance and financially included.

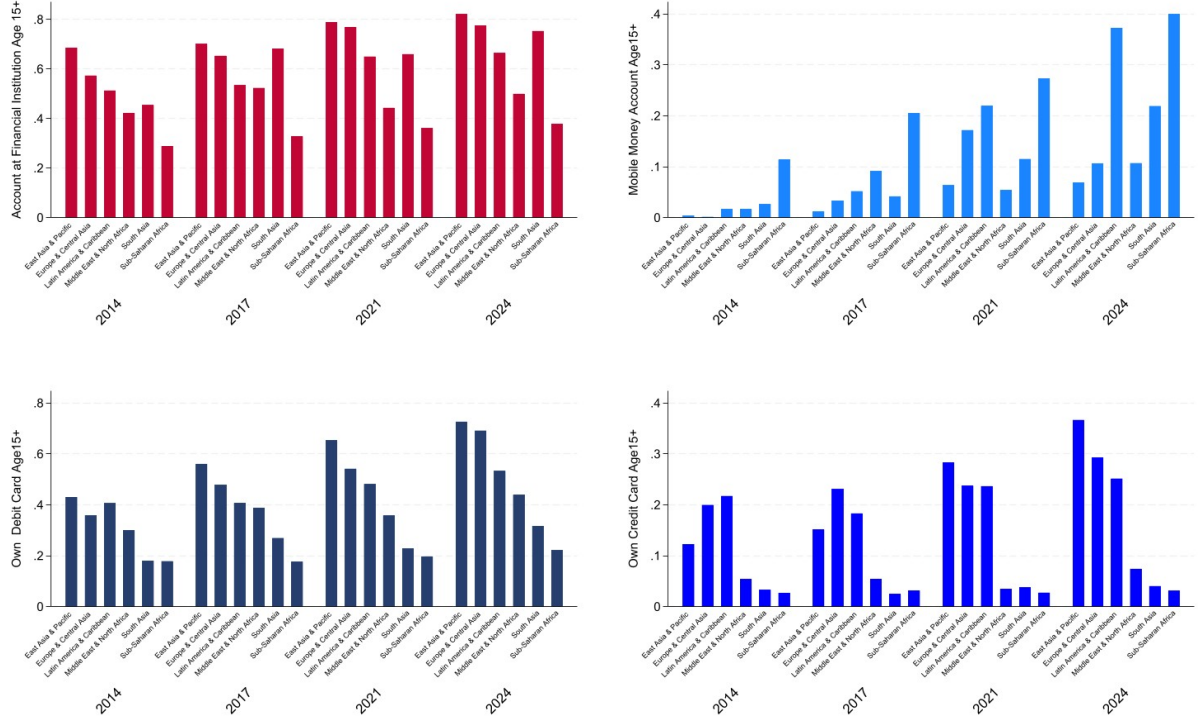
Moreover, debit and credit card evolution is averagely increasing across all region with East Asia and pacific, Europe and central Asia maintain a high rate of debit and credit card ownership. This is not surprising because debit and credit card are directly link to account ownership at financial institution in which the penetration rate is high in East Asia and pacific and Europe and central Asia. However, the evolution of debit and credit card on the contrary seems to be very low in Sub-Sahara Africa, and other region due to the growth of mobile money services which serves as a complementary banking service to traditional banking system.

Moreover, in our study we did not only focus on adoption of cashless payment instruments (mobile money, debit card, credit card), but also on their usgage to saved, borrowed, and make utility payment. Indeed, Access to formal financial services represents the possibility for individuals to penetrate and use them ([Cámara and Tuesta, 2014](#)).

Hence, figure 2 depict the evolution of savings , borrowing, and utility payment in developing countries for the period of 2014-2024. Borrowing and saving behaviour of the households is yet another component of using formal financial services and plays a vital role in measuring the rate of inclusive financial system. However, East Asia and Pacific record a little bit higher saving rate than the remaining regions which revolve around 0.4 and 0.6 mean (equivalent to 38%-59%) between 2014-2024. On the other hand, borrowing rate record an average growth below 0.4 mean (equivalent to 40%) across region over

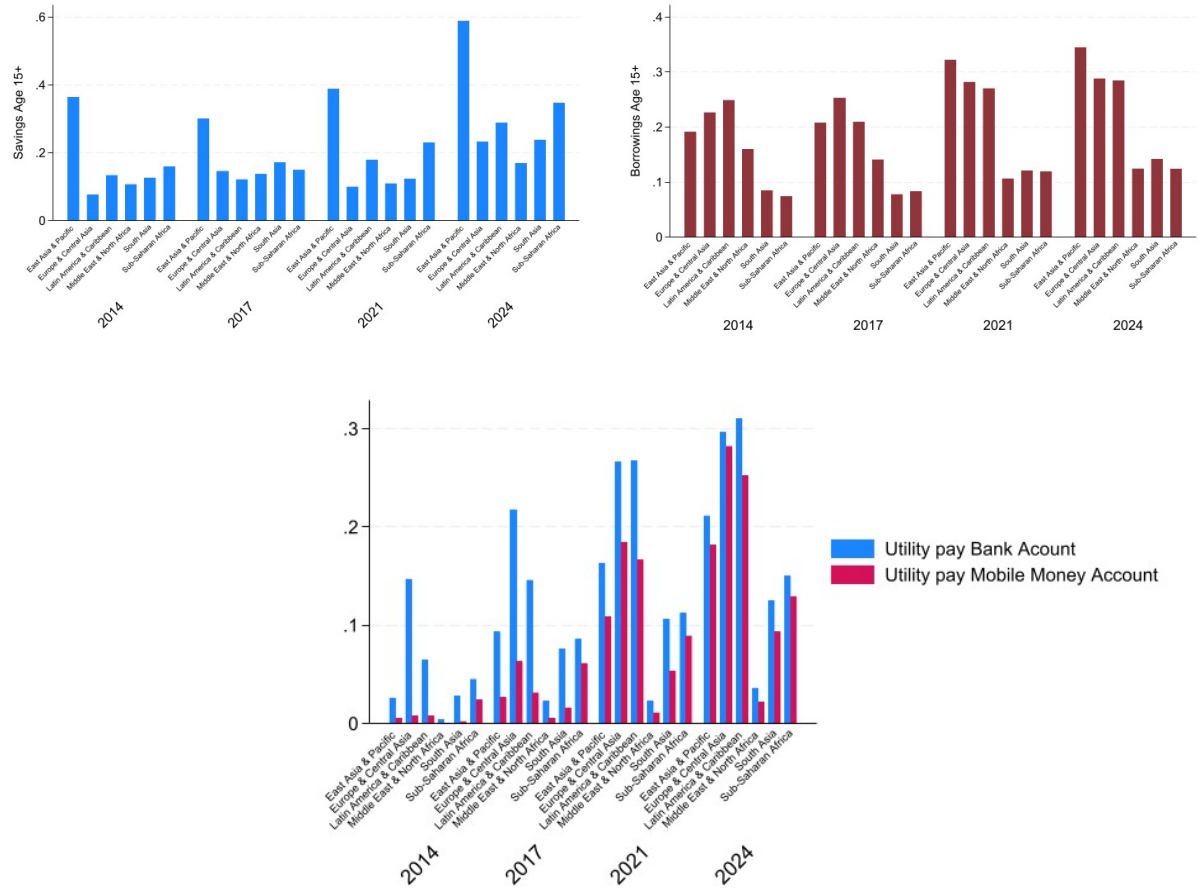
time. The low saving rate and borrowing across regions of developing countries is likely as a result of low per capital income of the households which plays a vital role in saving and borrowing behaviour of the households generally. However, between 2021 and 2024 the saving and borrowing has improved compared to previous years across region.

Figure 1: Cashless Payment Instruments (2014–2024)



On the other hand, Adopting cashless payment instrument make it easy to pay bills and utility through mobile phone or bank account and can play an important part toward digital inclusion. From figure 2, payment of utilities via account and mobile phone records a sharp increase between 2014 and 2024 in developing economies across regions. This increase may like be attributed instant payment of utilities, bills by individual digitally as well as digitizing government to person (G2P) payments, transfers as well private sector payments directly in to account or through mobile money account which is which is evolving in developing countries.

Figure 2: Cashless Payment Instruments (2014–2024)



3 Data and Methodology

3.1 Data

To source the data for the study we leverage on world bank global finindex dataset which has been the definitive source of data on the ways in which adults around the world access and use financial services, from payments, digital payments, to savings and borrowing, and manage financial events such as a major expense or a loss of income. Results from the first survey were published in 2011 and have been followed by subsequent survey results from 2014, 2017, 2021 and 2024. It is the world's only demand-side survey on financial inclusion and a leading source of data on how adults around the world access and use financial services which contains a nationally representative surveys of about 148,000 adults in 141 economies. In this study we used individual level data extracted from the three waves of global finindex survey for 2017, 2021 and 2024 restricting our sample to 69 developing and emerging economies.

Samples selection and missing values

The sample is extracted using the three waves of the Global Finindex database (2017, 2021, and 2024). The initial dataset includes all three waves with (198,452) observations. However, the main regressions use a much smaller sample after dropping missing observations. The missing observations are largely in the socio-economic controls more especially on the rural-urban household's stay across countries. To ensure consistency in the empirical analysis, observations with missing values are drop. Table 12 from appendix reports the extent of missing data, and the final regression sample. .

Our country level control variable were source from world development indicators (WDI) dataset for the purpose of analysis.

3.2 Variables, indicators and their measurements

To analyse the impact of cashless payment instrument on savings, borrowings and utility payment of the household's in developing and emerging economies , cashless payment instrument is treated as explanatory/independent variable while savings, borrowings and utility payment of the households are used as the dependent variable.

3.2.1 Dependent variable

In this study, we hypothesize that savings, borrowings, and utility payment depend on the cashless payment instrument. Hence, our dependent variable is measured using savings, borrowings and utility payment. Savings is measured using a dummy variable that takes the value of 1 if the respondent saved in the past 12 months and 0 otherwise. Borrowing

also is a dummy which take the value of 1 if the respondent borrowed in the past 12 month, and 0 otherwise. Lastly, Utility payment is also a dummy which take the value of 1 if the respondent makes utility bill payment in the past 12 month, and 0 otherwise. Moreover, in our robustness section we disaggregated the three dependent variables in to savings using financial institution account, borrowings from financial institution and utility payment using financial institution account and savings using mobile money account, borrowings from mobile money account and utility payment using mobile money account. Which are all measured as binary.

3.2.2 Independent variable

As we acknowledge in the literature, the use of non-cash/cashless payment Instruments (Credit or debit cards, mobile money) is increasing globally and has the potential of improving financial and payment system. In line with the literature [Mashabi and Wasiaturrahma \(2021\)](#); [Ismailov et al. \(2019\)](#), the independent variable is cashless payment instrument proxy by Mobile money account ownership, debit card ownership and credit card ownership. Mobile money account ownership is a dummy taking the value of 1 if the respondent has a mobile money account and 0 otherwise. debit card ownership is also a dummy variable which takes 1 if the respondent has a debit/ATM card and 0 otherwise. While credit card ownership also is a dummy variable It takes 1 if the respondent has a credit card and 0 otherwise. Hence, evidence from literature shows how significantly these variables could impact savings, borrowings and utility payments of the households. See for instance, [Ismailov et al. \(2019\)](#); [Awel and Yitbarek \(2022\)](#); [Jack et al. \(2013\)](#); [Naito et al. \(2021\)](#),

3.2.3 Control variables

In line with the literature [Allen et al. \(2016\)](#); [Ismailov et al. \(2019\)](#); [Awel and Yitbarek \(2022\)](#), we used individual level control variables in the study that are Gender of the respondent, Cluster type (urbancity), Income quartile, Employment status, Education level of the respondent, Age and age-squared, Internet access and Mobile phone ownership. Gender of the respondent is measured using dummy variable which takes the value of 1 if the respondent is female and 0 for male. Cluster type (urban city) is also a dummy taking the value of 1 if the respondent lives in rural area and 0 in urban area. rural area is defined as a town or village with less than 50,000 inhabitants [Allen et al. \(2016\)](#). The income quartile is based on the income of the respondents in a country which is a categorical variable from 1-5 (ranging from Poorest 20%, Second poorest 20%, Third poorest 20%, Fourth poorest 20% and Fifth poorest 20%). We assume that the likelihood of owning mobile money account, debit or credit card increases with the level of income.

Employment status is measured using dummy, It takes value 1 if the respondent is in workforce and 0 otherwise. we expect that Individuals who are employed has probability to have more easy access and use of digital financial services than those unemployed. Educational level of the respondent is measured with three modalities: primary or less education, secondary education, tertiary and more education. We expect the education level to have a positive impact on the likelihood of adopting cashless payment instrument and use it for payments, savings and borrowing . Indeed, the more educated the individual is, the more likely he will understand the importance of cashless payment instrument. age and age-squared are both in years and we believe the adoption and used of cashless payment instrument increase in the early age and decline with age as we grow older. Thus, in order to capture this trend, we include age squared. Internet access and mobile phone ownership are both dummies taking the values of 1 if the respondent owns a mobile phone and Internet access and 0 otherwise.

On the other hand, we also include a country level control variable . the country control variable are GDP per capita ppp (constant 2021 international \$) [Allen et al. \(2016\)](#), we also include Automated teller machine per 100,000 adult and banking penetration proxy by Commercial bank branch per 100,000 adults. We believe that access to formal finical infrastructure or Proximity to bank outlets and interoperability between ATMs outlet will significantly facilitate and improve saving, borrowing and payment behaviour of the households. We also include mobile phone usage proxy by Mobile cellular subscription (per 100 people) believing that it will moderate the effect of cashless payment instrument on savings, borrowing and payments behaviour of the households. We believe that educated people who can read and write has the likelihood of using digital financial services than uneducated people. Therefore, we include Literacy level of the adult population as control.

Moreover, country's institutions play a vital role on financial development and the payments system. Hence, we include government and institutional variable as controls. we include variable such as Government Effectiveness, Regulatory Quality , Rule of Law respectively which are Estimate that gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5. [Bahia et al. \(2020\)](#).

3.3 Methodology

3.3.1 Empirical and Estimation strategy

In order to analyze the effect of cashless payment instrument on savings, borrowing, and utility payment in emerging and developing economies. We are guided by the literature

(see Allen et al. (2016); Demombynes and Thegeya (2012); Awel and Yitbarek (2022); Ouma et al. (2017); Ismailov et al. (2019); Mashabi and Wasiaturrahma (2021) . However, we deviate from those literature and used multivariate probit model instead of standard probit model by integrating time and country-specific fixed effects to account for the individual changes over time. This is because we have multiple dependent variable (utility payment, savings, borrowing) that are interacting to each order. Hence, the choice of multivariate probit is best applicable to our study. the model specification is as follows :

$$Y_{it} = \beta + \alpha_1 X_{it} + \alpha_2 X_{it} + \alpha_3 X_{it} + Z_{it}\Upsilon + Q_{it}\lambda + \varepsilon_{it} \quad (1)$$

where i and t are individual countries and time respectively; Y_{it} is Dependent variable (Utility pay, Savings, Borrowings) with Savings measured using a dummy variable that takes the value of 1 if the respondent saved in the past 12 months and 0 otherwise. Borrowing also is a dummy which take the value of 1 if the respondent borrowed in the past 12 month, and 0 otherwise. Utility payment is also a dummy which takes the value of 1 if the respondent makes utility bill payment in the past 12 month, and 0 otherwise. (X_{1it} , X_{2it} , X_{3it}) are a mobile money account ownership and debit and credit card ownership. Mobile money account ownership is a dummy taking the value of 1 if the respondent has a mobile money account and 0 otherwise. debit card ownership is also a dummy variable which takes 1 if the respondent has a debit/ATM card and 0 otherwise. While credit card ownership also is a dummy variable It takes 1 if the respondent has a credit card and 0 otherwise. , $Z_{it}\Upsilon$ is a vector of individual control, $Q_{it}\lambda$, is a vector of country control, β and α are vectors of parameters, and ε_{it} is a normally distributed error term with zero mean and variance. From equation (1) the probit model estimated using maximum likelihood is formulated as follows:

$$\Pr(Y_{it} = 1 \mid X_{it}) = \Phi(\alpha + \alpha_1 \text{MobileMoney}_{it} + \alpha_2 \text{CreditCard}_{it} + \alpha_3 \text{DebitCard}_{it} + Z_{it}\Upsilon + Q_{it}\lambda) \quad (2)$$

Where $\Phi(.)$ is the cumulative distribution function of the standard normal distribution.

3.3.2 Endogeneity issues

Empirically there are many economic model that uses multiple dependent variable that are interrelated [Allen et al. \(2016\)](#); [Ismailov et al. \(2019\)](#); [Nakamura and Nakamura \(1998\)](#); [Skogqvist \(2019\)](#) which account for endogeneity caused by simultaneity, reverse causality and omission bias in the model. Indeed, failure to address the issue of endogeneity could lead biased estimation and misleading conclusion. Thus, in this study we model that cashless payment instrument (mobile money adoption, debit or credit cards) as independent variable and are exogenous and uncorrelated with the error term. However, we believe that the relationship between cashless payment instrument (mobile money adoption, debit or credit cards) savings, borrowing and utility payment will result to endogeneity which is as a result of simultaneity, reverse causality among the dependent and independent variable or unobserved factors that are likely not captured in our model which may result to omission bias. Indeed, the ideal way to correct endogeneity in time series analysis is through GMM or two stage least square technique. In the context of digital payment system, ample literature has documented the effectiveness of the use of two stage least square and instrumental variable to resolve the issue of endogeneity in their model (see for instance, [Allen et al. \(2016\)](#); [Skogqvist \(2019\)](#); [Jack et al. \(2013\)](#)).

However, to address the issue of endogeneity in our study, we used control function approach via multivariate probit and a conditional mixed process (CMP). We first estimate control function through the multivariate probit by including the residuals predicted in the model. We then check if the residual coefficients are jointly $= 0$. The intuition is that if the residuals are significantly different from zero , then endogeneity is present in the model and its corrected by the residuals. Otherwise, if the residuals are insignificant, then endogeneity is absent. On the other hand, we also estimated a conditional mixed process (CMP) to correct the endogeneity issue . The choice of CMP to address the endogeneity issue is because it is jointly estimating the adoption and outcome equations by full-information maximum likelihood (FIML), allowing for correlated unobserved factors across equations ([Roodman, 2011](#)). In contrast to control function approaches which requires inclusion of the residuals in the outcome equation, CMP does not require inclusion of residuals. Endogeneity is corrected through estimation of the joint error structure.

Indeed, previous studies have used instruments such as adopting policies of neighboring countries, geographical distance between countries , distance to nearest mobile network, Atm or commercial bank branches with mixed findings (see for instance; [Allen et al. \(2016\)](#); [Jack et al. \(2013\)](#); [OCHIENG \(2023\)](#)). Thus, in our study we carefully construct our instrument based on the inverse geographical distance between countries. The spatial weight matrix is constructed using the inverse of geographical distances between capital cities of the countries. We first construct a spatial weighting matrix using the inverse

of the great-circle (Haversine) distance between the capital cities of countries. Indeed, time-varying spatial lag instrument based on neighboring countries' cashless payment adoption is generated using Inverse geographical distance spatial weighting matrix. The intuition is that countries closer to each other are likely to adopt or replicate the policies of their neighbors. They are likely to experience policy imitation, regulation and financial innovation spillovers and technological diffusion. Thus, the cashless payment instrument adoption might relate and influence the domestic adoption patterns across countries. This is in line with the first law of geography: "Everything is related to everything else, but things close together are more related than things far apart" (Tobler, 1970), which explains the wide use of inverse geographical distance in spatial econometrics to measure connectivity.² Thus, the Algebraic, representation of geographical distance weighting matrix $w_{i,j}$ after normalization, are given as follows:

$$w_{i,j} = \begin{cases} \frac{1/d_{ij}}{\sum_j 1/d_{ij}}, & \text{for } i \neq j, \\ 0, & \text{for } i = j \end{cases} \quad (2.2)$$

where d_{ij} denotes the great-circle (Haversine) distance between the capital cities of country i and that of country j , for $i \neq j$.

For the instrument to work with country fixed effects, a time-varying spatial instrument is specify in equation (2.3) :

$$Z_{ct} = \sum_{j \neq c} w_{cj} \text{Adoption}_{jt} \quad (2.3)$$

Where:

- w_{cj} is the inverse-distance weight between country c and neighbouring country j ;
- Adoption_{jt} is the adoption of cashless payment instrument (mobile money, debit cards, or credit cards) in neighbouring countries at time t ;
- $j \neq c$ means that the country itself is excluded from the weighted average.

²However, The weights are normalized so that they lie in the closed interval $[0,1]$ and sum to unity.

4 Results

4.1 summary statistics

Table 1, provide the summary statistics of the main variables (individual characteristics and cashless payment instruments variables). using overall sample of our study, it is observed that Approximately 27% of households have mobile money accounts in their name, 31.3% and 11.6% own an ATM / debit card and credit cards that are linked to their account to withdraw and make payment from their existing deposit at the bank, respectively, indicating a relatively low access to formal financial service, more especially credit card ownership. Turning to the usage and financial behavior of the households, we observed that 47.1% of the respondents pay utility bills , 48.7% of the respondents make savings in a bank account or a mobile money account while 53.4% of the respondents indicate that they have borrowed from a bank account or a mobile money account.

Indeed, from our analysis, we observed that deposite the low access to financial instrument, usage is relatively high which indicate the need to improves the access to formal financial service in developing countries .

Table 1: Summary statistics

	Obs	Mean	Std. Dev.	Min	Max
Independent variables					
Mobile money account	176486	.27	.444	0	1
Own debit card	198452	.313	.464	0	1
Own credit card	127342	.116	.321	0	1
Independent variables					
Utility_pay	195461	.471	.499	0	1
Saved	198452	.487	.5	0	1
Borrowed	198452	.534	.499	0	1
Control variables					
Gender (female =1)	198452	.512	.5	0	1
Age	198277	37.705	16.285	15	100
Education	198233	1.7	.65	1	3
Income quintile	197530	3.241	1.424	1	5
Employment (in workforce = 1)	197723	.641	.48	0	1
Urbanicity (rural =1)	118310	.54	.498	0	1
Have mobile phone	198451	.82	.384	0	1

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy), Have mobile phone is the ownership of mobile phone by the households (dummy)

4.2 Cashless payment instruments, Utility payment, saving and borrowing,

In order to interpret our result we need to apply caution and It is important to acknowledge that due to the cross-sectional nature of the data we can only interpret these results as significant likelihood and correlations between cashless payment instrument and our dependent variable (Utility payment, savings and borrowing) and not as causal relationship. To isolate and take account for the interaction and correlations between the dependent variables, we estimate multivariate probit model integrating time and country-specific fixed effects to account for the individual changes over time. Table 2, contain a result for our baseline model which examine the link between cashless payment instruments (mobile money, debit card, credit card) and utility payment, savings and borrowing. We reported both standard probit coefficient and marginal effect coefficient for clarity, however, we interpret our result base on the germinal effect. We reported the standard probit coefficient in column (1-3) and the marginal effect coefficient in column (4-6) for the ownership of mobile money account, debit card, credit card and likelihood of using it to make utility payment, savings and borrowing.

In column (4) we observed that the adoption of mobile money accounts has the potential to increase the utility payment of households. The effect is positive and significant, which implies that owning a mobile money account has the probability of increasing utility payments by 9.7 percentage points. Hence, we cannot reject our null hypothesis. We also observed from columns (5) and (6) that the ownership of mobile money accounts has a probability of increasing the savings and borrowing behavior of households. The result implies that owning a mobile money account has the potential to increase savings and borrowing by 17.7 and 11. 9 percentage points. Indeed, this result reveals a strong and positive role for the digital payment instrument and financial services in enhancing financial inclusion and development. This result is supported and corroborated with the literature [Ismailov et al. \(2019\)](#); [Ouma et al. \(2017\)](#); [Klapper et al. \(2025\)](#); [Awel and Yitbarek \(2022\)](#); [Demombynes and Thegeya \(2012\)](#); [OCHIENG \(2023\)](#) which shows the usefulness of the adoption of mobile money in savings, borrowing and utility payments in developing countries. [Ouyang \(2021\)](#) also demonstrate how the mobile payment provider app in China increases not only cashless payments, but also access to credit.

However, credit and debit cards are another important payment instrument that is evolving in developing countries. We also observed in table 2, in column (4) that the person who owns a debit card is likely to make utility payments, implying that the adoption of debit cards in developing countries is a probability of increasing utility payments by approximately 3.5 percentage points. The effect of debit card on the savings behavior

of the household is observed to be positive and significant in column (5), this implies that debit/ATM card ownership has a likelihood of increasing savings by 3.2 percentage points. However, we discover that in column (6) the effect of debit card ownership on borrowing is negative but insignificant. this implies that debit/ATM card ownership has a likelihood of decreasing borrowings by 0.4 percentage point. this is not surprising because of the transactional nature of debit/ATM card intuitively. In general, a person who owns a debit card is more likely to make utility payments and saves than borrowing. the finding is supported by [Galbraith and Tkacz \(2007\)](#) who explore the usefulness of electronic transactions (debit card) in household transactions in Canada. However, our approach is holistic to the dimension of utility payment, savings, and borrowing in developing countries. [Bachas et al. \(2021\)](#) also shows how debit card enable poor to save, reduce transaction cost accessing money and monitoring cost.

Similarly, credit card ownership is another payment instrument that help individual to access finance and make payment. We observed from column (4) individuals that have credit card has the likelihood of making utility payment. The effect is significant and positive with about 6.8 percentage points. In column (5) the likelihood of the individual owning a credit card to save is positive and significant, implying that credit card ownership has a probability of improving saving behavior of households in developing countries with about 8.8 percentage points. In column (6) we observed that the effect of credit card on borrowing is significantly large with about 34.4 percentage points. This implies that ownership of credit card has more likelihood of increasing borrowing, and this is not surprising because intuitively the higher the amount of inflow and savings individual has in the account, the higher the probability of him getting access to credit and borrowing from bank. This finding is supported by a study of [Mashabi and Wasiaturrahma \(2021\)](#) that reveals the importance of electronic payment systems based on credit cards, debit cards, and electronic money in economic growth in Indonesia. Indeed, our result depict the role of cashless payment instrument on the access and usage of formal financial services in developing countries.

Moreover, we control for individual characteristics in our model. We found that in two out of three specifications. age and age-squared are found to be significant. Implying that the use of cashless payment instrument (mobile money, credit card , debit card) to make utility payment, saved and borrow increase in the early age and decline with age as we grow older.

In column (4), the gender (female = 1) is negatively correlated with utility payments while positively correlated with savings and borrowing, in general. This implies that Females are less likely to make utility payments than men in column (4), while female are more likely to save and borrow using cashless payment instruments compared to

males as observed in columns (5) and (6). The effect is large (0.021) and significant in saving compared to borrowing and utility payments. On the other hand, we observe from column (4) and (5) that individuals who finish secondary education, tertiary education, are more likely to make utility payments and savings and less likely to borrow compared to individuals who finish primary education in (6). The effect is positive and significant for utility payment and savings, while it is negative in terms of borrowing.

Indeed, Income plays a vital role when it comes to the adoption and usage of cashless payments. Generally, columns (4) and (5), the individual in the fourth (20%) and fifth (richest 20%) income quintile has more likelihood of making utility payments and savings than borrowing in column (6), compared to other income quintile. We also observed that people who are employed have a greater likelihood of making utility payments, savings, and borrowing compared to those who are not employed and the effects are positive in all specifications (4-6). Similarly, from column (4), the likelihood that a rural resident makes a utility payment is significantly lower compared to a urban resident, while rural residents have more likelihood of savings and borrowing compared to urban residents in columns (4) and (6).

Lastly, mobile phone penetration is one of the important drivers of the cashless and digital payment system in developing countries. Controlling mobile phone ownership is very vital in our model because ownership of a mobile phone has paved the way for many individuals to have access to and use digital financial services. We observed that in our result from column (4-6) an individual who has mobile phone devices has a higher probability of making utility payments, savings, and borrowings through a cashless payment instrument compared to those who don't have a mobile phone. The effect is positive and significant for savings and utility payments in comparison to borrowings. Generally, the signs of the control variables are mixed and are supported by the literature.(see, for instance; [Allen et al. \(2016\)](#); [Ismailov et al. \(2019\)](#); [Awel and Yitbarek \(2022\)](#); [Bahia et al. \(2020\)](#)).

Table 2: cashless payment instrument, utility payment, savings and borrowings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Utilitypay	Saved	Borrowed	Marginal(UT)	Marginal(SV)	Marginal (BR)
Mobile money account	0.279*** (0.0161)	0.576*** (0.0167)	0.367*** (0.0164)	0.097*** (0.006)	0.177*** (0.005)	0.119*** (0.005)
Own debit card	0.102*** (0.0152)	0.104*** (0.0162)	-0.00789 (0.0157)	0.035*** (0.005)	0.032*** (0.005)	-0.004 (0.005)
Own credit card	0.198*** (0.0201)	0.287*** (0.0215)	1.030*** (0.0260)	0.068*** (0.007)	0.088*** (0.006)	0.344*** (0.008)
Gender (Female=1)	-0.0374*** (0.0133)	0.0697*** (0.0140)	0.0165 (0.0137)	-0.013*** (0.005)	0.021*** (0.004)	0.004 (0.004)
Age	0.0534*** (0.00215)	-0.0145*** (0.00225)	0.0299*** (0.00226)	0.019*** (0.001)	-0.005*** (0.001)	0.010*** (0.001)
age2	-0.000448*** (2.37e-05)	9.60e-05*** (2.49e-05)	-0.000397*** (2.52e-05)	-0.000*** (0.000)	0.000*** (0.000)	-0.000*** (0.000)
Educ (completed secondary school)	0.125*** (0.0169)	0.112*** (0.0174)	-0.0420** (0.0174)	0.044*** (0.006)	0.039*** (0.005)	-0.014** (0.006)
Educ (completed tertiary education or more)	0.277*** (0.0233)	0.270*** (0.0243)	-0.118*** (0.0237)	0.096*** (0.008)	0.090*** (0.007)	-0.034*** (0.008)
Income (Second 20%)	-0.0112 (0.0245)	0.126*** (0.0249)	0.0185 (0.0252)	-0.004 (0.009)	0.040*** (0.008)	0.004 (0.008)
Income (Middle 20%)	0.0709*** (0.0237)	0.248*** (0.0240)	0.0319 (0.0244)	0.025*** (0.008)	0.080*** (0.008)	0.008 (0.008)
Income (Fourth 20%)	0.104*** (0.0228)	0.319*** (0.0234)	-0.0257 (0.0235)	0.037*** (0.008)	0.103*** (0.008)	-0.009 (0.007)
Income (Richest 20%)	0.199*** (0.0222)	0.490*** (0.0228)	-0.103*** (0.0228)	0.070*** (0.008)	0.158*** (0.007)	-0.033*** (0.007)
Employment (in workforce)	0.174*** (0.0153)	0.243*** (0.0159)	0.224*** (0.0155)	0.060*** (0.005)	0.077*** (0.005)	0.073*** (0.005)
Urbanicity (rural)	-0.113*** (0.0138)	0.0106 (0.0146)	0.0942*** (0.0142)	-0.039*** (0.005)	0.004 (0.004)	0.030*** (0.005)
Have_mobile phone	0.248*** (0.0237)	0.250*** (0.0242)	0.0861*** (0.0235)	0.086*** (0.008)	0.074*** (0.007)	0.026*** (0.008)
Atrho	0.112*** (0.00828)	0.137*** (0.00805)	0.146*** (0.00837)			
Constant	-1.495*** (0.114)	-1.006*** (0.111)	-0.745*** (0.107)			
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43,398	43,398	43,398	43,398	45,229	45,229

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy), Have mobile phone is the ownership of mobile phone by the households (dummy), and the “Atrho” shows the correlation/interaction between the dependent variable that justify the used of multivariate probit model. While Marginal(UT, SV,BR) are marginal effect for equation (1-3)

5 Robustness checks

To assess the robustness of our findings, we conducted several complementary analyzes to verify the consistency of our results. First, , given the possibility of endogeneity in our baseline specification where cashless payments instruments (mobile money, credit cards, debit cards) might be influenced by how households save, borrow and make utility payment (reverse causality and simultaneity) or omission biased, we employed control function approach and conditional mixed process (CMP) to correct for endogeneity issue in our model. Secondly, we re-estimated the baseline models using a standard logit regression with year and country fixed effect as an alternative estimation technique.

Thirdly , we used country control variable; GDP per capita, Automated teller machine per 100,000 adult and banking penetration proxy by Commercial bank branch per 100,000 adults, Mobile cellular subscription (per 100 people), urban population and Adult literacy. Finally, we also introduced government and institutional variable as controls. we include variable such as Control of corruption, Government Effectiveness, Political Stability and Absence of Violence/Terrorism, Regulatory Quality Voice and Accountability, Rule of Law as additional controls in the Multivariate probit regressions.

Moreover, for sensitivity and robustness of our result we further estimate heterogeneity across Gender, component of utility payments, savings and borrowings (using mobile money and bank account), year and region to see the variation in the effect of cashless payment instruments across year and region.

To address the possible concern for multicollinearity in our model, more especially among the control variables, we computed variance inflation factors (VIFs). The results indicate low levels of multicollinearity for all explanatory variables, with VIF lies below thresholds values (< 10). However, age and its squared term have high VIF values and this is expected because the age squared term is mechanically derived from age. The result for the VIF is attached at the table 14 of the appendix.

5.1 Control function approach and conditional mixed process (CMP) result

Table 3, presents the result for the control function approach and conditional mixed process (CMP) estimation for the probability of owning a mobile money account, debit card ownership, and credit card ownership and using it for utility payments, savings, and borrowings. We restrict our estimations to control function approach and conditional mixed process. For consistency and comparison, columns (1-3) show the estimation results for the control function approach and columns (4-6) are the estimation results of our baseline model using conditional mixed process (CMP) including our baseline controls. Moreover, Since our data for the main variables is at individual level and our instrument is constructed at country level, To estimate CMP we clustered the Standard errors at the country level to account for within-country dependence in unobserved determinants of cashless payment adoption and financial behaviors. This is important because the instruments are constructed at the country-year level and assigned to individuals within the same country-wave, which may otherwise lead to downward-biased standard errors [Moulton \(1990\)](#); [Cameron and Miller \(2015\)](#).

The results from control function approach in columns (1-2) is partially consistent with our baseline estimation in table 2 (multivariate probit) with slight differences in terms of coefficients and sign. However, the results of our baseline model estimation using the conditional mixed process (CMP) in columns (4-6) reveal a consistent result with our baseline result. Indeed, the conditional mixed process (CMP) approach, therefore, provides consistent estimates by accounting for unobserved heterogeneity across equations compared to the control function approach in the context of study due to the multiple endogenous regressors (Mobile money adoption, debit and credit card adoption) which are binary and jointly estimated the adoption and outcome equations by full-information maximum likelihood (FIML), allowing for correlated unobserved factors across equations [Roodman \(2011\)](#). the full result for adoption and outcome equation are reported in table 15 of the appendix.

Table 3: cashless payment instrument, utility payment, savings and borrowings (control function and CMP approach

	C-function	C-function	C-function	CMP	CMP	CMP
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Utilitypay	Saved	Borrowed	Utilitypay	Saved	Borrowed
Mobile money account	0.326*** (0.0250)	0.501*** (0.0259)	0.370*** (0.0253)	0.407*** (0.139)	0.785*** (0.185)	0.499*** (0.145)
Own debit card	0.119*** (0.0229)	0.127*** (0.0243)	0.0170 (0.0234)	0.160 (0.183)	0.196 (0.180)	-0.301* (0.174)
Own credit card	0.234*** (0.0329)	0.275*** (0.0352)	1.102*** (0.0420)	0.142 (0.176)	0.567*** (0.194)	1.464*** (0.135)
Constant	-2.309*** (0.188)	-0.622*** (0.187)	-0.666*** (0.186)	-1.453*** (0.146)	-0.914*** (0.210)	-1.056*** (0.122)
Mvprobit	Yes	Yes	Yes	—	—	—
Country /year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Baseline control	Yes	Yes	Yes	Yes	Yes	Yes
Cluster standard errors	No	No	No	Yes	Yes	Yes

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:The full CMP estimates in appendix reveal significant correlations among the error terms of the adoption and outcome equations which confirm the presence of endogeneity, justifying the use of a joint estimation framework. The CMP approach therefore provides consistent estimates by accounting for unobserved heterogeneity across equations. The predicted residuals for endogenous regressors in control function also confirms the presence of endogeneity. the first stage and full result of the CMP is reported at the appendix CMP is the conditional mixed process (CMP), C-function is control function approach.

5.2 Alternative Estimation Method

In this sub-section, we re-estimated a standard logit regression in Table 4. The marginal effect coefficients remain consistently significant and in line with our baseline model (multivariate probit), including our baseline control variable.

Table 4: cashless payment instrument, utility payment, savings and borrowings (logit estimation

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Utilitypay	Marginal (UT)	Saved	Marginal (SV)	Borrowed	Marginal (BR)
Mobile money account	0.464*** (0.027)	0.098*** (0.006)	0.963*** (0.028)	0.177*** (0.005)	0.597*** (0.027)	0.118*** (0.005)
Own debit card	0.164*** (0.025)	0.035*** (0.005)	0.172*** (0.027)	0.032*** (0.005)	-0.017 (0.026)	-0.003 (0.005)
Own credit card	0.330*** (0.034)	0.070*** (0.007)	0.475*** (0.035)	0.087*** (0.006)	1.868*** (0.048)	0.368*** (0.009)
Constant	-2.453*** (0.127)		-1.664*** (0.123)		-1.710*** (0.129)	
Observations	43,398	43,398	45,229	45,229	45,229	45,229
Logit	Yes	Yes	Yes	Yes	Yes	Yes
Baseline control	Yes	Yes	Yes	Yes	Yes	Yes
LR Chi2	5097		7951		5345	
Pseudo R2	0.108		0.178		0.127	

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy).

5.3 Additional control variable

To further, verify the robustness of our result we used country control variable; GDP per capita, Automated teller machine per 100,000 adult and banking penetration proxy by Commercial bank branch per 100,000 adults, Mobile cellular subscription (per 100 people), urban population and Adult literacy. We include government and institutional variable as controls such as Control of corruption, Government Effectiveness, Political Stability and Absence of Violence/Terrorism, Regulatory Quality Voice and Accountability, Rule of Law respectively. The results Table 5 reveals a consistent result with our baseline result.

Table 5: Impact of cashless payment instrument on utility payment, savings and borrowings (country control variable)

	(1)	(2)	(3)	(6)	(7)	(8)
VARIABLES	utilitypay	saved	borrowed	utilitypay	saved	borrowed
Mobile money account	0.210*** (0.023)	0.518*** (0.024)	0.410*** (0.023)	0.283*** (0.034)	0.433*** (0.036)	0.342*** (0.035)
Own debit card	0.122*** (0.022)	0.148*** (0.023)	-0.028 (0.022)	0.154*** (0.032)	0.086** (0.033)	-0.016 (0.032)
Own credit card	0.189*** (0.032)	0.233*** (0.034)	1.137*** (0.041)	0.242*** (0.050)	0.359*** (0.053)	1.214*** (0.065)
Constant	-2.446*** (0.167)	-2.075*** (0.173)	-0.602*** (0.172)	-3.197*** (0.439)	5.681*** (0.496)	-0.217 (0.448)
Observations	17,264	17,264	17,264	17,264	17,264	17,264
Probit	Yes	Yes	Yes	Yes	Yes	Yes
Infrastructure control	Yes	Yes	Yes	No	No	No
Macro / institution control	No	No	No	Yes	Yes	Yes
LR Chi2	1618	2778	1870	907.3	1665	876.2
Pseudo R2	0.0740	0.136	0.0993	0.0821	0.163	0.0877

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy), .

6 Heterogeneity test

6.1 Impact of cashless payment instrument on utility payment, savings and borrowings (By gender)

We start our heterogeneity analysis by observing whether there is gender gap decrease or disparities in the use of cashless payment instruments in developing countries. Table 4 reveal significant gender gap decrease and disparities in the adoption and use of the cashless payment instrument .The result indicate that Mobile money account ownership significantly increases the probability of paying utility bills for women compared to men, although its is also significant for men too. However, the effect are more with slightly stronger effects for men in saving and borrowing compared to women. Debit card ownership is positively associated with utility payments and saving for both genders, but its effect on borrowing is weak and negative for men compared to women . In contrast, credit card ownership reveals a strong and statistically significant positive effect across all specifications, particularly for borrowing, which demonstrates a central role of credit cards in facilitating access to formal credit.

In general, these findings suggest that there is a gender gap decrease in the use of a cashless payment instrument to pay bills, while the gender gap persisted when it comes to savings and borrowing, although there is significant improvement in terms of access and usage of financial services by women for the period reviewed.

Table 6: Impact of cashless payment instrument on utility payment, savings and borrowings (By gender)

	(1)	(2)	(3)	(4)	(5)	(6)
	Female=1	Male=0	Female=1	Male=0	Female=1	Male=0
VARIABLES	Utilitypay	Utilitypay	Saved	Saved	Borrowed	Borrowed
Mobile money account	0.298*** (0.023)	0.261*** (0.022)	0.551*** (0.024)	0.626*** (0.023)	0.356*** (0.023)	0.438*** (0.022)
Own debit card	0.103*** (0.022)	0.097*** (0.022)	0.116*** (0.022)	0.108*** (0.023)	0.044** (0.022)	-0.044** (0.022)
Own credit card	0.230*** (0.030)	0.162*** (0.027)	0.268*** (0.030)	0.297*** (0.029)	1.062*** (0.037)	1.049*** (0.034)
Constant	-1.550*** (0.101)	-1.563*** (0.114)	-0.991*** (0.098)	-0.804*** (0.110)	-0.974*** (0.103)	-0.716*** (0.113)
Observations	21,767	21,631	22,628	22,601	22,628	22,601
Country/year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Baseline control	Yes	Yes	Yes	Yes	Yes	Yes
LR Chi2	3141	2739	4314	4631	2778	3006
Pseudo R2	0.121	0.106	0.168	0.190	0.121	0.127

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy)

6.2 Cashless payment instrument on utility payment, savings and borrowings (by year)

As we acknowledge in the stylized fact section, that Cashless payment instrument adoption keep on increasing year in year out across region in developing and emerging economies, we therefore estimate probit regression by year and region to see if there is significant changes over the years across regions. Table 7, provides the result for the effect of Cashless payment instrument on utility payment, savings and borrowings behaviour of the households for 2017, 2021, 2024 . we observed that for mobile money adoption, across all years there is a sharp increase in terms of utility payment, savings and borrowings. Interestingly the effect is large and more pronounced between 2021 and 2024. Implying that the likelihood of adopting mobile money by individual and using it for utility payment, savings and borrowings is increasing and the growth and adoption of mobile money continue to improve the payment system, savings and borrowings in emerging country. This finding is in line with the data and literature that mobile money is gaining more ground in developing countries because of it convenient in terms of access and usage compared to traditional banking system [Klapper et al. \(2025\)](#).

On the contrary, we observed the sharp decline in terms of adopting and usage of credit and debit card for utility payment, savings and borrowings across the years. Implying that individuals are less becoming of using credit and debit card for utility payment, savings and borrowings compared to mobile money account. Although, effect of credit card on utility payment is relatively stable and significant across years. This is not surprising because mobile money is gaining ground in developing countries because of it convenient in terms of access and usage compared to traditional banking system. Indeed, our result are generally robust and are inline with our baseline estimation.

Table 7: Impact of cashless payment instrument on utility payment, savings and borrowings (by year)

VARIABLES	Utility pay			Saving			Borrowing		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	2017	2021	2024	2017	2021	2024	2017	2021	2024
Mobile money account	-0.013 (0.015)	0.149*** (0.021)	0.169*** (0.018)	0.585*** (0.016)	0.573*** (0.022)	0.677*** (0.018)	0.450*** (0.015)	0.448*** (0.022)	0.461*** (0.018)
Own debit card	0.431*** (0.014)	0.199*** (0.021)	0.163*** (0.019)	0.336*** (0.014)	0.111*** (0.021)	-0.018 (0.019)	0.171*** (0.013)	-0.061*** (0.021)	-0.154*** (0.019)
Own credit card	0.120*** (0.025)	0.212*** (0.031)	0.216*** (0.024)	0.236*** (0.025)	0.230*** (0.033)	0.199*** (0.024)	1.123*** (0.029)	1.117*** (0.040)	0.932*** (0.029)
Constant	-2.200*** (0.037)	-1.783*** (0.078)	-1.952*** (0.067)	-0.715*** (0.035)	-0.547*** (0.078)	-0.267*** (0.067)	-0.919*** (0.036)	-0.663*** (0.079)	-0.327*** (0.068)
Observations	59,102	18,217	25,181	59,102	18,217	27,012	59,102	18,217	27,012
Probit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LR Chi2	8215	1523	2224	7527	2306	4566	5158	1880	2711
Pseudo R2	0.113	0.0649	0.0696	0.102	0.105	0.141	0.0757	0.0922	0.0944

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy), .

6.3 Cashless payment instrument on utility payment, savings and borrowings (by region)

We estimate probit by region to see if there is variation across region. table 8, present a probit result on the effect of cashless payment instrument on utility payment savings and borrowing base on region. From the result we observed a heterogeneous effect of money adoption on utility payment savings and borrowing base across region. The effect of mobile money adoption on utility payment is positive and significant for East Asia and Pacific, Europe and Central Asia, South Asia and Sub-Saharan Africa while it is negative and insignificant for Middle East and North Africa, as well as positive but insignificant in Latin America and Caribbean. This signifies that individual in East Asia and Pacific, Europe and Central Asia, South Asia and Sub-Saharan Africa has more likelihood of using mobile money to make utility payment compared to other regions. In terms of credit card, the effect varies across region with East Asia and Pacific, Latin America and Caribbean, South Asia and Sub-Saharan Africa having significant effect while it is negative and insignificant for Europe and Central Asia and insignificant for Middle East and North Africa. However, ownership of debit cards has no significant effect on utility payments in all regions with the exception of Sub-Saharan Africa.

Turning to impact of mobile money adoption on savings. We observed that, across all region with the exception of Europe and Central Asia, the effect of mobile money adoption on savings behavior is large, positive, and significant. Implying that individuals across all regions have more likelihood of using mobile money account to save part of their income. Similarly, credit card ownership is found to be significant in all regions with the

exception of the Middle East and North Africa. Implying that an individual with credit card in their name has more likelihood of saving compared to those who don't. However, the ownership of debit cards is less significant compared to the ownership of credit cards in regions.

Lastly, from table 8 we also estimate the effect of mobile money, credit and debit card ownership on borrowing behavior of the households. The result reveals that mobile money adoption is more likely to influence the borrowing behavior of individuals across all regions, with the exception of Europe and Central Asia. Credit card is found to be positive and highly significant in all regions. This result implies that in all regions, individuals with credit cards in their name have a higher probability of borrowing compared to those who do not have. However, the debit card is found to be less significant in all regions. Indeed, our findings are supported by recent data release by global findex data base 2025 which demonstrate heterogeneity in growth of cashless payment instrument across countries and regions. indeed, mobile money service has proved to be a dominant and convenient payment instrument across region, especially ,in sub-Saharan Africa.

Table 8: Impact of cashless payment instrument on utility payment, savings and borrowings (by region)

	(1)	(2)	(3)	(4)	(5)	(6)
	EAP	ECA	LAC	MENA	SA	SSA
VARIABLES	Utility pay	Utility pay	Utility pay	Utility pay	Utility pay	Utility pay
Mobile money account	0.267*** (0.041)	0.061 (0.081)	0.205*** (0.042)	0.174** (0.077)	0.305*** (0.045)	0.367*** (0.024)
Own debit card	0.103** (0.046)	0.067 (0.086)	-0.039 (0.040)	0.055 (0.072)	0.087** (0.036)	0.159*** (0.023)
Own credit card	0.295*** (0.074)	0.069 (0.088)	0.216*** (0.039)	-0.012 (0.077)	0.222*** (0.065)	0.235*** (0.031)
Constant	-1.880*** (0.148)	-2.226*** (0.336)	-1.872*** (0.152)	-1.825*** (0.254)	-1.664*** (0.135)	-1.758*** (0.104)
	Savings	Savings	Savings	Savings	Savings	Savings
Mobile money account	0.481*** (0.040)	0.296*** (0.077)	0.677*** (0.041)	0.657*** (0.070)	0.605*** (0.045)	0.571*** (0.026)
Own debit card	0.049 (0.045)	0.191** (0.080)	0.020 (0.039)	0.228*** (0.072)	0.153*** (0.037)	0.106*** (0.026)
Own credit card	0.365*** (0.076)	0.417*** (0.085)	0.212*** (0.037)	0.290*** (0.067)	0.299*** (0.067)	0.313*** (0.036)
Constant	-0.388*** (0.149)	-0.507 (0.320)	-0.199 (0.152)	-0.901*** (0.219)	-1.619*** (0.141)	-0.394*** (0.109)
	Borrowing	Borrowing	Borrowing	Borrowing	Borrowing	Borrowing
Mobile money account	0.313*** (0.038)	0.068 (0.083)	0.413*** (0.042)	0.226*** (0.069)	0.354*** (0.047)	0.404*** (0.025)
Own debit card	0.101** (0.044)	0.142* (0.084)	-0.135*** (0.040)	-0.007 (0.067)	-0.006 (0.037)	0.007 (0.024)
Own credit card	1.040*** (0.079)	1.169*** (0.109)	1.295*** (0.045)	1.179*** (0.085)	0.827*** (0.081)	0.868*** (0.041)
Constant	-0.713*** (0.152)	-0.345 (0.364)	-0.902*** (0.155)	-0.039 (0.217)	-0.699*** (0.136)	-0.377*** (0.107)
Country fixed effect	yes	yes	Yes	Yes	yes	Yes
year fixed effect	yes	yes	Yes	Yes	yes	Yes
Baseline control	yes	yes	Yes	Yes	yes	Yes
Probit	yes	yes	Yes	Yes	yes	Yes

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:Utility pay is the utility payment made by households in the past 12 month (dummy), Saved is the savings made by households in the past 12 month (dummy) while borrowed is borrowings is made by households in the past 12 month (dummy), Mobile money account, Own debit card, Own credit card (dummy), EAP= East Asia & Pacific, ECA= Europe & Central Asia, LAC = Latin America & Caribbean, MENA = Middle East & North Africa, SA= Middle East & North Africa, SSA= Sub-Saharan Africa

6.4 Alternative dependent variable

In order to test our robustness further, we use alternative dependent variable. we disaggregated our dependent variable in to bank and mobile money account. We take account of savings, borrowing and utility payment made through financial institution account one hand and take in to account of savings, borrowing and utility payment made using mobile money account. From Table 9, we observed that there is variation in terms of effect of cashless payment instrument on utility payment, savings and borrowing using bank account and mobile money account. We observed that the likelihood of adopting mobile money and the use of it to make utility payment, savings and borrowing are more than that of utility payment, savings and borrowing using bank account. This is not surprising because mobile money is seen as a complimentary payment system to traditional banking system in developing and emerging economies because of it convenient and easy access by the household. indeed, Saving, borrowing, utility payment using a mobile money account can be more convenient than in an account at a bank or similar financial institution. Because mobile money service providers typically have larger retail networks than banks and similar financial institutions [Klapper et al. \(2025\)](#).

Similarly, we have observed little variation between the ownership of credit and debit cards and their use to make utility payments and savings through a bank account and mobile money account. The result indicates that individuals are more likely to use credit and debit cards to make utility payments and savings through a bank account compared to using a mobile money account. The intuition is that credit and debit card ownership align or link to having an account at a formal financial institution. Generally, our result remains consistently significant and In line with our baseline result. Although with some little variation in terms of coefficients which do not invalidate our general findings. Our control variables are generally in line with the literature as in the case of our baseline estimation.

Table 9: cashless payment instrument, utility payment, savings and borrowings (Using bank and mobile money component as dependent variable)

	TR-Banking	TR-Banking	TR-Banking	MB-Money	MB-Money	MB-Money
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	UTP-Bank	SV-Bank	BR-Bank	UTPMM	SVMM	BRMM
Mobile money account	0.581*** (0.023)	0.419*** (0.016)	0.255*** (0.018)	1.072*** (0.023)	0.612*** (0.032)	0.383*** (0.056)
Own debit card	0.182*** (0.023)	0.171*** (0.016)	0.027 (0.018)	0.214*** (0.025)	0.037 (0.025)	0.074** (0.030)
Own credit card	0.403*** (0.025)	0.348*** (0.019)	0.466*** (0.020)	0.328*** (0.028)	0.297*** (0.026)	0.370*** (0.030)
Constant	-0.836*** (0.106)	-1.850*** (0.077)	-3.108*** (0.099)	-1.518*** (0.124)	-0.787*** (0.120)	-1.902*** (0.160)
Probit	Yes	Yes	Yes	Yes	Yes	Yes
Country /year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Baseline control	Yes	Yes	Yes	Yes	Yes	Yes
LR Chi2	4996	6840	3534	8080	2674	1611
Pseudo R2	0.209	0.132	0.0949	0.390	0.122	0.107
Observations	24,805	45,229	45,229	24,805	18,782	17,270

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1,

Note:UTP is the utility payment made by households using financial institution account in the past 12 month (dummy), SV-bank is the savings made by households using financial institution account in the past 12 month (dummy) while BR-bank is borrowings is made by households using financial institution account in the past 12 month (dummy), UTPMM is the utility payment made by households using mobile money account in the past 12 month (dummy), SVMM is the savings made by households using mobile money account in the past 12 month (dummy) while BR is borrowings is made by households using mobile money account in the past 12 month (dummy), Mmoney account is Mobile money account, Own debit card, Own credit card (dummy). TR-banking and MB-money are traditional banking and mobile money banking respectively

7 Conclusion

This study investigates whether cashless payment instrument can serve as a lever to enhance utility payment, saving, and borrowing behavior of households in emerging and developing countries. To address this question, we leverage on household survey data from world bank global finindex dataset which has been the definitive source of data on the ways in which adults around the world access and use financial services, from payments, digital payments, to savings and borrowings, and manage financial events for 69 emerging and developing countries.

In order, to test our hypothesis we employed Multivariate probit model to estimate the likelihood of using cashless payment instruments (mobile money account, debit card, credit, card) to make utility payments, savings and borrowings. To address the issue of endogeneity in our model we employed control function approach and conditional mixed process (CMP).

Our study found that overall cashless payment instruments (mobile money account, debit card, credit, card) are associated with utility payments, savings and borrowings behaviour of the households. Indeed, the effect of mobile money adoption on utility payment, savings and borrowing behaviour of the households is more pronounce and large and significant compared to debit card and credit, card impact. This is not surprising because mobile money is seen as a complimentary payment system to traditional banking system in developing and emerging economies because of its convenient and easy access by the household. Our findings are supported by literature [Mbiti and Weil \(2015\)](#); [Ismaïlov et al. \(2019\)](#); [Ouyang \(2021\)](#); [Awel and Yitbarek \(2022\)](#); [Demombynes and Thegeya \(2012\)](#); [Jack et al. \(2013\)](#); [OCHIENG \(2023\)](#); [Galbraith and Tkacz \(2007\)](#); [Mashabi and Wasiaturrahma \(2021\)](#); [Bachas et al. \(2021\)](#) which shows the usefulness of cashless payment instruments on utility payment, savings and borrowing behaviour of the households.

Our heterogeneity analysis reveals a significant variation across years and regions of emerging and developing countries. We also found that among individual characteristics use as control variables , gender, education, income and mobile phone ownership plays a significant role in terms of cashless payment instrument adoption and usage .

We therefore recommend that authorities especially in countries where financial infrastructure remains underdeveloped to consider promoting cashless payments instrument as a means to enhance payments system, savings and borrowing and overall financial inclusion. Indeed, This could be achieved not only through targeted regulations but also through development of financial infrastructure, awareness and campaigns directed at banked and unbaked populations. Additionally, the successful promotion of digital cashless payments instruments requires the establishment of clear, inclusive, and robust regulatory frame-

works to ensure consumer protection and build trust in digital financial systems.

Moreover, our results have some potential implications that could inform and interest policymakers /government, payments system service providers, industries, and entrepreneurs in the financial sector to ensure a reliable and continuous payment system innovation in the financial sector. The findings also showcase the importance of cashless payment instruments in towards accelerating digital inclusion and payment system landscape. However, the study provides some methodological contribution which might be of great importance on assessing the impact cashless payment instruments (mobile money account, debit card, credit, card) on utility payment, saving and borrowing behaviour of the households.

However, It is important to acknowledge certain limitations in this study. (1) We relies on data from Global Findex Database and WDI of which the comprehensive data on cashless payment instruments are only available for (2017, 2021, 2024) which restricted our study to have a limited scope. Thus, we cannot estimate panel analysis. Having more years and data on cashless payment instruments variables will enhance the quality of the study. (2) Our study mainly focuses on some selected emerging and developing economies due to availability of data particular on cashless payment instruments. Hence, we cannot generalize our interpretation because of some factors peculiar to other emerging and developing that were not included in our sample (3) Since the study covers a specific time period (2017, 2021, 2024) replicating the study using additional data, countries and different methodology could enhance and help validate our findings and establish a strong causality.

References

- Aggarwal, S. and Klapper, L. (2013). Designing government policies to expand financial inclusion: Evidence from around the world. *The Journal of Finance*, 56(3):1029–1051.
- Ajefu, J. B. and Ogebe, J. O. (2019). Migrant remittances and financial inclusion among households in nigeria. *Oxford Development Studies*, 47(3):319–335.
- Allen, F., Demirguc-Kunt, A., Klapper, L., and Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of financial Intermediation*, 27:1–30.
- Aprigliano, V., Ardizzi, G., and Monteforte, L. (2017). Using the payment system data to forecast the italian gdp. *Bank of Italy Temi di Discussione (Working Paper) No*, 1098.
- Awel, Y. and Yitbarek, E. (2022). Mobile money demand in utility bill payments: A wtp estimate from ethiopia. *Journal of Development Effectiveness*, 14(1):56–75.
- Bachas, P., Gertler, P., Higgins, S., and Seira, E. (2021). How debit cards enable the poor to save more. *The Journal of finance*, 76(4):1913–1957.
- Bahia, K., Sánchez-Vidal, M., and Taberner, P. A. (2020). Exploring the relationship between mobile money regulation and usage. In *TPRC48: The 48th Research Conference on Communication, Information and Internet Policy*.
- Bezovski, Z. (2016). The future of the mobile payment as electronic payment system. *European Journal of Business and Management*, 8(8):127–132.
- Cámara, N. and Tuesta, D. (2014). Measuring financial inclusion: A multidimensional index. *BBVA Research Paper*, (14/26).
- Cameron, A. C. and Miller, D. L. (2015). A practitioner’s guide to cluster-robust inference. *Journal of Human Resources*, 50(2):317–372.
- Carlsen, M. and Storgaard, P. E. (2010). Dankort payments as a timely indicator of retail sales in denmark. Technical report, Danmarks Nationalbank Working Papers.
- Crowe, M., Tavilla, E., McGuire, B., et al. (2015). Mobile banking and mobile payment practices of us financial institutions: results from 2014 survey of fis in five federal reserve districts. *Federal Reserve Bank of Boston*, 17.
- Demombynes, G. and Thegeya, A. (2012). Kenya’s mobile revolution and the promise of mobile savings. *World Bank policy research working paper*, (5988).

- Dias, D. and McKee, K. (2010). Protecting branchless banking consumers: Policy objectives and regulatory options. *Focus Note*, 64(64):20.
- Forgor, A. T. and Julie, K. A. (2020). Financing innovative development in sub-saharan africa: the role of payment systems. In *International Conference on Arts, Humanity and Economics, Management (ICAHM 2019)*, pages 192–198. Atlantis Press.
- Fung, D. W., Lee, W. Y., Yeh, J. J., and Yuen, F. L. (2020). Friend or foe: The divergent effects of fintech on financial stability. *Emerging Markets Review*, 45:100727.
- Galbraith, J. and Tkacz, G. (2007). Electronic transactions as high-frequency indicators of economic activity. Technical report, Bank of Canada.
- Ghana, B. O. (2017). Impact of mobile money on the payment system in ghana: an econometric analysis.
- GSMA (2023). Gsma global repor. *THE STATE OF THE INDUSTRY REPORT ON MOBILE MONEY*.
- Ismailov, A., Kimaro, A. B., and Naito, H. (2019). The effect of mobile money usage on borrowing, saving, and receiving remittances: Evidence from tanzania. *University of Tsukuba*, pages 2019–002.
- Jack, W., Ray, A., and Suri, T. (2013). Transaction networks: Evidence from mobile money in kenya. *American Economic Review*, 103(3):356–361.
- Kipyegon, B. (2022). The role of mobile money in international remittances: Evidence from sub-saharan africa.
- Klapper, L., Singer, D., Starita, L., and Norris, A. (2025). The global finindex database 2025.
- Konte, M. and Tetteh, G. K. (2023). Mobile money, traditional financial services and firm productivity in africa. *Small Business Economics*, 60(2):745–769.
- Mashabi, M. and Wasiaturrahma, D. (2021). Analysis of the effect of electronic-based payment systems and economic growth in indonesia. *Jurnal Ilmu Ekonomi Terapan*, 6(1):97–121.
- Mbiti, I. and Weil, D. N. (2015). Mobile banking: The impact of m-pesa in kenya. In *African successes, Volume III: Modernization and development*, pages 247–293. University of Chicago Press.
- Moulton, B. R. (1990). An illustration of a pitfall in estimating the effects of aggregate variables on micro units. *The Review of Economics and Statistics*, 72(2):334–338.

- Naito, H., Ismailov, A., and Kimaro, A. B. (2021). The effect of mobile money on borrowing and saving: Evidence from tanzania. *World Development Perspectives*, 23:100342.
- Nakamura, A. and Nakamura, M. (1998). Model specification and endogeneity. *Journal of Econometrics*, 83(1-2):213–237.
- Ngaruiya, B., Bosire, M., and Kamau, S. M. (2014). Effect of mobile money transactions on financial performance of small and medium enterprises in nakuru central business district. *Research Journal of Finance and Accounting*, 5(12):53–58.
- OCHIENG, K. O. (2023). *The Influence of mobile money on savings behavior*. PhD thesis, KDI School.
- Ouma, S. A., Odongo, T. M., and Were, M. (2017). Mobile financial services and financial inclusion: Is it a boon for savings mobilization? *Review of development finance*, 7(1):29–35.
- Ouyang, S. (2021). Cashless payment and financial inclusion. *Available at SSRN 3948925*.
- Roodman, D. (2011). Fitting fully observed recursive mixed-process models with cmp. *The Stata Journal*, 11(2):159–206.
- Skogqvist, J. M. (2019). The effect of mobile money on savings behaviors of the financially excluded.
- Talom, F. S. G. and Tengeh, R. K. (2019). The impact of mobile money on the financial performance of the smes in douala, cameroon. *Sustainability*, 12(1):183.
- Tobler, W. R. (1970). A computer movie simulating urban growth in the detroit region. *Economic geography*, 46(sup1):234–240.
- Tut, D. (2023). Fintech and the covid-19 pandemic: Evidence from electronic payment systems. *Emerging Markets Review*, 54:100999.
- Wasiaturrahma, D., KURNIASARI, A. L., et al. (2021). Electronic payment and economic growth in indonesia. *Journal of Developing Economies (JDE)*, 6(2):286–307.
- Waweru, K. M. and Kamau, J. W. (2017). The effect of mobile money on saving and money transfer practices for low-income earners in kenya.
- WGPSS (2023). Survey of the global payment systems in six charts. *World Bank, Global Payment Systems Survey, 6th Iteration, October 2023*.

Table 10: Sampled countries

SSA	EAP	ECA	LAC	MENA	SA
Benin	Cambodia	Albania	Argentina	Algeria	Bangladesh
Botswana	Indonesia	Armenia	Brazil	Egypt, Arab Rep.	India
Burkina Faso	Lao PDR	Azerbaijan	Costa Rica	Iran, Islamic Rep.	Nepal
Cameroon	Malaysia	Kazakhstan	Dominican Republic	Iraq	Pakistan
Chad	Mongolia	Kosovo	Ecuador	Jordan	Sri Lanka
Congo, Dem. Rep.	Philippines	Moldova	El Salvador	Lebanon	
Congo, Rep.	Thailand		Guatemala	Morocco	
Ethiopia			Honduras	Tunisia	
Gabon			Mexico		
Ghana			Nicaragua		
Guinea			Paraguay		
Kenya			Peru		
Lesotho					
Liberia					
Madagascar					
Malawi					
Mali					
Mauritania					
Mauritius					
Mozambique					
Namibia					
Niger					
Nigeria					
Senegal					
Sierra Leone					
South Africa					
Tanzania					
Togo					
Uganda					
Zambia					
Zimbabwe					

:EAP= East Asia Pacific, ECA= Europe Central Asia, LAC = Latin America Caribbean, MENA = Middle East North Africa, SA= south asia , SSA= Sub-Saharan Africa

Table 12: SAMPLE DATA

Variables	Full sample	Missing observations	% Missing	Final sample
Mobile money_account	198,452	21,966	11.070	176,486
own_credit card	198,452	71,110	35.830	127,342
own_debit card	198,452	0	0.000	198,452
Utility pay	198,452	2,991	1.510	195,461
Savings	198,452	0	0.000	198,452
Borrowings	198,452	0	0.000	198,452
Gender	198,452	0	0.000	198,452
Age	198,452	175	0.090	198,277
Education level	198,452	219	0.110	198,233
Income_quintile	198,452	922	0.460	197,530
Employement_in	198,452	729	0.370	197,723
Urbanicity	198,452	80,142	40.380	118,310
Have_mobile phone	198,452	1	0.000	198,451

: NB : Fore the purpose of analysis the missing observations were automatically drop

Table 11: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Independent variables					
Mobile money account	176486	.27	.444	0	1
Own a debit	198452	.313	.464	0	1
Own a credit card	127342	.116	.321	0	1
Dependent variables					
Utility payment	195461	.471	.499	0	1
Savings	198452	.487	.5	0	1
Borrowings	198452	.534	.499	0	1
Alternative dependent variables					
Utility payment (mobile money)	91997	.243	.429	0	1
Utility payment (bank)	91997	.228	.42	0	1
Borrowings (mobile money)	38240	.16	.366	0	1
Borrowings (bank)	198452	.107	.309	0	1
Savings (bank)	198452	.171	.377	0	1
Savings (mobile money)	42060	.423	.494	0	1
Individual control variable					
Internet access	64274	.58	.494	0	1
Have mobile phone	198451	.82	.384	0	1
Gender	198452	.512	.5	0	1
Age	198277	37.705	16.285	15	100
Age2	198277	1686.882	1455.955	225	10000
Education level	198233	1.7	.65	1	3
Income quintile	197530	3.241	1.424	1	5
Employment status	197723	.641	.48	0	1
Country control variables					
Literacy	66	80.678	15.779	36.97	99.79
Adult population (log)	207	16.525	1.553	13.84	20.798
GDP per capita (log)	223	8.95	.842	7.133	10.489
log ATM	137	2.927	1.094	.301	4.776
Commercial bank branch (log)	139	2.127	.863	-.168	4.251
mobile cellular subscription (log)	148	4.578	.365	3.448	5.193
Rule of law	150	-.514	.486	-1.755	.843
Regulatory quality	150	-.43	.519	-1.634	1.159
Political stab	150	-.547	.725	-2.397	1.041
Government effectiveness	150	-.473	.525	-1.757	.96
Control of corruption	150	-.599	.455	-1.57	.712
Voice accountability	150	-.358	.625	-1.752	1.122

source: Authors computation

Table 13: Pairwise correlations for the main variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) utilitypay	1.000													
(2) saved	0.106	1.000												
(3) borrowed	0.087	0.226	1.000											
(4) mmoney_acct	0.080	0.313	0.214	1.000										
(5) own_drcard	0.238	0.192	0.097	0.161	1.000									
(6) own_crcard	0.131	0.133	0.262	0.180	0.281	1.000								
(7) gender	-0.010	-0.017	-0.001	-0.028	-0.021	0.004	1.000							
(8) age	0.204	-0.113	-0.083	-0.133	0.087	0.018	-0.003	1.000						
(9) age2	0.173	-0.122	-0.106	-0.144	0.062	0.003	-0.003	0.978	1.000					
(10) educ	0.158	0.191	0.060	0.213	0.338	0.199	-0.011	-0.153	-0.163	1.000				
(11) inc_q	0.121	0.203	0.037	0.163	0.191	0.121	-0.028	-0.006	-0.011	0.267	1.000			
(12) emp_in	0.115	0.196	0.150	0.157	0.120	0.102	-0.058	-0.090	-0.135	0.092	0.091	1.000		
(13) urbanicity	-0.116	-0.043	0.054	-0.049	-0.111	-0.044	-0.013	0.007	0.009	-0.202	-0.178	0.018	1.000	
(14) have_mphone	0.177	0.158	0.087	0.210	0.216	0.108	-0.010	-0.044	-0.074	0.262	0.159	0.106	-0.110	1.000

Table 14: Variance inflation factor

	VIF	1/VIF
Mobile money_account	1.188	.842
own_credit card	1.136	.88
own_debit card	1.069	.935
Gender	1.057	.946
Age	27.227	.037
Age2	27.632	.036
Educ (completed secondary school)	1.584	.631
Educ (completed tertiary educ or more)	1.59	.629
Income (Second 20%)	1.828	.547
Income (Middle 20%)	1.977	.506
Income (Fourth 20%)	2.197	.455
Income (Richest 20%)	2.698	.371
Employment_in	2.698	.371
Urbanicity	1.068	.936
Have_mobile phone	1.127	.888
Mean VIF	4.968	

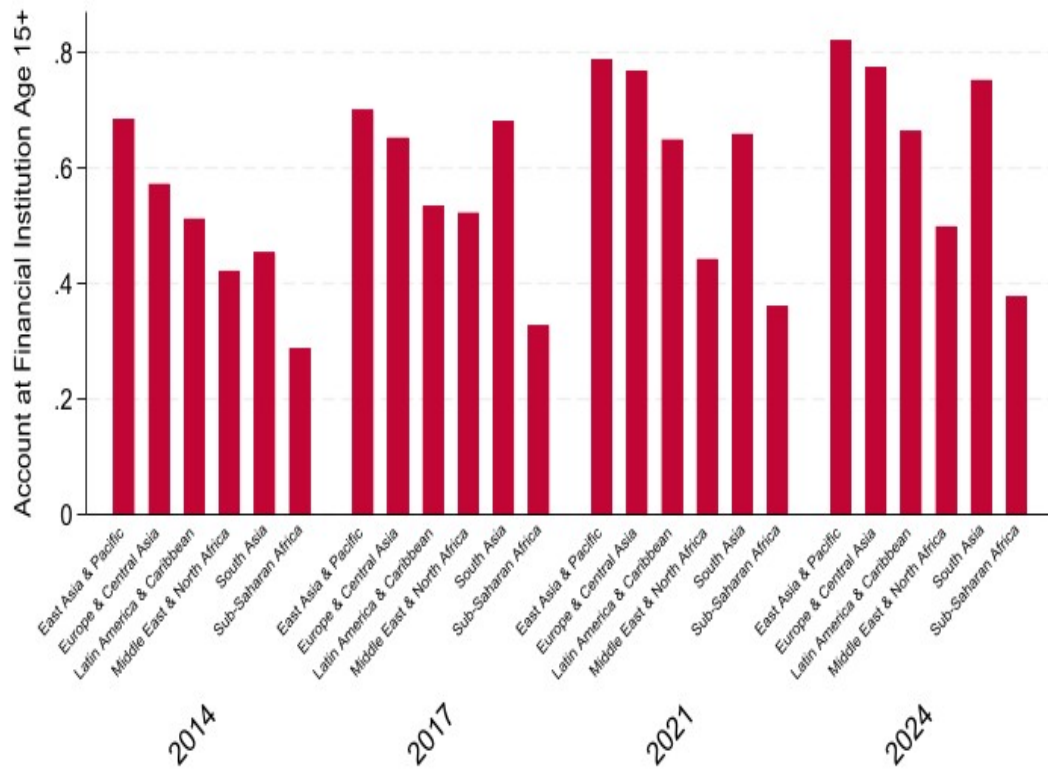
Table 15: Conditional mixed process (CMP) full result

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	mmoney_acct	own_drcard	own_crcard	Utilitypay	Saved	Borrowed
Mobile money account				0.407*** (0.139)	0.785*** (0.185)	0.499*** (0.145)
Own debit card				0.160 (0.183)	0.196 (0.180)	-0.301* (0.174)
Own credit card				0.142 (0.176)	0.567*** (0.194)	1.464*** (0.135)
Mobile money account						
Gender	-0.0920*** (0.0240)	-0.103*** (0.0272)	-0.0771*** (0.0242)	-0.0329 (0.0299)	0.0790*** (0.0254)	0.0109 (0.0201)
Age	0.00945*** (0.00353)	0.0381*** (0.00400)	0.0206*** (0.00520)	0.0524*** (0.00542)	-0.0177*** (0.00650)	0.0312*** (0.00458)
Age2	-0.000213*** (3.96e-05)	-0.000304*** (5.83e-05)	-0.000213*** (5.67e-05)	-0.000437*** (5.25e-05)	0.000129** (6.45e-05)	-0.000395*** (4.70e-05)
Educ (completed secondary school)	0.386*** (0.0507)	0.578*** (0.0621)	0.235*** (0.0530)	0.100** (0.0432)	0.0641 (0.0521)	-0.0157 (0.0440)
Educ (completed tertiary education or more)	0.638*** (0.0908)	1.170*** (0.0939)	0.593*** (0.0850)	0.234*** (0.0835)	0.163 (0.102)	-0.0619 (0.0853)
Income (Second 20%)	0.0921*** (0.0184)	0.0315 (0.0200)	-0.0362 (0.0344)	-0.0152 (0.0295)	0.116*** (0.0260)	0.0147 (0.0348)
Income (Middle 20%)	0.166*** (0.0226)	0.0615** (0.0289)	0.0268 (0.0388)	0.0633** (0.0254)	0.228*** (0.0234)	0.0227 (0.0317)
Income (Fourth 20%)	0.270*** (0.0305)	0.154*** (0.0422)	0.0719 (0.0481)	0.0907** (0.0396)	0.285*** (0.0318)	-0.0267 (0.0340)
Income (Richest 20%)	0.390*** (0.0441)	0.319*** (0.0543)	0.211*** (0.0624)	0.179*** (0.0466)	0.438*** (0.0469)	-0.101*** (0.0376)
Employment (in workforce)	0.379*** (0.0370)	0.215*** (0.0397)	0.266*** (0.0305)	0.157*** (0.0255)	0.200*** (0.0337)	0.202*** (0.0501)
Urbanicity (rural)	-0.0931** (0.0392)	-0.114*** (0.0359)	-0.0291 (0.0303)	-0.108*** (0.0315)	0.0231 (0.0263)	0.0835*** (0.0169)
Have_mobile phone	0.914*** (0.0519)	0.591*** (0.0549)	0.268*** (0.0563)	0.212*** (0.0445)	0.166*** (0.0528)	0.0903 (0.0563)
IVmmoney	2.423*** (0.247)					
IVdrcard		0.927*** (0.306)				
IVcrcard			1.338*** (0.276)			
Constant	-3.478*** (0.184)	-3.052*** (0.168)	-3.197*** (0.243)	-1.453*** (0.146)	-0.914*** (0.210)	-1.056*** (0.122)
Country /year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Baseline control	Yes	Yes	Yes	Yes	Yes	Yes
Cluster standard errons	Yes	Yes	Yes	Yes	Yes	Yes
Observations	117,142	117,142	117,142	117,142	117,142	117,142

Table 16: Users and Non-users cashless payment instrument and formal financial services

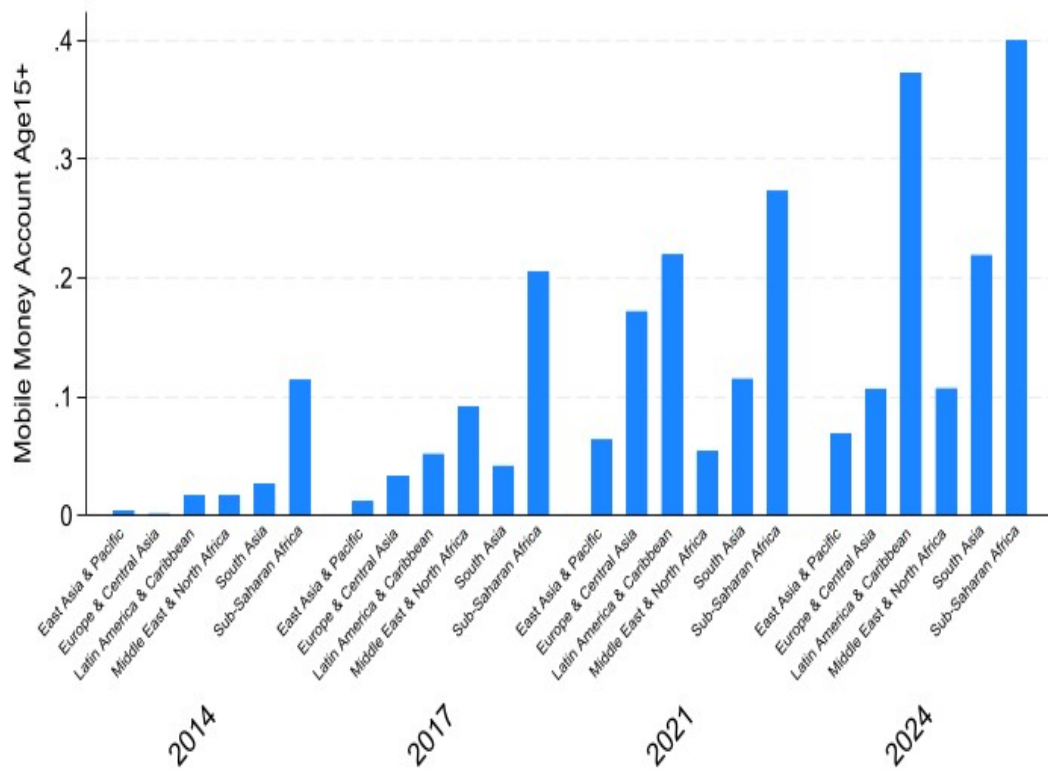
Variable	Frequency	Percentage	Cumulative Percentage
Has an account			
Non user	82567	41.61	41.61
User	115885	58.39	100.00
Has a mobile money account			
Non user	128783	72.97	72.97
User	47703	27.03	100.00
Has a credit card			
Non user	112527	88.37	88.37
User	14815	11.63	100.00
Has a debit card			
Non user	136378	68.72	68.72
User	62074	31.28	100.00
Saved			
Non user	101889	51.34	51.34
User	96563	48.66	100.00
Borrowed			
Non user	92520	46.62	46.62
User	105932	53.38	100.00
Paid utility bills			
Non user	103464	52.93	52.93
User	91997	47.07	100.00
Paid utility bills: using bank account			
Non user	71024	77.20	77.20
User	20973	22.80	100.00
Paid utility bills: using mobile money account			
Non user	69644	75.70	75.70
User	22353	24.30	100.00
Saved: using an account at a financial institution			
Non user	164485	82.88	82.88
User	33967	17.12	100.00
Saved using a mobile money account			
Non user	24289	57.75	57.75
User	17771	42.25	100.00
Borrowed using mobile money account			
Non user	32138	84.04	84.04
User	6102	15.96	100.00
Borrowed: from a financial institution			
Non user	177297	89.34	89.34
User	21155	10.66	100.00

Figure 3: Account Ownership at Bank (2014-2024)



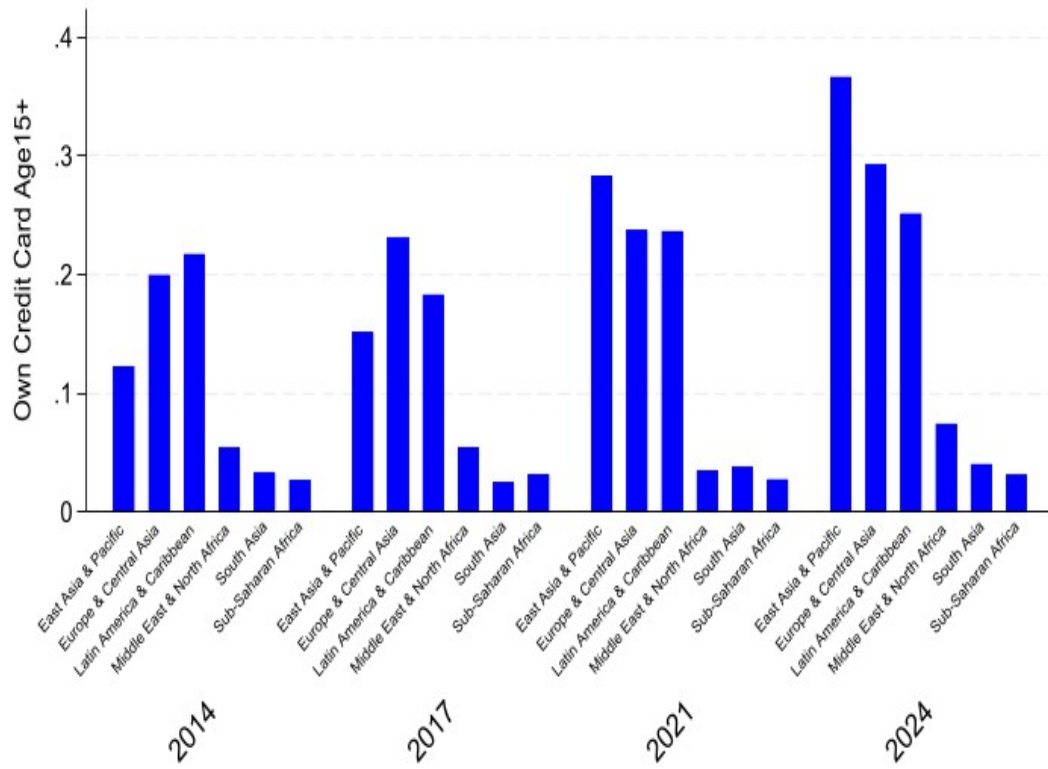
Source: Authors computation Using Data from Global finindex database

Figure 4: Mobile Money Account (2014-2024)



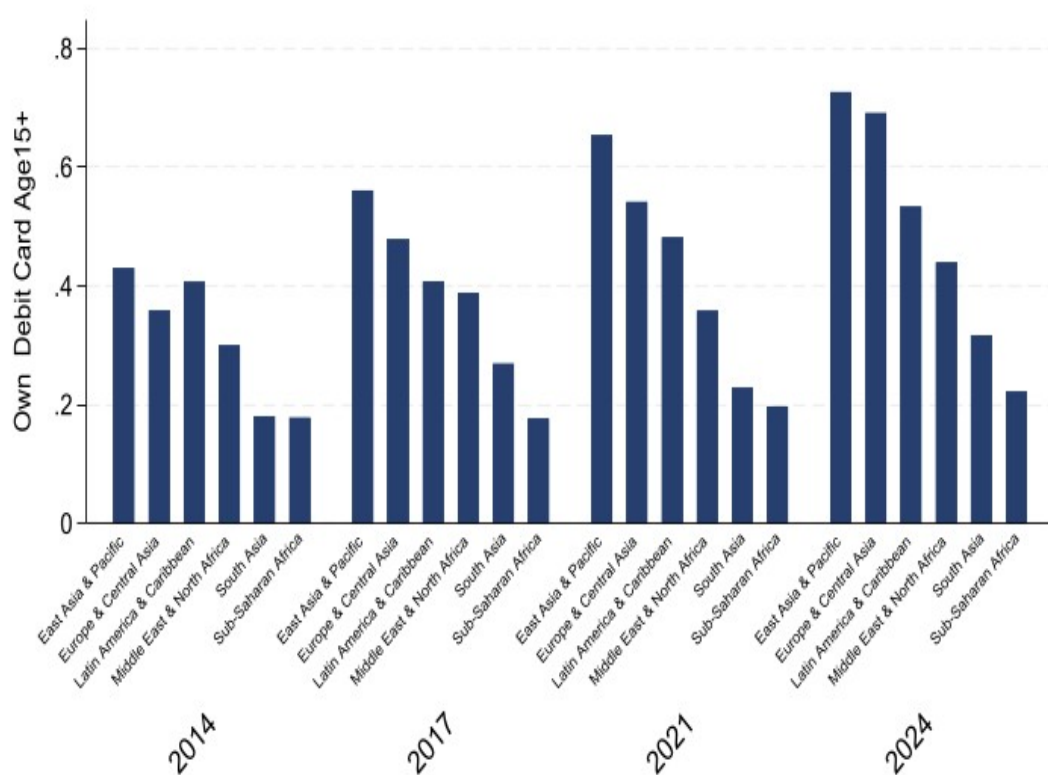
Source: Authors computation Using Data from Global finindex database

Figure 5: Credit card ownership (2014-2024)



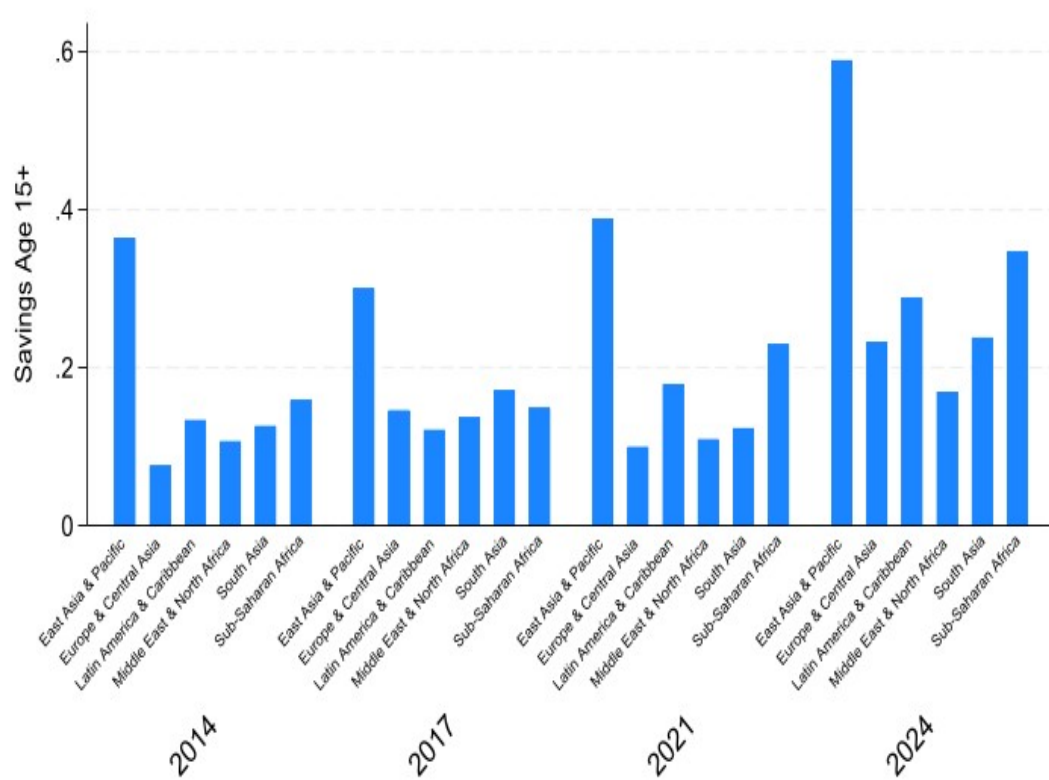
Source: Authors computation Using Data from Global finindex database

Figure 6: Debit card ownership (2014-2024)



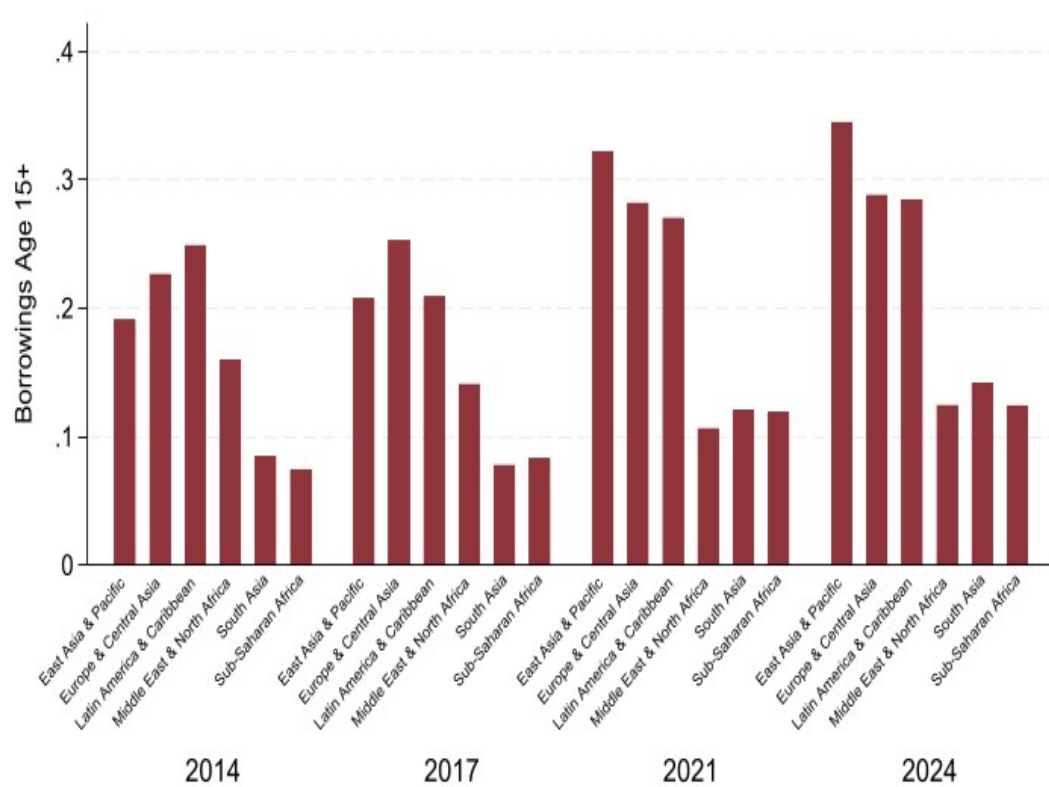
Source: Authors computation Using Data from Global finindex database

Figure 7: Savings (2014-2024)



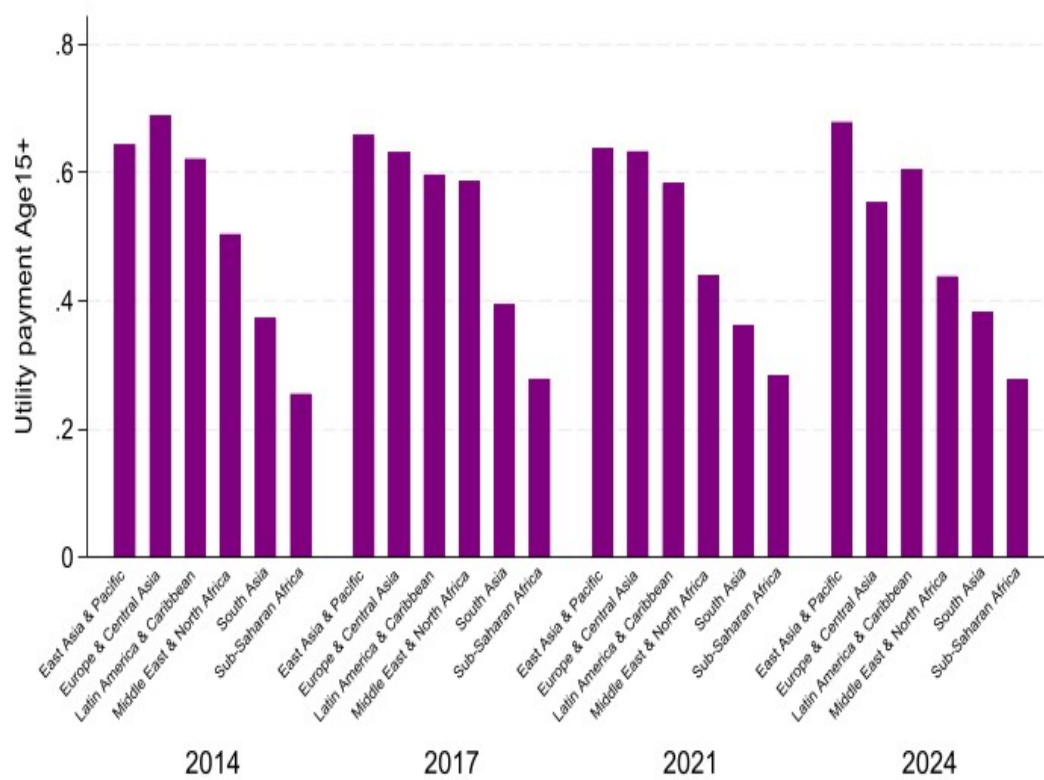
Source: Authors computation Using Data from Global finindex database

Figure 8: Borrowings (2014-2024)



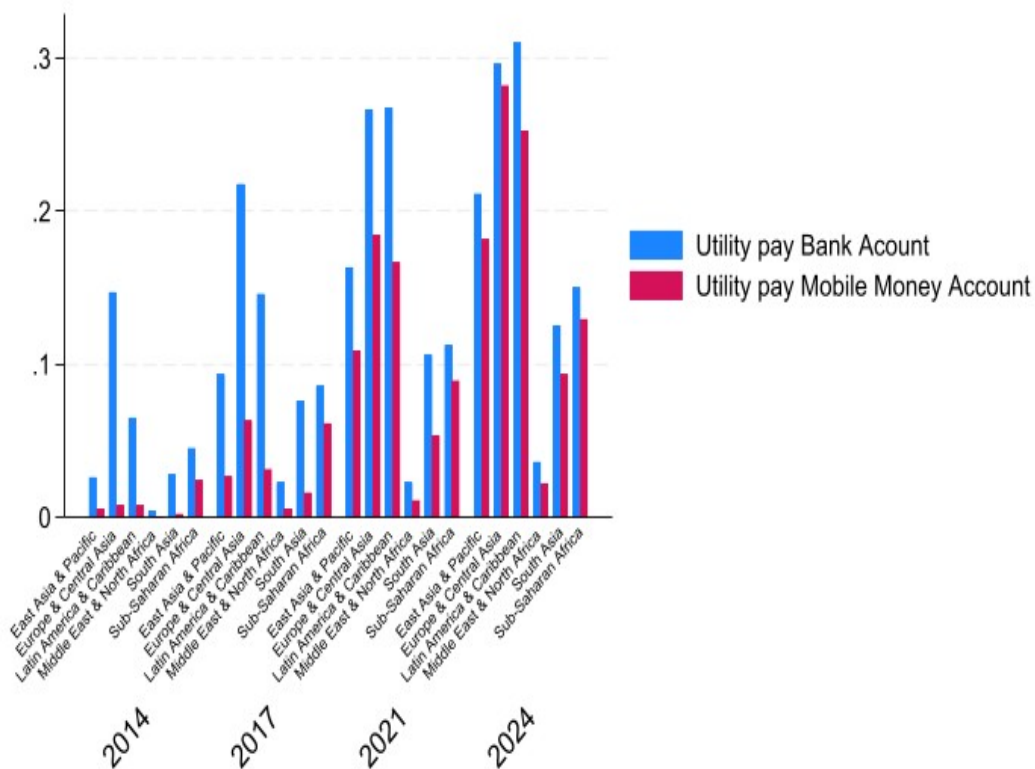
Source: Authors computation Using Data from Global finindex database

Figure 9: Utility payments (2014-2024)



Source: Authors computation Using Data from Global finindex database

Figure 10: Utility payments (2014-2024)



Source: Authors computation Using Data from Global finindex database

Appendix B Robustness checks