Digital Connectivity and Financial Inclusion: An Empirical Cross-Country Analysis Using the Global Findex 2025 Database

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Article

Digital Connectivity and Financial Inclusion: An Empirical Cross-Country Analysis Using the Global Findex 2025 Database

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Abstract

This study empirically explores the digital determinants of financial account ownership of 152 economies using the Global Findex Database 2025, which is the most recent cross-country repository on financial inclusion produced by the World Bank. By combining cross-sectional analysis for 2024 with a panel data framework spanning four waves of the Global Findex database (2014–2024), this study examines the extent to which digital financial access, mobile money account ownership and internet usage predict financial account ownership at country level. The results show that digital financial access is the strongest and statistically significant determinant of financial account ownership globally with a coefficient of 0.911 ($p < 0.001$), while the full model explains 76.7% of the cross-country variation in account ownership. The panel results reveal a strong and statistically significant positive association between mobile money adoption and financial account ownership within countries over time, while the 2024 cross-sectional results indicate a substitution effect in more digitally advanced economies. This contrast highlights a dynamic, stage-dependent role of mobile money in the evolution of financial inclusion. Mobile money enters the model with a negative and statistically significant coefficient of -0.236 ($p = 0.006$) indicating a substitution effect in economies where mobile money becomes the primary avenue to financial access in lieu of the traditional infrastructure of a banking sector. While internet usage is positively correlated with account ownership in bivariate tests, in the multivariate model, internet usage is not found statistically significant in driving financial inclusion without the presence of functioning digital financial infrastructure alongside it. The regional analysis shows significant disparities in the results of financial inclusion. High income economies have an average account ownership rate of 92.03%, compared with 42.41% in the Middle East and North Africa and 55.60% in Sub-Saharan Africa. These results have some interesting implications for policymakers and development-finance institutions interested in designing inclusive digital financial ecosystems; they highlight the importance of investing in digital financial infrastructure in a targeted way rather than simply expanding internet access as a tool of financial inclusion. This study provides one of the earliest cross-country empirical analyses using the Global Findex 2025 dataset and offers timely and original evidence that can be relevant for policy formulation and practice concerning digital financial inclusion.

Keywords: financial inclusion; digital financial access; mobile money; panel data; fixed effects; Global Findex 2025; cross-country analysis; digital economy

1. Introduction

Financial inclusion has become a top agenda for development in the twenty-first century. Fundamentally, it refers to the ability of both individuals and enterprises to access and make effective

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use of a range of formal financial services (including savings accounts, credit facilities, insurance products and payment systems) at affordable costs and free from discriminatory barriers. Access to formal financial services has been widely thought of as a fundamental enabler of economic participation, poverty reduction and sustainable development. The United Nations Sustainable Development Goals, specifically SDG 1 on ending poverty, SDG 8 on decent work and economic growth and SDG 10 on reducing inequalities, all recognise the importance of financial inclusion as a key mechanism through which vulnerable populations can improve their economic prospects and also increase their resilience.

Despite years of policy efforts and important institutional investment, financial exclusion continues to be a serious and unsolved challenge in many parts of the world. According to the World Bank's Global Findex Database 2021, an estimated 1.4 billion adults around the world do not have access to a formal financial account, with exclusion rates especially acute in Sub-Saharan Africa, South Asia and parts of Latin America and the Caribbean. The barriers to financial inclusion are multifaceted and include geographical remoteness, lack of documentation, high transaction costs, low financial literacy, cultural, gender-based constraints as well as poor regulatory frameworks. Traditional banking systems, which are built on the physical network of branches and the existence of formal credit history, have historically been ill-geared to provide services to poor and rural populations on a large scale.

The development of digital financial technologies, more commonly known as fintech, has completely disrupted this landscape. The spread of mobile phones, internet connectivity and digital payment facilities has opened new opportunities, as never before, to reach segments of the population who have been excluded from financial services markets through cost-effective, accessible and scalable digital channels. Mobile-money services like M-Pesa in Kenya, bKash in Bangladesh and similar services across the developing world have shown that digital financial infrastructure can have huge penetration into economies with underdeveloped traditional banking sectors. According to the International Monetary Fund's Financial Access Survey (2024), the number of mobile money accounts has increased dramatically in all developing regions with the Sub-Saharan region leading in global adoption rates.

The intersection of digital connectivity and financial inclusion has therefore attracted a lot of scholarly and policy attention. Researchers have tried to understand how internet usage, mobile money adoption and digital account access result in meaningful improvements in financial participation at the individual and country levels. While a growing body of literature makes a positive case for the relationship between digital technology adoption and financial inclusion, empirical findings are inconclusive. A number of studies have expressed concerns about a digital divide, where the drive towards digitalization is likely to benefit populations that are already connected while leaving others further behind, and may actually serve to deepen rather than reduce existing inequalities.

A major shortcoming of the existing empirical literature is that it is based on old data. The majority of cross-country studies on digital financial inclusion have been based on the Global Findex 2017 or 2021 editions of the survey, which means that the very significant changes in digital-financial behaviour that occurred during and after the Covid-19 pandemic are not properly captured in the data. The pandemic has brought forward the process of digitalization of financial services on a global scale in a way that is only now becoming fully measurable. The World Bank's Global Findex Database 2025, which is based on nationally representative surveys of about 145,000 adults across 141 economies conducted in the 2024 calendar year, is the most up-to-date and comprehensive source of data from the demand side of the market available for this purpose and the systematic empirical analysis of it is therefore very timely and necessary.

This study contributes to the identified gap by performing a rigorous cross country empirical analysis using the Global Findex 2025 dataset to study the determinants of financial account ownership in 152 economies. Specifically, the study analyzes the extent to which digital financial access, mobile-money adoption and internet usage predict financial account ownership using a

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combined cross-sectional and panel data empirical framework, descriptive and regional comparative analysis. The results show that digital financial access is the best and most statistically significant predictor of account ownership worldwide ($\beta = 0.91$, $p < 0.001$), with the full model accounting for 76.7% of cross-country variation in financial account ownership, demonstrating the transformative role of digitalization in spurring financial participation.

The contributions of this study are three-fold. First, it provides the most current empirical cross-country data on the digital drivers of financial inclusion, using the recently released Global Findex 2025 data. Second, it provides a comparative regional analysis that sheds light on important heterogeneity in patterns of digital financial inclusion by income group and by geographic regions. Third, it produces actionable evidence for policymakers, financial regulators and development finance institutions, and FinTech practitioners, who are looking to design inclusive digital financial ecosystems that leave no population behind.

The remainder of this paper is organized as follows: Section 2 presents a review of the relevant theoretical and empirical literature; Section 3 describes data sources, variable construction, and methodological approach; Section 4 presents and discusses the empirical findings; and Section 5 concludes with policy implications, study limitations, and recommendations for future research.

2. Literature Review

2.1. Theoretical Foundations

The academic discussion on financial inclusion is based on a rich supply of theoretical frameworks. Financial intermediation theory, explained further by Levine (1997), explains the basic argument that financial institutions allocate savings in productive investments, which in turn boosts economic growth and income levels, reducing disparities in income. From this perspective, exclusion from the formal financial systems means that people are denied access to capital and their ability to invest, manage their risks, and smooth their consumption over time. This theoretical logic is the basis for treating financial account ownership as the proxy for meaningful economic participation (rather than just as some banking metric).

Sen's (1999) capability approach takes this argument one step further, into the arena of human development, where financial inclusion is seen as a basic enabler of individual freedom. Access to financial services, in this view, increases the range of options at the disposal of individuals, especially those who belong to economically marginalized groups, and contributes to supporting their ability to lead productive and dignified lives. This perspective has been widely used in development economics to provide the economic rationale for financial inclusion as a policy goal to be achieved in line with the goals of the Sustainable Development Goals (SDGs).

At the micro level, the Technology Acceptance Model (TAM) conceptualized by Davis (1989) gives a very common approach to understanding the acceptance of digital financial services. TAM assumes that perceived usefulness and perceived ease of use are the two most important drivers of an individual's intention to adopt a new technology. Applied to mobile money, internet banking, and digital payment platforms, according to TAM, the use of these tools is fundamentally determined by how favourably and accessibly users subjectively evaluate their usefulness in practice. The Unified theory of acceptance and use of technology (UTAUT), developed by Venkatesh et al. (2003), built on TAM by adding social influence and facilitating conditions as additional determinants for acceptance that provided a more comprehensive theory for explaining cross-country variation in digital financial adoption. A recent systematic review and meta-analysis of mobile fintech adoption in Sub-Saharan Africa by Jogiyanto et al. (2024) confirmed that the two core TAM constructs, perceived ease of use and perceived usefulness, were consistently found to be the most significant predictors of mobile fintech adoption in 67 empirical studies, demonstrating the persistence of the theoretical relevance of TAM in the digital financial inclusion context.

Rogers' (1983) Diffusion of Innovation Theory offers a complementary macro-level perspective, which explains the spread of the new financial technologies over time through the population via

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social networks and communication channels. This theory explains the S curve path of mobile money adoption in many developing economies where the initial adoption in urban areas is followed by a process of diffusion to wider rural populations through the effects of demonstrators and networks. Building on this, Ediagbonya and Tioluwani (2023) expanded this framework by examining how fintech innovativeness are disruptive forces that bypass the traditional financial infrastructure altogether by creating new avenues for inclusion that are particularly relevant in economies where the banking sector still remains underdeveloped.

2.2. Digital Technology and Financial Inclusion: What is the Evidence?

A growing and substantial body of empirical evidence shows a positive correlation between the adoption of digital technology and improvements in financial inclusion in a wide variety of country contexts. Demirguc-Kunt et al. (2018), using the Global Findex 2017 database, showed that the proportion of adults worldwide with a financial account has increased from 51% in 2011 to 69% in 2017 with an important portion of this growth driven by digital financial services. Their analysis highlighted the fact that in the developing economy, mobile money had become an increasingly important entry point into the formal financial system, especially in Sub-Saharan Africa where mobile money account ownership grew from 12% in 2011, to 33% in 2021 (Ayadi and Sha'ban, 2024).

Jack and Suri's (2014) landmark study on M-Pesa in Kenya set a foundational empirical precedent in the sense that it found that mobile money adoption significantly lowered transaction costs associated with sending and receiving remittances as well as the fact that households with access to mobile money were much better able to absorb income shocks compared to non-users. Suri and Jack (2016) built on this work and found that mobile money had significant long run poverty reduction and gender equity benefits in Kenya as well, with the effects being particularly pronounced for female-headed households. These results made mobile money not only a payment instrument but a total financial inclusion mechanism with macroeconomic welfare implications.

Allen et al. (2016), using probit models based on Global Findex data for 2011, for 98 developing countries, found that older, employed, married, wealthier, and better-educated people were much more likely to have formal financial accounts, to save through official channels, and to borrow from formal institutions. Zins and Weill (2016) similarly examined access to financial inclusion determinants in 37 African countries and found that income and education were the strongest and most reliable predictors of formal financial account ownership, which has been replicated in further studies of different regional contexts.

Ozili (2018) studied the effect of digital finance on financial inclusion and stability in various countries and discovered that internet penetration, bank branch density, and GDP per capita were some of the most important factors that influenced formal account ownership. More recently, Ocharive and Iworiso (2024), utilizing underlying panel data regressions in several countries and based on Global Findex data that spanned 2011, 2014, 2017 and 2021, validated that mobile money accounts and electronic payments played a key role in financial inclusion as demographic variables such as age, income, education and gender all turned out to be significant moderators.

Khera et al. (2021) in a paper done by the IMF covering 52 developing countries, found that the exogenous component of digital financial inclusion was positively and significantly associated with GDP per capita growth, and identified infrastructure access, financial and digital literacy, and institutional quality as the main country-level determinants of digital financial inclusion. Mothobi and Kebotsamang, (2024), after surveying nine countries in Sub-Saharan Africa and combining the data with information on proximity to mobile network towers, showed a significant and positive relationship between network coverage and digital financial services adoption, confirming that physical digital infrastructure is one of the necessary preconditions for digital financial inclusion via fintech.

The evidence on internet usage as the determinant for financial inclusion is similarly well established. Ahamed et al. (2022), studying determinants of financial inclusion in Ethiopia using Global Findex 2025 data found that internet use was one of the most statistically significant

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determinants of financial account ownership, and internet users were significantly more likely to have and use a formal financial account. This relationship is consistent with the results of cross-regional studies. Meng et al. (2024) considered the role of digital literacy and blockchain adoption in financial inclusion among 56 emerging countries in Africa, Asia and Latin America between 2011 and 2021 and found that digital literacy had a positive effect on financial inclusion in all African countries, but the effect was moderated by the level of existing financial development.

2.3. Regional Heterogeneity & the Digital Divide

While the general evidence is positive around the link between digital connectivity and financial inclusion, an important strand of the literature underscores the fact that there are considerable differences in outcomes by income group, geographical location and demographic features. The concept of digital divide, that is, inequalities regarding access to and successful use of digital technologies, has become a key factor in determination of how benefits of digitalization are distributed across different populations.

Demirguc-Kunt et al., (2022) based on the Global Findex 2021 data indicated that while global account ownership was 76%, there were significant gaps in account ownership in different regions and between different demographics. High-income economies reported account ownership rates of around 94%, compared to 63% in developing economies and Sub-Saharan Africa continued to report the lowest levels of formal bank account ownership of any region globally. Critically, the report found that while the gender gap in access to accounts had narrowed but not closed within developing economies, within these economies, women were consistently less likely than men to own formal financial accounts.

Fungacova and Weill (2015), in their research on the financial inclusion determinants in China, found that wealthier, older and more educated men were significantly more financially included; and that people with incomes in the lowest quintile often cited lack of funds and proximity as barriers, indicating that digital solutions alone cannot overcome structural socioeconomic exclusion. Nandru et al. (2024) in analysing socioeconomic determinants of digital financial inclusion across SAARC countries using Global Findex 2021 data found that young population, male population, higher-income and urban population were consistently more likely to adopt digital financial services that show a significant impact of socioeconomic conditions on digital financial inclusion across regional contexts within South Asia.

Soro (2023), looking at digital financial inclusion and income inequality across WAEMU countries, found that although digital financial inclusion was found to be helpful in reducing income inequality, the magnitude of this effect varied considerably across countries and much depended on the quality of the digital infrastructure and strength of institutional governance. This finding is consistent with Ayadi and Sha'ban (2024), who showed that in Sub-Saharan Africa, the best performing countries on digital financial inclusion were mainly the developing African countries and the high-income European countries performed well on traditional financial inclusion indicators, suggesting that digital and traditional financial inclusion have different developmental trajectories.

Dluhopolskyi et al. (2023) examined the effects of the Covid-19 pandemic on the patterns of digital financial inclusion and found that the pandemic accelerated the adoption of digital financial services worldwide, but at the same time exposed and exacerbated the patterns of digital inequalities, especially among older people, rural populations and low-income households who lacked the devices, connectivity or digital literacy needed to participate in the digital financial transition. These results highlight the importance of addressing structural preconditions for digital financial inclusion instead of relying on the assumption that access to technology is enough to promote inclusive outcomes.

2.4. Gender, Income and Structural Barriers to Financial Inclusion

The gender aspect of financial inclusion has received significant and increasing empirical attention. Demirguc-Kunt and Klapper (2013) working with the 2012 Global Findex database for 98

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developing countries documented a significant and persistent gender gap in account ownership, formal saving and formal credit access, finding that the probability of financial exclusion increased materially with being a woman. This finding has been replicated and expanded upon in subsequent studies in a variety of regional contexts.

Suri and Jack (2016) found that mobile money had particularly significant poverty reduction effects for female-headed households in Kenya and hence it appears that well-designed digital financial products can be effective instruments to close the gender gap in financial inclusion. However, Auer et al. (2023) in their analysis on the fintech gender gap warned that the barriers to mobile phone ownership, internet access, and digital literacy to women in many developing economies, substantially limit women's ability to benefit from digital financial services, even where such services are nominally available. They recorded that women in Sub-Saharan Africa and South Asia were 23% less likely than men to have access to mobile internet and rural people 40% less likely than urban people to use mobile internet, which shows compounded barriers for rural women.

Income-related barriers to financial inclusion are similarly well known. Yakubi et al. (2022) looking at the role of digital financial inclusion on socioeconomic development in low-income countries, discovered that the three facets of financial inclusion namely access, usage and quality had significant and positive impacts on socioeconomic development outcomes, although that access and usage effects were substantially higher than quality effects. This finding underscores the fact that reaching more people with digital financial services is more impactful in low-income country contexts in the short-term than optimizing the quality of these services.

Institutional quality has been sought to be a substantial structural determinant of digital financial inclusion as well. A recent study analyzing 191 countries and years 2004-2023 using a two-step system GMM estimator revealed that institutional quality had a positive and significant impact on digital financial inclusion, where government effectiveness, regulatory quality and control of corruption turned out to be the most influential dimensions in governance (Amnas et al., 2025). The effects were largest for lower middle-income countries, raising the possibility that institutional reform might have disproportionate effects on increasing digital financial access in economies that are at intermediate stages of development.

2.5. COVID-19 and Acceleration of Digital Financial Inclusion

The pandemic with the novel coronavirus (Covid-19) was a watershed moment for digital financial services in the world. Governments and financial institutions in both advanced and developing economies looked to digital payment systems and mobile money platforms as important tools in delivering economic relief and ensuring continuity of financial systems during periods of lockdown and physical distancing. Dluhopolskyi et al. (2023) report that there was a boom in the use of digital financial services during the pandemic, especially digital payments and mobile money, due to necessity but also the closure of physical bank branches.

Yakubi et al. (2022) carried out an analysis of the pandemic's longer-term effects on the pattern of digital financial inclusion and found out that although the pandemic hastened the adoption of technologies in many different contexts, the benefits were not evenly distributed. Those who already had access to digital infrastructure, and some level of financial literacy, benefited the most, while those without the foundations found themselves even more excluded. This finding adds force to the argument made by Ayadi and Sha'ban (2024) that digital financial inclusion needs to be viewed as a multidimensional process, which includes not only access to technology, but also financial capability and institutional infrastructure and the regulatory environment required to enable meaningful participation.

2.6. Research Gap and the Contribution of the Present Study

The above review of the literature shows a number of key gaps that the current study is poised to fill. First, most of the empirical studies on cross-country digital financial inclusion are based on the Global Findex 2017 or 2021 editions, therefore leaving out the major changes in digital financial

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behaviour during and after the Covid-19 pandemic in published empirical research. The release of the Global Findex 2025 database, which is based on the surveys conducted in 141 economies in 2024 and includes new indicators on digital connectivity and the ownership of mobile phones, opens the door to an immediate opportunity for an updated cross-country empirical analysis, which the current study takes advantage of.

Second, few published studies have simultaneously studied the joint effects of internet usage, mobile money adoption and digital financial access on financial account ownership in a unified OLS regression framework applied to global cross-country data. Most existing studies are either regionally specific, using older data sets, or analyse these variables separately and not as part of an integrated empirical modelling. The present study fills this gap by modelling three important digital determinants of financial inclusion across 152 economies at the same time and using the most current globally comparable data available.

Third, although regional heterogeneity in financial inclusion patterns have been documented in literature, comparative analysis using the Global Findex 2025 database that covers 152 economies across all income groups and geographic regions has not yet been published in the academic literature. Consequently, this study offers timely, original and policy-relevant empirical data that directly adds to the current literature base on the topic of digital financial inclusion.

3. Data and Methodology

3.1. Data Source

This research uses data taken from the Global Findex Database 2025, which is published by the World Bank. The Global Findex represents the most comprehensive demand-side repository on financial inclusion globally and contains nationally representative surveys of approximately 145,000 adults in 141 economies in the 2024 calendar year. Having been released for the first time in 2011, the database has been released in five editions in 2011, 2014, 2017, 2021 and 2025—providing similar, cross-country indicators that track the way adults access and use financial services over time. The 2025 edition is of particular interest, given the addition of new indicators related to mobile phone ownership, internet use and digital safety in the form of the first ever Global Findex Digital Connectivity Tracker, thus making it an ideal product to examine the nexus between digital connectivity and financial inclusion in the current global context.

The analytical emphasis of this study is on the 2024 wave of country level data, which is the most recent and complete cross-country observations available. Following the exclusion of observations with missing values on the key variables of interest and restriction to aggregate national level data, the final analytical sample is between 87 and 152 economies depending on the availability of the variables, thus providing a broad and globally representative dataset, spanning all income groups and geographic regions as classified by the World Bank.

3.2. Variables

The dependent variable in this study is financial account ownership (account_t_d) which is measured as the proportion of the population in this age group (adults 15 and older) who said they own an account at a formal financial institution or with a mobile money provider. This variable is the most widely used in empirical literature based on cross-country data as a proxy for financial inclusion and it directly captures the main dimension of financial access considered in the present study.

Three independent variables are used to model the digital determinants of financial inclusion. Firstly, digital financial access (dig_acc) refers to the proportion of adults who have access to digital financial services and is the main predictor of interest as it is directly related to the inclusion generated by fintech. Secondly, mobile money account ownership (mobileaccount_t_d) captures percentage of adults that report ownership of a mobile money account reflecting the role mobile-based financial infrastructure plays in extending the reach of inclusion to conventional banking and beyond. Thirdly, internet usage (internet) measures the proportion of adults who say they use the

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internet which is a proxy for the broader measure of digital connectivity and the role that the internet plays in enabling people to access digital financial services.

Two extra variables are included into the descriptive analysis in order to provide a fuller portrait of financial behaviour patterns in the sample. Saving behaviour (save_any_t_d) describes the percentage of adults who say they saved money through any formal or informal means while borrowing behaviour (borrow_any_t_d) is the percentage of adults who have borrowed in the last year from any source. These variables put the financial inclusion landscape into perspective and not just account ownership.

3.3. Methodology

This study employs a two-part empirical strategy that combines a panel data framework spanning four waves of the Global Findex database (2014, 2017, 2021, 2024) with a cross-sectional analysis of the 2024 wave. The two methodologies are synergistic: the panel design fills in intra-national dynamics over time while holding the latent heterogeneity of these dynamics constant, whereas the cross section design provides a structural snapshot of all the digital connectivity indicators for the most recent year. Their combination allows the separation of the long-run effect of mobile money on inclusion from the dynamics of substitution that occurs simultaneously between mobile money and access to other digital financial systems.

For the cross-sectional component, this study employs an Ordinary Least Squares (OLS) regression framework to examine the link between indicators of digital connectivity and financial account ownership on a country by country basis. OLS regression is often used in cross-country financial inclusion research because it is interpretable, simple and can measure the direction and magnitude of links between key variables at the country level. The regression model at the baseline is as follows: Section 2 gives the theoretical base for the present specification. Financial intermediation theory, as enunciated by Levine (1997), states that formal financial infrastructure is the major channel through which savings and credit are transmitted to the underserved. The Technology Acceptance Model (TAM; Davis, 1989) lists perceived usefulness and ease of use as the main drivers of adoption of digital services, while Rogers (1983) Diffusion of Innovation theory explains the diffusion of new financial technologies through populations, in terms of the influence of social networks and accessibility of infrastructure. Collectively, these frameworks provide evidence for the three-predictor specification of digital financial access, which is active engagement with digital financial services and captures the demand-side adoption channel outlined by TAM, mobile money account ownership, which is an alternative, first-generation inclusion pathway independent of formal banking infrastructure, and internet usage, which refers to the underlying connectivity infrastructure that enables both of these adoption channels. The three variables directly match the supply-side, alternative-channel, and infrastructure dimensions of digital financial inclusion by the empirical research (Ozili, 2018; Khera et al., 2021; Allen et al., 2016). Consequently, the regression equation is not ad hoc but rather the result of a well-established theoretical architecture that has links between infrastructure, adoption, and inclusion outcomes at the national level.

3.3.1. Cross-Sectional Model (2024)

The cross-sectional analysis makes use of the 2024 Global Findex database to estimate the structural determinants of financial account ownership, for 87 economies for which we have complete data on all three digital connectivity predictors. The baseline regression equation (is):

$$\text{Account Ownership} = a + b1(\text{Digital Financial Access}) + b2(\text{Mobile Money Accounts}) + b3(\text{Internet Usage}) + e$$

where Account Ownership represents the dependent variable, in this case, the percentage of adults who hold a formal financial account, the three digital connectivity variables are the independent predictors, ‘a’ is the intercept of the regression equation, b1, b2 and b3 are the estimated regression

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coefficients for the independent variables, and e is the error term which measures the unexplained variation in the model.

Prior to regression estimation, descriptive statistics are computed for all key variables in order to characterise financial inclusion and digital connectivity indicator distribution across the sample. Regional comparative analysis is performed by clustering the countries based on geographical and income group classifications of the World Bank to identify the patterns of heterogeneity in financial inclusion outcomes in different economic contexts. Correlation and scatter plot analysis is also used to analyse the bivariate relationships of internet usage and account ownership before moving on to the multivariate regression framework.

All data processing, statistical analysis and figure generation were done in Python 3, using the pandas, numpy, statsmodels, matplotlib and seaborn libraries. Figures were created at 300 DPI resolution to meet the quality standards of journal publishing. To check the robustness of the main empirical results, three additional specifications in addition to the baseline model were estimated. First, a parsimonious two predictor specification, which omits internet usage, was estimated in order to confirm the invariance of the coefficients relating to digital financial access and mobile money to the exclusion of the connectivity control variable. Second, a specification dropping nine leverage-influencing economies (estimated using Cook's distance diagnostics, threshold: 4/N = 0.046) was estimated in order to check that the results are not driven by influential outliers. Third, broad specification using N = 108 covering only digital financial access and internet usage only, excluding mobile money usage, was estimated to validate the robustness of digital access coefficient over the entire sample available for which mobile money data was missing. Heteroscedasticity-robust standard errors (HC3) were used for all specifications following White (1980) and the suitability of the robust standard error correction was confirmed using the Breusch-Pagan Lagrange Multiplier test. Prior to the interpretation of the coefficients from the regression, multicollinearity between the predictor variables was checked for using Variance Inflation Factors (VIF) and a value less than five was considered acceptable.

3.3.2. Panel Data Model (2014–2024)

To address the point that the reviewer made on the limitations of having a single cross-section, and the need to reflect the longitudinal development of mobile money adoption, the panel data model is estimated based on the 2014, 2017, 2021, and 2024 waves of the Global Findex database. The panel is unbalanced with 108 countries in four waves providing 346 country-year observations with both financial account ownership and mobile money data available. Digital financial access (dig_acc) is only available from the 2024 wave onwards and internet usage is recorded systematically only in 2024; the panel model therefore focuses on the relationship between the adoption of mobile money and the ownership of a financial account, the latter being the variable that is available at all four waves. The regression equation for the panel is:

$$\text{Account}(it) = \alpha + \beta_1\, \text{Mobile}(it) + \mu_i + \lambda_t + \varepsilon(it),$$

where i indexes countries and t indexes time. Account(it) is the proportion of adults with a financial account in country i at time t, Mobile(it) is mobile money account ownership, μ_i represents country fixed effects and captures all time-invariant features of countries, such as institutional quality, culture, geography, and regulatory environment, λ_t represents time fixed effects, reflecting time specific shocks from a global shock that affects all countries participating in a given wave (for example, the Covid-19 pandemic and the expansion of fintech worldwide), and $\varepsilon(it)$ is the idiosyncratic error term. Four model specifications are estimated: a pooled random effects model (RE), a random effects model augmented with controls for income group (RE+), an entity fixed effects model (FE), and a two way fixed effects model with country as well as time effects (TWFE). The Hausman test is used to test the appropriateness of fixed or random effects based on the structure of the data. Cluster robust standard errors are used at the country level for each of the panel specifications to account for within-country serial correlation across waves.

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Due to data availability constraints across all Global Findex waves, the panel specification focuses on mobile money as the primary time-varying regressor. Country fixed effects absorb all time-invariant structural characteristics such as institutional quality, regulatory environment, geography, and financial development, while time fixed effects capture global shocks and common temporal trends affecting all countries. This specification enables identification of the within-country association between mobile money adoption and financial account ownership over time, while mitigating omitted variable bias arising from unobserved heterogeneity.

3.4. Limitations

Some limitations of the study should be noted. First, the cross-sectional nature of the 2024 data limits our ability to draw causal relationships between digital connectivity and financial inclusion. While the results of this regression provide statistically significant associations, reverse causality cannot be clearly excluded because populations with greater levels of financial inclusion may be more likely to use digital technologies. The possible endogeneity of the main explaining variables is explicitly recognized: there is a conceptual interconnectedness between digital financial access and financial account ownership, as higher levels of inclusion may at the same time involve greater digital adoption, which would create a reverse causality issue. While the inclusion of income group controls in Model 3 has to some extent balanced out omitted variable bias due to structural economic difference, the lack of instrumental variable approach implies that estimated coefficients should be interpreted as conditional association and not causal. Future research should overcome this limitation by using instrumental variable estimation or panel data techniques using more than one Findex wave. It is important to note, as well, that the variables considered in the present analysis are long run outcomes of institutional, infrastructural as well as economic development processes. The 2024 wave gives us a single contemporaneous cross-section rather than a time-series; therefore, issues related to spurious regression due to non-stationarity are more of a concern for time series data than for the cross-sectional data used here. The ordinary least squares framework is the standard and commonly used methodology in the financial inclusion literature using Findex data (Allen et al., 2016; Zins and Weill, 2016; Demirguc-Kunt et al., 2022); the R Squared value of 0.767 is in line with other cross-country studies of similar variable sets and does not suggest model misspecification.

Second, the use of country-level aggregate data means it is not possible to analyse individual-level demographic determinants, such as gender, age, income, and education, which have been identified in the literature as important moderators of the digital financial inclusion relationship. Third, missing data on some variables—notably mobile money account ownership and digital financial access—had reduced the size of the regression analysis sample from 152 to 87 countries, and could possibly lead to sample selection issues. Future studies should overcome such limitations by using panel data techniques, instrumental variable methods and individual-level survey data to make more robust causal inferences.

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 presents the descriptive statistics of the key variables that are considered for the analysis of the 2024 Global Findex sample. Across the 152 economies that are included in the sample, financial account ownership (account_t_d) has a mean of 70.70% and a standard deviation of 22.37%, highlighting an important level of heterogeneity across countries. The lower limit of 14.83% and the upper limit of 99.85% only further prove that financial access is still very unequal across the world, with certain economies nearing universal financial access and others still being far away from it.

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Table 1. Descriptive Statistics of Key Variables (Global Findex 2025, 2024 Wave).

Variable	N	Mean	Std Dev	Min	25th Pct	Median	75th Pct	Max
Financial account Ownership (%)	152	70.70	22.37	14.83	54.49	73.33	89.73	99.85
Digital Financial Access (%)	108	46.58	21.22	7.43	29.17	47.66	62.05	96.20
Mobile Money Account Ownership (%)	92	30.66	20.31	2.65	12.79	27.31	47.43	87.50
Internet Usage (%)	152	73.12	23.27	11.06	58.93	82.88	90.25	99.12
Saving Behaviour (%)	108	49.06	13.78	20.39	38.50	48.35	58.24	83.41
Borrowing Behaviour (%)	108	58.44	13.57	24.89	47.56	58.14	69.19	90.21

Internet utilisation is the highest mean amongst the digital connectivity indicators with an average of 73.12% signifying widespread penetration across the sample economies. Digital financial access is an average of 46.58% across 108 economies to which the indicator is available, while mobile money account ownership reaches a mean of 30.66% across 92 economies. The relatively low coverage related to mobile money and digital financial access reflects the fact that these indicators are not yet reported universally across all economies and this shortcoming is addressed in the following regression analysis.

Regarding financial behaviour, the average rate of saving is 49.06% and the average rate of borrowing is 58.44%, which means that while a majority of adults borrow in one way or the other, formal saving behaviour is below the global majority threshold.

4.2. Regional Analysis

Table 2. Mean Financial Inclusion and Digital Connectivity Indicators by Region and income Group (2024).

Panel A: By World Region

Region	N	Acct Own.	Internet	Mobile Money
Middle East & N. Africa	10	42.41%	78.23%	9.82
Sub-Saharan Africa	35	55.60%	41.33%	43.13
Latin America & Caribbean	16	59.93%	81.99%	24.44
South Asia	5	60.26%	43.62%	15.16
East Asia & Pacific	9	69.10%	80.67%	33.56
Europe & Central Asia	18	72.19%	84.20%	23.47
High Income	47	92.03%	91.75%	47.78

Panel B: By Income Group

Income Group	N	Acct Own.	Internet	Mobile Money
Low income	16	45.45%	30.70%	36.14
Lower middle income	40	56.34%	62.31%	29.97
Upper middle income	37	69.48%	81.54%	30.80
High income	47	92.03%	91.75%	47.78

Figure 1 shows the spatial distribution of mean financial account ownership in the World Bank geographical regions in 2024. The results show a strong regional hierarchy of the financial inclusion outcomes. High-income economies report the highest average account ownership rate of 92.03% reflecting their well-developed financial infrastructure and the near-universal access which is a characteristic of advanced economies. Europe and Central Asia come next with a mean of 72.19% followed by East Asia and the Pacific at 69.10%. Registers below 61% are found in Latin America and the Caribbean and South Asia, at 59.93% and 60.26%, respectively, and 55.60% in Sub-Saharan Africa.

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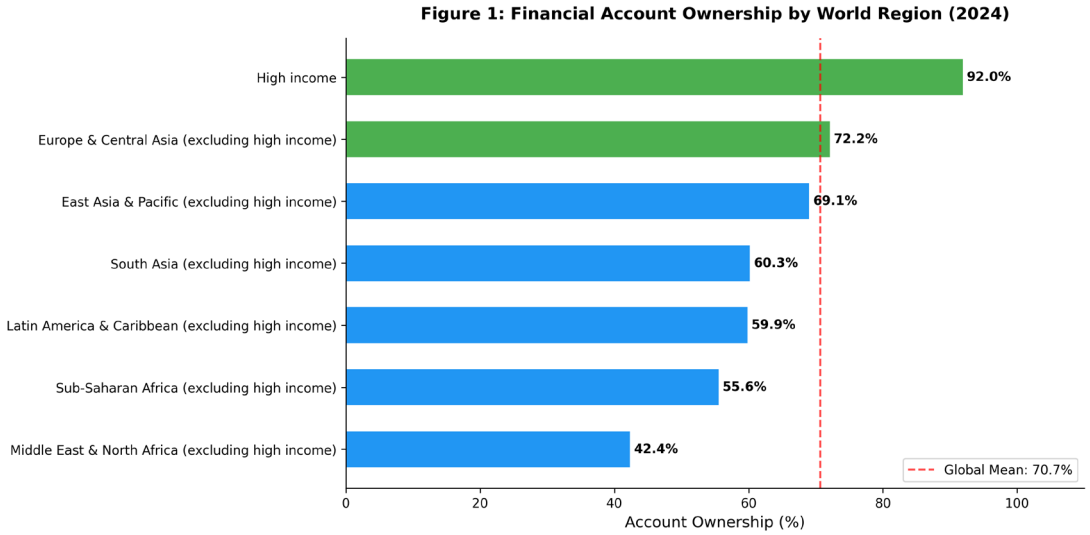

Figure 1. Financial Account Ownership by World Region (2024).

The Middle East and North Africa region has the lowest mean account ownership of any developing region at 42.41%, in line with prior literature that documents the existence of persistent structural and regulatory impediments to financial access in that region. The global average of 70.70% hides these notable regional differences, making it necessary to do disaggregated regional analysis for a complete understanding of the state of financial inclusion globally.

Analysis by income group produces a similarly sharp pattern. Low income economies achieve a mean account ownership of just 45.45%, while lower middle income economies achieve an account ownership of 56.34%, upper middle income economies achieve an account ownership of 69.48% and high income economies achieve an account ownership of 92.03%. The monotonic relationship between income level and account ownership strongly supports the argument that economic development and financial inclusion are closely linked, and that in low income economies there are the greatest structural barriers to increasing financial access.

4.3. Trends in Digital Financial Inclusion (2011 to 2024)

Figure 4 shows the trend in the proportion of people worldwide owning a financial account, owning a mobile money account or using the internet in the five Global Findex waves between 2011 and 2024. Financial account ownership increased from about 51% in 2011 to 70.70% in 2024, which is a gain of nearly 20 percentage points in the thirteen years. Internet usage has been significantly higher in recent years as well, growing from about 34% in 2011 to 73.12% in 2024. Mobile money account ownership, which is practically nil in 2011, reached a global mean of 30.66% by 2024, with most of the growth occurring between 2017-2024 as mobile money platforms proliferated in Sub-Saharan Africa and South Asia.

Collectively, these trends suggest that the global digital financial landscape has fundamentally changed since 2011 with digital connectivity and mobile-based financial services becoming increasingly important driving forces of financial inclusion. The fact that the growth in both internet usage and ownership of a financial account were occurring simultaneously in this period helps to offer descriptive support for the hypothesis that digital connectivity is associated positively with financial inclusion, a hypothesis examined formally in the regression analysis below.

4.4. Bivariate Analysis

A scatter plot using internet usage and financial account ownership as the two variables for the 140 economies with points disaggregated by income group is shown in Figure 2. A clear positive association can be seen, with the greater the usage of the internet, the greater the financial account

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ownership across all income groups. The fitted regression line does support this relationship, with a bivariate R^2 of 0.375 which means that internet use alone explains about 37.5% of cross-country variation in account ownership.

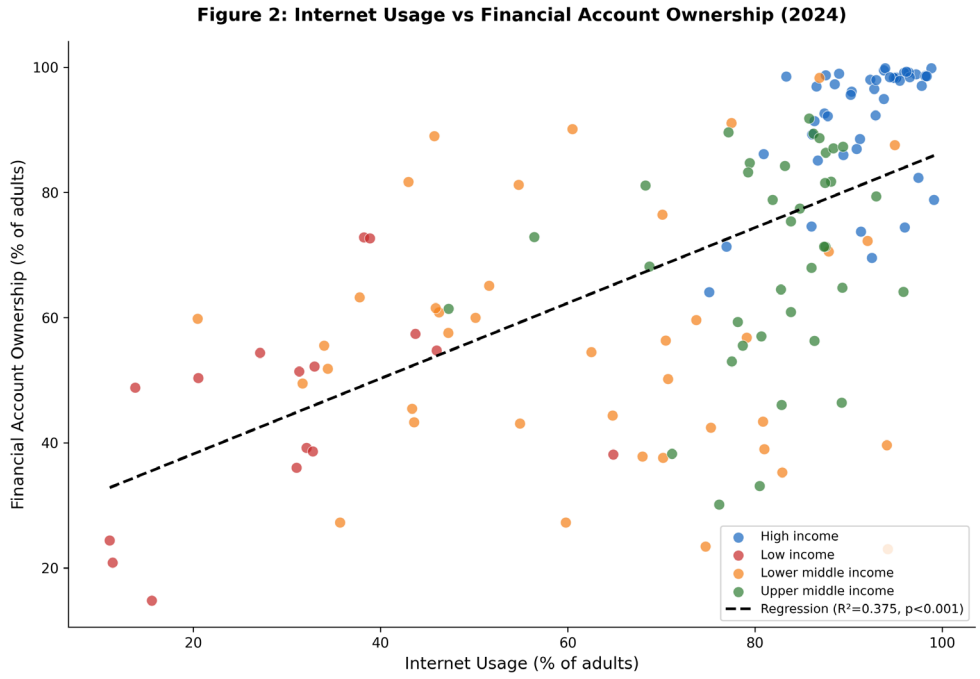

Figure 2. Internet Usage vs Financial Account Ownership (2024).

Figure 3 shows the relationship between mobile money account ownership and digital financial access for developing as compared to high income economies. The findings show a complex divergence in that a positive link between mobile money and digital financial access is found in developing economies with a moderate positive relationship, which may support the expectation that mobile money is a key channel to digital financial access in developing countries. In high income economies, this relationship is comparatively weaker, reflecting the fact that advanced economies are reliant on internet banking and card-based payment infrastructures, other than mobile money, to provide digital financial access.

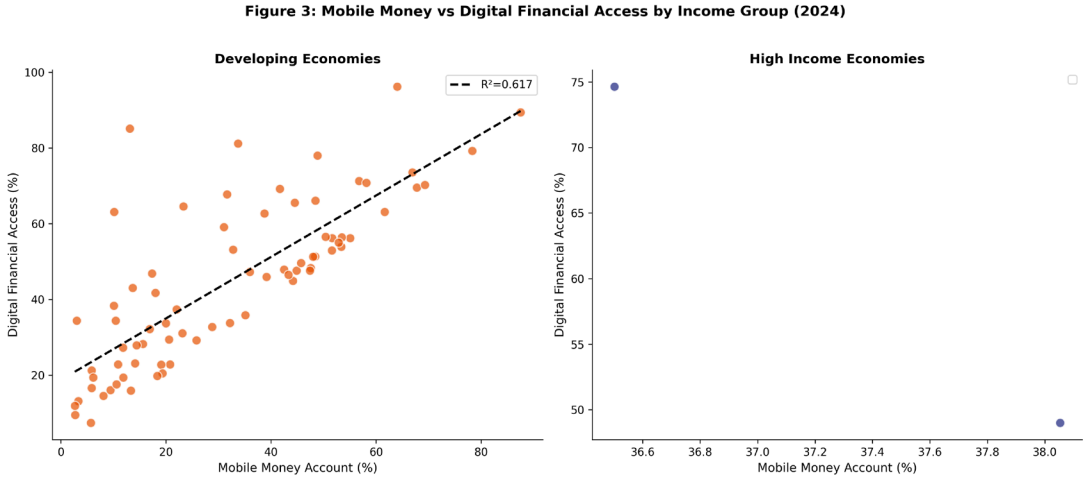

Figure 3. Mobile Money vs Digital Financial Access by Income Group (2024).

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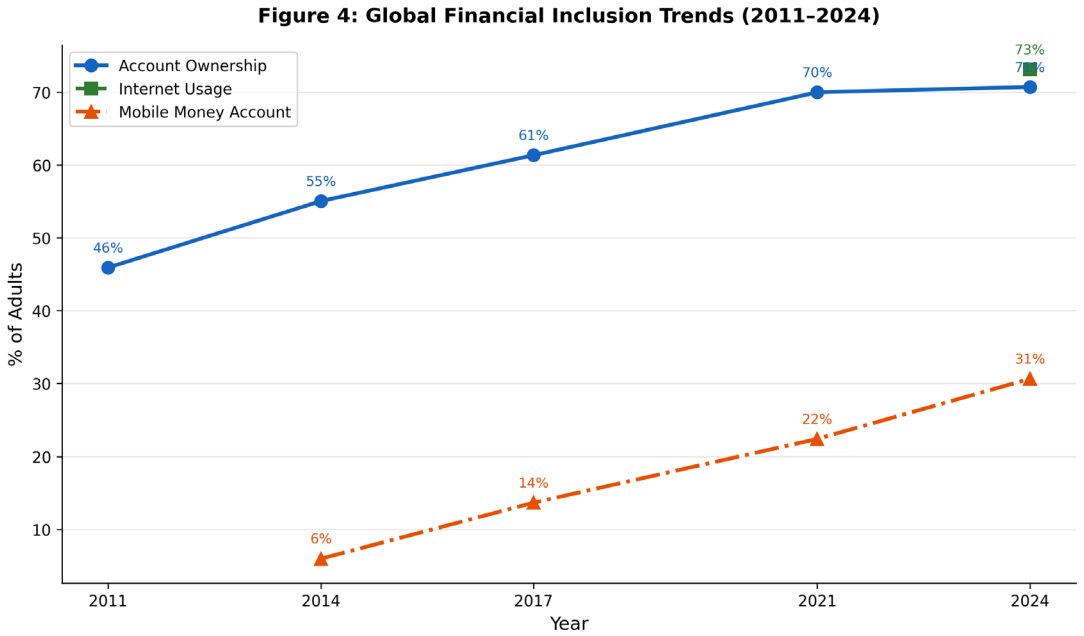

Figure 4. Global Financial Inclusion Trends (2011–2024).

4.5. Multivariate Regression Outcomes

4.5.1. Panel Data Results (2014–2024)

Table 3 summarizes the results from the panel data regression for four models. The panel consists of 346 country-year observations from 108 countries in the four Findex waves of 2014, 2017, 2021, and 2024. The Hausman test statistic ($H = 0.167$, $p = 0.683$) cannot reject the null hypothesis of no systematic difference between estimates of fixed and random effects, and this indicates that the random effects specification is preferred. Consistent with best practice in panel econometrics, random effects and fixed effects findings are both reported to show robustness. Across all four of the panel specifications, ownership of a mobile money account is positively and significantly related to financial account ownership. In the baseline random-effects model (M1) a one percentage point increase in mobile money adoption is found to be associated with a 0.651 percentage point increase in account ownership ($p < 0.001$). This positive relationship is robust to the inclusion of income group controls in M2 ($\beta = 0.654$, $p < 0.001$), to the use of entity fixed effects in M3 ($\beta = 0.659$, $p < 0.001$), and to the two way fixed effects specification controlling for both country heterogeneity and global time shocks in M4 ($\beta = 0.453$, $p < 0.001$). The robustness of the positive coefficient across all four panel specifications provides strong evidence that mobile money adoption is positively associated with financial account ownership over time and across countries. The result for the entity fixed effects (M3) is of particular interest, since it destroys for all time-invariant country characteristics, such as institutional quality, regulatory environment, geography and culture, and yet shows a strong positive relationship. The two-way fixed effects result (M4) further absorbs the shocks that are common to all countries in a given wave, such as the one from the Covid-19 pandemic, and from the global expansion of fintech, and the coefficient for mobile money is positive and very significant.

Table 3. Panel Data Regression Results—Dependent Variable: Financial Account Ownership (%) (Waves: 2014, 2017, 2021, 2024; N = 346 obs, 108 Countries).

Variable	M1: RE	M2: RE+	M3: FE	M4: TWFE
Mobile Money (%)	0.651***	0.654***	0.659***	0.453***
Income Controls	No	Yes	Absorbed	Absorbed
Country FE	No	No	Yes	Yes
Time FE	No	No	No	Yes

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Observations	346	346	346	346
Countries	108	108	108	108
R^2	0.598	0.645	0.673 (within)	0.325 (within)

Note: Cluster-robust standard errors at country level. *** p < 0.001. RE = Random Effects; FE = Entity Fixed Effects; TWFE = Two-Way Fixed Effects. Hausman test: H = 0.167, p = 0.683 (RE preferred). Source: World Bank Global Findex Database 2025.

4.5.2. Cross-Sectional Results (2024)

Table 4 shows the results of an ordinary least squares (OLS) regression estimating financial account ownership on the three digital connectivity predictors for 87 economies where there are complete data for all variables. The overall model is highly statistically significant, with an F-statistic of 91.16 (p < 0.001) and an R2 of 0.767, implying that the three digital connectivity variables explain 76.7% of cross-country variation in account ownership in aggregate. The adjusted R2 0.759 indicates that this explanatory power is robust to the inclusion of other predictors in the model.

Table 4. OLS regression results—Determinants of Financial Account Ownership. Dependent Variable: Financial Account Ownership (%).

Variable	Coefficient	Std. Error	t-Statistic	p-Value	95% Conf. Interval
Constant	21.3772***	3.4892	6.127	0.0000	[14.4374, 28.3171]
Internet Usage	0.0657	0.0527	1.247	0.2159	[-0.0391, 0.1706]
Mobile Money Account Ownership	-0.2361**	0.0833	-2.836	0.0057	[-0.4017, -0.0705]
Digital Financial Access	0.9110***	0.0814	11.191	0.0000	[0.7491, 1.0729]

Observations	87
R-squared	0.767
Adjusted R-squared	0.759
F-statistic	91.16
Prob (F-statistic)	3.48e-26

Note: *** p<0.001, **p<0.01, *p<0.05.

The biggest predictor of digital financial access, and the only one which is statistically significant, is dig_acc, with a coefficient of 0.911 (p < 0.001). This finding suggests that one percentage point rise in digital financial access is linked, on average, to a 0.911 percentage point increase in financial account ownership, controlling for other variables. The outcome is consistent with Khera et al. (2021), which found digital infrastructure access as the major factor contributing to digital financial inclusion in developing countries, as well as with Ocharive and Iworiso (2024), which highlighted the critical role of digital financial services in promoting formal account ownership in a variety of country contexts.

Mobile money account ownership (mobileaccount_t_d) has a negative and statistically significant coefficient of -0.236 (p = 0.006) in the model. While counterintuitive at first glance, this result is consistent with other evidence that where mobile money is the main channel for access to finance, mobile-money accounts may replace, rather than supplement, formal bank accounts. This substitution effect has been documented in Sub-Saharan Africa where mobile money penetration is highest in economies where the traditional banking penetration is the lowest (Ayadi and Sha'ban 2024). Consequently, the negative coefficient attests to a compositional effect in the data and not to a cause and effect adverse impact of mobile money on financial inclusion.

Internet usage (internet) enters the regression with a positive coefficient of 0.066 but does not appear to be statistically significant at conventional levels (p = 0.216). This implies that the independent contribution of internet usage to the ownership of an account is not statistically

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distinguishable from zero at the country level, controlling for digital financial access. The finding supports the argument that internet usage is a necessary but not sufficient condition to digital financial inclusion and that it is the degree to which connectivity is converted into financial services utilisation—measured by the digital financial access variable that really matters.

Diagnostic tests are used to support the validity of the modelling strategy. Breusch-Pagan Lagrange Multiplier test did not provide any evidence of positive heteroscedasticity in the residuals (LM = 7.115, p = 0.068), thus justifying the use of HC3 robust standard errors as a conservative precaution. VIF diagnostics showed acceptable levels of multicollinearity for all three predictors: digital financial access (VIF = 2.80), mobile money (VIF= 2.67) and internet usage (VIF= 1.52) that all fall well below conventional thresholds of 10 and more stringent thresholds of 5. The results of the robustness checks are summarised in Table 4. Specification R1, which excludes internet usage, does not change the digital financial access coefficient substantially ($\beta = 0.968$, $p < 0.001$) and increases the mobile money substitution effect ($\beta = -0.292$, $p < 0.001$), confirming that results of main findings are not sensitive to the connectivity control. Specification R2, which excludes the nine leverage-influencing economies identified using Cook's distance, dramatically improves model fit ($R^2 = 0.909$) with no change in the sign, magnitude and significance of all key coefficients suggesting that results are not driven by outliers. Specification R3, using the more general population sample, N = 108, without mobile money, confirms that digital financial access is the leading predictor ($\beta=0.737$, $p<=0.001$) even in economies with no mobile money data. Collectively, all three of these checks provide evidence that the core findings are robust to alternative specifications, reduced samples, and expanded sample compositions.

Table 5. Robustness Checks—OLS Regression Results (Dependent Variable: Financial Account Ownership %).

Variable	Baseline N=87	R1: No Internet N=87	R2: No Outliers N=78	R3: No Mobile N=108
Constant	21.377**	24.481***	12.980***	16.473***
Digital Financial Access	0.911***	0.968***	0.940***	0.737***
Mobile Money	-0.236**	-0.292***	-0.195**	—
Internet Usage	0.066	—	0.138***	0.162*
R^2	0.767	0.763	0.909	0.767
Adjusted R^2	0.759	0.757	0.904	0.762

Note: HC3 heteroscedasticity-robust standard errors. *** p < 0.001, ** p < 0.01, * p < 0.05. R1 = baseline excluding internet usage. R2 = baseline excluding nine leverage-influencing economies identified via Cook's distance (Ethiopia, India, Iran, Lebanon, Nepal, Niger, Sri Lanka). R3 = broader sample excluding mobile money. Source: World Bank Global Findex Database 2025.

Table 6. Variance Inflation Factor (VIF) Diagnostics—Model 2.

Variable	VIF	Tolerance	Assessment
Digital Financial Access	2.80	0.357	Acceptable (< 5)
Mobile Money Account Ownership	2.67	0.375	Acceptable (< 5)
Internet Usage	1.52	0.658	Acceptable (< 5)

Note: VIF = Variance Inflation Factor. Tolerance = 1/VIF. Values below 5 indicate acceptable multicollinearity levels (Hair et al., 2010). All specifications use HC3 robust standard errors. Source: Authors' calculations using World Bank Global Findex Database 2025.

4.6. Discussion

The results of this research have several important theoretical and policy implications. From a theoretical perspective, the findings align with the framework of Technology Acceptance Model, in

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so far as they confirm that it is indeed the actual utilisation of digital financial services, rather than connectivity, that is the decisive factor in driving financial account ownership at the country level. This is consistent with the focus of the Technology Acceptance Model on perceived usefulness rather than on access per se, and speaks to the proposition by Venkatesh et al. (2003) that facilitating conditions, which include not only internet access but also working digital financial infrastructure, are essential enablers for technology adoption. A key theoretical contribution of this study is the identification of a dynamic stage-dependent role for mobile money in financial inclusion. The results from the panel that covers the period 2014-2024 show that, within countries over time, mobile money adoption is associated with a consistent and significant increase in financial account ownership of 0.453 to 0.659 across four different panel specifications. This finding is consistent with Rogers'' (1983) Diffusion of Innovation framework that predicts that new financial technologies follow an S-curve adoption curve: mobile money appears to have served the primary role of inclusion mechanism in the early to mid stages of digital financial development, gradually increasing the number of previously unbanked populations in the formal financial system. The entity fixed-effects result is especially relevant in this regard because it addresses for all time-invariant characteristics of countries and is therefore the most credible within-country estimate of the longitudinal effect of mobile money on inclusion. The two-way fixed effects result further confirms that this relationship is even after absorbing global shocks which are common to all countries in each survey wave. However, the results of this cross-section show a fundamentally different picture when looking at variation across countries at the current frontier of digital financial development in 2024. Once the access to digital finance is controlled for, mobile money exhibits a significant negative coefficient ($\beta = -0.236$, $p = 0.011$), hence pointing to a substitution effect in economies where formal digital financial infrastructure is already well set up. This sign reversal is not contradictory to the panel finding, rather it is documentation of a structural transition in the mechanism of financial inclusion. In nascent digital economies, mobile money is the major inclusion channel. And as digital financial ecosystems mature and digital financial access grows, there is increasingly a focus on mobile money functioning for those who may not yet be able to access and use wider digital financial services; whilst more financially sophisticated populations gradually move towards fuller digital financial participation. Taken together, the findings of the panel and the cross sectionals point to the complex and context-dependent nature of the role of mobile money in financial inclusion, where in the growth phase it is a strong inclusion driver, but at the current state of digital financial development globally becomes a substitute for, rather than a complement to, broader digital financial access. To the best of our knowledge, this dynamic stage-dependent relationship has not been previously documented using the Global Findex 2025 data and is a substantive empirical and theoretical contribution to the financial inclusion literature.

In terms of policy, the findings imply that investments in general internet infrastructure are not sufficient to generate meaningful gains in financial inclusion. What is needed instead is targeted investment in digital financial access infrastructure that includes mobile payment platforms, digital identity systems, agent banking networks and interoperable payment ecosystems and gives populations the tools to translate digital connectivity into actual use of financial services. This point is particularly relevant in low-income and lower-middle-income economies, where the disparity between the rate of internet penetration and actual digital financial access is typically the widest.

The persistent regional disparities documented in this study including the low account ownership rates in the Middle East and North Africa, Sub-Saharan Africa and South Asia, further heightens the need for context-specific policy intervention that addresses structural, regulatory and cultural barriers to financial inclusion that cannot be overcome by digital technology alone.

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5. Conclusions, Implications for Policy, and Further Research

5.1. Conclusions

The current research was set up to empirically examine the digital drivers of financial account ownership in 152 economies drawn from the recently released Global Findex Database 2025, which is the most up-to-date and comprehensive cross-country repository of financial inclusion data. By undertaking the implementation of ordinary least squares regression analysis coupled with descriptive, regional, and bivariate analyses, the extent to which access to digital finance, ownership of mobile money accounts, and internet usage predict financial account ownership at country level was examined. Crucially, the research goes beyond a single cross sectionality and extends the analysis to a panel data framework over four waves of the Global Findex database (2014, 2017, 2021 and 2024), with 346 country—year observations in 108 countries. This two-part empirical strategy enables the analysis to investigate both the temporal dynamics of mobile money adoption in the moment of consumption across the entire spectrum of digital financial development and the structural drivers of financial inclusion on the cutting edge of the global digital economy.

The analysis made three main findings. First, digital financial access was the strongest and the statistically significant predictor of financial account-ownership on a global basis, with a coefficient of 0.911 ($p<0.001$). The full model explains 76.7% of the cross-country variation in account ownership, thus making the digital financial infrastructure the most important factor driving financial inclusion at the current level of international development and reinforcing and extending the results of Khera et al. (2021) and Ocharive and Iworiso (2024). Second, the account ownership of mobile money entered the model with a negative and statistically significant coefficient, indicating a substitution effect in economies where mobile money is the preeminent channel of access to financial services in the absence of conventional banking infrastructure; this pattern is consistent with evidence of the Sub-Saharan African region documented by Ayadi and Sha'ban (2024). Third, internet usage, although positively associated with account ownership in bivariate analysis, did not reach statistical significance in the multivariate model, therefore indicating that internet connectivity is a necessary but not sufficient condition for financial inclusion and that what matters is whether or not connectivity leads to active digital financial service utilisation. Fourth, and most important, the panel data analysis from 2014 to 2024 shows that the role of mobile money in financial inclusion is dynamic and dependent on the stage. Within countries over time, financial account ownership is statistically significantly and consistently higher with mobile money adoption under all four specifications in the panel, including entity fixed effects ($\beta = 0.659$, $p < 0.001$) and two-way fixed effects ($\beta = 0.453$, $p < 0.001$) models controlling for unobserved country heterogeneity and global time shocks respectively. The random effects are supported by the Hausman test ($H = 0.167$, $p = 0.683$) and the consistency of the results between fixed and random effects models confirms the robustness. The difference between the positive coefficient of the panel and the negative 2024 cross sectional coefficient document a structural transition in the mechanism of financial inclusion: mobile money is an excellent inclusion mechanism in the growth phase of digital financial development, but a substitute for broader digital financial access when digital financial ecosystems are mature. This represents the central theoretical and empirical contribution of the paper which is a dynamic finding.

Taken together, these findings suggest that the state of financial inclusion in the world in 2024 is determined more by the quality and reach of digital financial infrastructure than the availability of internet connectivity. The enduring regional differences indicated throughout this report—which underline the fact that high-income economies average 92.03% account ownership as opposed to 42.41% in the Middle East and North Africa and 55.60% in Sub-Saharan Africa—further highlight the lopsided spread of digital financial inclusion's benefits across the global economy.

5.2. Policy Implications

The results of the study have some salient implications for policy makers, regulators, development finance institutions and fintech practitioners seeking to promote financial inclusion.

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First, the importance of digital financial access over internet access in predicting account ownership suggests that policy efforts should focus on the development of functional digital financial ecosystems as opposed to a focus on expanding the availability of broadband or mobile internet connectivity. Investments in digital payment infrastructure, agent banking networks, digital identity systems and interoperable payment platforms are expected to bring about higher gains in inclusivity than investments in internet access alone, especially in low and lower middle-income economies where the difference between internet access and digital financial access is still high.

Second, the substitution effect that was found between mobile money and formal bank account ownership flags the need for regulatory frameworks that promote mobile money platforms to integrate and work seamlessly with the broader formal financial system. Rather than viewing mobile money as a standalone product, regulators should consider designing incentives to help mobile money providers act as 'on-ramps' to the formal financial system to ensure that users are able to move from basic mobile money services to savings, credit and insurance products over time.

Third, the uneven regional patterns of financial inclusion results revealed in this research especially in Sub-Saharan Africa, the Middle East and North Africa and South Asia require specialised regional approaches that go beyond the provision of technology to address structural, regulatory, cultural and gender-based barriers to preventing certain populations from accessing and using formal financial services. While digital technology will be a powerful enabler, it cannot replace fundamental reforms in financial regulation, consumer protection, digital literacy and identity infrastructure.

Fourth, considering that the Global Findex 2025 numbers show that the average global saving behaviour is only 49.06% and the average global borrowing behaviour is 58.44%, there is a clear need for financial inclusion strategies that go beyond just account ownership and promote active and meaningful utilisation of financial services. Account ownership alone does not translate into the welfare benefits that are associated with financial inclusion; therefore, policymakers are encouraged to design incentive systems and financial products that will encourage account holders to maintain their engagement with formal financial services over time.

5.3. Limitations and Future Research

This study has a number of limitations that should be considered by future studies. First, the cross-sectional nature of the 2024 Global Findex data prevents the formation of any causal inference and the associations documented herein should be interpreted as correlational rather than causal. Future research should exploit the advantages of panel data techniques using more than one wave of Findex data, or instrumental variable techniques to find more robust causal links between digital connectivity and the results on financial inclusion.

Second, the country level aggregate nature of the data precludes analysis of individual level demographic variables related to digital financial inclusion such as gender, age, income quintile, education, urban or rural residence, etc—variables that have been established as important moderators of the financial inclusion relationship in the existing literature. Future research that draws upon individual level micro data available through the World Bank Microdata Library, would make possible a more fine grained analysis of the demographic dimensions of digital financial inclusion.

Third, the analytical framework used for this study does not consider the possibility of endogeneity between digital financial access and financial account ownership, with countries that have a higher level of financial inclusion also attracting more investment in digital financial infrastructure. Future research should directly address this endogeneity by using the appropriate econometric techniques to assure that the relationships that are estimated are robust and reliable.

Finally, the Global Findex 2025 database presents, for the first time, the Digital Connectivity Tracker, which includes new indicators of mobile phone ownership, use of the internet and digital safety. Future research should take advantage of these novel indicators to explore more nuanced aspects of the digital financial inclusion relationship, such as the role of digital safety concerns,

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cybersecurity awareness, and smartphone ownership in adoption and utilisation of financial accounts in a range of country contexts.

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