DETERMINANTS OF FINANCIAL INCLUSION IN SIERRA LEONE: EVIDENCE FROM FINDEX SURVEYS

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Abstract
Despite financial inclusion playing a critical role in achieving sustainable development goals in many developing countries including Sierra Leone, studies on key determinants of financial inclusion are scarce. Thus, the objective of this paper is to examine the factors affecting financial inclusion in Sierra Leone between 2017 and 2021, using micro-level data from the World Bank's Global Financial Inclusion Findex surveys. Estimating probit models, the findings show that richer, older, and formally employed people are more likely to have financial access, usage, and innovation, with more pronouncement in the post-Covid-19 period than in pre Covid-19 period. However, informal borrowing, remittances, and transfers from individuals and governments negatively affect financial inclusion, while individuals with savings are more likely to access credit. Although there is no significant gender inequality in the two survey waves, younger and educated individuals are more likely to have financial access than older and uneducated individuals. The study recommends measures to promote financial access, such as enhancing access to financial institutions and promoting mobile money adoption, to be effective in reducing inequality and poverty. Additionally, the study emphasises the need for targeted policies prioritising financial inclusion to under-represented groups and access to basic financial services such as opening bank accounts and using mobile money for transactions in Sierra Leone.

Keywords*:* Poverty; Financial inclusion; Covid-19; Mobile money; Findex
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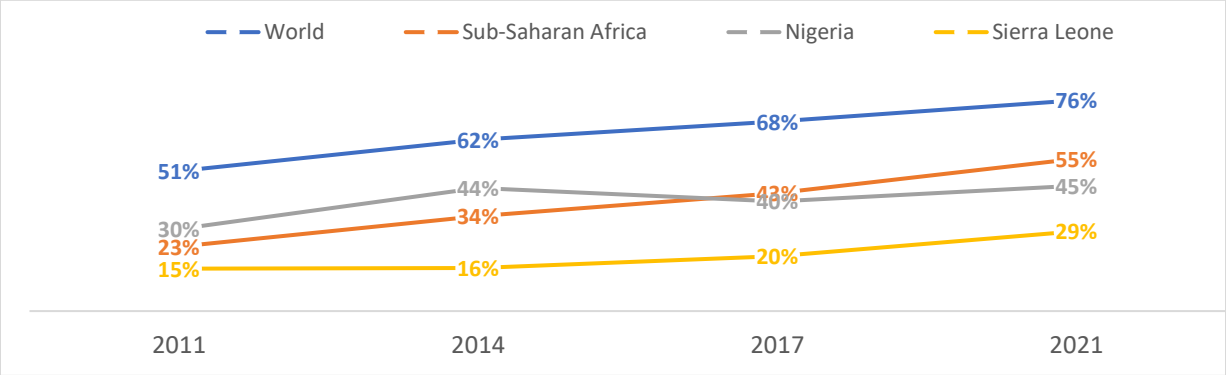
Introduction

Across the world, enormous progress has been made in achieving Sustainable Development Goal (SDG) 1.1: Eradicating extreme poverty by 2030 but the outbreak of the Covid-19 pandemic, the Russia-Ukraine war and inflationary pressures have led to a surge in poverty. Based on the World Bank estimate, 75-95 million people live in poverty in 2022 compared to pre-pandemic projections, the highest since world war II (Poverty and Shared Prosperity 2022: Correcting Course). In Sierra Leone, Covid-19 has caused poverty to increase from 40.6 per cent in 2019 to 44.2 per cent in 2020. Spatially, about 60 per cent of the rural population lives in poverty compared to only 20 per cent in urban areas. Inequality has risen too from 0.33 in 2019 to 0.36 in 2021. Identifying policy instruments to alleviate poverty by the government, including central banks is more critical to a resilient recovery. One such policy tool is financial inclusion (Saha & Qin, 2022).

Financial inclusion plays a crucial role in advancing Sustainable Development Goals (SDGs), as it contributes to the attainment of eight out of the seventeen SDGs. These include SDG 1: eradicating extreme poverty, SDG 2: reducing hunger and promoting food security, SDG 3: achieving good health and well-being, SDG 4: fostering quality education, SDG 5: promoting gender equality, SDG 8: promoting shared

economic growth, and SDG 9: promoting innovation and sustainable industrialization. Growth in financial inclusion in Sierra Leone compared to other countries has been slow. Figure 1 shows the trend in financial inclusion growth.

Figure 1. Trends in formal financial inclusion



Source: Findex database (2021).

Although formal inclusion rebounded strongly after the Ebola pandemic, growth of 29 per cent is still below the regional average of 55 per cent as of 2021. As a result, the Bank of Sierra Leone (BSL) has developed the second National Strategy for Financial Inclusion (2022-2026) focusing on increasing financial access and usage to under-represented groups (women, youth, rural populations, small, micro and medium enterprises).

Furthermore, financial inclusion could play an important instrument that can boost financial development, stimulate economic growth, reduces inequality in all its forms and thus improve a household's poverty status. By enabling individuals to participate in the financial system, they also become better equipped to start and expand businesses, invest in education for their children, and cope with financial setbacks or enable speedy economic recovery. However, before 2011, there was limited understanding of the scope of financial inclusion and the extent to which marginalized groups, such as the impoverished, women, and rural residents, were excluded from formal financial systems. In addition, Covid-19 has significantly boosted the adaption of financial innovation especially mobile money in sub-Saharan Africa. About 40 per cent of adults in developing economies excluding China used cards, mobile phones or the internet and for utility payments, more than a third use digital financial services to make payments (Demirgüç-Kunt et al, 2022).

Despite the important role that financial inclusion plays in the economy, few empirical studies have assessed the determinants of financial inclusion at the micro or household level. Several cross-country studies, such as those conducted by Park and Mercado (2018), Swamy (2010), and Omar and Inaba (2020) revealed that there is correlation between financial inclusion and some notable socioeconomic indicators. However, more recent research, including studies by Saha and Qin (2022), Kara *et al*. (2021), and Aslan (2019), indicate that the effectiveness of financial inclusion as a policy tool could be influenced by unequal access to and usage of financial services. According to Demirgüç-Kunt et al. (2022) and Aker *et al*. (2014), access to payment systems, savings, credit, and insurance services could make some notable determinants of financial inclusion among households. This is particularly relevant for disadvantaged groups, including women, ethnic minorities, individuals with disabilities, and immigrants, who face a higher probability of being excluded from formal financial services. Data gathered from the COVID-19 Impact Monitoring Survey, a high-frequency survey, reveals that approximately 60% of households experienced a reduction in income, with self-employment income being the most affected. The survey also shows that income from other sources, including non-farm self-employment, has declined, leaving farmers without the necessary funds to purchase sufficient seeds.

This study aims to analyse the factors that determine financial inclusion in Sierra Leone using micro-level data. It stands apart from previous research in three key ways. Firstly, unlike earlier studies that relied on supply-side aggregate data, this study uses micro-level demand-side data from the Global Findex Database. Secondly, while previous studies have primarily utilized qualitative methods, this study employs a quantitative approach to examine the key socioeconomic determinants of financial inclusion. Finally, this study conducts a comparative analysis between the pre-Covid year (2017) and the post-Covid year (2021), which has not been previously done. The results of this study can offer valuable insights to policymakers such as the Bank of Sierra Leone, as it not only investigates the impact of individual socio-economic drivers on financial inclusion but also considers the role of financial inclusion and innovation in promoting sustainable development and resilient post covid-19 recovery.

Literature Review

To explain the dynamics of financial inclusion, this study focuses on three key financial inclusion theories, namely supply-side theory, demand-side theory and technology adoption theory. These theories provide insights into the factors that influence financial inclusion and guide the design of effective policies and interventions. It is important to note that these theories are not mutually exclusive, and a holistic approach that combines multiple perspectives is often needed to address the complex challenges of financial inclusion.

While Supply-Side Theory focuses on the availability and accessibility of financial services as a determinant of financial inclusion, Demand-Side Theory emphasizes the demand for financial services as a driver of financial inclusion. This suggests that individuals' attitudes, preferences, and behaviours influence their adoption of formal financial services as well as limited access to financial institutions and services could be a key barrier to financial inclusion. Demand-side interventions focus on raising awareness, improving financial literacy, and designing products that meet the specific needs of underserved populations. Supply-side interventions aim to expand the reach of formal financial institutions, establish new delivery channels, and promote innovative technologies to improve access to financial services. On the other hand, technology adoption theory focuses on the role of technology in promoting financial inclusion. It suggests that the adoption of digital financial services can overcome traditional barriers of distance, cost, and documentation. Technology adoption interventions involve promoting mobile banking, digital payments, and other technological innovations to improve access to financial services.

Previous studies on financial access and inclusion at a microeconomic level have primarily relied on descriptive analysis and anecdotal evidence, lacking rigorous statistical testing. Honohan (2008) examined the factors influencing financial access by creating a composite indicator for financial access in 160 countries. His findings showed that aid and grants, dependency ratio, and population negatively impact financial access globally, whereas mobile phone penetration and institutional quality significantly increase it. Adams *et al.* (1984) argued that cheap and abundant credit is essential for rural development but that actions taken based on this assumption have given disappointing results. But access to funding and financial services by firms and households is still much skewed in many developing countries. Claessens and Perotti (2007) suggest that poor access does not only reflect economic constraints but also barriers erected by insiders to financial inclusion. Therefore, financial regulation in many unequal countries is often captured by small elites who obtain most of the benefits while risks are socialized.

Drivers of financial inclusion could be broadly classified into demand and supply factors such as socioeconomic, institutional, policy and regulatory factors. In 40 countries, Tinta, Ouédraogo, and Al-Hassan (2022) found that individual characteristics, obstacles to formal access, financial literacy, and innovation impact traditional or mobile account ownership thus, affecting their financial inclusion and resilience. Informal savings are prevalent among women, youth, and rural areas, while formal savings are more common among men, the elderly, and urban areas. Those with higher levels of education and income

were more inclined to migrate to formal savings. Additionally, financial inclusion can also affect people's willingness to become entrepreneurs. Ajide (2020) posits that financial inclusion has a significant and positive effect on entrepreneurship in Africa. Koloma (2021) utilized the World Bank's Global Findex database to investigate the factors determining financial inclusion among youth in Mali. The study found that high educational attainment, employment status, belonging to a wealthy family, and having at least one family member with a bank account are significant determinants of financial inclusion. The cost of financial services, lack of funds, and the perception that financial services, particularly savings, are not necessities, are among the obstacles to better financial inclusion of youth. Additionally, savings and loans were found to have a statistically significant impact on the willingness to engage in entrepreneurial activity, including in the agricultural sector.

Utilising longitudinal data from three (3) survey waves, Ibrahim and Aliero (2020) examined the adoption of financial inclusion as a tool for reducing income disparity in Nigerian households. The study controlled for endogeneity issues and found that financial inclusion had a positive and consistent effect on per capita income, benefiting households across all income distributions. Regardless of the income distribution, the results of instrumental and quantile regressions indicated a positive effect on household income. While financial inclusion initially caused income inequality to increase, leading to a wider gap between households with different income levels, a shift towards income convergence started among middle to higher-income groups, while the lowest-income households fell behind during the second phase. Nevertheless, in the third phase, even the lowest-income households experienced convergence. The research indicates that financial inclusion could be instrumental in alleviating income inequality.

On the contrary, the studies conducted by Senou et al. (2019) and Jack and Suri (2011) have discovered that younger individuals show a higher propensity to embrace mobile money. In a similar vein, Mugume and Bulime (2022) analyse the experiences of Kenya and Uganda to investigate the factors influencing digital financial inclusion as a means to support post-COVID-19 recovery. Their findings indicate that middle-aged males who utilize multiple SIM cards registered under their names are more inclined to have access to digital financial services. Additionally, the results suggest that individuals who trust mobile money agents demonstrate a greater likelihood of utilising digital financial platforms compared to others. Drawing upon these results, Mugume and Bulime (2022) propose several recommendations. They suggest that the government should enhance the National Identification Systems and consumer protection policies to foster trust in digital financial services. Furthermore, financial sector stakeholders such as mobile network operators and commercial banks should engage in innovation and introduce customised digital financial products specifically designed for underserved populations, including women, the elderly, and the youth. These measures aim to promote greater financial inclusion and access to digital financial services for marginalized and unbanked individuals.

According to Coulibaly (2021), within the West African Monetary Union, males, older, more educated, wealthier, and employed are more likely to adopt and utilize mobile money services. This suggests that the most vulnerable segments of society are more prone to financial exclusion. Similarly, Koloma (2021) discovered that youth face significant barriers to financial inclusion due to the high cost of financial services and the lack of funds. Ndoya and Tsala (2021), using Finscope 2017 data and Fairlie's decomposition method, identified a gender disparity in financial inclusion in Cameroon, which aligns with the findings of Ndanshau and Njau (2021) and Mndolwa and Alhassan (2020) for Tanzania. Various studies on financial inclusion have demonstrated its positive impact on several social and economic indicators, including economic growth, income equality, wealth, household well-being, innovation, employment, female empowerment, and firm creation (Prasad, 2010; Khan, 2011).

There is scant empirical evidence on financial access, inclusion and usage in Sierra Leone. Kargbo (2021) utilised data from the 2018 Sierra Leone Integrated Household Survey to explore this relationship and found that access to formal financial services was positively associated with household welfare, particularly for

female-headed households. Similarly, Keita (2021) found that access to financial services was positively linked with household income and poverty reduction in Sierra Leone. Several other studies, including those by Hossain and Srivastava (2021), Kabbia et al. (2021), and Baah and Danso (2021) have also indicated that financial inclusion can enhance household welfare and reduce poverty by providing access to formal financial services like bank accounts and credit, which can help households increase their income and reduce their vulnerability to economic shocks. Furthermore, mobile money adoption has been associated with poverty and inequality reduction, especially among rural households, while access to financial services such as credit and savings accounts can assist small and medium-sized enterprises (SMEs) in growing and creating jobs, which can contribute to poverty reduction over the long term.

This study thus analyses the key socio-economic factors of and barriers to financial access, inclusion, and innovation in Sierra Leone between 2017 (a pre covid 19 year) and 2021 (a post covid 19 year) using the Global Findex data, which contains comprehensive information on how individuals manage their daily finances and offers policymakers, researchers, businesses, and development practitioners an opportunity to monitor the evolution of financial service utilization over time. Moreover, the database facilitates the identification of disparities in accessing formal financial systems and enables the development of policies aimed at promoting financial inclusion. Unlike the IMF's Financial Access Survey which collects supply-side data, Global Findex collects data on demand-side financial access, usage and education. This enables us to determine key socio-economic factors driving financial access, inclusion, and innovation from the point of users. Furthermore, we explored the factors that contribute to digital financial innovation like mobile money, which serves as a rapid means of financing the recovery from the impacts of the COVID-19 pandemic. This is particularly crucial for addressing the financial needs of marginalised and unbanked populations, including youth, elderly individuals, and women.

Data and Methodology

This section presents the data source and the survey design used to collect the data used in the study. It also specifies the econometric model used to estimate the key determinants of financial access, inclusion, and innovation in Sierra Leone. Broadly, the drivers of financial inclusion can be either supply-led (i.e., the drivers of access) or demand-led (i.e., drivers of usage). Recently, Covid-19 and Russia-Ukraine war have also amplified the adoption of mobile money as a key driver of financial inclusion.

Data and sources

The data for this study is sourced from the World Bank's Global Financial Inclusion Findex survey, with funding from Bill & Melinda Gates Foundation. It covers more than 150,000 randomly selected adults in 140 economies countries worldwide. Each of the countries has at least 1,000 observations, and the same methodology is adopted in collecting the data thereby enabling comparative analysis. Unlike FinScope surveys, Findex collects comparable data on demand-side financial inclusion i.e., how adults save, borrow, make payments and manage risk. It is conducted every three (3) years since 2011 and Sierra Leone features in all rounds. This study uses pre-pandemic 2017 year and post-pandemic year 2021 data to examine financial inclusion determinants in the post-pandemic period. It is worth noting that due to Covid-19-related mobility restrictions at the time of data collection in 2021, face-to-face interviewing was impossible. A phone-based survey was therefore conducted, like in many other surveys at that time.

Model specification

This study employed the probit model to estimate the determinants of financial access, inclusion and innovation in Sierra Leone as stated in Equation (1).

$$f_i = x'\beta + \varepsilon \quad (1)$$

where x' is the vector of the socio-economic factors affecting financial access, inclusion and innovation (household income, gender, age, educational level, etc.) and β is the coefficients or parameters to be

estimated. ε is the error term which is assumed to be normally distributed. Table 1 shows the list of variable definitions. For robust findings, three variables were considered: formal account ownership, accessing formal credit and using mobile money for daily transactions; representing financial access, financial usage and financial innovation respectively.

The financial inclusion index f coded into two discrete categories, which can be observed, is specified as:

$$f = \begin{cases} 0 \text{ if } f = 0 \text{ (financially excluded)} \\ 1 \text{ if } f = 1 \text{ (financially included)} \end{cases} \quad (2)$$

It can be assumed that every individual has a critical or threshold level of the index, denoted as f_i, which determines if they are financially included or not. If the value of f_i exceeds f^*_i, the individual is considered financially included, otherwise, they are not. Although the margin f^*_i and f_i are both unobservable, it is assumed that the margin is normally distributed with a constant mean and variance making it possible to measure the parameters of the index in equation (1) and obtain valuable information about the observed index.

If we assume a normal distribution, we can calculate the probability that f^*_i is less than or equal to f_i as follows:

$$P_i = \Pr(Y = 1) = \Pr\left(f_j^* \leq f_j\right) = \frac{1}{\sqrt{2\pi}} \int T_i - \infty \frac{-t^2}{e2dt} \quad (3)$$

$$P_i = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\beta_1 + \beta_2 X_i} e^{-t^2/2dt} \quad (4)$$

where t is a standardized normal variable, i.e., t ~N(0,1).

The measurement of P_i, which represents the probability of financial inclusion, is obtained by calculating the area under the standard normal curve up to f_j (Green, 2012).

As the estimated coefficient from this model cannot be directly interpreted, we estimate marginal effects as in equation (5) below.

$$\frac{\partial y}{\partial x_j} = \beta_j \theta(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots . + \beta_n x_n) \quad (5)$$

The calculation of the impacts of x_j on y involves considering all other x_j values, often at their means or medians. The resulting marginal effects are then interpreted as elasticities.

Table 1: Variables Description

Variables	Description
Formal Account Ownership	=1 if the respondent currently has an account in a formal financial institution,0 if otherwise
Formal Credit	=1 if respondents borrow money in the past 12 months in a formal financial institution, 0 if otherwise
Mobile Money Usage	=1 if the respondent transacts in mobile money, 0 if otherwise
Female	=1 if female, 0 if otherwise
Age	Age in years
Age Square	Square of age in years
Education	=0 if completed no education, =1 if completed at least primary school, and 2 if beyond secondary education
Income Quintile	=0 if respondent falls in the lowest income quintile, =1 if second lowest income quintile, =2 if middle income quintile, =3 if fourth highest income quintile, =4 if fourth highest income quintile
Employment income	=1 if the respondent receives employment income, 0 if otherwise
Relative has an Account	=1 if a relative having account is a barrier to account ownership, 0 if otherwise
Informal Borrowing	=1 if respondent borrows from family/friends, stores, 0 if otherwise
Savings	=1 if the respondent saved in the past 12 months, 0 if otherwise
Receive wages	=1 if the respondent received wage payment, 0 if otherwise
Receive transfers	=1 if the respondent received government transfer payment, 0 if otherwise
Receive pension	=1 if the respondent received pension payment, 0 if otherwise
Receive agriculture	=1 if the respondent received payment for agriculture goods sale, 0 if otherwise
Pay Utilities	=1 if the respondent paid the utility bill, 0 if otherwise
Remittances	=1 if the respondent made or received remittance, 0 if otherwise

Source: compiled by the Author

Estimation Results and Discussions

In this section, the results of the descriptive statistics of the variables are first presented. Later, probit estimates of the determinants of access to, and use of financial services in Sierra Leone are shown, before presenting the robustness results of the models.

Descriptive analysis

Table 2 shows the summary of the descriptive statistics. The findings indicate that the proportion of formally financially included individuals has risen from an average of 19.8 per cent in 2017 to 28.8 per cent in 2021. Additionally, over half of the account holders now borrow funds from the financial system in 2021, compared to only 49 per cent in 2017. Due to high levels of financial exclusion, the poorest population in Sub-Saharan Africa increasingly rely on financial innovation tools for their daily transactions. Specifically, the use of mobile money has doubled from 11.6 per cent in 2017 to 21.78 per cent in 2021. Despite the progress made, mobile money adoption in Sierra Leone remains below the Sub-Saharan African average of 54%. Furthermore, the majority of financially included individuals in the country have attained only primary school education. In 2021, 37.96% of the poorest 40% are financially included, compared to 35.1% in 2017. However, it's important to note that this 2.86% increase in financial inclusion may be solely attributed to population growth. Additionally, the percentage of relatives who own accounts has only increased from 4.56% in 2017 to 5.66% in 2021, suggesting that if a family member has a bank account, the likelihood of other members owning one remains low. When it comes to income from employment, wages, and transfers, there has been notable progress. This suggests that more people tend to borrow from

family and friends rather than turn to formal financial institutions, possibly due to the high-interest rates charged by banks, cumbersome documentation processes, and lack of proximity to financial institutions. In the past 12 months, half of the respondents saved money, and 8% more people made or received domestic remittances in 2021 compared to 2017. Table 3 displays the age distribution of the respondents, with a mean age of 34 years, which remained unchanged between the review periods, highlighting that Sierra Leone still has a relatively youthful population.

Table 2: Descriptive Statistics (Percent)

Variables	Measures	Response	2017	2021
Observations			1,000	1,001
Formal Account	Has an account at a financial institution, MFI and Post office	Yes	19.8	28.8
		No	78.2	66.43
Formal Credit	Borrow money in a financial institution, MFI and Post office in the past 12 Months	Yes	49.3	54.95
		No	50.7	45.05
Mobile Money	Have a mobile money account	Yes	11.6	21.78
		No	88.4	78.22
Gender	Male	Male	43.8	40.96
	Female	Female	56.2	59.04
Educational Status	Primary or less	Completed	69.4	60.14
	Secondary	Completed	27.9	36.9
	Tertiary or more	Completed	2.7	2.96
Income Characteristics	Income quintile	Poorest 20%	16.9	19.58
		Second 20%	18.2	18.38
		Middle 20%	17.9	19.38
		Fourth 20%	20.7	19.68
		Richest 20%	26.3	22.98
Employment income	The respondent is in the workforce	Yes	65.8	79.22
		No	34.2	20.78
Relative has account	Does not have an account because a family member has	Yes	4.56	5.66
		No	95.44	93.42
Informal Borrowing	Borrowed money from family or friends in the past 12 months	Yes	29	39.26
		No	71	60.34
Savings	Has saved money in the past 12 months	Yes	56.5	52.35
		No	43.5	47.65
Receive_wages	Received a wage payment	Yes	85.1	89.41
		No	14.9	10.59
Receive_transfers	Received a government transfer payment	Yes	7	9.09
		No	93	90.91
Receive_pension	Received a government pension payment	Yes	4.2	1.2
		No	95.8	98.8
Receive_agriculture	Received payment for the sale of agricultural goods	Yes	37.3	39.16
		No	62.7	60.84
Pay_utilities	Paid a utility bill	Yes	17.3	21.68
		No	82.7	78.32
Remittances	Made or received a domestic remittance payment	Yes	39.3	42.26
		No	60.7	57.74

Source: compiled by the Author

Table 3: Age distribution of respondents between 2017 and 2021

Year	Obs.	Mean	Std. dev.	Min	Max
2017	1,000	34.26	16.22	15	99
2021	1,001	34.98	14.71	15	99

Source: compiled by the Author

Results of probabilistic estimates

Table 4 displays the results of the probit regression method used to estimate three equations (Equation 1 for financial access, Equation 2 for financial usage, and Equation 3 for financial innovation). The findings demonstrate that poverty is negatively and significantly associated with financial access, inclusion, and innovation. However, the lowest and middle quintiles exhibit a positive and significant relationship with financial innovation, measured by mobile money usage. The coefficients for the poorest income quintiles are notably high among all the indicators, indicating that individuals in the poorest quintiles are less likely to be financially included compared to those in the richest quintile. Consequently, the poorest 40% of the population primarily uses mobile money accounts for their transactions. The government has been promoting mobile money as a means of enhancing financial inclusion and ensuring that nobody is left behind in the development process. Despite these efforts, Sierra Leone still lags behind Kenya and South Africa in the sub-region regarding financial innovation adoption.

The analysis also indicates that women and age have a positive relationship with financial access, inclusion, and innovation, but their impact is not statistically significant. However, older individuals are less likely to be financially included, and this relationship is statistically significant only for formal credit. Education is another crucial determinant of financial inclusion, with the dummy variables for education positively associated with all the indicators used in the study. The coefficients are more substantial for secondary education, indicating that an individual's education level has a significant influence on their ability to access and use financial services for daily transactions. This is particularly true as many organizations now pay their staff salaries through financial intermediaries, mainly banks. However, the impact is more pronounced concerning mobile money usage, as people are compelled to use mobile money to pay bills due to exclusion by formal financial institutions. This finding is consistent with Efobi et al.'s (2014) study, which documents a significant and positive relationship between education and the use of bank services and savings accounts in Nigeria. Additionally, this result is consistent with Fungáčová and Weill's (2014) study which found a positive relationship between education and financial inclusion indicators such as formal accounts and credit in China. However, their research did not establish a significant relationship for formal savings because a considerable portion of the population in China sees it as wise to save regardless of their educational level. Moreover, Modigliani's life cycle hypothesis posits that the amount individuals save changes over time since they must accumulate their assets during the early stages of their working life to spend during retirement. However, this finding contradicts Tinta, Ouédraogo, and Al-Hassan's (2022) research which documents that the decision to have formal savings (contingent on having a formal account) is not related to age.

The presence of a relative who possesses a formal account has a noteworthy negative impact on all indicators of financial inclusion. This implies that individuals residing in households where a family member already has an account are less inclined to have their account but more likely to utilize mobile money for bill payments. This variable was included in the analysis due to the strong correlation observed between other barriers to financial access and inclusion, such as documentation requirements, religious factors, distance to financial institutions, lack of funds, and lack of trust, with account ownership, credit access, and mobile money usage. The findings suggest that while the ownership of a formal account by a relative hampers individual account ownership, the possession of mobile money by a relative encourages its usage, thereby increasing the likelihood of achieving financial inclusion. Consequently, this could contribute to enhancing an individual's integration into the formal financial system.

The act of informal borrowing, involving sources such as stores, family/friends, employers, and private money lenders, provides insights into both market-related and regulatory obstacles. The research findings indicate that borrowing from a store does not hold significant weight for formal account holders and credit access; however, it does exhibit a positive correlation, implying that these individuals are more likely to be financially included. Furthermore, the results suggest that individuals who borrow from a store also exhibit a higher likelihood of borrowing from a financial institution, thereby increasing their level of financial inclusion. On the other hand, individuals who borrow from friends or family members are less inclined to utilize mobile money services. In summary, for financial inclusion to effectively contribute to poverty alleviation, it is important to prioritize financial innovation mechanisms. The study reveals that savings have a positive impact on all indicators between 2017 and 2021. Additionally, individuals who engaged in savings were more likely to have access to formal credit compared to non-savers

Another key determinant of financial inclusion is transfers and remittances. During the review period, people receiving remittances and transfers were less likely to be financially included. However, those receiving wages and paying utilities were more likely to be financially innovative as most people now adopt mobile money as the quickest means of transferring funds. Receiving wages was nonetheless not statistically significant with accessing formal credit and this shows that there is a need for more credit expansion and the development of diverse financial products and services.

Table 4: Probit Results with marginal effects of Financial Access, Inclusion and Innovation

	Equ (1)		Equ (2)		Equ (3)	
Variables	Formal Account		Formal Credit		Mobile Money	
	2017	2021	2017	2021	2017	2021
dy/dx						
Female	0.0003	0.018	-0.017	-0.03	-0.012	0.019
	(-0.03)	(-0.63)	(-0.39)	(-0.71)	(-1.38)	(-0.76)
Age	0.001	0.006	0.011***	0.002	0.0016	0.005
	(-0.78)	(-1.32)	(-1.86)	(-0.38)	(-1.14)	(-1.24)
Age Square	-0.00002	-0.00007	-0.0001**	-0.00005	-0.00002	-0.00007
	(-1.12)	(-1.34)	(-1.96)	(-0.83)	(-1.42)	(-1.32)
Secondary education	0.014	0.08***	0.04	-0.08*	0.008	0.07***
	(-0.93)	(-2.39)	(-0.73)	(-1.64)	(-0.73)	(-2.25)
Tertiary education	0.34	0.13	-0.22	-0.36	0.11	0.05
	(-1.23)	(-0.83)	(-0.47)	(-1.35)	(-0.89)	(-0.42)
Income: Second 20%	-0.0002	-0.08***	-0.05	-0.10**	-0.013**	-0.06*
	(-0.01)	(-2.01)	(-0.73)	(-1.88)	(-0.67)	(-1.75)
Income: Middle 20%	-0.005*	-0.038	-0.06	-0.007	-0.006	-0.052
	(-0.24)	(-0.97)	(-0.92)	(-0.92)	(-0.39)	(-1.53)
Income: Fourth 20%	-0.02	0.07*	-0.011	-0.055	-0.013	0.10***
	(-1.03)	(-1.79)	(-0.159)	(-0.77)	(-0.98)	(-2.76)
Income: Richest 20%	-0.014	0.14***	0.03	-0.04	-0.001	0.15***
	(-0.74)	(-3.06)	(-0.43)	(-0.6)	(-0.06)	(-3.68)
Employment income	-0.018	0.09***	0.049	0.026	-0.02	0.077*
	(-1.54)	(-2.65)	(-1.04)	(-0.47)	(-2.18)	(-2.49)
Relative has account	-0.018	0.012	0.032	-0.007	-0.014	0.009

	(-1.01)	(-0.23)	(-0.39)	(-0.11)	(-1.03)	(-0.19)
Informal Borrowing	-0.007	-0.035	-1.22***	-1.14***	0.00059	-0.037
	(-0.65)	(-1.28)	(-12.42)	(-21.49)	(-0.07)	(-1.51)
Savings	-0.033***	0.036	0.305***	0.34***	-0.015	0.001
	(-2.47)	(-1.25)	(-6.46)	(-7.1)	(-1.54)	(-0.05)
Receive_wages	-0.02***	-0.011	0.029	-0.049	-0.01**	-0.015
	(-2.93)	(-0.44)	(-0.77)	(-1.19)	(-2.09)	(-0.69)
Receive_transfers	-0.028***	-0.07***	-0.018	0.034	-0.012***	-0.038***
	(-2.9)	(-2.63)	(-0.38)	(-0.68)	(-1.72)	(-1.64)
Receive_pension	-0.003	-0.12***	-0.04	-0.13	0.005	0.11
	(-0.19)	(-1.69)	(-0.42)	(-1.03)	-0.35	(-1.00)
Receive_agriculture	-0.023***	-0.06***	-0.03	-0.03*	-0.01**	-0.03*
	(-3.85)	(-4.3)	(-1.39)	(-1.74)	-2.28	(-2.66)
Pay_utilities	-0.029***	-0.018	-0.003	-0.029	-0.007*	0.043***
	(-0.01)	(-1.19)	(-0.09)	(-1.13)	(-1.66)	-2.91
Remittances	-0.042***	-0.074***	-0.029*	-0.014	-0.031***	-0.076***
	(-5.58)	(-9.12)	(-1.58)	(-1.1)	(-4.57)	(-10.25)

Source: compiled by the Author, Note: SE in parentheses. *p < .1; **p < .05; ***p < .01. dy/dx depicts the marginal effects.

Robustness checks

Table 5 and Table 6 show the results of the robustness checks on the three estimated probit models. In Table 5, the p-values of 0.0000 for all the equations for all the years indicate that the models fully passed the goodness of fit. For probit regression, perfectly correctly classified values in Table 6 are the measures of the goodness of fits akin to R-squared for linear regression. The perfectly classified values of 79.10 per cent, 85.90 per cent, and 82.43 per cent indicate that all the models perfectly predict the outcomes and the models are well specified. To sum up, the findings consistently demonstrate that the socioeconomic factors utilized in the study provide a comprehensive explanation for financial inclusion, covering access, adoption, and usage of financial products and services. Therefore, the results are deemed to be robust and reliable.

Table 5: Pseudo R^2 for the three (3) Probit Results

Probit model for:	Equ (1)		Equ (2)		Equ (3)	
	Formal Account		Formal Credit		Mobile Money	
	2017	2021	2017	2021	2017	2021
Observations	1000	1001	1000	1001	1000	1001
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log-likelihood	-166.366	-361.404	-322.901	-256.185	-141.093	-326.076
Pseudo R^2	0.4501	0.2293	0.4688	0.571	0.4633	0.2442

Source: compiled by the Author

Table 6: Perfectly Correctly classified checks for the three (3) Probit Results

Probit model for 2021 only:		Formal Account	Formal Credit	Mobile Money
Sensitivity	Pr(+| D)	38.81%	80.22%	37.79%
Specificity	Pr(-|~D)	91.28%	92.50%	93.51%
Positive predictive value	Pr(D| +)	57.35%	92.56%	59.09%
Negative predictive value	Pr(~D| -)	83.15%	80.09%	85.83%
False + rate for true ~D	Pr(+|~D)	8.72%	7.50%	6.49%
False - rate for true D	Pr(-| D)	61.19%	19.78%	62.21%
False + rate for classified +	Pr(~D| +)	42.65%	7.44%	40.91%
False - rate for classified -	Pr(D| -)	16.85%	19.91%	14.17%
Correctly classified		79.10%	85.90%	82.43%

Source: compiled by the Author

Conclusion and Policy Recommendations

This study investigates key socio-economic determinants of financial access, inclusion, and innovation in Sierra Leone based on data collected in 2017 and 2021. Financial inclusion is widely recognized as a means of promoting sustainable development, reducing poverty and inequality, and enhancing overall welfare, as acknowledged by the United Nations. Therefore, this study is pertinent and timely for Sierra Leone, which has endorsed the Maya Declaration. The COVID-19 pandemic has also prompted the adoption of financial innovation, as evidenced by the government's transfer of emergency relief payments to bank accounts and debit cards. The three hypotheses (supply-side theory, demand-side theory and technology adoption theory) contribute to understanding the multifaceted determinants of financial inclusion. The probit model used in this study satisfies all the relevant diagnostic tests, indicating that the model is well specified. Even after controlling for all relevant variables, key socio-economic factors were found to be significant determinants of financial inclusion. This finding is consistent with previous cross-country studies (Keita 2021, Park & Mercado 2018; Swamy 2010; Omar & Inaba 2020). Studies by Tinta *et al.* (2022) and Aker *et al.* (2014) suggest that financial inclusion can expand opportunities for those who are excluded from formal financial services by offering credit, savings, insurance, and digital financial services, thus reducing inequality and poverty by increasing efficiency, smoothing consumption, and raising labour force participation. These results underscore the importance of reducing unequal access to financial services to achieve economic growth.

Furthermore, our analysis demonstrates that income level is a key determinant of financial inclusion across different income groups, underscoring the usefulness of financial inclusion policies for poverty alleviation. Based on our findings, we recommend that government takes steps to address supply-side deficiencies in the provision of high-quality financial services, as well as emerging challenges such as cyber fraud and excessive transaction fees in the mobile money industry. Government should also establish and enforce effective consumer protection policies to combat cybercrime and accelerate the implementation of national payment systems. Such measures can help to build public trust in digital financial platforms and promote their adoption.

In conclusion, there is a need for more innovation from mobile network providers and commercial banks to offer customized financial products that go beyond mobile money transfers. These new products could include mobile insurance, mobile savings wallets, and credit products, rather than the current one-size-fits-all approach. Such tailored financial products will help to increase the adoption of financial inclusion services among marginalized groups, including women, the elderly, and the youth. Further research could explore how financial inclusion impacts poverty, entrepreneurship and self-sustainability, especially among vulnerable groups in Sierra Leone.

References

Adams, D. W., & Von-Pischke, J. D. (1984). Microenterprise credit programs: Déjà vu. *World Development, 12(9),* 1007-1017.

Ajide, F. M. (2020). Financial Inclusion in Africa: Does it Promote Entrepreneurship? *Journal of Financial Economic Policy, 12(3):* 687–706. doi:10.1108/JFEP-08-2019-0159.

Allen, F., Demirgüç-Kunt, A., Klapper, L. F., & Martinez Peria, M. S. (2012). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *World Bank Policy Research Working Paper* (6290).

Aker J. C, Boumnijel R, McClelland A, & Tierney N (2014) Payment mechanism and anti-poverty programs: evidence from a mobile money cash transfer experiment in Niger. *Tufts University Working paper*. http://sites.tufts.edu/jennyaker/files/2010/02/Zap_-26aug2014.pdf

Aslan, G (2019). Towards Financial Inclusion in South Asia: A Youth and Gender Perspective," *Development Papers* 1902, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) South and South-West Asia Office.

Baah, A., & Danso, A. (2021). Financial Inclusion and SMEs in Sierra Leone. *Journal of African Business, 22(1),* 1-18.

Claessens, S., & Perotti, E. (2007). Finance and inequality: Channels and evidence. *Journal of Comparative Economics, 35(4),* 748-773.

Coulibaly, S. S (2022). An analysis of the factors affecting the financial inclusion in Côte d'Ivoire, 2147-4486, *ZDB*-ID 2724514-7. 11(1) 69-84

Demirgüç-Kunt, A, Klapper,L Singer, D & Ansar, S (2022). *The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19.* Washington, DC: World Bank. doi:10.1596/978-1-4648-1897-4.

Efobi, U., Beecroft, I., & Osabuohien, E. (2014). Access to and use of bank services in Nigeria: Micro-econometric evidence. *Review of Development Finance*.

Fungáčováac, Z & Weil, L (2015). *Understanding financial inclusion in China,* https://doi.org/10.1016/j.chieco.2014.12.004, 34, 196-206.

Green W. H. (2012). *Econometric Analysis (7th Edi).* Upper Saddle River, NJ: Prentice-Hall.

Honohan, P. (2008). Cross-country variation in household access to financial services. *Journal of Banking & Finance, 32(11),* 2493-2500.

Hossain, M., & Srivastava, P. (2021). Financial Inclusion, Household Welfare, and Poverty Reduction in Sierra Leone. *Journal of International Development, 33(3),* 370-390.

Ibrahim, S. S & H. M (2020). Testing the impact of financial inclusion on income convergence: Empirical evidence from Nigeria, *African Development Review*, 42-54

Jack, W. & Suri, T (2011). The Risk Sharing Benefits of Mobile Money, *Working Paper*, January 2011.

Jiang, W., Levine, R., & Lin, C. (2019). Does Financing Spur Small Business Productivity? Evidence from a Natural Experiment. *Journal of Financial Economics, 132(1),* 76-96.

Kara, S. B. K., Günes, D. Z., & Tüysüzer, B. S. (2021). Work-family conflict during working from home due to pandemic: A qualitative research on female teachers. *Int. J. Curric. Instruct. 13*, 251–273.

Kargbo, F. J. (2021). Financial Inclusion and Household Welfare in Sierra Leone: Evidence from the 2018 Sierra Leone Integrated Household Survey. *African Development Review, 33(2),* 223-235.

Keita, F. M. (2021). Financial Inclusion and Poverty Reduction in Sierra Leone: Evidence from Survey Data. *Journal of African Business, 22(4),* 475-491.

Khan, H. R. (2011). Financial inclusion and financial stability: Are they two sides of the same coin? *At BANCON. Organized by the Indian Bankers Association and Indian Overseas Bank. BIS central bankers' speeches*.

Koloma, Y. (2021). COVID-19, financing and sales decline of informal sector MSMEs in Senegal, African Development Review, 33(S1) Special Issue on The impact of COVID-19 on African Economies, 207-220

Mayoux, L. (2000). *Microfinance and the empowerment of women: A review of the key issues.* Social Finance Unit, Department of Development Studies, University of London.

Mugume, R., & Bulime, E. W. N (2022). Post-COVID-19 recovery for African economies: Lessons for digital financial inclusion from Kenya and Uganda, Special Issue on *The African Economic Conference 2021: "Financing Africa's Post-COVID-19 Development*" 34(S1).

Mndolwa, F.D & Alhassan, A.L (2020). Gender disparities in financial inclusion: Insights from Tanzania, *African Development Review, 32(4),* 578-590.

Ndanshau, M.O.A., & Njau, F. E (2021). Empirical Investigation into Demand-Side Determinants of Financial Inclusion in Tanzania, *African Journal of Economic Review, 09(1).* 1-20.

Ndoya, H. H., & Tsala, C. O. (2021). What drives the gender gap in financial inclusion? Evidence from Cameroon. *African Development Review*, 1–14. https://doi.org/10.1111/1467-8268.12608

Otero, M., & Rhyne, E. (1994). *The New World of Microenterprise Finance: Building Healthy Financial Institutions for the Poor.* Inter-American Development Bank.

Omar MA, & Inaba K (2020). Does financial inclusion reduce poverty and income inequality in developing countries? *Panel Data Anal Econ Struct* 9:37. https://doi.org/10.1186/s40008-020-00214-4

Park C. Y, & Mercado R (2018). Financial inclusion, poverty, and income inequality. Singapore *Econ Rev* 63(1):185–206. https://doi.org/10.1142/S0217590818410059

Prasad, E. S. (2010). Financial Sector Regulation and Reforms in Emerging Markets: An Overview. *IZA Discussion Paper* Number 5233. Bonn: Institute for the Study of Labor, October.

Saha, S.K., & Qin, J. (2022). Financial inclusion and poverty alleviation: an empirical examination. *Econ Change Restruct* . https://doi.org/10.1007/s10644-022-09428-x

Senou, M. M, Ouattara, W & Houensou, D. A (2019) in Sergio Rossi (Reviewing editor) (2019) Financial inclusion dynamics in WAEMU: Was digital technology the missing piece? *Cogent Economics & Finance, 7:1*, DOI: 10.1080/23322039.2019.1665432

Sierra Leone Poverty Assessment: *Poverty Trends, Development, and Drivers* https://www.worldbank.org/en/country/sierraleone/publication/sierra-leone-poverty-assessment-poverty-trends-development-and-drivers

Swamy V (2010). Financial development and inclusive growth: impact of government intervention in prioritized credit *Zagreb international review of economics and business 13(2):*55–72. https://ideas.repec.org/a/zag/zirebs/v12y2010i2p55-72.html

Tinta, A. A, Ouédraogo, M. I & Al-Hassan, R.M (2022). The micro determinants of financial inclusion and financial resilience in Africa, African Development Review, *African Development Bank, 34(2),* 293-306

World Bank (2022). *Poverty and Shared Prosperity 2022: Correcting Course.* Washington, DC: World Bank. doi:10.1596/978-1-4648-1893-6.