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Kristina Kocisova [*]***, Tamara Petriková*** [**]

[*] Technical University of Kosice, Faculty of Economics, Slovakia

E-mail (Corresponding author): Kristina.Kocisova@tuke.sk

[**] Technical University of Kosice, Faculty of Economics, Slovakia

E-mail: Tamara.Petrikova@tuke.sk

Can Digitalisation Mitigate Financial Exclusion? Investigation of Regional Disparities

Abstract: In this study, we use data from the World Bank Global Findex database for 2021 to investigate both voluntary and involuntary reasons for financial exclusion in an era of increasing digitalisation. Our analysis reveals that socio-demographic characteristics play a significant role in determining the reasons for financial exclusion. The results confirmed that increased access to the Internet could mitigate involuntary reasons for financial exclusion, mainly in middle- and low-income countries where the digitalisation boom has occurred in the last few years. The findings also highlight significant regional disparities: involuntary reasons for exclusion dominate in regions such as Sub-Saharan Africa, Latin America, and the Caribbean, while voluntary are more prevalent in areas like the Middle East and North Africa. These results underscore the issue's complexity, showing that applying a single policy universally applicable to all countries is impossible. Each government and its regulators must consider regional specificities when defining policies to eliminate financial exclusion. Such targeted policies are crucial for reducing social inequalities, fostering broader financial inclusion, and promoting sustainable economic development.

Keywords: digitisation, barriers of financial inclusion, Findex, probit model.

JEL Classification: G21, O16, P34.

Introduction

The banking and financial sector has recently experienced a significant digital transformation. This transformation makes various financial services accessible to all economic entities, as evidenced by the increase in the number of accounts at financial institutions, the basic indicator of financial inclusion. According to the latest findings from the Findex database presented by Demirgüç-Kunt, Leora, Dorothe & Saniya (2022), 76% of adults worldwide now have an account in a financial institution, a significant increase from the 50% of the population who reported account ownership a decade ago. This increase in account ownership has been particularly pronounced in recent years, rising by seven percentage points during the pre-pandemic and pandemic period between 2017 and 2021. Account ownership rates in developing countries increased by 29 percentage points between 2011 (42%) and 2021 (71%). Developed or high-income countries showed high account ownership rates for both 2011 (88%) and 2021 (96%), with an increase of 12 p.p. over this period. On the other hand, low-income economies are characterised by low levels of account ownership, even in 2021. Still, positive progress is also visible for these countries (from 10% in 2011 to 24% in 2021). Among the 123 countries, account ownership in 2021 was lowest in South Sudan (6%), Afghanistan (10%) and Iraq (19%), while high-income economies (e.g. Denmark, Iceland, Germany, Austria, the UK, Netherlands, Sweden, Ireland, Canada) will perform excellently (100%).

As presented by many authors, such as Fungáčová and Weill (2014), Fungáčová and Weill (2015), Zins and Weill (2016), Lyons, Grable & Joo et al. (2018), Martinez, Scherger Guercio & Orazi (2020), Nagpal, Jain & Jain (2020), Cassimon, Maravalle, Pandiella & Turroques (2022), Demirgüç-Kunt et al. (2022) or Mossie (2023), the expansion of financial inclusion brings multiple benefits not only to individuals but also to the economy as a whole. Moreover, such initiatives hold the promise of reducing poverty, closing gender gaps in access to finance and promoting socio-economic development, as highlighted by Polloni-Silva, da Costa, Moralles & Sacomano Neto (2021). Increasing financial inclusion can be a powerful tool to reduce poverty and inequality by providing various tools that enable individuals to invest in their future - whether through education, health care, entrepreneurship or retirement planning - while promoting consumption stability and increasing resilience to financial risks.

However, despite progress in financial development worldwide, disparities remain, and some regions face significant financial inclusion gaps. As presented by Demirgüç-Kunt et al. (2022), approximately 1.4 billion adults worldwide remain unbanked, meaning they lack an account at a financial institution or through

a mobile money provider. In high-income economies, account ownership is nearly universal, so the vast majority of unbanked adults reside in developing countries. Indeed, 52% of the unbanked live mainly in the region of Sub-Saharan Africa (excluding high income), Middle East and North Africa (excluding high income), and South Asia, where the level of financial inclusion (the share of adults with financial account) is 40%, 47%, and 66%, respectively. Ozili (2023) reports that a significant proportion of the population in these regions is financially excluded (either for voluntary or non-voluntary reasons), which limits their access to other financial services. Many people have limited access to financial services mainly because of poor branch infrastructure, the absence of a well-developed digital payment system, the high cost of banking services or a lack of financial literacy. However, besides these reasons, other reasons, such as lack of trust, religious or other subjective reasons, lead to voluntary financial exclusion. As a result of both subjective and objective reasons, these individuals rely heavily on cash transactions or turn to family and friends for financial help. This increase in informal financial practices increases inequality and slows the region's financial and economic growth.

Studying barriers to financial inclusion in different regions is important for several reasons. As many authors present, financial inclusion is essential for economic growth and development. Financial exclusion can create fragile economies and hinder global economic stability. Regions with financially excluded populations may experience less economic resilience, greater inequality, and more limited capital flows. Global initiatives can be better aligned to promote stability by understanding the barriers regionally. However, barriers vary significantly across regions due to differences in infrastructure, policies, and socioeconomic conditions. Each region faces unique challenges based on its economic structure, cultural norms, and political environments. For example, in developing regions, lack of infrastructure (e.g., poor Internet access, inadequate banking networks) might be a key barrier, whereas in wealthier regions, financial literacy or trust in institutions could be the primary obstacle. Financial exclusion disproportionately affects the most vulnerable groups, such as women, rural populations, and low-income individuals. These groups may face structural barriers, such as gender discrimination or cultural norms, that limit their access to financial services. Studying these barriers in different regions helps tailor solutions to bridge inequalities and ensure that no group is left behind in the financial system. Policymakers must design and implement context-specific solutions to overcome barriers to financial inclusion. What works in one region might not be effective in another. Therefore, a detailed understanding of local barriers informs better policy interventions. Studying reasons for financial exclusion on a regional level helps ensure that policies and innovations are effective, equitable,

and contextually appropriate. It provides insights into addressing structural issues and improving access for underserved populations, leading to greater social and economic benefits globally.

This study contributes to the existing literature in several ways. First, it contributes to the growing research on the causes of financial exclusion, complementing previous studies that have examined this issue globally (e.g. Claessens, 2006; Allen, Demirgüç -Kunt, Klapper, & Martinez Peria, 2016; Lyons et al., 2018; Demirgüç-Kunt et al., 2022), within specific regions (e.g., Fungáčová and Weill (2014) in Asia; Zins and Weill (2016) in Africa; Erlando, Riyanto & Masakazu (2020) in Indonesia), or at the country level (e.g., Leyshon and Thrift (1995) in the United Kingdom and the United States; Fungáčová and Weill (2015) in China; Cassimon et al. (2022) in Mexico; or Mossie (2023) in Ethiopia). Although the existing studies focus on financial inclusion and exclusion in the countries mentioned above, they do not examine the role of ICTs in accelerating access to financial services or eliminating the reasons for financial exclusion. This segment has experienced remarkable growth in recent years, mainly driven by the pandemic. The study, therefore, fills this gap by examining the individual determinants of voluntary and involuntary reasons for financial exclusion, focusing also on the impact of increasing digitalisation.

The study is divided into the following chapters: The first reviews the relevant literature on financial inclusion and exclusion. The second focuses on the definition of the data and methodology. The main findings are then presented in the third chapter. The study ends with a conclusion.

Literature review

Financial inclusion is often understood as using formal financial services, an important feature of financial development. Different definitions of financial inclusion can be found in the literature. According to the Global Findex Database (2023), financial inclusion involves providing accessible and affordable financial products and services that meet the diverse needs of individuals and businesses. These services include various financial activities, including payments, savings, credit, and insurance, and are provided responsibly and appropriately. Zins and Weill (2016) and Chinoda and Mashamba (2021) characterise financial inclusion as ensuring individuals can access basic financial services within the formal financial sector. Allen et al. (2016), Erlando et al. (2020), and Demirgüç-Kunt et al. (2022) state that the first step in financial inclusion is having a financial account. Through financial accounts, citizens can use financial services in a way that leads

to their personal development, which also fosters countries' development. Owners of different types of accounts can withstand financial shocks more quickly than those who do not have such access. Sapovadia (2018), Bozkurt and Karakuş (2020), and Adeleke and Alabede (2022) emphasise the importance of ensuring that households have access to appropriate financial services and can use them effectively, while Roa (2015), Jovović, Femić-Radosavović & Lipovina-Božović (2017), Jovović, Mišnić, Pejović & Mijušković (2023) and Eshun and Kočenda (2023) emphasise not only the availability but also the quality of these services across countries.

The opposite of financial inclusion is financial exclusion. One of the earliest attempts to define financial exclusion can be found in a study by Leyshon and Thrift (1995), who define it as the processes that exclude disadvantaged people from accessing financial services. According to Sinclair (2001), financial exclusion is the inability to access necessary financial services. Zins and Weill (2016) note that it is important to distinguish between voluntary and involuntary exclusion. People who choose not to open an account with a financial institution because of their financial constraints, religious or cultural preferences, because another family member already has an account, or because they believe they do not need financial services are considered to be voluntarily excluded. Conversely, involuntary exclusion is due to market failures, such as significant geographical distance, high cost or lack of documentation to maintain an account, or a lack of trust in financial institutions. Fungáčová and Weill (2014) highlight the importance of distinguishing between voluntary and involuntary exclusion when formulating effective policy recommendations to increase financial inclusion in the region, as addressing involuntary exclusion highlights barriers to financial inclusion that appropriate policy interventions can mitigate.

Demirgüç-Kunt et al. (2015; 2018; 2022) point out that the reasons for financial exclusion of individuals in different countries indicate inefficiencies that slow economic growth. They support the idea of financial inclusion as a transformative factor, which they see as a critical factor in reducing poverty or income inequality, but also in achieving inclusive economic growth. These findings point to the need for governments, central banks, or other regulators to understand the determinants of financial inclusion and the reasons for financial exclusion to set policy and regulatory measures correctly and effectively.

As Fungáčová and Weill (2015), Allen et al. (2016), and Zins and Weill (2016) report, individual characteristics of respondents are considered to be significant factors in determining financial inclusion and finding reasons for financial exclusion. They found that gender is associated with several barriers to financial inclu-

sion. While lack of money and family members having an account play a stronger role for women, the fact that the bank is far away, banking services are too expensive, the lack of documentation, the lack of trust and religious reasons are less important barriers for women. Another factor that highly influences financial exclusion is the respondent's age. They pointed out that with age, lack of money seems to be a decreasing problem, while new issues emerge for older people: distance, cost, trust and religion become more problematic. They also presented that income level and education influence the reasons for financial exclusion. Most of the analysed barriers are problems for poorer, less educated, unemployed, or rural residents. Claessens (2006) also emphasises that financial exclusion depends on factors such as education, employment status, income level and other individual characteristics. Notably, women and people with lower incomes often face barriers such as geographical distance from bank branches and the need for assistance in navigating procedures related to the use of financial services (e.g. the process of opening a financial account or obtaining a loan), which prevent them from effectively using financial services. According to Cabeza-García, Del Brio & Oscanoa-Victorio (2019), income inequality is an important socio-economic factor with a strong impact on financial inclusion, while it is equally important in influencing the existence of barriers that lead to the financial exclusion of individuals. According to them, people living in poverty face more significant barriers when accessing financial services. Limited access to financial services exacerbates poverty and hampers a country's economic growth. Furthermore, financial exclusion exacerbates income inequality, threatens social stability and hinders the achievement of social development goals in many countries, as reported by Wang and Guan (2017).

Several studies (Younas, Qureshi & Al-Faryan, 2022; Hasan, Yajuan & Khan, 2022; Vučinić and Luburić, 2022) point to the positive impact of digitalisation in removing barriers to financial exclusion. According to Martins, Oliveira & Popovič (2014), in an era of increasing digitalisation, access to banking and financial services has increased, especially in emerging economies. Demirgüç-Kunt and Klapper (2013) argue that African economies are among the poorest countries, with low GDP per capita, characterised by higher levels of income inequality, poorer connectivity, lower literacy rates and lower levels of urbanisation. The increasing level of digitalisation in these countries could lead to lower bank costs, making the entire banking process more efficient and faster. It would positively impact bank profitability and help rural and poor areas in financial inclusion. However, Aziz and Naima (2021) note that the provision of digital financial services by banks will not lead to greater financial inclusion of rural people unless these people have access to digital devices and the Internet. Therefore, ensuring

that these rural areas are also equipped with technologies that could contribute to poverty alleviation and greater financial inclusion is important.

The literature review shows that the analysis of financial inclusion and the reasons for financial exclusion is mainly focused on regions such as China, Asia and Africa. Most authors rely on data from the Findex database, which is further analysed using binary variable models in the form of a probit or logit model. Compared to previous research, our contribution lies in integrating the digitalisation indicator. This factor enriches our analysis and allows for a more comprehensive understanding of the factors leading to financial exclusion in an era of increasing digitalisation.

Data and methodology

We apply the binary variable regression method in the analytical part. As stated by Coss (2015), we use this method when the categorical dependent variable takes only two possible values, i.e. it is a binary variable. In categorical dependent variable modelling, we attempt to estimate a model that allows us to specify the relationship of the binary dependent variable to a set of explanatory variables.

Y is the dependent variable, which can take a value of 0 or 1. It will equal one when an individual is financially excluded and 0 otherwise. The probability of an individual being excluded from the formal financial market is defined as follows:

$$P(Y = 1) = \pi \tag{1}$$

The probability of not being financially excluded is defined as follows:

$$P(Y = 0) = 1 - \pi \tag{2}$$

The probability model is a regression of the conditional expectation of Y on X, resulting in:

$$E(Y) = 1 \cdot P(Y = 1) + 0 \cdot P(Y = 0) = 1 \cdot \pi + 0 \cdot (1 - \pi) = \pi \tag{3}$$

The variance of a given distribution is given by:

$$D(Y) = \pi(1 - \pi) \tag{4}$$

Since the value of the probability π could be changed depending on the change in the value of the variable X, we use the symbol $\pi(x)$ to denote this probability.

If we want to model the probability of the phenomenon occurring, assuming that **x** is the vector of values of the independent variables X_1,..., X_k, we can write it as follows:

$$\pi(\mathbf{x}) = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k \tag{5}$$

The model is then estimated using the maximum likelihood method.

$$\text{probit}(\pi(\mathbf{x})) = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k \tag{6}$$

The analysis of reasons for financial exclusion is based on respondent-level data from the World Bank's Findex database. As presented by Demirgüç-Kunt et al. (2022), 24% of adults worldwide are unbanked. To shed light on why people do not have an account, the Global Findex 2021 survey asked unbanked adults why they do not have a financial institution or a mobile money account. The Global Findex identifies several reasons people do not have access to financial services, where respondents could give more than one reason, and most, on average, gave more than two reasons for not having a financial account. Each response option (too far away, too expensive, lack of documentation, do not trust financial institutions, religious reasons, do not have enough money to use services at financial institutions, someone else in the family already has an account, do not need financial services at a formal institution) is represented by a dummy variable equal to 1 if the individual answered 'yes' and 0 otherwise. The socio-demographic characteristics of the respondent present the independent variables. The general form of the basic micro-level probit model used can be written as follows:

$$\begin{aligned} Exclusion_i = {} & \beta_0 + \beta_1 Gender_i + \beta_2 Age_i + \beta_3 Education_i + \beta_4 Income_i \\ & + \beta_5 Employment_i + \beta_6 Internet_i + \beta_7 Region/Country_i \\ & + \varepsilon_i \end{aligned}$$

The independent variables in the baseline model represent the individual characteristics of the respondent: gender, age, education, income, employment and region/country. *Gender* is defined by a dummy variable equal to one if the respondent is female, 0 otherwise. *Age* is proxied by the number of years of the respondent. *Education* is divided into three sub-groups according to the respondent's level of education - primary, secondary, and tertiary (in the probit model, secondary education was omitted as the model defined this variable as irrelevant). Dummy variables equal one if a respondent has completed specific education in a defined sub-group and 0 otherwise. *Income* is divided into five subgroups according to the income quintile to which the respondent belongs (In the probit model, the fifth income quintile was omitted as the model defined this variable as irrelevant). Dummy variables equal one if the respondent's income is in a specific quintile,

0 otherwise. *Employment* is a dummy variable equal to one if the respondent is employed, 0 otherwise. The final dummy variable is *Region* or *Country*, which indicates the respondent's affiliation to one of the eight world regions or one of the 123 countries. Including the *Internet* variable in the equation, alongside the traditional socio-demographic characteristics used in previous studies, allows us to assess whether better access to the Internet at the respondent level can remove barriers to accessing financial accounts. We assume that better access to the *Internet* may have a positive impact on eliminating the reasons why respondents do not have an account with a financial institution, particularly those related to involuntary exclusion, such as living a long distance from a bank branch or the high costs associated with conducting transactions in a bank branch.

Table 1: Descriptive statistics of variables

Variable name	Acronym	Count	Mean	Standard deviation
Reasons for financial exclusion				
Too far away	Distance	39220	0.2735	0.4458
Too expensive	Expensive	39220	0.3503	0.4771
Do not have the necessary documentation	Lack of documentation	39220	0.2813	0.4497
Do not trust financial institutions	Lack of trust	39220	0.2361	0.4247
Religious reasons	Religious	39220	0.0853	0.2794
Do not have enough money to use financial institutions	Insufficient funds	39220	0.7033	0.4568
Someone else in the family already has an account	Family	39220	0.2001	0.4001
No need for financial services at a formal institution	No need	39220	0.3220	0.4673
Individual characteristics of respondents				
Gender of the respondent	Gender	39220	0.4095	0.4917
Respondent age	Age	39220	36.59	16.88
Respondent's education level – primary	Education: Primary	39220	0.4766	0.4995
Respondent's education level – secondary	Education: Secondary	39220	0.4611	0.4985
Respondent's education level – tertiary and higher	Education: Tertiary	39220	0.0554	0.2287
Within-economy household income quintile – first	Income: Quintile 1	39220	0.2144	0.4104
Within-economy household income quintile – second	Income: Quintile 2	39220	0.1976	0.3982
Within-economy household income quintile – third	Income: Quintile 3	39220	0.2021	0.4015
Within-economy household income quintile – fourth	Income: Quintile 4	39220	0.1998	0.3999
Within-economy household income quintile – fifth.	Income: Quintile 5	39220	0.1861	0.3892
The respondent is in the workforce	Employment	39220	0.5838	0.4929
Internet access in any way, whether on a mobile phone, a computer, or some other	Internet	39220	0.4652	0.4988
Respondent's affiliation to one of the 9 world regions or one of the 123 countries	Region/Country	39220		

Source: prepared by authors

Table 1 provides descriptive statistics and variable definitions. The first part of the table presents the main statistical findings on the various reasons for financial exclusion. Across all countries, on average, the most frequently cited reason for not having an account at a financial institution is lack of money, with 70% of respondents without a financial account defining this as the main reason. This problem is faced by countries in the Middle East and North Africa region, excluding high-income (81% of unbanked) and Sub-Saharan Africa, excluding high-income (74% of unbanked). The second most common reason respondents do not have a financial account is that the cost of financial services is too high, as 35% of respondents reported. This fact is evident mainly in Latin America and the Caribbean, excluding high-income (60% of unbanked) and South Asia (39% of unbanked). This finding is consistent with the study by Fungáčová and Weill (2015) and Allen et al. (2016). Their results suggest that individuals without sufficient income do not perceive the overall benefits of having a bank account as beneficial, as they are largely outweighed by the costs associated with maintaining a financial account. Twenty-eight per cent of the unbanked reporting lacks the documentation to open an account. Unbanked adults were more likely to cite this barrier in regions such as Sub-Saharan Africa (37% of unbanked), Latin America and the Caribbean (33% of unbanked). Distance is a barrier for 27% of unbanked adults. In contrast, regions with a higher share of unbanked adults cited distance as a barrier were South Asia (36% of unbanked) and Sub-Saharan Africa (34% of unbanked). Distrust of the financial system is more significant in some regions and globally was cited by 23% of unbanked adults. In Europe and Central Asia, excluding high-income countries, Latin America, and the Caribbean, about 32% of unbanked adults said they do not have an account because they distrust the banking system. Globally, 20% of unbanked adults said that they do not have an account because a family member already has one. This barrier is dominant in East Asia and Pacific regions, excluding high-income (35% of unbanked) and South Asia (35% of unbanked). Documentation requirements may also hamper account ownership. Finally, only 8% of the unbanked adults globally cited religion as a barrier. The Middle East and North Africa (13% of the unbanked), Latin America and the Caribbean (11% of the unbanked) and South Asia (10% of the unbanked) cited religion as a barrier.

Table 1 also reports the descriptive statistics for the individual characteristics of financially excluded respondents involved in our estimation. We can see that 40.95% of unbanked respondents are female, while the average age of all unbanked respondents is 36.59 years. Approximately 48% of the unbanked have only primary or lower education, while only 5.54% have attained college or higher education. Regarding income distribution, 21.44% of the unbanked belong

to the lowest income quintile, and 18.61% belong to the fifth income quintile. In addition, more than 58% of the unbanked are actively engaged in the workforce, and 46.52% of respondents have Internet access.

Results and discussion

This section examines how individual characteristics affect the reasons for financial exclusion. Our analysis includes estimates to explain each of the eight reported reasons for financial exclusion identified in the World Bank survey. As Amari and Anis (2021) noted, different population segments may experience different barriers preventing them from actively using financial services in the formal financial sector. Fundamental differences exist between individuals who do not have financial accounts due to objective barriers and those who voluntarily choose not to use these financial services. It is, therefore, necessary to distinguish between involuntary reasons for financial exclusion, such as geographical distance, cost of using financial services, lack of documentation and low trust in banks, which are listed in Table 2, and voluntary reasons for financial exclusion, which include religious reasons, financial constraints in the form of lack of funds, having an existing family account and perceived unnecessity of financial services, which are listed in Table 3.

Table 2: Determinants of involuntary reasons for financial exclusion - world

	Distance		Expensive		Lack of documentation		Lack of trust	
Gender	0.0165	***	0.0071		-0.0035		0.0324	***
	0.0144		0.0137		0.0144		0.0146	
Age	-0.0009	***	0.0014	***	-0.0038	***	0.0007	***
	0.0004		0.0004		0.0005		0.0004	
Education: Primary	0.0423	***	0.0152	**	0.0576	***	-0.0179	***
	0.0151		0.0145		0.0151		0.0155	
Education: Tertiary	-0.0508	***	-0.0147		-0.0996	***	0.0464	***
	0.0339		0.0302		0.0354		0.0307	
Income: Quintile 1	0.0744	***	0.1058	***	0.0475	***	0.0266	***
	0.0224		0.0213		0.0222		0.0225	
Income: Quintile 2	0.0609	***	0.0833	***	0.0358	***	0.0071	
	0.0227		0.0216		0.0224		0.0229	
Income: Quintile 3	0.0515	***	0.0703	***	0.0207	**	0.0105	
	0.0226		0.0214		0.0224		0.0226	
Income: Quintile 4	0.0309	***	0.0462	***	0.0105		0.0006	
	0.0228		0.0215		0.0224		0.0226	
Employment	0.0398	***	0.0464	***	0.0372	***	0.0260	***
	0.0145		0.0138		0.0144		0.0148	
Internet	-0.1144	***	-0.0135	*	-0.0578	***	0.0110	*
	0.0157		0.0149		0.0156		0.0159	
Region fixed effects	Yes	***	No		Yes	***	Yes	*
Observations	39220		39220		39220		39220	
AIC	44831		50289		45113		42630	
Pseudo R2	0.0252		0.0093		0.0314		0.0047	
Loglikehood	-22403 (df=12)		-25132 (df=13)		-22544 (df=12)		-21303 (df=12)	

The dependent variable is one of the involuntary reasons for financial exclusion. We report the estimated marginal effects in the first line, and standard errors are in the second line. Stars denote significance at the *** 99 per cent, ** 95 per cent, * 90 per cent levels.

Source: prepared by the authors

Income plays a significant role in explaining the various reasons for financial exclusion. Low-income status is a key determinant of the absence of formal accounts, as evidenced by the highest values of the marginal effects for the dummy variable defining respondents within the lowest income quintile (Quintile 1) for each reason for involuntary financial exclusion. Individuals with lower incomes face increased sensitivity to reasons such as distance from bank branches and the

cost of banking services. For these lower-income respondents, these services may be cost-unavailable, while they are also unavailable, and it is difficult for them to travel long distances to access financial services. These findings are consistent with previous studies. Mossie (2023) suggests that an effective strategy to reduce the impact of geographical barriers involves adopting cost-effective digital technologies such as mobile and Internet banking, which not only offers convenience to users but also represents a cost-effective option for banks compared to setting up new physical branches. Other reasons for the financial exclusion of the lowest income groups include "Lack of documentation", which includes a lack of in-house experience and knowledge to complete the paperwork required to set up or use banking services, highlighting the need for financial education, particularly among these income groups. It also shows that respondents in the lowest income quintile are likelier to report a lack of trust in banks.

Education variables are significantly correlated with all involuntary reasons for financial exclusion. Among individuals with primary education, factors such as distance from bank branches, costs associated with banking services, and lack of documentation are significant reasons for financial exclusion, with lack of documentation showing the highest value of the marginal effect. It suggests that if the respondent has only primary education, the probability of being financially excluded for this reason increases by up to 5.67%. It may be due to the first-mentioned lack of knowledge required to fill in the necessary documents, which were not provided to the respondent in basic education. It points to the need to focus on raising the level of financial literacy at the primary school level. A good financial literacy base acquired at an early age can help individuals to become financially inclusive while avoiding the risk of becoming over-indebted or exposed to various cyber-risks that may cause them to lose their lifetime savings. The analysis results in Table 2 further suggest that those with tertiary education are less sensitive to geographic distance and documentation requirements. However, we see the opposite situation for the reason "Lack of trust", where the results show that the respondents with the highest education show a higher probability of distrusting banking institutions. The richer knowledge and broader general outlook of these respondents, as well as a better availability of information, allows them to gain a deeper insight into the financial world, not only in the local domestic market but also in a global context. As a result of the broader range of information on how banks generate their profits, trade in financial markets or operate in an international context, their confidence in the performance of banks may be undermined, especially in times of crisis.

Another statistically significant variable is Internet usage at the respondent level. This variable was included in the model to assess whether better Internet avail-

ability eliminates the reasons for a respondent not to own an account at a financial institution. We hypothesised that better access to the Internet might positively reduce barriers, especially those related to involuntary exclusion, such as the distance from bank branches or the high costs associated with using banking services. The analysis shows that improved access to the Internet can potentially remove involuntary barriers to access to financial accounts. Individuals with Internet access show reduced sensitivity to all involuntary barriers except a lack of trust. These findings are consistent with the observation of Nagpal et al. (2020), who highlighted the role of ICT in increasing financial inclusion by enabling individuals to conduct financial transactions through online platforms.

Employment status is also positively associated with involuntary reasons for financial exclusion. As employed persons are more sensitive to all involuntary barriers, we can assume they have a higher level of financial literacy and can adequately assess their options and limitations. They might have different attitudes towards financial institutions than those who are unemployed. They could consider traditional banks and financial services unnecessary or restrictive, especially if they have alternative financial strategies that better meet their needs. Employment status often correlates with more control over one's financial situation. Those who are employed may know how to manage their finances independently. They might opt out of conventional financial services if they feel they can better manage their money through alternative means, such as digital wallets, cryptocurrencies, or direct investments.

Gender is associated only with certain involuntary reasons for financial exclusion, namely "Distance" and "Lack of trust". This result is consistent with the existing literature, suggesting that women are more likely to be excluded if bank branches are too far away or do not trust banking institutions.

The last variable is the age of the respondent. Based on the results, we can say that in most cases, age is not a factor that significantly affects the involuntary reasons for financial exclusion, as the values of the marginal effects are less than 1%. For reasons such as "Expensive "and "Lack of trust ", we see that the value of the coefficient is positive. This implies that as the age of the respondents increases, their sensitivity to the above barrier also increases. The high cost of banking products may be a barrier for older individuals that discourages them from having an account. On the other hand, reasons such as high requirements from the bank to provide documents related to banking products or long distances may be a barrier for young individuals to have an account. In both cases, these age groups may find it easier to decide to use cash, which is more convenient for them both in terms of accessibility and in terms of managing their finances as it allows them

to control how much they spend and how much money they have left as a contingency reserve for unexpected situations.

Table 3: Determinants of voluntary reasons for financial exclusion – world

	Religious		Insufficient funds		Family		No need	
Gender	0.0065	*	-0.0202	***	-0.0268	***	0.0317	***
	0.0191		0.0142		0.0157		0.0141	
Age	-0.0001		0.0000		-0.0014	***	-0.0004	*
	0.0006		0.0004		0.0005		0.0004	
Education: Primary	0.0264	***	0.0483	***	-0.0304	***	-0.0057	
	0.0202		0.0150		0.0164		0.0148	
Education: Tertiary	0.0080		-0.0721	***	0.0159	*	-0.0064	
	0.0434		0.0293		0.0310		0.0297	
Income: Quintile 1	0.0156	***	0.0810	***	-0.0640	***	-0.0382	***
	0.0292		0.0216		0.0240		0.0216	
Income: Quintile 2	0.0087	*	0.0837	***	-0.0441	***	-0.0174	*
	0.0299		0.0219		0.0239		0.0218	
Income: Quintile 3	0.0006		0.0755	***	-0.0289	***	-0.0113	
	0.0301		0.0216		0.0234		0.0215	
Income: Quintile 4	0.0309		0.0435	***	-0.0103	*	-0.0095	
	0.0303		0.0214		0.0231		0.0215	
Employment	0.0016		0.0686	***	-0.0365	***	-0.0253	***
	0.0192		0.0142		0.0154		0.0141	
Internet	-0.0139	***	-0.0032		0.0654	***	0.0324	***
	0.0208		0.0153		0.0166		0.0151	
Region fixed effects	No		Yes	***	Yes	***	Yes	***
Observations	39220		39220		39220		39220	
AIC	22683		46267		37332		42630	
Pseudo R2	0.0077		0.0285		0.0481		0.0047	
Loglikehood	-11329 (df=12)		-23121 (df=12)		-18654 (df=12)		-21303 (df=12)	

The dependent variable is one of the voluntary reasons for financial exclusion. We report the estimated marginal effects in the first line, and standard errors are in the second line. Stars denote significance at the *** 99 per cent, ** 95 per cent, * 90 per cent levels.

Source: prepared by the authors

In the case of voluntary reasons for financial exclusion (Table 3), the presence of another account in the family, as well as the respondent's view that he or she does not need to have an account at a financial institution, appear to show op-

posite effects among low-income individuals than is the case for other reasons for financial exclusion. It suggests that lower-income individuals are less likely to set up a financial account if another family member already has one or does not think they need one. Individuals with limited financial capabilities may feel less need to have their financial account and thus maintain multiple accounts within the family than their wealthier counterparts. A positive and significant coefficient is evident for the reason "Insufficient funds", with the strongest effect within the second and first income quintiles. It suggests that individuals belonging to the lower income baskets are more sensitive to financial constraints compared to other income groups.

In the context of voluntary barriers, the greatest impact of education is seen in the barrier labelled "Insufficient funds". Being less educated increases the probability of not having an account due to lack of funds by 4.83%. On the other hand, being tertiary educated reduces the probability of being excluded by 7.21%. The opposite situation is seen for the "Family" reason, where the probability of being excluded increases for respondents with tertiary education.

Regarding the voluntary barriers, the variable representing access to the Internet shows significant and positive coefficients for the reasons "Family" and "No need". It suggests that individuals with Internet access are increasingly likely to not use financial accounts for the reasons mentioned above. We can hypothesise that if an individual has better access to the Internet, he or she can use it to connect to an account already held by another person in the family, which increases the probability of not having his or her financial account. In the same way, better access to the Internet increases the probability of not owning an account because the respondent does not feel the need to own one since access to the Internet offers other alternative options that the services of banks can substitute for.

Employment status is positively associated with the barrier "Insufficient funds". We can suppose that employment status alone does not guarantee financial stability. People in low-wage jobs or underemployed may struggle with insufficient income. Despite being employed, their financial resources might be inadequate to meet the minimum criteria for accessing certain financial products or services, pushing them towards financial exclusion. On the other hand, for the reasons "Family" and "No need", employed respondents are less likely to not own accounts for the reasons given. Employed individuals are typically more financially independent. They often have their income and may prefer to manage their finances separately rather than relying on a family member's account. This independence reduces the probability of using a family member's account as a reason for financial exclusion. They also are more likely to recognise the benefits of having a

financial account for managing their income, expenses, and savings. Thus, they are less likely to claim they have "No need" for a financial account than those who might be less financially stable.

In the case of gender, we see a differential impact on the voluntary reasons for financial exclusion. "Religion" and "No need" are positively associated with gender, while we see a negative relationship between gender and "Insufficient funds" and "Family". We can suppose that increased participation of women in the workforce often correlates with better access to financial services. Employed women are more likely to have their financial accounts and less likely to rely on family members. Consequently, the reason a family member has one becomes less relevant. On the other hand, in some cultures or for religious reasons, women may be less involved in financial decision-making or rely on family members for financial management. It can lead to a lower perception of the need for their financial accounts if they assume that their family or spouse manages finances effectively.

We can also note that age plays a partial role in the voluntary reasons for financial exclusion, "Family" and "No need", but only for the youngest respondents. For these respondents, we see an increased probability of not having a financial account precisely because the account is, in most cases, held by the parents of these young people who allow them to dispose of the funds in their account, if necessary, through credit cards, or set up a 'sub-account' within their main account. At the same time, we see that the youngest respondents are the most likely not to feel the need to have a financial account and use it for financial services. It may be influenced by the fact that this 15+ age group still largely relies on the cash they receive in pocket money from their parents. Since, at this age, their parents provide them with basic food, clothing, electronics or educational aids, they only use their financial resources to meet their teenage needs, which they can do using cash. These findings are consistent with previous studies by Fungáčová and Weill (2015) in China, Zins and Weill (2016) in Africa, Amari and Anis (2021) in Tunisia, and Mossie (2023) in Ethiopia, which examined similar dynamics in their respective regions.

Sub-models have also been developed to test the robustness of our model and examine the main reasons for financial exclusion in different regions of the world. Through these models, we attempt to see if regional differences are associated with the main reason for financial exclusion regarding socio-demographic characteristics. Table 4 presents the main findings considering "Insufficient funds" in different regions, as region-fixed effects were marked as relevant in Table 3.

Table 4: Determinants of "Insufficient funds" – region level

	East Asia and Pacific (excluding high-income)		Europe and Central Asia (excluding high-income)		High-income: nonOECD		High-income: OECD	
Gender	-0.0320	*	-0.0141		-0.0642		-0.1422	***
	0.0526		0.0392		0.0985		0.1104	
Age	-0.0005		0.0029	***	0.0017		-0.0008	
	0.0018		0.0011		0.0028		0.0027	
Education: Primary	0.0559	**	0.0549	***	0.1640	***	0.0564	
	0.0613		0.0426		0.1212		0.1175	
Education: Tertiary	0.0322		-0.0702	**	-0.0898	*	-0.2415	**
	0.1270		0.0578		0.1223		0.2066	
Income: Quintile 1	0.0779	**	0.1698	***	0.1317	*	0.2627	***
	0.0837		0.0583		0.1618		0.1877	
Income: Quintile 2	0.1071	***	0.1228	***	0.1057		0.2153	**
	0.0864		0.0598		0.1630		0.1979	
Income: Quintile 3	0.0796	**	0.1020	***	0.1164		0.2528	**
	0.0841		0.0592		0.1709		0.2081	
Income: Quintile 4	0.0370		0.0320		0.0288		0.1494	
	0.0843		0.0597		0.1710		0.2103	
Employment	0.1237	***	0.0005		-0.0157		-0.1005	*
	0.0549		0.0394		0.1016		0.1145	
Internet	-0.0076		0.0120		0.1282	**	0.0137	
	0.0614		0.0419		0.1277		0.1290	
Country fixed effects	Yes	***	Yes	***	Yes	*	No	
Observations	3048		4924		770		611	
AIC	3215		6563		1026		810	
Pseudo R2	0.0464		0.0334		0.0609		0.0690	
Loglikehood	-1595 (df=12)		-3269 (df=12)		-501 (df=12)		-392 (df=12)	

The dependent variable is one of the voluntary reasons for financial exclusion. We report the estimated marginal effects in the first line, and standard errors are in the second line. Stars denote significance at the *** 99 per cent, ** 95 per cent, * 90 per cent levels.

Source: prepared by the authors

Table 4: Determinants of "Insufficient funds" – region level (continued)

	Latin America and the Caribbean (excluding high-income)		Middle East & North Africa (excluding high-income)		South Asia		Sub-Saharan Africa (excluding high-income)	
Gender	-0.0704	***	-0.0420	**	-0.0029		-0.0068	
	0.0357		0.0468		0.0530		0.0233	
Age	-0.0008	*	0.0006		0.0011	*	0.0007	**
	0.0010		0.0015		0.0017		0.0008	
Education: Primary	0.0224		0.0314	*	0.0412	*	0.0101	
	0.0384		0.0477		0.0538		0.0252	
Education: Tertiary	-0.0346		-0.0619	**	-0.0071		-0.0071	
	0.0673		0.0672		0.1364		0.0969	
Income: Quintile 1	0.0385		0.1615	***	0.0895	***	0.0539	***
	0.0545		0.0664		0.0749		0.0361	
Income: Quintile 2	0.0749	***	0.1481	***	0.1111	***	0.0455	***
	0.0555		0.0644		0.0763		0.0360	
Income: Quintile 3	0.0709	***	0.1365	***	0.0397		0.0512	***
	0.0552		0.0631		0.0713		0.0357	
Income: Quintile 4	0.0450	*	0.0920	***	0.0375		0.0300	**
	0.0548		0.0616		0.0710		0.0347	
Employment	0.0673	***	0.0988	***	0.0955	***	0.0656	***
	0.0365		0.0469		0.0522		0.0240	
Internet	0.0367	**	-0.0387	**	0.0254		-0.0199	*
	0.0375		0.0515		0.0630		0.0273	
Country fixed effects	No		Yes	***	Yes	*	Yes	*
Observations	5944		4909		3444		15550	
AIC	7895		5051		3934.3		42630	
Pseudo R2	0.0107		0.0437		0.0734		0.0047	
Loglikehood	-3935 (df=12)		-2513 (df=12)		-1955 (df=12)		-21303 (df=12)	

The dependent variable is one of the voluntary reasons for financial exclusion. We report the estimated marginal effects in the first line, and standard errors are in the second line. Stars denote significance at the *** 99 per cent, ** 95 per cent, * 90 per cent levels.

Source: prepared by the authors

The results of the analysis confirm that regional differences exist. As can be seen, gender is statistically significant only in the case of East Asia and the Pacific (excluding high-income), Latin America and the Caribbean (excluding high-income), Middle East and North Africa (excluding high-income) and High-income: OECD, where the impact is much higher in OECD countries. It signalises that being female in those countries reduces the probability of being excluded because of insufficient financial resources. Many high-income OECD countries have implemented policies to reduce gender disparities, including access to financial resources. These may include maternity leave, childcare support, equal pay laws, and initiatives that promote women's financial independence. Social safety nets, such as unemployment benefits and healthcare, also reduce the probability that women will face severe financial exclusion. Also, women's participation in the labour force has increased in many high-income countries. Women are more likely to hold stable jobs, have access to retirement savings, and accumulate wealth. Increased education and professional opportunities also contribute to better financial security for women.

From the education point of view, the results confirmed our expectation that being only primarily educated increases the probability of being financially excluded. In contrast, tertiary education decreases the probability of being financially excluded because of insufficient funds. This was not confirmed only in the case of Latin America and the Caribbean (excluding high-income) and Sub-Saharan Africa (excluding high-income). In these regions, even educated individuals often struggle with low-income levels, limiting their ability to accumulate sufficient financial resources. Educational attainment does not always translate into higher wages or better employment opportunities. Many jobs available, even to educated individuals, are low-paying or in the informal sector, which offers little financial stability or savings potential. Even if individuals are educated and employed, the cost of living in many parts of Latin America and Sub-Saharan Africa can be high relative to wages. This leaves little room for savings, and many households struggle to meet basic needs. In these cases, insufficient funds for financial activities (like accessing loans, opening accounts, or making investments) remain a barrier, even for those with education. As a result, financial exclusion due to insufficient funds remains a challenge.

The results for employment status pointed to the fact that being employed decreases the probability of suffering from insufficient funds only in the case of high-income countries. In low-income countries, being employed is not a guarantee of sufficient funds. The labour market in these regions often fails to provide sufficient formal employment opportunities. The economies of many low- and middle-income countries are characterised by a large informal sector, where jobs

do not require formal education and access to financial services is limited. Education does not necessarily guarantee better access to jobs, income, or financial services in such contexts.

The results from the income point of view confirmed that being in the lowest income quintile is connected with the highest probability of being financially excluded, as presented above. Also, the increased connectivity via the Internet reduces the probability of being excluded, primarily in African countries. The increasing availability of the Internet, mobile banking, and fintech platforms across Africa has revolutionised financial inclusion. Internet access allows individuals to use mobile banking services to save, transfer, and manage money, even with limited financial resources. People no longer need to visit traditional banks (often distant and costly to access) but can instead use their mobile phones to carry out transactions, reducing costs and overcoming the barrier of insufficient funds. Internet access provides a platform for individuals to engage in income-generating activities like e-commerce or online work. Increased income through these activities can help individuals overcome financial limitations and engage with financial services, such as saving, investing, or insuring their assets.

Hence, the results largely confirm that different regions are connected with different reasons and factors leading to financial exclusion. The analysis results underscore the issue's complexity, showing that applying a single policy universally applicable to all countries is impossible. Each government and its regulators must consider regional specificities when defining policies to eliminate financial exclusion. This regional approach is crucial to effectively combating financial exclusion, eliminating social inequalities, and increasing financial and economic development in the countries concerned.

Conclusion

Today, using financial services is an integral part of our lives. Financial inclusion is becoming more important with the increasing use of information and communication technologies in the banking sector. The rapid penetration of ICT brings new opportunities and challenges for businesses, individuals, and the economy as ICT contributes to increased efficiency, new services, improved living standards for the population, and employment and economic development in the country. ICT contributes significantly to digitalisation in the financial system, with increasing levels of digitalisation helping to make various financial services more accessible. The use of accounts improves access to financial services, leading to the use of other banking services and thus to a higher degree of financial inclu-

sion through credit, saving money or making digital payments. On the other hand, limited access to financial services and products places certain population groups among the financially excluded individuals for various reasons, such as the distance of banks from their homes, the limited level of awareness of individuals about different financial services and products, low financial literacy, lack of access to the Internet, or various psychological barriers such as distrust in financial institutions or the high cost of living for people.

The main characteristics that negatively affect the use of financial services are the income and education of an individual. Low income or low education, particularly in the financial area, can present barriers to accessing financial services. Regulators should, therefore, aim to increase financial literacy as part of their overall strategy, tailoring this education to the specific demographic group to encourage optimal use of financial services. In this way, demographic groups can make financial decisions that mitigate the adverse effects of daily risks. This approach would ensure that individuals enjoy the individual benefits of access to financial services while protecting them from potential problems from both the perspective of clients and banks.

By analysing the causes of financial exclusion, regulators can highlight the factors contributing to lower financial inclusion levels in countries. It can lead to efforts to remove some of the barriers, ultimately encouraging the use of financial services and may also have implications for a country's economic development. Increased access to formal financial services can promote economic growth by enabling individuals to manage their finances better and invest and develop businesses.

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