Determinants of Financial Inclusion in Vietnam: A Comprehensive Analysis

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List of Acronyms

AIC	Akaike Information Criterion
ATM	Automatic Teller Machine
BIC	Bayesian Information Criterion
FII	Financial Inclusion Index
GLM	Generalized Linear Model
H0	Null hypothesis
OLS	Ordinary Least Square
SBV	State Bank of Vietnam
SES	Socio-Economic Status
VHLSS	Vietnam Household Living Standards Survey
VIF	Variance Inflation Factor
VND	Vietnamese dong
WTO	World Trade Organization

Abstract

This study focuses on analyzing the determinants of financial inclusion in Vietnam, emphasizing how socio-economic factors such as gender, age, education, marital status, income and migration influence individuals' access to and usage of formal financial services. Financial inclusion is crucial for sustainable development, as it allows broader participation in the economy, particularly for vulnerable groups. However, despite Vietnam's economic progress, financial inclusion levels remain below global and regional averages. The study seeks to address the role of socio-economic elements in influencing financial inclusion. Using econometric methods OLS and GLM, the research analyzes data from both demand and supply sides to evaluate financial inclusion index in Vietnam. The findings emphasizes the magnitude of education and income as primary drivers of financial access, while other factors show limited or no impact. Higher-income individuals and married households are more likely to access financial services, while lower-income groups, especially in rural areas, face barriers despite improvements in service availability. These results suggest that policy interventions are needed to address both supply-side challenges, like service availability, and demand-side constraints, such as socio-economic disparities, to improve financial inclusion. This comprehensive analysis provides valuable insights for policymakers aiming to reduce socio-economic inequalities and enhance access to financial services in Vietnam.

Relevance to Development Studies

This research is highly relevant to Development Studies as it addresses the critical issue of why Vietnam's financial inclusion remains below the regional averages in Southeast Asia, despite significant economic advancement. By examining the effects of socio-economic factors such as age, education, income, marital status, and migration on financial inclusion, this study seeks to fill an important gap in existing literature. These insights are vital for understanding the systemic barriers that prevent vulnerable groups from accessing formal financial services. By unpacking these complexities, the research lays the groundwork for developing inclusive financial policies that not only foster equitable economic growth but also support sustainable development. The practical implications derived from this study can assist policymakers in designing strategies to bridge the financial access gap, thereby promoting broader socio-economic progress in emerging economies like Vietnam.

Keywords

Financial inclusion; socio-economic factors; behavioral economics; demand-supply side; regional disparities; Vietnam.

Chapter 1
Introduction

In recent years, financial inclusion has become a key focus in the sustainable development strategies of many countries, including Vietnam (Sarma and Pais, 2010; Yangdol and Sarma, 2019; Lyons and Kass-Hanna, 2019; Nandru et al., 2021). According to Sarma and Pais (2010), financial inclusion refers to the provision, access, and utilization of formal financial services by all members of the economy, as opposed to informal finance (Allen et al., 2016; Abel et al., 2018; Sethi and Acharya, 2018; Nandru et al., 2021; Fahmy and Ghoneim, 2023). This impact brings not only short-term positive benefits but also enhances long-term economic stability and quality of life (Allen et al., 2016; Amidzic et al., 2014; Beck et al., 2007; Lyons et al., 2017a; 2017b). This, above all, reflects the effective allocation of national resources in improving financial access (Mukhopadhyay, 2016), leading inevitably to the reduction of income inequality and poverty (Clarke et al., 2003; Beck et al., 2007; Ozili, 2020; Nandru et al., 2021; Liu et al., 2022).

In Vietnam, since the economic reforms known as "Doi Moi" in 1986, the financial system has witnessed significant development. However, the country's financial inclusion index remains lower than the regional averages of Southeast Asia and the world (Nandru et al., 2021). The percentage of adults owning a bank account in Vietnam increased from 31% in 2017 to 56% in 2021, but this is still below the global and Southeast Asian averages. This discrepancy raises questions about the underlying causes of the financial inclusion gap in Vietnam. Hence, the main aim of this study iss to to investigate the factors influencing financial inclusion and propose effective strategies to enhance financial access in this specific context.

1.1 Research gap and objectives

Although financial inclusion is a well-researched topic internationally, it remains relatively new in Vietnam. Moreover, empirical studies focus on the supply side of services, such as availability, affordability, penetration, and usage of formal financial services, while socioeconomic perspectives are less explored (Osovsky, 2012; Fahmy and Ghoneim, 2023). Additionally, Vietnam is not yet a fully developed market economy, which creates unique characteristics within its national financial system. This context highlights the need for a comprehensive study of financial inclusion in Vietnam that considers both supply and demand perspectives.

Furthermore, financial inclusion is also one of the strategic goals in the Vietnamese government's five-year development plan. According to Decision No. 149 issued in 2020, the government aims to increase the proportion of adults with transaction accounts to 80% by 2025. However, the current figures fall short of this target, prompting questions regarding the barriers hindering financial inclusion and the necessary strategies to meet this goal. Thus, this study is significant not only for contributing to the existing body of theoretical literature on financial inclusion but also for its practical implications for policy development in Vietnam.

1.2 Research contributions

Investigating the financial inclusion index is a continuing concern within many countries, especially in Vietnam. To contribute as a part of this field, the study concentrates on the impacts of socio-economic factors on financial inclusion in Vietnam – a topic that has been underexplored in previous studies. Second, the research introduces a multidimensional theoretical framework that combines the theories of Club Goods, Public Service, and the Socio-Economic Status (SES) concept. The framework provides a robust foundation for subsequent analyses of financial inclusion. Finally, this proposes concrete policy recommendations based on empirical estimations of demographic factors, such as gender, age, income, education, and migration. These insights provide policymakers with a solid basis for designing financial strategies aimed at enhancing financial inclusion in Vietnam. As a result, these contributions are both theoretical and practical, especially given the national target as outlined in Decision No. 149.

1.3 Research question

To achieve the objectives outlined above, the primary research question is: "***What is the role of socio-economic factors in determining household access to financial services in Vietnam?***" This question will be addressed by examining such elements as gender, age, education level, marital status, income, and migration to identify key determinants of financial inclusion and propose strategies for enhancing inclusive finance.

1.4 Research structure

This paper has been divided into six chapters as follows:

- **Chapter 1: Introduction** – Provides the background, problem statement, objectives, research questions, and contributions of the study.
- **Chapter 2: Theoretical Framework** – Describes the theoretical foundation based on the theories of Club Goods, Public Service, and SES concept, setting the stage for further analysis.
- **Chapter 3: Research Methodology** – Outlines the methods for data collection and analysis, as well as the econometric models employed to examine the factors affecting the financial inclusion index.
- **Chapter 4: Analysis Results** – Presents the empirical findings, comparing results across different demographic groups and geographical regions in Vietnam.
- **Chapter 5: Discussion and Policy Recommendations** – Discusses the research findings and offers policy recommendations to enhance financial inclusion in Vietnam.
- **Chapter 6: Limitations and Conclusion** – Summarizes the main findings, outlines the study's limitations, and suggests directions for future research.

Chapter 2
Literature Review

2.1 Introduction

Chapter 2 provides a comprehensive overview of theories and practical foundations for this research paper. The objective is to evaluate and analyze key theories, thereby constructing an appropriate theoretical framework to explain the determinants of financial inclusion in Vietnam. Specifically, it digs deeply into two main theoretical aspects: Club Goods and Public Service theories, combined with the SES concept, to establish a solid foundation for subsequent empirical analysis.

2.2 Financial market context of Vietnam

Vietnam's financial system has undergone extensive reforms since the 1980s, as the economy transitioned from a centrally planned model to a socialist-oriented market economy. The "Doi Moi" reforms in 1986 marked a significant turning point in the financial market structure, particularly with the separation of the SBV from commercial banking activities (Vo, 2016). These laid the appearance of a two-tier banking system, fostering the growth of both state-owned and private commercial banks. So today, Vietnam's financial system encompasses commercial banks, insurance companies, investment funds, and non-bank financial institutions that creates an all-inclusive financial network.

As participated in WTO since 2017, Vietnam experienced numerous benefits to its financial market. Notably, the open market attracted foreign investment, allowing international banks to establish branches and joint ventures, which in turn enhanced capital access and increased the competitiveness of domestic banks. However, financial liberalization has posed significant challenges like international capital flow management and financial system stability. This dependence on foreign capital heightens risks during global economic fluctuations, necessitating flexible regulatory policies from the SBV.

One of the notable highlights in Vietnamese financial landscape nowadays is the rapid development of digital financial services, driven by the expansion of FinTech companies like Momo, VNPay, and ZaloPay. These applications expand consumers' ability to access financial services, particularly in rural and remote areas where traditional banking infrastructure remains limited. However, the adoption rate of these services in rural areas remains low due to barriers such as limited telecommunications infrastructure, low financial literacy, or cash payment preference. Data on the participation and usage rates of digital financial services is also limited, complicating the accurate assessment of financial inclusion through digital channels. Therefore, this study does not consider the impact of FinTech on financial inclusion.

Despite significant progress, only a portion of the urban population has access to formal financial services, while the majority of rural residents still face difficulties in accessing these services. This highlights the essential role of the SBV in devising supportive and regulatory policies to improve financial access, especially for vulnerable and underserved areas. To implement this, the government has implemented several policies to encourage the use of financial services, such as Decision No. 149 in 2020, which aims to ensure that 80% of adults possess a transaction account by 2025. However, by 2021, the account ownership rate was only 56%, falling short of the target and lagging the global and Southeast Asian averages.

This disparity raises questions about the factors influencing on financial inclusion and the effectiveness of current policies.

In this context, Vietnam's financial sector faces an urgent need for a comprehensive theoretical framework that could fully reflect the determinants of financial inclusion. Both supply and demand elements should be considered simultanously with a focus on the roles of the State Bank (SBV) and the government in creating a favorable environment for the growth of both public and private sectors. This framework helps clarify the policy and socioeconomic factors affecting access to financial products and services. From that, suitable policy recommendations is provided to promote a sustainable financial inclusion in Vietnam.

2.3 Theoretical framework

In global circumstances, financial inclusion becomes an important policy goal, primarily for developing and emerging countries. Although financial inclusion can be defined in various ways, the core of all definitions is to ensure that all members of society, especially vulnerable groups, have the right to access formal financial services. However, most current research and theories predominatedly focus on the strong correlation between financial inclusion, inequality, and economic development (Demirgüç-Kunt et al., 2018; Beck, Demirgüç-Kunt and Honohan, 2009), with little emphasis on the behavioral factors of participating agents (Lusardi and Mitchell, 2007).

There is sizable uncertainty among academics and policymakers about the value of constructing a framework for financial inclusion. Some argue that accumulating empirical evidence is more important than focusing on building hypothesis (Ozili, 2020:2). This raise concerns that developing a theory of financial inclusion may be viewed as impractical or irrelevant to policymakers and practitioners (Thalassinos et al., 2014). A lack of a clear theoretical framework may cause research only to scratch the surface of socio-economic issues without exploiting an understanding of financial behavior, leading to strategies that do not achieve the desired effectiveness.

Therefore, a robust theory of financial inclusion is needed to move beyond traditional approaches and focus more on the socioeconomic aspect. This framework not only guides policy strategies but also provides deeper insights into how individuals and organizations interact with the financial system. As a result, inclusive financial policies are optimized, ensuring that established goals are clear and can be achieved sustainably.

2.3.1 Financial products as public goods or club goods

Most previous studies have considered financial products as public goods, which are accessible to everyone equally (Ozili, 2020:95). According to this approach, financial inclusion is seen as a fundamental right that all individuals in society can utilize. However, while this perspective has theoretical value, it does not accurately reflect the practical dynamics of the financial market. In reality, financial products do not entirely exhibit the characteristics of non-excludability and non-rivalrousness, which are typical of public goods.

Instead, this study argues that financial products should be regarded as club goods, better reflecting the nature of the market. Club goods are characterized as non-rivalrous but are excludable, meaning only individuals who meet certain criteria can access the services (Mankiw, 2018). This discloses the realities of financial access, where factors such as income, geographical location, and educational attainment play a decisive role. Viewing financial products as club goods allows for a clearer sense of access barriers and highlights the government's responsibility in balancing benefits and providing incentives for both the public and private sectors.

In Vietnam, SBV acts as a regulatory "shield", guaranteeing the stability of the national financial system. It implements policies to foster balanced development between state-owned and private banks, while supporting initiatives from the FinTech sector to enhance financial access for the population, typically in rural and underserved areas. This action assures its stability and helps create a sustainable financial environment where all sectors have opportunities to grow and compete effectively.

Moreover, viewing financial products as club goods underscores the importance of institutional trust – the public's confidence in the financial system and service providers. Institutional trust serves as a critical catalyst, bolstering the public's faith in the financial system, which in turn encourages sustainable participation and utilization of financial services. However, due to data limitations, this study does not count for its impact, highlighting a potential avenue for future research.

In short, integrating public goods and club goods theories provides an extensive theoretical framework for investigating financial inclusion. This combination not only establishes a solid hypothesis for initiating flexible policies but also aligns them with the unique socio-economic conditions of Vietnam. Thus, it ensures the active contribution of public and private sectors in forming a sustainable and reliable financial system.

2.3.2 Public service theory

Public service theory posits those fundamental financial services – including bank accounts, credit, and insurance – should be considered part of the public service infrastructure, akin to education or healthcare (Ozili, 2020:99). Due to this, government plays a pivotal role in providing financial services, ensuring that every citizen, regardless of income or social status, has equitable access. Public service theory suggests that financial inclusion is not merely an economic objective but a societal duty, where the state must ensure that no individual is excluded from the formal financial system. Access to financial services is viewed as part of social welfare, contributing to the reduction of inequality and promoting sustainable socio-economic development.

The strength of this theory lies in its ability to provide a robust framework for exploring the government's part in promoting financial inclusion. In Vietnam, where the financial market is still developing and infrastructure remains inadequate, this concept helps to elucidate why SBV intervention is necessary to expand financial services and reduce access barriers for marginalized groups and rural populations. Preferential interest rates offered for commercial banks, providing financial support to the FinTech sector, or encouraging innovation are common instances featuring the role of government in enhancing financial access.

Although public services theory offers a well reference framework for grasping the government's role, the absence of the private sector's involvement may present practical limitations. The government alone may not be able to meet the diverse needs of the market, particularly in emerging economies like Vietnam. In such cases, a collaborative approach between the public and private areas seems as the most effective way to expand financial services to underserved areas. Public-private cooperation leads to an optimization in resource allocation and innovation, then upgrading the efficiency of financial service delivery, and ensuring its sustainable development process.

2.3.3 How if it combines?

The club goods and public service theories combine to bring an in-depth theoretical framework tailored to the Vietnamese financial market. Public service theory emphasizes the

role of the government and SBV in ensuring constancy and equitable access to financial services, while club goods theory highlights actual barriers, showing that access often depends on criteria like income and education.

This combined method offers a holistic view, addressing the limitations of single-theory models. It also allows for a deeper analysis of the government's regulatory role in fostering sustainable development across both sectors, leading to adaptive policies that enhance financial inclusion. Hence, this framework helps bridge existing gaps in the literature and offers actionable insights for policymakers to address structural and behavioral barriers, facilitating a more inclusive financial system.

2.3.4 Enhancing the framework with SES concept

Socio-Economic Status (SES) is a theoretical concept developed based on studies of class and social stratification. According to Hauser and Warren (1997), SES is often used as a shorthand to describe variables that characterize the position of individuals, families, households, or other groups in society, related to their ability to produce or consume valuable goods.

SES reflects the position of an individual or group within the stratified structure of society through the measurement of indicators such as income, education, and occupational status. Income determines an individual's ability to access goods, services, and opportunities, directly impacting their quality of life and social mobility (Duncan, 1961). Occupational status represents the prestige or social standing of an individual's job or profession. Higher-status occupations typically provide higher income, stability, and greater access to influential networks (Hauser & Warren, 1997). Education is not only a direct indicator of SES but also a pathway to achieving higher SES, influencing knowledge, skills, and attitudes and being a crucial determinant of occupational status and income (Hout, 2012).

SES plays a significant role in shaping an individual's lifestyle, health, and access to resources. It affects outcomes in health, education, and financial behavior (Bradley and Corwyn, 2002; Oakes and Rossi, 2003). Individuals with higher SES tend to have better access to healthcare, achieve higher levels of education, and enjoy more stable and lucrative employment opportunities. These advantages create a cycle of prosperity, where wealth and status generate more wealth and status (Lynch & Kaplan, 2000). Conversely, lower SES is associated with various disadvantages, including poorer health outcomes, lower educational achievement, and limited access to financial resources. Individuals from lower SES backgrounds often face barriers to social mobility, such as limited access to quality education and restricted influential networks, perpetuating cycles of poverty and social inequality (Adler et al., 1993).

When combined with the two previously mentioned theories of public good and public service, SES enhances the theoretical framework by providing deeper insights into the socio-economic factors that influence financial inclusion from both demand and supply perspectives.

From the demand side: SES allows for a more detailed analysis of the barriers that individuals with low SES face when accessing financial services. This clarifies the public good theory by emphasizing that not all individuals in society have equal opportunities to access financial services, even when these are provided for free or considered public goods.

From the supply side: SES also adds depth to the public service theory by clarifying the necessity of tailoring inclusive financial policies to specific target groups based on their socio-economic circumstances. This ensures that policies not only encompass the entire society but are also particularly effective in helping the most vulnerable groups overcome barriers and improve their economic conditions.

The combination of the club goods, public service theories, and SES creates a comprehensive theoretical framework that helps better understand how financial inclusion can be implemented and maintained sustainably and equitably. This also emphasizes that, in addition to macroeconomic and institutional factors, socio-economic factors and individual behaviors play an important role in achieving the goals of financial inclusion.

2.4 Empirical studies

There are many approaches and definitions of financial inclusion. One of them views it as the opposite of financial exclusion – the process of preventing disadvantaged individuals from accessing the economic system (Leyshon and Thrift, 1995). According to Demirgüç-Kunt et al. (2015), financial inclusion involves individuals and organizations having a bank account, using it regularly, and making payments quickly and affordably. Similarly, another popular definition describes financial inclusion as the provision, access, and use of formal financial services by all members of the economy (Sarma and Pais, 2010; Allen et al., 2016; Abel et al., 2018; Sethi and Acharya, 2018; Nandru et al., 2021; Fahmy and Ghoneim, 2023).

Most studies consider financial inclusion on the supply side as a multidimensional factor with three main dimensions: access, usage, and quality of formal bank accounts (BCBS, 2015; G20 Global Partnership on Financial Inclusion 2016a, 2016b; Sarma, 2016). Access to accounts is considered the foundation for expanding and using other financial services such as savings, loans, credit, investment, and payments in both the formal and informal sectors (ADB, 2016, 2017; Davutyan and Öztürkkal, 2016; Demirgüç-Kunt and Singer, 2017; Lyons et al., 2018).

However, current research primarily focuses on service delivery, while socioeconomic aspects are less explored (Osovsky, 2012; Fahmy and Ghoneim, 2023). This is understandable because supply-side data is often available and regularly updated by financial regulators or government agencies. In contrast, demand-side data is often unavailable in many countries, including Vietnam, and requires preliminary surveys of individuals or households.

Hence, this study bridges the gap by deeply examining the socio-economic factors influencing financial inclusion in Vietnam. This analysis provides a broad perspective, enabling policymakers to better understand consumer behavior and subsequently develop tailored strategies that align with the specific socio-economic context of the country.

2.4.1 Financial inclusion: From a supply-side lens

Financial inclusion is more than merely having a bank account or using financial services regularly. From a service provision perspective, it includes both the physical and digital presence of financial institutions, such as bank branches or ATMs. The primary goal is to ensure that everyone, regardless of geographical or economic circumstances, can access and utilize formal financial services. It enables researchers and policymakers to assess the effectiveness of current strategies and recommend improvements, focusing not only on accessibility but also on the efficient usage of these services. However, access alone does not guarantee comprehensive financial inclusion; without actual usage, the concept loses its intended impact.

Usage

Financial inclusion, from a supply-side perspective, is often understood through the concepts of access and usage of formal financial services. Access refers to the physical and digital presence of financial institutions, such as bank branches and ATMs, while usage pertains to

the actual utilization of these services by individuals and businesses, including borrowing, saving, insurance, financial investment, or the use of ATM services (Camara & Tuesta, 2014; Sarma, 2016). The traditional approach assumes that enhancing access to financial services will naturally lead to increased usage, thereby improving financial inclusion.

Although access is a crucial component of financial inclusion, it is insufficient for a comprehensive evaluation. Having access without actual usage renders the concept meaningless. Access that does not translate into usage will not achieve the core objective of financial inclusion, which is to integrate individuals into the formal financial system (Beck, Demirgüç-Kunt and Honohan, 2009). Conversely, the level of usage implies that access barriers have been overcome. If financial services are being utilized, it indicates that individuals have surpassed access challenges. Therefore, usage has become the primary measure of financial inclusion in numerous studies, as it more accurately reflects the actual impact of financial services on individuals and businesses (Demirgüç-Kunt and Klapper, 2013; Allen et al., 2016).

In Vietnam, financial inclusion from the service provision perspective has become a focal point for policymakers and researchers, particularly within the broader context of the country's economic and social development goals. The presence and accessibility of financial services have been unevenly distributed nationwide, with significant disparities between urban and rural areas. Urban centers are generally better served by a dense network of banks and financial institutions, while rural and remote areas, particularly in the northern and central highlands, often face considerable barriers to access (Nguyen and Nguyen, 2020). Consequently, a thorough examination of these factors is essential for researchers and policymakers to gain a comprehensive understanding and more accurate assessment of the situation, thereby formulating appropriate strategies.

Affordability

Affordability in the context of financial inclusion refers to the relationship between the costs of financial services and the income of users. High costs are associated with maintaining bank accounts, transferring money, or accessing credit. These are such barriers to financial inclusion, particularly for low-income individuals. So, it plays a crucial role in determining whether individuals' access and utilize financial services.

Numerous studies have analyzed the impact of financial service costs on accessibility and usage, finding that high fees and interest rates often exclude the most vulnerable populations from the formal financial system (Cull, Ehrbeck and Holle, 2014). In Vietnam, high transaction fees and account maintenance costs represent major barriers to financial inclusion, especially for rural communities and low-income households (Le, 2017). The State Bank of Vietnam has recognized these challenges and implemented policies aimed at reducing these costs, such as capping fees for basic banking services and promoting low-cost financial products (Demirgüç-Kunt et al., 2018).

Many studies have explored the relationship between the cost of financial services and individuals' access to the formal financial system. However, there is still considerable debate regarding which representative variables should be used to measure affordability. Some studies focus on transaction fees, while others consider account maintenance fees (Cull, Ehrbeck, and Holle, 2014). This highlights the need for a standard measure to assess the level of affordability, especially in developing economies like Vietnam.

2.4.2 Financial inclusion: From a demand-side lens

As for the concept of socio-economic status, human behavior varies based on personal and socio-economic factors. Different demographic and personality characteristics lead to

different behavioral decisions. This highlights the significance of examining financial inclusion from the demand-side perspective. It enables researchers and policymakers to observe and develop strategies to promote appropriate financial behaviors.

Gender

Regarding gender, the number of account holders has increased significantly, but the gender gap still exists in many countries (Demirgüç-Kunt et al., 2018). When classified by gender, disparities between men and women remain, especially in developing and emerging economies (Asuming et al., 2018; Yangdol and Sarma, 2019; Kaur and Kapuria, 2020). The report from Global Findex 2021 shows a global gender gap of 4 percentage points, with 78% of men having an account compared to 74% of women. Although this gap is narrowing in developing countries, it is still 6 percentage points higher than the global average.

In Western countries, women generally have better access to financial services compared to most Asian women, thanks to stronger legal protections and policies that safeguard women's rights. This results in higher financial awareness among women in the West. Conversely, in many Asian countries, traditional gender biases often hinder women's financial inclusion. For instance, in India, women typically face more challenges in accessing financial services than men due to lower levels of education and employment (Chandralekha and Rimita, 2019). In Vietnam, similar barriers are observed. Women have less access to financial products and services because financial institutions are often located far away, or because another family member already holds an account (Tram and Nguyen, 2023).

It can be said that women tend to have lower levels of financial access and usage than men – a trend confirmed across various countries. Moving on now to consider the broader cultural and social context to gain a nuanced comprehension when assessing the gender impact.

Age

Age is also essential to financial inclusion (Demirgüç-Kunt & Klapper, 2012). The "generation effect" suggests that older people use formal financial services more than other age groups (Fungáčová and Weill, 2015). This is because of their accumulated financial experience and higher trust in formal financial system. Similarly, Asuming et al. (2018) confirmed a positive correlation between age and financial inclusion, showing that financial coverage increases with age, particularly for African populations over the age of 30. Adversely, research by Aga and Martinez (2014) and Fahmy and Ghoneim (2023) showed that older African household members are less likely to have bank accounts.

In addition, Allen et al. (2016) found a non-linear relationship between age and financial inclusion. Though age variable has no significant effect, the square of age has a negative one. This correlation points out that people tend to have higher inclusion as they reach a certain age (Tram and Nguyen, 2023). Physical health, retirement or lack of demand are barriers that seem to prevent them from using financial products and services.

Therefore, the age factor also needs to be considered. As it not only reflects behavioral differences but also highlights disparities in access and usage of financial services. This consideration is especially relevant for digital finance – things that be forecasted to become a boom in Vietnamese finance market in future.

Education

Education is an indispensable component of financial inclusion, providing the knowledge and numeracy skills needed when conducting financial transactions (Atkinson and Messy, 2013). In countries with low levels of education and high illiteracy rates, access to formal financial services is often uncommon (Esquivias et al., 2020). It means the higher education

acheivement, the greater financial literacy that someone can have – or it can say education and financial inclusion are positively correlated.

Research by Morgan and Trinh (2019) on the impact of socio-economic factors on financial literacy in Cambodia and Vietnam supports this relationship. Their findings indicate that individuals with higher educational attainment have better access to financial services and possess a deeper insight of financial products. Additionally, a global study by Yangdol and Sarma (2019), using World Bank data, affirmed the positive effect of education on financial inclusion across 142 countries. Both studies revealed that improvements in education levels are associated with significant increases in financial inclusion.

Lack of education, then, leads to limited literacy, numeracy skills, and language barriers, creating obstacles to the use of formal financial services (Atkinson and Messy, 2013), including the use of technology (Diniz et al., 2012). Therefore, education is considered an important factor in promoting personal behavioral change, such as the ability to access and use financial services (Allen et al., 2016; Abel et al., 2018).

Income

Income has a strong impact on financial inclusion as it determines an individual's ability to access and use financial services. According to the research by Demirgüç-Kunt and Klapper (2012), higher-income individuals tend to use formal financial services more frequently. This is because those with higher incomes not only have the ability to open bank accounts but also can access more complex financial products such as investments, credit, or insurance.

Other studies also reinforce the view that income level directly affects the ownership of financial services and products, including basic services such as bank accounts, affordable credit, remittances, and insurance (Singh and Tandon, 2012). Furthermore, financial service providers often target individuals with stable incomes to offer their products and services, leading to financial exclusion for low-income individuals (Esquivias et al., 2020). The lack of financial services for low-income individuals can result in a cycle of poverty, difficulties in saving, and an inability to take advantage of financial opportunities.

Thus, analyzing the impact of income on financial inclusion provides deeper insights into the disparities between different income groups in accessing financial services, thereby suggesting appropriate financial policies.

Marriage status

Marital status also has a significant impact on financial inclusion, particularly in managing household finances and accessing formal financial services. Research by Demirgüç-Kunt and Klapper (2013) indicates that married individuals tend to have higher levels of financial access compared to those who are unmarried. This may be because married households often face greater living expenses, leading them to open bank accounts, take out loans, or purchase insurance products to manage their personal finances more effectively.

Moreover, marital status influences household spending, saving, and investment decisions. Married families may have stronger motivations to access financial services to ensure economic stability, especially when they need to cover large expenses such as raising children, buying a home, or investing for the future. However, this does not mean that unmarried or single individuals have less financial access; rather, they may have more flexibility in spending and investing in various financial products. Therefore, marital status is an important variable that should be considered.

Migration

Finally, migration is a significant factor influencing financial inclusion, particularly in developing countries. Migration can be categorized into two main types: rural-to-urban migration and international migration. However, due to data limitations, this study focuses on scrutinizing the impact of rural-to-urban migration, especially towards major cities and centrally governed urban areas.

Existing studies suggest that rural-to-urban migration is often associated with improved access to financial services. The high density of bank branches, ATMs, and digital financial facilities in urban areas provides migrants with more options and easier access to banking services, credit, and other financial products (Zhang et al., 2024).

Nevertheless, barriers still occur, such as for migrants who lack identification documents or sufficient financial literacy. Research by Zhang et al. (2024) emphasize that despite migration offering increased access to financial services, migrants may face difficulties in fully utilizing these services due to a lack of information or insufficient understanding of financial products.

As discussed above, migration demonstrates a positive relationship with financial inclusion by authorizing individuals to relocate to areas with better financial infrastructure and more job opportunities, thus encouraging financial services usage. So, it can be seen as a key variable from the demand-side aspect, clarifying its impact on financial access in Vietnam – where labor migration is a major concern of the economy, yet remains underexplored in current financial inclusion studies.

2.5 Chapter conclusion

Chapter 2 establishs a theoretical framework for financial inclusion by integrating club goods theory, public service theory, and socio-economic status (SES) concept. This work brings a better viewpoint from both supply- and deman-side factors. Also, this fills the existing research gap, which mainly focuses on the supply-side aspects rather than incorporating socioeconomic factors.

In the context of Vietnam, despite notable progress in expanding financial inclusion, significant disparities persist across income groups and geographic areas. Therefore, inclusive financial policies should not only aim to expand access but also consider socio-economic elements. This is a crucial foundation for the study, enabling a comprehensive investigation of financial inclusion dynamics in Vietnam and guiding the formulation of policy recommendations tailored to the country's current socio-economic context.

Chapter 3
Methodology

3.1 Data descriptive

The research data in this study is drawn from the Vietnam Household Living Standards Survey (VHLSS) 2020, conducted by the General Statistics Office of Vietnam. This investigation provides a broad view of Vietnamese households' living standards, thereby authorizing an in-depth assessment of the country's economic development strategies and poverty alleviation efforts. The dataset comprises responses from 11,571 households across the nation, capturing a wide range of demographic and economic characteristics such as gender, age, educational attainment, income level, marital and migration status.

In addition, this study estimates another key variable "Affordability" to assess households' ability to pay for financial services. Its value is calculated based on available information, partly reflecting the financial inclusion level in Vietnam. Details on how to calculate this will be presented in the Appendix.

3.2 Economics estimation

3.2.1 Measurement of Financial Inclusion Index

The Financial Inclusion Index (FII) is constructed based on three main aspects: account ownership, savings, and borrowing. Following the method of Lyons and Kass-Hanna (2019), the relevant questions were extracted from Section 8 of the VHLSS, including 8 binary questions aimed at measuring whether households utilize formal financial products such as bank accounts, credit cards, or insurance.

Table 3.1 Financial Inclusion Questionnaires Descriptive

Variable	Type	Question
m8c3a	Dummy (1 = Yes)	Has your household got a bank account at this moment?
m8c3b	Dummy (1 = Yes)	Has your household got a savings book at this moment?
m8c4a	Dummy (1 = Yes)	Has your household used an ATM (Debit) card at this moment?
m8c4b	Dummy (1 = Yes)	Has your household used a credit card at this moment?

m8c4c	Dummy (1 = Yes)	Has your household got any life insurance at this moment?
m8c4d	Dummy (1 = Yes)	Has your household got any non-life insurance at this moment?
m8c4e	Dummy (1 = Yes)	Has your household got any stock or securities at this moment?
m8c5	Dummy (1 = Yes)	Has your household borrowed any money or goods over the last 12 months?

Each question is coded as a binary variable with a value of 1 if the household uses the financial product or service and 0 if not. These questions cover the three main aspects of financial inclusion: accessibility, usage, and borrowing capacity, providing the foundation for calculating the FII.

Additionally, the study incorporates an important variable "Affordability", to expand the scope of financial inclusion assessment. This allows the FII to not only reflect the behavior of using financial services but also to consider the bearing of these services.

Measurement of Affordability

Affordability is used to assess the alignment between the cost of using financial services and the income of individuals, particularly in the context of low-income households. However, the data collected from the VHLSS does not distinguish which bank services the surveyed individuals use. Therefore, the author made several adjustments to create a representative variable for affordability.

Its calculation is based on the average annual fee for debit and domestic payment cards, estimated to be around 75,000 VND[1] per year. To assess the level of affordability, the author uses the ratio of this financial service fee to the average annual income of each household. The adjusted formula is as follows:

$$Affordability = \frac{Average\ annual\ fee}{Average\ household\ income}$$

where the average annual fee represents the estimated cost for financial services, specifically for debit and domestic payment cards. The average household income is taken from VHLSS data, representing the annual average income of households in each province.

This Affordability index allows for an evaluation of the financial cost difficulties that households face when accessing financial services. A higher ratio indicates lower affordability, meaning that households experience greater challenges in accessing financial services due to high costs.

After calculating the index for each province, the author also performs Min-Max normalization to bring this value into a range from 0 to 1, facilitating the comparison of affordability levels among the provinces. The normalization formula is as follows:

[1] The annual fees for debit and domestic payment cards at banks in Vietnam range from 50,000 to 100,000 VND. Therefore, the average estimated fee is 75,000 VND.

$$Normalized\ Affordability\ = \frac{Affordability\ -\ Min\ Affordability}{Max\ Affordability\ -\ Min\ Affordability}$$

where Min Affordability represents the province with the lowest ratio of financial service costs to income, meaning it has the highest affordability. In contrast, Max Affordability represents the province with the highest ratio of financial service costs to income, meaning it has the lowest affordability.

This normalization method ensures that the province with the lowest Affordability receives a value of 1 (indicating the best affordability), while the province with the highest Affordability receives a value of 0 (indicating the worst affordability), with other provinces having values ranging from 0 to 1. This allows the author to compare the affordability of financial services comprehensively and clearly.

Measurement of Financial Inclusion Indicator

The FII for each household is calculated by summing all the binary variables from the 8 questions about financial inclusion, combined with the standardized affordability variables. Then, it ranges from 0 to 9, where 0 represents the lowest level of financial inclusion and 9 represents the highest.

To standardize for econometric analyses, we use the z-score normalization method with the following formula:

$$\mathrm{FII}_{\mathrm{z-score}} = \frac{\mathrm{FII\ score} - \ \mathrm{mean(FII\ score)}}{\mathrm{sd(FII\ score)}}$$

The adjusted FII reflects the relative comparison between households and regions, with values closer to 1 indicating a higher level of financial inclusion, and conversely, values closer to 0 indicating a lower level of financial inclusion.

3.2.2 Empirical research model

To examine the factors affecting the financial inclusion of households, the study employs Ordinary Least Square (OLS) and Generalized Linear Model (GLM) model with two cases: with and without the control variable i.tinh. The dependent variable is the FII z-score of households, with the main independent variables, including gender, age, the square of age, education level, marital status, income, migration and the interaction variable between education level and income.

$$\mathrm{FII\_zscore}_i = \beta_1 + \beta_2 \mathrm{gender}_i + \beta_3 \mathrm{age}_i + \beta_4 \mathrm{age}_i^2 + \beta_5 \mathrm{education}_i + \beta_6 \mathrm{marriage}_i + \beta_7 \mathrm{income}_i + \beta_8 \mathrm{migration}_i + \beta_9 \mathrm{educome}_i + \varepsilon_i$$

Table 3.2 Research Model Descriptive

Variable	Description
$\mathrm{FII\_zscore}_i$	Financial Inclusion Index (*FII_zscore*) of household *i*
gender_i	Gender of household *i* (0 = female, 1 = male)
age_i	Age of household *i*
age_i^2	Square of age

education_i	Education level of household *i* (0 = no degree, 1 = primary, 2 = lower secondary, 3 = upper secondary, 4 = college, 5 = university or higher)
marriage_i	Marital status of household *i* (0 = single, 1 = married)
income_i	Logarithm of household *i* income
migration_i	Migration of household *i* (0 = no migration, 1 = migration but not 5 municipal cities, 2 = migration to 1 of 5 municipal cities)
educome_i	Interaction variable between education level and income of household *i*
ε_i	Random error in the regression model

The variable age_i^2 is included in the model to test the nonlinear relationship between age and financial inclusion. The hypothesis posits that age and the Financial Inclusion Index are correlated non-linearly; that is, as age increases, the index rises to a certain point and then gradually declines if age continues to increase. This reflects the reality that younger and middle-aged individuals tend to use more financial services to meet their needs for borrowing, investment, or consumption. However, as age increases, the demand for complex financial services diminishes, resulting in a negative impact of age in later stages.

Additionally, the variable educome_i is included in the model to examine the combined effect of these two factors on financial inclusion. This is important because education level and income often have a complex relationship, and their impacts on the FII may not be completely independent.

Education equips individuals with the knowledge and skills necessary to access and use complex financial products, but the utilization of these financial products also depends on their actual financial capacity, namely income. Conversely, high income may allow individuals to access more financial services; however, without a high level of education, they may not be able to use financial products effectively.

Thus, the variable educome_i helps to investigate whether the impact of education level on the FII depends on the household's income level. This is significant in identifying household groups that may need additional support in financial education to optimize their use of financial services, even if they have good income.

Measurement of Income

Household income is calculated as the total income from various sources, including wages, salaries, and other economic activities. The formula for calculating income is as follows:

$$\begin{aligned}\text{income}_{i,t} = {} & \text{m4atn}_{i,t} + \left(\text{m4b1t}_{i,t} - \text{m4b1c}_{i,t}\right) + \left(\text{m4b2t}_{i,t} - \text{m4b2c}_{i,t}\right) \\ & + \left(\text{m4b22t}_{i,t} - \text{m4b22c}_{i,t}\right) + \left(\text{m4b3t}_{i,t} - \text{m4b3c}_{i,t}\right) + \\ & \left(\text{m4b4t}_{i,t} - \text{m4b4c}_{i,t}\right) + \left(\text{m5b1t}_{i,t} - \text{m5b1c}_{i,t}\right) \\ & + \left(\text{m4ct}_{i,t} - \text{m4cc}_{i,t}\right) + \text{m4dtn}_{i,t}\end{aligned}$$

Table 3.3 Income Calculation Descriptive

Variable	Description
$\mathrm{m4atn}_{i,t}$	Total income from wages and salaries of household *i*
$\mathrm{m4b1t}_{i,t}, \mathrm{m4b1c}_{i,t}$	Total income and expenses from agricultural production activities
$\mathrm{m4b2t}_{i,t}, \mathrm{m4b2c}_{i,t}$	Income and expenses from livestock production
$\mathrm{m4b22t}_{i,t}, \mathrm{m4b22c}_{i,t}$	Income and expenses from other production activities
$\mathrm{m4b3t}_{i,t}, \mathrm{m4b3c}_{i,t}$	Income and expenses from forestry activities
$\mathrm{m4b4t}_{i,t}, \mathrm{m4b4c}_{i,t}$	Income and expenses from fishery activities
$\mathrm{m5b1t}_{i,t}, \mathrm{m5b1c}_{i,t}$	Income and expenses from small business activities
$\mathrm{m4ct}_{i,t}, \mathrm{m4cc}_{i,t}$	Income and expenses from non-agricultural activities
$\mathrm{m4dtn}_{i,t}$	Other income sources from household *i*

These variables allow for the calculation of total household income based on various sources of income and expenses, ensuring the completeness of the income variable in the regression model.

3.2.3 Analytical method

This study employs two primary regression methods: Ordinary Least Squares (OLS) and Generalized Linear Model (GLM), to examine the impact of demographic and socio-economic factors on the FII of households in Vietnam. The OLS method is the basic choice for estimating the relationship between the dependent variable and independent variables when the dependent variable is continuous. However, during the analysis, the data recorded the phenomenon of heteroskedasticity. This means that the variance of the errors is not uniform, which reduces the accuracy of estimates from the OLS method. To address this issue, the GLM method was used to enhance the accuracy and efficiency of the model.

Another important factor in the model is the control variable i.tinh. This variable is used to control for differences in socio-economic conditions among provinces, which may affect access to financial services. By adding i.tinh to the model, the study can eliminate the impact of geographical location, leading to more accurate estimates. The study conducts both OLS and GLM analyses with two scenarios: with and without the control variable i.tinh.

Ordinary Least Squares Method

Ordinary Least Squares is a fundamental linear regression method that estimates the parameters of the model based on the relationship between the dependent variable ($\mathrm{FII\_zscore}_i$) and independent variables such as age, gender, education level, marital status, and income. OLS seeks to minimize the sum of squared errors between the actual values and the predicted values of the dependent variable to determine the linear relationship among the variables.

The OLS method is based on several important assumptions. First, it assumes that the relationship between the dependent variable and independent variables is linear. Second, independent variables should not exhibit high correlation with each other (no multicollinearity). Third, it assumes that the variance of the errors is homogenous (or homoskedasticity), meaning the variance of the errors does not change with the values of the independent variables. Finally, the random errors in the model are assumed to follow a normal distribution.

The advantage of the OLS method is that it provides easily interpretable and quick estimates when these assumptions are met. However, if heteroskedasticity occurs, the results from OLS may lack accuracy. In this study, OLS is applied in two scenarios: without the control variable i.tinh *(to analyze the effects of factors without considering differences between provinces)* and with the control variable i.tinh *(to eliminate the impact of geographical location and differing conditions among provinces)*.

Generalized Linear Model Method

This approach is chosen to address issues caused by the heteroskedasticity phenomenon detected during the data analysis (see Appendix B). GLM is a generalized regression method that does not require strict assumptions about homoscedasticity like OLS. This method allows for the use of models with various distributions for the dependent variable, ensuring that estimates remain accurate even when the data is heterogeneous.

In this study, the inverse Gaussian distribution is selected for GLM because the FII contains negative values and does not follow a normal distribution. Heteroskedasticity has also been recorded. Tests to determine the appropriate distribution for GLM, including the reasons for choosing the inverse Gaussian, have been conducted, and detailed results are presented in the appendix.

The GLM method has a significant advantage in handling data with non-normal distributions and effectively controlling heteroskedasticity. This enhances the model's accuracy and ensures that the estimated results are reliable. Similar to OLS, GLM is also applied in two scenarios: with and without the control variable i.tinh, helping the examination eliminate geographical differences and access conditions for financial services among localities, thus providing more accurate and comprehensive results.

3.3 Chapter conclusion

In summary, combining both OLS and GLM allows the study to comprehensively assess the impact of demographic and socio-economic factors on the financial inclusion of households. While OLS serves as the basic method for testing linear relationships, GLM is used to handle more complex issues in the data, especially when heteroskedasticity is present, ensuring that the estimated results achieve the highest accuracy.

Chapter 4
Results & Analysis

4.1 Introduction

This chapter presents the analysis results regarding the impact of demographic and socio-economic factors on the FII of households in Vietnam. First, the interaction variable $educome_i$ was removed from the model due to causing multicollinearity, which reduced the accuracy of the estimates (see Appendix A). To address this issue, the author applied two main regression methods – OLS and GLM. Both methods were implemented with and without the control variable i.tinh to account for geographical differences among provinces.

The first part of the chapter provides descriptive statistics on the demographic characteristics and income of households, clarifying the context and social characteristics of the research sample. Next, the regression results are presented to assess the impact of factors such as age, gender, education level, marital status, and income on the FII. The regression methods are used to examine the validity and effectiveness of the model in analyzing the level of financial inclusion in Vietnam.

4.2 Descriptive statistics

4.2.1 Socio-Economics descriptive

Table 4.1 presents the demographic characteristics and income of 11,571 households in the research sample, providing an overview of the social structure of the Vietnamese population. This table not only clarifies the context for deeper analyses of access to and use of financial services but also opens opportunities to explore the relationship between social factors and financial aspects.

Table 4.1 Socio-economics Descriptive Statistics

Variable	Observation	Mean	Standard Deviation	Min	Max
gender	11,571	0.4955492	0.5000018	0	1
age	11,571	35.81722	20.67841	1	100
education	11,571	1.895083	1.421122	0	5
marriage	11,571	0.542304	0.4982287	0	1
income	11,571	214927.4	342713.4	5092	2.39e+07
migration	11,571	0.0068274	0.0913079	0	2

As can seen from the table, gender has average value around 0.4955, indicating that the gender ratio in the sample is nearly balanced, with an equivalent number of males and females. This ensures representativeness for the analysis results and reflects gender diversity

in the study, helping to ensure that subsequent analyses are not biased towards any particular gender.

As for age, mean is 35.82 with a standard deviation of 20.68. This states that the research sample includes a wide range of age groups, from children (1 year old) to the elderly (100 years old). The significant variability in age within the sample may influence financial behavior, especially in terms of access to and use of financial services among different age groups. Adults, particularly those of working age, may have a higher tendency to use financial services.

Regarding education level, 1.89 is the recorded average value. It means most households have an education level equivalent to lower secondary or upper secondary school. This demonstrates that education level has an effect on individuals' financial awareness and behavior, particularly their ability to understand and use complex financial products/services.

For marital status, the average value is 0.5423, reflecting that 54.23% of households in the sample are married. This indicates a relatively high rate of married households, which may affect their spending, saving, and investment structures, as families typically bear larger living expenses such as child-rearing and general living costs.

The average income is 214.93 million VND per year, with a standard deviation of 342.7 million VND per year. The significant gap between the minimum value (5.092 million VND) and the maximum (23.9 billion VND) indicates a large income disparity among surveyed households. This difference not only affects access to financial services but also reflects financial inequality within society. Households with lower incomes may face greater challenges in accessing formal financial services, resulting in lower financial inclusion compared to higher-income households.

In terms of migration pattern, the mean value of 0.0068 with a standard deviation of 0.0913 shows a very low migration rate within the sample. The range from 0 to 2 captures different levels of migrations, including non-migration, inter-provincal migration excluding major cities, and migarion to 1 of 5 municipal cities. This status may influence financial access, ass migrants moving to urban areas often have more opportunities to engage with financial services compared to those in less developed regions.

In summary, these demographic characteristics suggest that factors such as gender, age, education, income, and migarion may have varying impacts on the ability to access and use financial services, warranting further analysis to clarify the influencing factors on the FII.

4.2.2 Financial inclusion indicatior descriptive

Table 4.2 presents descriptive statistics for the FII_zscore, reflecting the level of financial inclusion among 11,571 households in the research sample.

Table 4.2 FII_zcore Descriptive

Statistics	**Values**
Number of Observations	11,571
Mean	-3.00e-11
Standard Deviation	1
Min	-1.090995
Max	4.214895

1st Percentile	-1.083036
5th Percentile	-1.07681
10th Percentile	-1.071839
25th Percentile	-1.04956
50th Percentile	-0.3021795
75th Percentile	0.4450992
90th Percentile	1.192331
95th Percentile	1.93285
99th Percentile	2.687905
Skewness	0.6903047
Kurtosis	2.896998

The mean value of the FII_zscore is -3.00e-11, indicating that most households have a level of financial inclusion below the average. The standard deviation is 1, suggesting significant variability within the sample, with some households experiencing high levels of financial inclusion while others face challenges.

Analyzing the percentiles reveals a clear disparity in financial inclusion among households. For instance, at the 25th percentile, the value is -1.049, while at the 75th percentile, it is 0.445. This shows that 50% of households have a financial inclusion index below -0.302, reflecting an uneven distribution and considerable gaps between groups.

The skewness value is 0.6903 or data has right-skewed shape, meaning that a small number of households have high financial inclusion scores, while the majority have lower scores. The kurtosis value is 2.897, which is close to 3, suggesting that the distribution is not excessively peaked, and the concentration of values is relatively even.

These results display remarkable variation in the FII among households, which need to be further examined and interpreted through multivariate analysis methods such as GLM to better understand the impact of demographic factors on financial inclusion.

4.3 Data processing

Before implementing the regression step, it is crucial to clarify the data processing of FII in this study. Initially, FII_zscore contained negative values, which could pose issues when applying GLM due to its condition about a positive one. To deal with this, the author adjusted the variable by adding a fixed constant (1.1), creating the new variable FII_zscore_transformed. This modification not only meets the requirement of GLM but also preserves the integrity of the data for subsequent analysis.

Though OLS does not demand the same restriction, tests showed that regression results using FII_zscore and FII_zscore_transformed as dependent variables did not exhibit any differences. Thus, FII_zscore_transformed is utilized for both OLS and GLM methods to maintain its consistency and minimize potential bias across models. This work ensures uniformity in the interpretation of results and enhances the robustness of the findings.

4.4 Regression results

As validating the suitability of GLM analysis, key indicators such as AIC and BIC are used to explain (see Appendix C). The AIC (8.65) and BIC (1,107.47) values of GLM are significantly lower than these indexes of OLS (30,227.69 and 30,742.63 are respectively) while being controlled by provincal factor. This substantial disparity indicates that the GLM offers a better fit and is less sensitive to model complexity, confirming its superiority in capturing the effects of demographic and geographical factors on financial inclusion, especially given the right-skewed and dispersed nature of the data.

Table 4.3 presents the regression results from both OLS and GLM methods, highlighting the differences between with and without i.tinh. This helps account for geographical differences among the 63 provinces, as access to financial services can vary significantly based on the economic conditions and infrastructure of each region.

Table 4.3 Regression Estimates Results

Variables	(1)	(2)	(3)	(4)
	OLS	**OLS(1)**	**GLM**	**GLM(1)**
age	-0.001	-0.000	0.003	0.006
	(0.002)	(0.002)	(0.002)$^{+}$	(0.002)**
age2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)**	(0.000)**
education	0.079	0.066	0.080	0.070
	(0.006)**	(0.006)**	(0.007)**	(0.007)**
gender	-0.026	-0.030	-0.016	-0.029
	(0.017)	(0.017)$^{+}$	(0.019)	(0.021)
marriage	-0.008	-0.008	-0.042	-0.043
	(0.024)	(0.024)	(0.027)	(0.029)
ln_income	0.554	0.556	0.520	0.534
	(0.013)**	(0.013)**	(0.012)**	(0.014)**
migration	-0.013	-0.051	0.137	0.053
	(0.093)	(0.092)	(0.125)	(0.132)
_cons	-5.633	-5.560	-6.337	-6.495
	(0.158)**	(0.172)**	(0.150)**	(0.186)**
N	11571	11571	11571	11571
r2	0.171	0.211		

Note: Standard errors in parentheses, $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$

Also, the regression results indicate that factors such as age, education level, and income all have consistent and statistically significant impacts on FII.

Impact of age

The OLS regression results (column (1) and (2)) display that age does not hold statistical significance or it can be said that age may have no impact on financial inclusion. However, this analysis by GLM shows a positive effect with coefficients of 0.003 (p-value < 0.10) and 0.006 (p-value < 0.01), respectively. This implies that with each additional year of age, the financial inclusion index increases by approximately 0.6% (e^(0.006) ≈ 1.006). The findings reflect an increasing trend in access to financial services as individuals grow older. The discrepancy between OLS and GLM results may stem from the GLM's capacity to better manage non-linear data distributions, thereby revealing complex and latent relationships between age and financial inclusion that OLS may overlook.

However, the age-squared variable in the GLM exhibits a negative coefficient (-0.000) with high statistical significance (p-value < 0.01), demonstrating a non-linear relationship between age and financial inclusion, consistent with the theory of diminishing returns. Specifically, the positive impact of age on financial inclusion diminishes as age increases, reaching an optimal turning point at 24 years. Beyond this age, the additional gains in financial inclusion start to decline. The turning point at 24, lower than the average age of the survey sample, may be explained by the fact that many young adults at this stage have secured stable employment, experience rising incomes, and enhanced financial literacy, which collectively boost their ability to access financial services more rapidly.

After the age of 24, the growth in financial inclusion tends to plateau as adults transition to a phase of asset management and accumulation rather than seeking new financial access opportunities. This demographic group is likely to prioritize saving and wealth preservation over continuously engaging with new financial products. This trend reflects a common financial lifecycle, where the demand for new financial services decreases as income stabilizes and long-term financial goals take precedence. Overall, the results suggest that while age has a positive impact on financial inclusion, this effect does not persist indefinitely but instead diminishes after reaching an optimal point in the trajectory of personal financial development.

Impact of education level

The education level has a positive coefficient and is statistically significant in all four equations, indicating a positive impact of education on financial inclusion. Specifically, in the GLM(1), the education coefficient is 0.07 (p-value < 0.01), meaning that for each additional level of education attained, FII increases by approximately 7% (e^(0.07) ≈ 1.07). This result aligns with many previous studies, which suggest that individuals with higher education levels have greater access to and use of a diverse range of financial products, such as credit, investments, and insurance products.

The GLM approach reveals a stronger impact on education compared to the OLS model, affirming its ability to capture complex situations. This difference underscores the critical role of education in enhancing financial inclusion, especially in the context of Vietnam. It seems possible that promoting early financial literacy and providing widespread financial knowledge could be effective strategies for enhancing financial access across the population. Also, it reinforces the notion that education is a pivotal factor in driving inclusive financial development and reducing disparities in financial access.

Impact of income

Income emerges as one of the most influential determinants of financial inclusion, consistently displaying positive and highly significant coefficients across all regression models. In the OLS results, the coefficient is 0.554 without controls and 0.556 with controls. The GLM method, on the other hand, shows slightly lower coefficients of 0.520 and 0.534, separately. Despite the minor discrepancy between these two approaches, both OLS and GLM confirm the critical role that income plays in facilitating access to financial services. According to the GLM(1) model, a 1% increase in income leads to approximately a 53.4% increase in the financial inclusion index (e^(0.534) ≈ 1.705). These findings have implications for the importance of income – which serves as a financial resource and a key driver in unlocking access to a variety of financial products and services.

Households with higher incomes typically have better conditions for saving, investing, and accessing financial products such as credit, insurance, and other investment forms. In contrast, households with lower incomes may face difficulties accessing financial services due to a lack of financial means to open accounts, borrow funds, or invest. Consequently, they are exacerbated from formal financial systems. This raises a need for policy interventions

focused on enhancing income levels and reducing financial barriers for low-income households. Individuals, therefore, have equal opportunities to participate in and benefit from the formal financial sector.

Impact of marital status

The regression results denote that the marriage status has a negative influence on FII but lacks statistical significance among methods. It can therefore be assumed that the marital status does not exert a meaningful influence on the financial inclusion in Vietnam. Moreover, these results imply that marriage is not a decisive element in determining financial access and usage. This may be attributed to the common financial obligations faced by married households, such as child-rearing expenses and regular household expenditures, which constrain their ability to save or invest in diverse financial products.

The financial responsibilities associated with marriage, though significant, do not translate into any higher engagement with the formal financial system. It means despite increasing the need for long-term financial planning, marriage does not seem to drive a greater demand for expanded access to financial services.

Impact of gender

The regression results represent that gender does not have a significant impact on the FII. While gender impact is recorded in OLS(1) analysis with a weak significant value, it lacks statistical significance in all GLM approaches. An implication of this finding is the possibility that gender is not a key determinant in accessing financial inclusion in Vietnam – which is in contrast to previous studies that often feature financial barriers faced by women due to cultural, social, and economic factors.

It seems possible that this divergence lies in the rapid expansion of digital banking services, such as e-wallets or online banking, which have effectively reduced gender-based barriers to access. Nonetheless, further investigations are recommended to uncover potential underlying factors that might influence financial inclusion from a gender perspective. For instance, in-depth examination about this effect across different contexts and demographic groups is neccessary to have a broader point of view in interpreting gender dynamics in financial market.

Impact of migration

The "migration" variable exhibits unstable effects and insignificance across all regression models, despite occasional shifts in the coefficient direction. It signifies that migration does not have a clear or consistent impact on FII within this dataset. One possible explanation is that migrants often face barriers. For example, limited knowledge of local financial services, challenges meeting legal or financial requirements when relocating to a new area. On the other hand, some migrants may experience an improvement in their financial situation due to increased income from new employment opportunities in their destination area, thereby enhancing their chance to reach financial products/services.

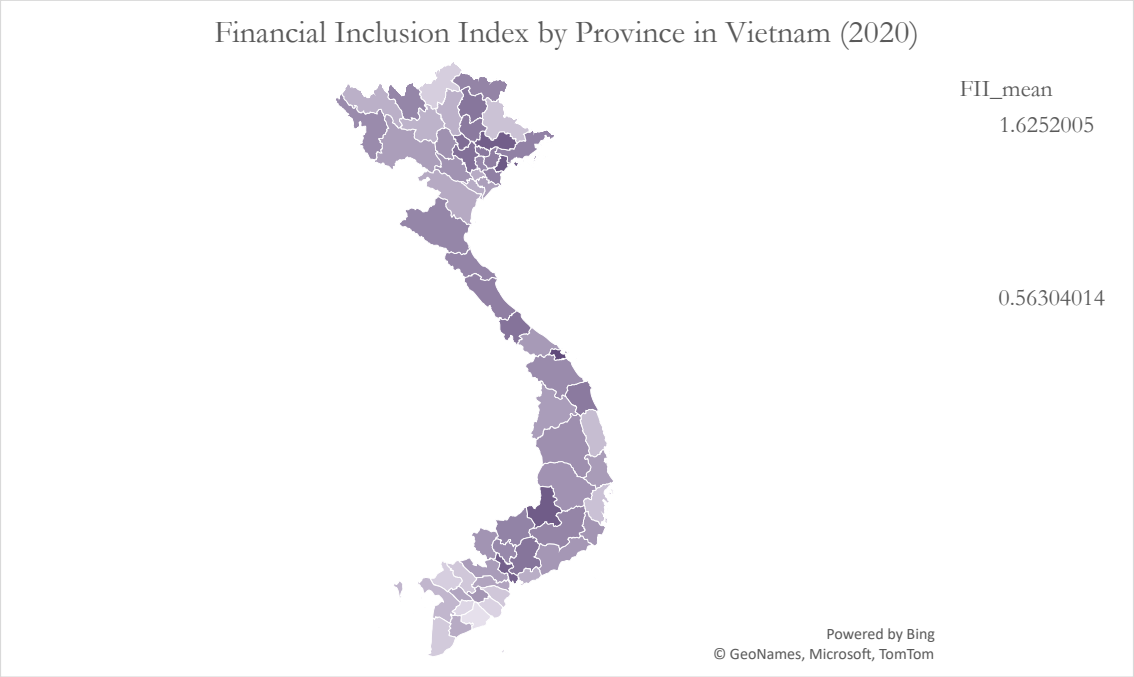
Hence, this finding is rather difficult to interpret because the effect of migration might be contingent upon other factors, such as the economic conditions of the destination area, the migrant's ability to adapt, or the availability of financial support from the government or non-governmental organizations. Also, the lack of significance outcome indicates a need for further in-depth studies to explore the complexities of migration's impact on financial inclusion. The duration of residence in the new location and the role of social networks in assisting migrants with accessing financial services are things that should be considered in the following research.

4.5 Regional financial inclusion assessment

Due to Appendix D, this analysis clarifies the disparities in financial inclusion across regions from the North to the South to provide a foundation for following startegic recommendations.

In the Northern region, provinces like Hanoi, Bac Ninh, and Vinh Phuc exhibit the highest levels of financial inclusion, with the average FII from both methods ranking among the top. Hanoi, the captial and one of the largest financial centers in Vietnam, has an FII score of 1.27 using OLS and 1.26 using GLM, indicating consistent results. Bac Ninh, with its strong industrial growth, also shows a high FII score, reaching 1.36 with GLM, slightly higher than 1.35 with OLS. This reflects the well-developed financial infrastructure and high service accessibility in these provinces. In contrast, mountainous provinces in the Northern region, such as Ha Giang, Cao Bang, and Lai Chau, show significantly lower levels of financial inclusion. For example, in Ha Giang, the FII score is 0.79 using OLS and 0.82 using GLM. Although GLM shows a higher score, this difference primarily reflects the model's better handling of income volatility and nonlinear factors.

Figure 4.1 Financial Inclusion Index by Province in Vietnam (2020)



As for the Central, this region displays clear disparities in financial inclusion between coastal and mountainous provinces. Provinces like Quang Ninh and Da Nang are among those with the highest FII scores, with the average FII in Da Nang being 1.21 using OLS and 1.20 using GLM. This result accurately reflects the development of financial infrastructure and higher-than-average income levels in these areas. In contrast, mountainous provinces like Quang Tri and Quang Binh have lower FII scores, with minor differences between OLS and GLM. For instance, Quang Tri's FII score is 1.02 using OLS and 0.99 using GLM, suggesting that GLM predicts slightly lower financial inclusion levels, likely due to economic and low-income factors impacting the region.

Regarding the Central Highlands, provinces like Gia Lai, Kon Tum, and Dak Lak exhibit notable differences between the two models. Financial inclusion in Kon Tum is predicted to be higher by GLM (1.11) compared to OLS (1.13). This indicates that GLM may better capture nonlinear factors, such as variations in economic conditions and migration in the region. Dak Lak, a major agricultural province, shows almost identical FII scores between

the two models (around 0.99), highlighting stable results while also pointing out the relatively low level of financial inclusion compared to the national average. This suggests a need for stronger financial support programs in this area.

The Southeast region, then, encompassing major industrial hubs like Binh Duong and Dong Nai, demonstrates the highest levels of financial inclusion nationwide. Binh Duong, the province with the highest FII score in both models, reaches 1.39 using OLS and 1.44 using GLM, indicating exceptional growth in financial infrastructure and service accessibility. Dong Nai also shows similar results, with high and stable FII scores, reflecting consistency across both models. These findings confirm that the Southeast region, driven by robust industrial growth and high income levels, has the best financial inclusion performance, far surpassing other regions.

Finally, differences between the two models in the Mekong Delta are more pronounced. Provinces like Can Tho, Kien Giang, and Tien Giang have higher FII scores when using the GLM model, suggesting more accurate predictions in areas with significant income variability. Can Tho, the largest economic center of the region, has an FII score of 1.10 with OLS and 1.14 with GLM. In contrast, provinces like Ben Tre and An Giang show lower FII scores, especially with OLS. This indicates that these areas face challenges in accessing financial services, possibly due to underdeveloped infrastructure and lower income levels.

As discussed above, the analysis reveals that developed urban areas and major industrial centers such as Hanoi, Ho Chi Minh City, Binh Duong, and Dong Nai exhibit the highest levels of financial inclusion, indicating strong financial infrastructure and positive economic development. Conversely, mountainous provinces in the Northern region, as well as certain areas in the Central, Central Highlands, and Mekong Delta regions, have lower levels of financial inclusion, as evidenced by the results from both models.

4.6 Chapter conclusion

Age, education level, and income are evidenced to influence financial inclusion in Vietnam. Specifically, age demonstrates a non-linear relationship with financial inclusion, with a turning point identified at 24 years old. That means access to financial services increases rapidly during early adulthood but diminishes after a certain threshold, reflecting the principle of diminishing returns. In addition, income becomes the most critical driver of financial inclusion, emphasizing the magnitude of economic policies aimed at boosting household income, particularly for low-income families. Educational attainment also shows a strong positive impact, affirming that individuals with higher education levels are generally more capable of accessing and utilizing a wider range of complex financial services.

Furthermore, the analysis indicates that gender and marital status are insignificant suggesting that traditional social and cultural barriers may no longer hinder financial access given the rapid growth of digital finance market. As for migration, there are demonstration that migration may influence financial access depending on the economic conditions and adaptability of migrants in their new locales. This, soon, implies a need for further research to better understand its impact.

Turning to the regional analysis, it is not suprising that there is a discrepancy in financial inclusion among geographical locations. Provinces in urban and industrial hubs like Hanoi, Ho Chi Minh City, Binh Duong, and Dong Nai exhibit the highest FII scores, driven by modern financial infrastructure and higher income levels. In contrast, northern mountainous provinces such as Ha Giang, Cao Bang, and Lai Chau, along with parts of the Central Highlands and the Mekong Delta like An Giang and Ben Tre, show considerably lower FII scores. These findings reinforce the notion of uneven development, as rural and

underdeveloped areas still face substantial barriers to accessing financial services. This raises a signal for suggested policy interventions should be based on economic infrastructure status.

In short, these results highlight the importance of improving income levels and promoting financial literacy while developing targeted support policies for vulnerable groups, such as migrants, to comprehensively expand financial inclusion in Vietnam. Such policies would not only enhance access to financial services but also contribute to building a more sustainable and equitable financial ecosystem for society as a whole.

Chapter 5
Discussion

Based on the analysis results in Chapter 4, education and income are identified as two key determinants that strongly influence the level of financial inclusion among households. Income not only expands access to financial services but also directly affects consumption levels, savings capacity, and the ability to invest in financial products. This reflects the reality for many households in Vietnam, where low income creates difficulties in accessing necessary financial products, and even harder for those who living far away from cities.

Education also plays an important role in enhancing individuals' knowledge, broadening their opportunities to access and use financial services more effectively. However, merely having a high level of education does not guarantee effective use of financial services. Therefore, financial education needs to be more deeply integrated into the curriculum. Knowledge of personal financial management, such as understanding compound interest and budgeting, will equip people with practical financial skills, thereby enhancing responsible financial behavior.

The latest reform program from the Ministry of Education has begun to integrate financial knowledge into teaching, with practical exercises related to simple and compound interest. Although this initiative has only been implemented for the past 1-2 years, it represents a positive step toward improving the financial inclusion index in Vietnam. Future studies could further investigate the impact of financial education on shaping the financial habits and behaviors of the population.

Financial literacy, like the FII, is an abstract and difficult-to-measure concept. Currently, there is no unified and widely applied formula for measuring financial literacy. Financial literacy measurement methods are often based on self-assessment questionnaires, measuring individuals' understanding of basic financial concepts such as interest rates, inflation, risk, and investment diversification. However, these questionnaires often only reflect the level of theoretical understanding, while individuals' actual financial behavior can be influenced by many other factors such as experience, living environment, and financial stress. The lack of a clear measurement standard for financial literacy leads to risks in the consistency and reliability of this variable when included in the analytical model. Previous studies have shown that different measurement methods can yield different results, making comparisons between studies difficult. In addition, measurement can also be affected by cultural bias, especially when applied in countries with different economic and social contexts.

For migration, although having unstable effect, the presence of positive cofficients, albeit not statistically significant, proposes that migration may enhance financial inclusion under specific conditions. It is possible if migrants gain access to higher-income employment opportunities in more economically developed regions, thereby increasing their ability to access financial services. Nonetheless, legal barriers, a lack of information, and limited social networks may hinder their financial integration. These obstacles can complicate migrants' access to banking services and limit their participation in the formal financial system.

Moreover, regardless of OLS and GLM method, marital status does not affect financial inclusion. This may be attributed to shared household expenses and financial responsibilities within marriages, which do not substantially influence access to financial services. Suprisingly, this variable has traditionally been considered a factor affecting household financial behavior. However, in the current Vietnamese context, this influence appears to be less pronounced. That means financial inclusion strategies that address key drivers may bring more effective than adjusting them based on marriage demographics.

Flexible financial policies are also a crucial factor that policymakers should consider. In the context of rising living costs, financial counseling programs, savings packages, credit, and preferential loans for low-income households will provide them with additional resources to invest in education, production, and business. These supports not only improve the financial situation of households but also encourage them to participate actively in the formal financial system.

In another view, the differentiation in the level of financial inclusion in the provinces is clear. Northern mountainous provinces such as Ha Giang, Cao Bang, and Lai Chau, along with the Central Highlands and some Mekong Delta provinces such as An Giang and Ben Tre, continue to show lower FII indexes than the national average. This raises an urgent need for specific intervention policies for these regions to narrow the gap in financial inclusion and ensure synchronization in development across the country.

A potential solution that the government should consider is to invest more in less developed regions where there is a large demand for financial access but the infrastructure is not yet adequate, instead of allocating financial resources equally. This could include expanding microcredit programs, providing preferential loans for low-income households, and supporting small business development, which will both boost the local economy and improve access to financial services. Financial support programs combined with local financial education are also conceivable, where this approach helps improve education in general and financial literacy in particular.

Removing gender barriers to financial access in Vietnam is gradually becoming an actual. This opens up opportunities for the development of financial products suitable for both men and women, particularly in the digital era. Digital banking applications and e-wallets like Momo, VNPay, and ZaloPay are becoming increasingly popular, allowing users to easily access and conduct financial transactions with just a few simple steps. Digital finance is not only a useful tool but also serves as a new gateway, enabling everyone to access financial services more conveniently and comprehensively. Policymakers, therefore, should focus on developing FinTech-oriented strategies to encourage the use of digital financial services. This makes sure that everyone, regardless of education level, age, or gender, can easily access and use financial services anywhere and anytime.

Besides, financial infrastructure plays an indispensable role in enhancing access to financial services. Investing in expanding the network of bank branches and ATMs, especially in rural and remote areas, could ensure that residents can easily access the necessary financial services. By combining microcredit programs and digital finance with improvements in financial infrastructure, Vietnam may make significant strides toward achieving financial inclusion goals.

Finally, collaboration between the public and private sectors is a key element in encouraging financial inclusion in Vietnam. The government leads the role in building a legal framework, regulating financial activities, and providing support policies to promote financial inclusion, such as reducing account maintenance fees or encouraging the expansion of digital financial services. Initiatives like the National Comprehensive Finance Development Project have facilitated access to financial services for the population, particularly vulnerable groups.

The private sector, especially commercial banks, and FinTech companies, is given major importance in extending financial services to underserved and hard-to-reach areas. These organizations typically possess the agility to innovate rapidly, developing digital financial solutions such as e-wallets and online banking. Their innovations allow users to access formal financial products/services conveniently without the need for physical bank branches. This collaboration not only ensures the availability of services but also caters to the diverse needs of the population.

To foster this, government should continue to incentivize private sector participation in the delivery of financial services through supportive policies, technological infrastructure development, and the streamlining of unnecessary administrative procedures. In particular, greater investment in digital financial solutions is needed to reduce dependence on physical branch networks, thereby facilitating easier access for vulnerable and underserved groups. Strengthening digital financial offerings can bridge the gap in financial access, promote inclusion, and empower individuals across different regions, including those in rural and remote areas. This strategy aligns with the broader goal of enhancing financial inclusion, ensuring that technological advancements benefit the entire population.

In conclusion, achieving sustainable financial inclusion requires strategies that are flexible and multifaceted, including improving access to services and financial education, as well as enhancing cooperation between the public and private sectors. By doing so, households will not only improve their quality of life but also contribute to poverty reduction and the sustainable socio-economic development of Vietnam.

Chapter 6
Conclusion

This study set out to investigate the impact of determinants on financial inclusion in Vietnam. The most obvious finding to emerge from this study is the role of income and education. Higher income expands access to financial services, while education equips individuals with the skills necessary to understand and utilize financial products effectively. Additionally, this investigation identified nuanced effects of gender, marital status, and migration on FII. Taken together, these results underscore the need for supportive economic and educational policies to foster sustainable financial inclusion.

The contribution of this study has also been to confirm through its theoretical framework. Combining Club Goods, Pubic Services theories and SES concept brings a well foundation to interpret the impacts of demographic factors and financial behaivors of Vietnamese households. The government's regulatory role, therefore, is highlighted. This implies that policymakers should ensure financial services are not only available but also easily accessible and affordable for all population groups, especially those with lower SES.

Despite shedding light on several aspects of financial inclusion, this study acknowledges some limitations. First, the impact of digital banking – an essential driver of financial development in Vietnam in recent years – was not considered due to data constraints. Excluding the effects of digital banking may limit the study's ability to provide a comprehensive picture of financial inclusion, especially given the rapid growth of digital era. Second, there is still a lack of a standardized formula for measuring the financial inclusion index, leading to inconsistencies in approaches across studies. Also, factors like the number of ATMs and bank branches – key indicators for assessing financial coverage in Vietnam – were not included due to limited data.

Future studies, therefore, should dig deeper into financial literacy as a variable distinct from general educational attainment. While Vietnam has achieved a high literacy rate, the level of financial inclusion remains low, indicating that literacy alone may not be sufficient to enable effective use of financial services. Financial literacy encompasses specific skills such as understanding compound interest, managing debt, and making informed investment decisions. Therefore, future studies should explore the direct impact of financial literacy on financial inclusion to provide a more nuanced understanding of how educational interventions can enhance financial behaviors and outcomes.

Additionally, an area for future exploration could be the distinction between households with and without children. The presence of children may influence financial needs and affect access to financial products such as loans or insurance. Investigating these differences could offer new insights into how household dynamics shape financial behaviors and preferences, and help tailor financial products to meet the specific needs of different demographic groups.

From a policy perspective, the findings emphasize initiatives aimed at boosting financial inclusion should focus on expanding financial education and reducing service costs, particularly for low-income households. The robust development of digital finance and the integration of financial literacy into the national education curriculum are vital steps toward enhancing the public's ability to access and utilize financial services. Collaboration between the public and private sectors, including financial institutions and fintech companies, will be essential in providing sustainable financial solutions tailored to the diverse needs of the population.

In conclusion, Vietnam has made significant progress in advancing financial inclusion, particularly in urban areas, but considerable challenges remain in narrowing the access gap across different geographic regions and income groups. Future policies should prioritize both improving financial infrastructure and implementing demand-side strategies, such as enhancing financial literacy and minimizing cost barriers. A multi-dimensional and flexible approach will be key to achieving Vietnam's financial inclusion goals, ensuring that no one is left behind in the journey toward sustainable socio-economic development.

Appendices

Multicolinearity test

In the model analysis, the author conducted a check for multicollinearity to determine whether there was a high correlation among the independent variables in the model. Multicollinearity can cause instability in regression estimates, leading to affected coefficients of independent variables and complicating result analysis.

Appendix A VIF Results

Variable	VIF(1)	VIF(2)
age	20.60	20.60
age2	17.02	17.02
marriage	2.03	2.03
ln_income	2.63	1.06
gender	1.01	1.01
education	279.27	1.01
migration	1.00	1.00
educome	284.99	
Mean VIF	**76.07**	**6.25**

Note: VIF(1) is the result of the equation containing the variable educome, VIF(2) is the result after removing the variable educome.

To check for the existence of multicollinearity, the author used the Variance Inflation Factor (VIF), a tool that measures the correlation level among independent variables. Theoretically, if the VIF value of a variable exceeds 10, it indicates the presence of serious multicollinearity. The initial check results showed that the interaction variable educome (interaction between education and income) had a very high VIF value of 284.99, far exceeding the acceptable threshold. Additionally, the education variable also had a high VIF of 279.27, indicating a very high correlation between these two variables.

Although other variables, such as age, age2, ln_income, marriage, and gender, had lower VIF values within an acceptable range, the high correlation between educome and education caused significant multicollinearity. This reduced the reliability of the estimates, potentially increasing the model's sensitivity to the independent variables and leading to inaccurate result interpretations.

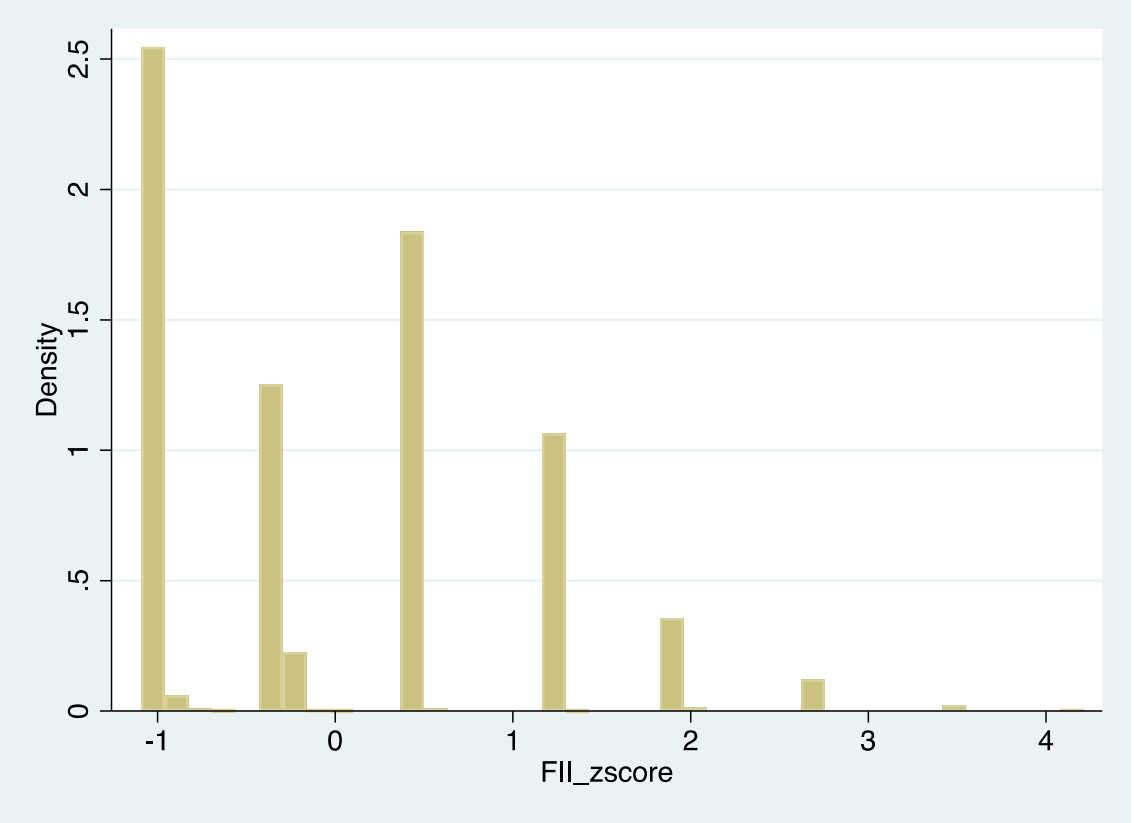
To address this issue and improve the accuracy of the model, the author decided to remove the interaction variable educome from the model. After this removal, the second VIF check showed that the remaining variables all had VIF values below the threshold of 10, with an average VIF of 6.25, which is an acceptable value. This indicates that after removing the educome variable, the multicollinearity issue was resolved, and the regression model could provide more reliable estimates.

The regression results after removing the educome variable also indicated that the coefficients of the remaining variables, such as age, education, and ln_income, were statistically significant, reinforcing the analysis results and enhancing the accuracy of the estimates.

Heteroskedasticity test

The author conducted a check for heteroskedasticity to determine whether the variance of the errors changes with the values of the independent variables. The presence of heteroskedasticity can reduce the accuracy of estimates when using the OLS method, and alternative regression methods may need to be employed if this phenomenon is detected.

Appendix B Histogram Financial Inclusion Index



First, the author performed a frequency analysis to assess the distribution of the dependent variable FII_zscore. This histogram indicates that the FII_zscore tends to be right-skewed, with most households having a financial inclusion index ranging from -1 to 1, and very few households having scores above 2. This suggests that most households in Vietnam have a level of financial inclusion that is average to low, with only a few households exhibiting higher scores. Preliminary analysis from the histogram indicated the asymmetry in the distribution of the dependent variable.

Next, the author conducted the Shapiro-Wilk test to check whether the FII_zscore follows a normal distribution. The test results showed a W value of 0.88118, with a p-value of 0.0000, which is statistically significant. Since the p-value is less than the significance level of 0.01, we reject the null hypothesis (H0) that the FII_zscore follows a normal distribution. This confirms that the data is not normally distributed, which could affect the OLS regression results that rely on the assumption of normally distributed errors.

After determining that the data is not normally distributed, the author proceeded to test for the presence of heteroskedasticity using the Breusch-Pagan/Cook-Weisberg test. This method helps to check whether the variance of the errors changes with the values of the independent variables. The test results indicated a chi-squared value of 273.91 with a p-value of 0.0000, suggesting that the variance of the errors is not homogeneous. Therefore, we reject

the null hypothesis (H0) that the variance is homogeneous and confirm the existence of heteroskedasticity in the model. The presence of heteroskedasticity indicates that the OLS method may not be suitable, and switching to another regression method is necessary.

Due to the discovery of heteroskedasticity, the author decided to use the GLM with an inverse Gaussian distribution to address this issue. The choice of the inverse Gaussian distribution was based on the characteristics of the dependent variable FII_zscore, which contains negative values and does not follow a normal distribution. The inverse Gaussian distribution is suitable for cases where the dependent variable has heterogeneous variability and negative values, helping to resolve the issues encountered with OLS.

To ensure that the inverse Gaussian distribution is the best choice for the GLM model, the author conducted deviance and AIC tests to evaluate the model fit. The results indicated that the deviance value of the GLM model with the inverse Gaussian distribution was 1.096837, and the AIC was 2.460836, lower than for other distributions. This indicates that the GLM model with the inverse Gaussian distribution is the optimal method for this analysis, enhancing prediction accuracy and ensuring higher precision in estimates compared to OLS.

From these results, it can be concluded that the GLM method with the inverse Gaussian distribution is the most suitable choice for analyzing the impacts of demographic and socio-economic factors on the Financial Inclusion Index (FII_zscore). This method not only addresses the issue of heteroskedasticity but also ensures that the estimates from the model achieve higher accuracy than those obtained using OLS, especially when the data does not conform to OLS assumptions.

Turning point calculation

In the regression model with the variables age and age2, the relationship between age and the FII (FII_zscore) is not linear but quadratic. This means that the impact of age on the Financial Inclusion Index will increase up to a certain level (the turning point) and then begin to decline.

The formula for calculating the turning point for the age variable in a quadratic model is as follows:

$$Turning\ point\ =\ -\frac{\beta_1}{2\beta_2}$$

where β_1 is the coefficient of the age variable; β_2 is the coefficient of the age² variable.

When running the GLM model with the control variable i.tinh, the regression results show that the coefficient for age is 0.006 and the coefficient for age² is -0.000. Based on these coefficients, the turning point can be calculated by substituting the values into the formula:

$$Turning\ point\ =\ -\frac{0.006}{2\times(-0.000)}$$

The calculated turning point is 24 years. This means that the impact of age on the FII peaks when a person is around 24 years old. Before reaching 24, access to and utilization of financial services increase rapidly as young individuals enter the workforce, earn their first income, and have growing needs for financial services, such as opening bank accounts, taking out consumer loans, or using digital payment solutions.

However, after the age of 24, the influence of age on financial inclusion begins to decline, reflecting the phenomenon of diminishing returns – where the incremental gains in financial access are no longer as strong as before. This can be explained by the fact that after

achieving a certain level of financial stability, adults tend to shift from expanding their financial access to optimizing asset management and accumulation. They are more likely to focus on saving, engaging in long-term investments, or preserving their wealth rather than continually expanding the use of new financial products.

Calculating this turning point provides deeper insight into the relationship between age and access to financial services, especially when local differences are controlled for through the variable i.tinh.

Appendix C AIC and BIC results

Index	OLS	GLM
AIC	30277.69	8.65059
BIC	30742.63	1107.474

Appendix D Provincial mean FII in 2020

tinh	FII_mean_OLS	FII_mean_GLM
Ha Noi	1.265095	1.2612798
Ha Giang	0.78659689	0.81706923
Cao Bang	0.95968825	1.0079229
Bac Kan	0.97346693	0.9722665
Tuyen Quang	0.96433032	0.95445621
Lao Cai	1.0898925	1.1067189
Dien Bien	1.0067288	0.99862331
Lai Chau	0.7498877	0.79751027
Son La	1.0279119	1.0388082
Yen Bai	0.9792555	0.96535945
Hoa Binh	1.0216287	1.0056906
Thai Nguyen	1.0118077	1.0085949
Lang Son	0.94850016	0.94230831
Quang Ninh	1.1729544	1.1751789
Bac Giang	1.1841053	1.1643169
Phu Tho	1.0845236	1.0827875
Vinh Phuc	1.2629591	1.2528065
Bac Ninh	1.3552067	1.3654172
Hai Duong	1.2398359	1.2239385
Hai Phong	1.2346624	1.2270042
Hung Yen	1.1882939	1.1527156
Thai Binh	1.1925842	1.148998
Ha Nam	1.1586152	1.188864
Nam Dinh	1.1545963	1.1730936
Ninh Binh	1.1095223	1.0847347
Thanh Hoa	1.1264871	1.1129569
Nghe An	1.1477804	1.1291714
Ha Tinh	0.96571749	0.95150191
Quang Binh	1.020049	1.0023119

Quang Tri	1.0224228	0.99207258
Thua Thien Hue	1.0488762	1.0287752
Da Nang	1.2190586	1.2099277
Quang Nam	1.0889301	1.071489
Quang Ngai	1.0256472	1.013898
Binh Dinh	0.98887408	0.97143239
Phu Yen	0.95602095	0.96053535
Khanh Hoa	0.98156959	0.95071536
Ninh Thuan	1.0238659	1.007508
Binh Thuan	1.1306996	1.1080064
Kon Tum	1.1347083	1.1091672
Gia Lai	1.0136299	1.0109034
Dak Lak	0.99726081	0.99489641
Dak Nong	1.0304623	1.018108
Lam Dong	1.1226459	1.0917809
Binh Phuoc	1.1933843	1.2157493
Tay Ninh	1.1059828	1.0880755
Binh Duong	1.3918558	1.4372436
Dong Nai	1.2666121	1.2823216
Ba Ria - Vung Tau	1.0489732	1.0535895
Ho Chi Minh City	1.2687049	1.2665108
Long An	1.0699867	1.0695077
Tien Giang	1.1201619	1.0971758
Ben Tre	0.8660934	0.88735855
Tra Vinh	1.0441922	1.0789816
Vinh Long	0.9733718	0.96749079
Dong Thap	1.102868	1.0599627
An Giang	0.97315919	0.95307976
Kien Giang	1.1618949	1.2089504
Can Tho	1.1031711	1.1437089
Hau Giang	1.0531129	1.0373805
Soc Trang	0.99848413	0.99392837
Bac Lieu	1.1867814	1.187917
Ca Mau	0.90189499	0.92864323

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