Doctoral Dissertation

The Role of Financial Inclusion in Achieving Key Sustainable Development Goals (SDGs) in Developing Countries

September 2023

Doctoral Program in Economics

Graduate School of Economics

Ritsumeikan University

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Doctoral Dissertation Reviewed

by Ritsumeikan University

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（金融包摂が発展途上国における主要な持続可能な発展目標に果たす役割）

September 2023

2023 年 9 月

Doctoral Program in Economics
Graduate School of Economics
Ritsumeikan University
立命館大学大学院経済学研究科
経済学専攻博士課程後期課程

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Abstract

This research focuses on the impact of financial inclusion on three key Sustainable Development Goals (SDGs): poverty reduction (SDG-1), economic growth (SDG-8), and gender equality (SDG-5) in developing countries. The primary objective is to empirically examine how financial inclusion influences these SDGs. Chapter 1 provides background information, research objectives, summary results, and the link between financial inclusion and the selected SDGs in developing countries.

Chapter 2 provides a comprehensive review of relevant literature on the impact of financial inclusion on the selected SDGs. Previous studies have shown that financial inclusion can provide new opportunities to financially excluded individuals in various ways. For instance, Chliova et al. (2015) demonstrate that access to finance can benefit poor people by stimulating income, encouraging savings, smoothing consumption, and supporting business growth. Similarly, Kara et al. (2021) find that households use financial services to fulfill their financial needs, own houses, establish businesses, and invest in skill development and education. These findings suggest that by enabling financially excluded individuals to utilize such opportunities, financial inclusion can promote economic growth and reduce poverty and gender inequality in developing countries.

Chapter 3 discusses data and methodological issues. This research constructs a novel composite financial inclusion index (FII) based on Sarma (2012). The index combines six financial access indicators collected from the Financial Access Survey of the IMF. The index is used to investigate the impact of financial inclusion on the three SDGs in developing countries during 2004-2019 using annual panel data. Data for the analysis have been collected primarily from the World Development Indicators (WDI) of the World Bank.

Chapter 4 applies dynamic and static panel estimation techniques to analyze the impact of financial inclusion on two different poverty levels. Previous studies have found that women and people with lower income, wealth, and financial literacy often face discrimination in accessing financial services. This research expands the analysis of poverty by examining how unequal access, various inequalities, education level, and

institutional quality influence poverty reduction through financial inclusion. The results reveal that financial inclusion can reduce poverty in developing countries, particularly if disadvantaged groups such as women and the poor are given more opportunities to utilize financial services. Furthermore, the impact of financial inclusion is influenced by various factors, including inequalities in accessing financial services, women's participation in decision-making, financial literacy levels, and institutional quality. If these factors encourage the utilization of financial services, financial inclusion can substantially reduce poverty.

Chapter 5 employs the two-stage system generalized method of moments (GMM) method to analyze the impact of financial inclusion on economic growth. The results indicate that financial inclusion has a significant positive effect on economic growth in developing countries. The findings suggest that the increased economic activity of lower-income individuals, induced by financial inclusion, contributes to economic growth.

Chapter 6 applies an instrumental variable approach and follows the framework proposed by Kim (2021) to analyze the impact of financial inclusion on gender inequality. Building on the work of Duflo (2012), the research argues that financial inclusion policies can reduce poverty and increase income, which disproportionately benefits women. The findings suggest that, despite the discrimination faced by women in accessing financial services, financial inclusion can still alleviate gender inequality in developing countries, primarily through the economic development channel. Specifically, the results confirm that economic growth and poverty reduction through financial inclusion enable lower-income households to allocate more resources toward women's health and education, ultimately helping to reduce gender inequality.

Chapter 7 analyzes the impact of financial inclusion in Bangladesh and finds that financial inclusion helps attain high economic growth and lower poverty and gender inequality in the country. The research also finds that although Bangladesh has made significant progress in financial inclusion over the last decade, the overall level of financial access in Bangladesh still lags behind most other neighboring South Asian countries.

The research suggests that policymakers in developing countries can rely on greater financial inclusion to combat poverty and gender inequality and boost economic growth.

To achieve this, policymakers should make financial services more accessible to disadvantaged groups such as women and the poor. Additionally, the research proposes that policymakers work to enhance financial literacy and institutional quality, as these factors can enhance financial inclusion's impact on the three selected SDGs. Given the scope for expanding financial services to untapped customers in developing countries, the study recommends that financial institutions grow their business by offering customized financial services that meet the need of the users.

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List of Abbreviations

ARDL	Autoregressive Distributed Lag
ATM	Automated Trailer Machine
ECM	Error Correction Model
EU	European Union
FE	Fixed Effects
FII	Financial Inclusion Index
FMOLS	Fully Modified Least Squares
GDP	Gross Domestic Product
GDPPC	Gross Domestic Product Per Capita
GII	Gender Inequality Index
GINI	Gini coefficient of disposable income
GMM	Generalized Method of Moments
MENA	Middle Eastern and North African
OECD	Organization for Economic Cooperation and Development
OIC	Organization of Islamic cooperation
OLS	Ordinary Least Square
SDG	Sustainable Development Goals
WID	World Inequality Database
WDI	World Development Indicators
WGI	World Governance Indicators
VAR	Vector Autoregressive

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Chapter 1: Introduction

This research analyzes financial inclusion's impact on three key Sustainable Development Goals[1](SDGs). It empirically examines how financial inclusion influences poverty levels, economic growth, and gender inequality in developing countries[2]. Financial inclusion can influence these SDGs by opening up different opportunities to financially excluded people.

1.1 Research Background

Financial inclusion is the process of making formal financial services accessible and usable to all. Policymakers in developing countries are trying to expand financial services and use financial inclusion as a policy tool to combat poverty and gender inequality and stimulate economic growth[3]. The research proposes that financial inclusion can improve these interrelated SDGs by expanding opportunities for disadvantaged groups, particularly the poor and women.

Previous studies find that financial inclusion can offer new opportunities to financially excluded people in various ways. In their systemic review of microfinance literature, Duvendack et al. (2011) and Chliova et al. (2015) show that microfinance could benefit poor people through changes in their financial behaviors, such as stimulating income, encouraging savings, smoothing consumption, and business growth. Kara et al. (2021) find that households use financial services to meet their financial needs, own houses, establish businesses, and invest in skill development and education. Through randomized control trials, Orton et al. (2016) find health benefits of group microfinance for women and children. El-Zoghbi et al. (2019) show that financial services facilitate recovery from shock, investment in risky long-term projects, enhance women's empowerment, and boost economic growth with poverty reduction. Chapter 2

[1] The Sustainable Development Goals (SDGs) are a collection of 17 interlinked global goals designed to achieve peace and prosperity and were set up in 2015 by the United Nations General Assembly (UN-GA). These SDGs are intended to be achieved by 2030. This research focuses on SDG -1 (No poverty), SDG-5 (Gender equality), and SDG-8 (Decent work and economic growth).

[2] This research uses the World Bank's income categories to classify countries into four groups: high-income, upper-middle-income, lower-middle-income, and low-income countries. Upper-middle-income, lower-middle-income, and low-income countries are labeled as developing countries.

[3] According to the Global Findex Database 2021, 71 percent of the adult population in developing countries have an account in a bank or financial institution.

reviews these issues in more detail. This research aims to investigate whether these opportunities enabled by financial inclusion contribute to achieving the three SDGs in developing countries.

1.2 Research Objective

The primary objective of this research is to empirically investigate the effect of financial inclusion on poverty, economic growth, and gender equality in developing countries. This study constructs a novel composite financial inclusion index to measure financial inclusion. It also proposes and examines transmission channels through which financial inclusion can affect these SDGs. The essential objectives of this study are as follows.

- Investigate the impact of financial inclusion on poverty reduction.
- Examine whether different inequalities affect poverty reduction through financial inclusion.
- Scrutinize financial inclusion's effect on economic growth.
- Examine how financial inclusion affects gender inequality; and
- Explore the possible channel through which financial inclusion affects these interlinked SDGs.

1.3 Research Methodology

The research applies dynamic and static panel estimation techniques to analyze financial inclusion's impact on attaining three key Sustainable Development Goals. First, this study examines how financial inclusion affects two different poverty levels in different income groups of countries. It uses the two-stage system generalized method of moments (GMM) to analyze the poverty-financial inclusion relationship. Due to lower frequency data, it also applies the fixed-effect method for checking the robustness of results. This research extends the analysis of poverty by incorporating how unequal access, different inequalities, education level, and institutional quality influences poverty reduction through financial inclusion. For this investigation, this research applies an instrumental variable approach and analyzes the conditional relationship between different factors and financial inclusion. This instrumental variable approach is suitable for addressing the reverse causality issue. This research proposes that financial inclusion stimulates economic growth through increased economic activities of lower-income

people in developing countries. Due to the availability of frequent annual data, the study applies the two-stage system GMM method for this investigation. This research also proposes that financial inclusion can improve gender equality through economic development channels. The study applies both fixed-effect analysis and instrumental variable approach for analyzing the gender inequality-financial inclusion relationship.

1.4 Stylized Facts on financial inclusion in developing countries.

This research constructs a composite financial inclusion index (FII) to measure countrywide progress in financial inclusion. The index indicates that developing countries are experiencing increased financial services but still lag behind high-income countries. Moreover, disadvantaged groups such as women, the poor, and people with less wealth and education also face constraints in accessing financial services in developing countries. There is also a substantial difference among countries regarding educational attainment and the quality of institutions. The study claims that these differences influence the effectiveness of financial inclusion in attaining the SDGs. This research also shows that developing countries have improved gender equality in the last two decades but still could not match the high-income countries. This research explores how financial inclusion affects SDGs in developing countries in more detail in different chapters.

1.5 Linkage between financial inclusion and key SDGs

The sustainable development goals are interlinked. The research proposes that financial inclusion influences these SDGs by enabling disadvantaged groups, particularly the poor and women, to utilize the benefits of financial services. According to this investigation, financial inclusion may influence poverty alleviation in two ways. Financial services enhance the economic activities of the lower income people and help reduce poverty through increased income. As financial inclusion ensures inclusive economic growth, the income level of lower-income people increases, which helps reduce poverty. The research also reveals that financial inclusion can reduce poverty through consumption smoothing, cost savings, and efficiency gains. The research finds that financial inclusion significantly improves economic growth in developing countries due to the increased economic activities of lower-income people. Financial inclusion may affect gender inequality positively or negatively. The study finds that females face discrimination in accessing and utilizing financial services. So, there is the possibility that

opportunities from financial services will be skewed in favor of men, and this inequality in financial access might increase gender inequality. On the other hand, financial inclusion also contributes to economic development through income rise and poverty reduction. Economic development through financial inclusion allows households to increase their spending on women's welfare, which results in improved gender equality. The empirical result suggests that the economic development achieved through financial inclusion plays a more significant role in reducing gender inequality in developing countries.

1.6 Summary results

This research finds that financial inclusion alleviates poverty in developing countries. This impact prevails in all the sub-groups of developing countries. Financial inclusion has a stronger impact on extreme poverty reduction than moderate poverty. Poverty alleviation through financial inclusion is intensified if disadvantaged groups, such as women and the poor, access financial services. The research also finds that income and wealth inequality, financial literacy, and institutional quality influence poverty reduction through financial inclusion. Financial inclusion is effective in countries with low inequalities and higher educational attainment and institutional quality. The study also finds that financial inclusion contributes to economic growth in developing countries as long as it can offer new opportunities to financially excluded people. Once most people in a country are financially included, developing countries need to focus on improving the efficiency of the capital market and financial institutions. The results also indicate that financial inclusion initiatives effectively reduce gender inequality in low- and lower-middle-income countries and countries where women and the poor have low financial access. Past financial inclusion initiatives have a significant influence on future gender inequality. The study finds that compulsory education and improvement in institutional quality promote gender equality in developing countries. By incorporating a squared term of the financial inclusion index, this research finds a diminishing impact of more financial inclusion on gender inequality reduction in higher-income countries. The study prescribes that lower-income countries use financial inclusion initiatives to improve gender equality. Upper-middle-income countries should focus on other aspects, such as

promoting educational support and institutional quality improvements to achieve gender equality.

1.7 Structure and Chapter Overview

The outline of the rest of the research is as follows: Chapter 2 discusses the literature review; Chapter 3 covers methodological issues and describes the procedure of constructing the financial inclusion index; Chapter 4 expresses empirical results on poverty reduction through financial inclusion; Chapter 5 discusses the impact of financial inclusion on economic growth; Chapter 6 examines financial inclusion-gender inequality linkage; Chapter 7 discusses Bangladesh specific issues, and Chapter 8 concludes with policy recommendations.

Chapter 2: Literature Review

This chapter reviews related literature on financial inclusion and three SDGs. Section 2.1 reviews how financial inclusion affects two different poverty levels in different income groups of countries. Section 2.2 reviews factors that influence financial inclusion's effectiveness on poverty alleviation. Section 2.3 discusses past studies examining the relationship between financial inclusion and economic growth, and section 2.4 highlights literature related to financial inclusion and gender inequality.

2.1 Review of literature on financial inclusion and poverty

In their review of randomized control-based studies, Demirguc-Kunt et al. (2017) demonstrate that financial inclusion affects poverty by making payment services, savings, credit, and insurance services available to the poor. These services reduce poverty by increasing the poor's income level or allowing the poor to increase household spending. Aker et al. (2014) and Muralidharan et al. (2014) show that digital payment of welfare benefits save cost in the form of avoidance of making a physical trip for cash collection or offering bribes to corrupt officials. These cost savings allow the poor to spend the money for other purposes, which helps reduce poverty. Similarly, Prina (2015) shows that account payments enhance women's decision-making in the household, thereby increasing the expenditure on education and food. Brune et al. (2016) and Dupas and Robinson (2013) demonstrate that savings in a formal financial institution increase private expenditure, business investment, agricultural output, and household expenditures. Although Morduch (1999) establishes the substantial benefits of micro-credit access, Banerjee et al. (2015) and Duvendack et al. (2011) find moderate benefits. All these studies have validated how financial inclusion can alleviate poverty. However, the findings of these randomized experimental studies might not be applicable for cross-country analyses due to the considerable variations among countries.

Various researchers analyze the impact of financial inclusion on poverty using cross-country analyses. Gutiérrez-Romero and Ahamed (2021) apply the theoretical framework of Ravallion and Datt (1992) and analyze the poverty-financial inclusion relationship in 79 low and lower-middle-income countries and find that financial inclusion primarily reduces poverty through the reduction of inequality. Park and

Mercado (2018, 2015) analyze the impact of financial inclusion on poverty and income inequality globally and for developing Asian countries and determine that financial inclusion significantly reduces poverty for the entire sample and Asian developing countries. More recently, Omar and Inaba (2020) investigate the impact of financial inclusion on poverty and income inequality in 116 developing countries. They show that financial inclusion significantly reduces poverty rates in developing countries. Cabeza et al. (2019) demonstrate that greater financial inclusion encourages women's economic participation and positively affects economic development.

Country-specific studies also find that financial inclusion helps reduce poverty. Swamy (2010) examines priority sector lending in India and finds that financial inclusion through prioritized lending can achieve inclusive growth by reducing the rural poverty rates. Abor et al. (2018) analyze the impact of financial inclusion and mobile telephone penetration on poverty in Ghana using 16,772 Ghanaian households. The study results show that mobile penetration and financial inclusion help smooth consumption and significantly reduce the probability of a household becoming poor and are correlated with an increase in per capita household consumption of food and non-food items. Though these cross-country and country-specific studies analyze the poverty-financial inclusion relationship from different perspectives, they lack a comprehensive panel data analysis on countries in different stages of development. Moreover, most studies use a limited set of variables when they construct financial inclusion indices.

2.2 Review of literature on constraints on accessing financial services

Though past studies show that while financial inclusion negatively correlates with poverty, its impact on poverty might be weaker if disadvantaged groups cannot access or use financial services. Using the Global Findex Database 2011, Demirgüç-Kunt & Klapper (2013) find disparity across the world in accessing financial services and credit. Kara et al. (2021) review recent empirical literature and find that gender, race, income, and education of individuals affect their ability to access credit.

The empirical literature provides overwhelming evidence that households with lower income and less accumulated wealth are often excluded from the formal credit market. Demirgüç-Kunt & Klapper (2013) investigate the data of 148 countries and find wide gaps in account penetration between high-income and developing countries. The

gap also exists within a country between the rich and the poor. Corrado & Corrado (2015), Klapper & Singer (2015), and Shihadeh (2018) investigate multi-country data and find that poor and low-income families are more likely not to have formal credit. Kara et al. (2021) argue that higher income and accumulated wealth are prerequisites in accessing formal credit since banks assess borrowers' repayment ability primarily through applicants' income and wealth levels. Chen & Jin (2017) show that household use of formal credit is limited and skewed toward the already better-off in China. In India, Ghosh & Vinod (2017) also find that borrowing costs are lower for wealthy borrowers.

Existing literature demonstrates that women in developing countries face more discrimination in accessing financial services. Focusing on African countries, Klapper and Singer (2015) find that women primarily use informal credit, which indicates an inability to access formal credit. By examining the Global Findex database, Morsy (2020) finds a gender gap in the formal credit markets and finds that women are more likely to be excluded from the financial sector. Xu et al. (2018) find that women face more barriers to obtaining business loans than men, even though they are less likely to default on a loan than men. In India, Sandhu et al. (2012) find that loan rejection rates for female business owners are higher than for male owners, and for approved loans, collateral requirements are also high for female applicants.

In general, educated individuals usually make more informed financial decisions. Boshara et al. (2015) argue that higher educational attainment contributes to better financial decision-making. Klapper & Singer (2015), Chen & Jin (2017), Deku et al. (2016), and Barik & Sharma (2019) show that households with better education are associated with greater use of formal finance both in developed and developing countries. Xu et al. (2020) and Luan (2019) find that education enables people to receive more favorable terms when they borrow in peer-to-peer platforms. Focusing on SMEs, Nkundabanyanga et al. (2014), Mishra & Tripathi (2017), and Xu et al. (2020) find that owners with lower financial literacy pay higher interest rates and have limited access to formal credit.

2.3 Review of literature on financial inclusion and economic growth

Country-specific studies analyze the impact of financial inclusion on economic growth primarily by applying time series techniques. Several studies find financial

inclusion supports economic growth by ensuring higher deposit mobilization. Brune et al. (2011) find that the microfinance program promotes savings in Malawi. Babajide et al. (2015) show that more deposit allocation through financial inclusion leads to more investment and economic growth in Nigeria. Using the autoregressive distributed lag (ARDL) and error correction model (ECM), Lenka and Sharma (2017) find similar results in India. Aduda and Kalunda (2012) and Omojolaibi (2017) identify that lowering collateral requirements and increasing access to credit contributes to economic growth and poverty reduction in Kenya and Nigeria. Angadi (2003), Neal (1990), and North (1990) opine that financial inclusion stimulates economic growth by helping to establish a well-developed financial infrastructure. Beck et al. (2007) and Mehrotra et al. (2009) argue that financial inclusion channelizes money to a formal channel and stimulates growth with a multiplier effect. Khan (2011) and Serrao (2012) opine that access to essential financial services boosts the economic participation of disadvantaged groups in India, which results in higher economic growth. Ghosh (2011) also finds a significant impact of financial inclusion but argues that the quality of state-level institutions and infrastructure affects economic growth through financial inclusion.

Various researchers analyze the impact of financial inclusion on economic growth using cross-country and panel data estimation techniques. Kim et al. (2016) find that financial inclusion positively affects growth primarily by alleviating the income inequality scenario in 40 OECD and EU countries from 2004 to 2011. Kim et al. (2018) examine the relationship between financial inclusion and economic growth in 55 Organization of Islamic Cooperation (OIC) countries from 1990 to 2013 with system-GMM and VAR methodology. The study finds that financial inclusion has a positive impact on economic growth in OIC countries. Karim et al. (2021) examine the impact of financial inclusiveness on economic growth using a sample of 60 emerging and less-developed countries from 2010 to 2017. Adopting a dynamic panel threshold estimation technique, the authors find that the impact of financial inclusion is positive and has a more significant growth-enhancing effect among less developed and emerging market countries relative to developed ones. Cabeza-García et al. (2019) show that greater financial inclusion of women, measured as access to a bank account and access to credit cards, has a positive effect on economic development in 91 developing countries. Emara

and Said (2021) investigate the relationship between financial inclusion, governance, and economic growth in 44 Middle East and North African (MENA) countries. The results indicate that financial inclusion has a significant impact only in the presence of strong institutions. Huang et al. (2021) adopt the fully modified least squares (FMOLS) method in examining the relationship between financial inclusion and economic development in 27 European Union (EC) countries from 1995 to 2015. The results indicate that financial inclusion indicators have a significant positive impact on economic growth in EU countries, and the impact is stronger in new EU and low-income EU economies. Marcelin et al. (2021) analyze financial inclusion and bank ownership structure's macro impact, using data from 44 developing countries from 2004-2017. They use the dynamic panel estimation method and find that financial services support economic growth, but foreign bank participation reduces GDP growth through restricted intermediation.

Studies focusing on developing countries find several other ways by which financial inclusion affects economic growth. Younas et al. (2022) find that financial inclusion can improve economic growth by reducing the size of the shadow economy in developing countries. Several studies identify that financial inclusion facilitates the creation of a well-organized financial system that promotes economic growth. Andrianaivo and Kpodar (2011) show that mobile phone development consolidates financial inclusion's impact on economic growth in African countries. Inoue and Hamori (2016) find that financial access has a statistically significant and robust effect on increasing economic growth in 37 Sub-Saharan African countries. Andrianaivo and Kpodar (2011), using the GMM approach, find that financial inclusion significantly increases economic growth in 44 African countries. Balach R et al. (2016) use "commercial bank branches per 100,000 adults and ATMs per 100,000 adults" as proxies of financial inclusion to assess its effect on economic growth in 97 cross-section countries during 2004-2012. The results confirm the positive effect on growth for both proxies. Sethi and Acharya (2018) use dynamic OLS (DOLS) and fully modify OLS (FMOLS) to assess the link between financial inclusion and growth in 31 countries and conclude that financial inclusion has a long-term positive effect on economic growth in these countries.

Studies on financial development find that financial development significantly increases economic growth. Using the World Bank survey data on six different countries,

Dabla-Norris et al. (2015) show that alleviation of different financial frictions contributes to economic growth and country-specific characteristics play a central role in determining the linkages and tradeoffs between inclusion, economic growth, and inequality. Hassan et al. (2011). find a positive relationship between financial development and economic growth in developing countries. They argue that a well-functioning financial system is a necessary but not sufficient condition to reach steady economic growth in developing countries. Most studies find that financial development primarily stimulates economic growth by ensuring efficient intermediation and resource allocation. Nguyen et al. (2021) find that financial development has a positive impact on economic growth and has bidirectional causality with economic growth in 22 emerging market countries. Samargandi et al. (2015) investigate the relationship between financial development and economic growth in a panel of 52 middle-income countries over the 1980–2008 period. They show an inverted U-shaped relationship between finance and growth using pooled mean group estimations in a dynamic panel setting.

Some studies do not find a positive impact of financial inclusion on economic growth. Pearce (2011) argues that the inability of financial services to reach the majority of the population, including the poor, woman, elders, and other disadvantaged groups, can be the reason behind the non-significant effect. Moore and Craigwell (2003) claim that smaller financial products do not produce a higher financial return for commercial banks compared to the operating cost of proving the service. Natamba et al. (2013) find similar results about the impact of high transaction costs of micro-finance products.

2.4 Review of literature on financial inclusion and gender inequality

Past studies identify factors that influence gender equality in developing countries. Duflo (2012) argues that gender-blind policies that aim at the economic welfare of households can improve gender equality. Gender inequality is often higher among the poor, both within and across countries. As poverty declines and income grows, countries experience less gender gap in school enrollment and wages, labor force participation, and the life expectancy of women also increases. Studies also show that when households face constraints, they usually resolve the problem at the cost of women's well-being (Rose, 1999; Duflo, 2012). Goldin (2006) shows that economic development leads to a change in the nature of work that is more conducive to women's work. Greenwood, Seshadri, and

Yorukoglu (2005) argue that economic development can lead to women's empowerment by freeing their time. Rose (1999) finds that when they cannot afford to feed everyone, families disproportionately sacrifice the welfare of girls. Duflo (2012) also shows that poverty reduction and economic growth reduce inequality by relaxing the constraints poor households face. Hence, poverty reduction and income enhancement policies disproportionately help women even without targeting them.

Access to finance can help to reduce poverty in various ways. In their systemic review of microfinance literature, Duvendack et al. (2011) and Chliova et al. (2015) show that microfinance could benefit poor people through changes in their financial behaviors, such as encouraging savings, expanding income opportunities, and smoothing consumption. Demirguc-Kunt et al. (2013, 2017) find that financial inclusion reduces income inequalities, which helps in reducing poverty and improving economic development. Kara et al. (2021) find that financial services help poor households to meet their financial needs, own houses, establish businesses, and invest in skill development and education. Various researchers apply composite financial inclusion indices to analyze the impact of financial inclusion on poverty. Omar and Inaba (2020) follow Sarma's (2012) approach and apply panel regression analysis to investigate the impact of financial inclusion on poverty in 116 developing countries. They find a significant negative impact of financial inclusion on poverty. Gutiérrez-Romero and Ahamed (2021) use two sub-indices of financial inclusion in 79 low and lower-middle-income countries. They find that financial inclusion reduces poverty by reducing income inequality.

Financial inclusion can improve gender equality through the economic development channel. Past studies show that financial inclusion is correlated with economic development. Huang et al. (2021) show that access, depth, efficiency, and overall development of financial institutions significantly increase economic growth in European countries. Emara and Said (2021) empirically investigate the relationship between financial inclusion, governance, and economic growth in 44 emerging markets (EMs) and MENA over the period 1990 to 2018 and find that financial inclusion has a positive and statistically significant impact on economic growth, but requires better institutional quality. Cabeza-García et al. (2019) provide evidence that suggests that greater financial inclusion of women, measured by bank account ownership and credit

card access, has a positive effect on economic development. Chuc et al. (2022) investigate the joint impact of international remittance inflows and financial inclusion on income growth in 60 low- and middle-income countries from 1996 to 2017. The results show that financial inclusion could strengthen the growth-enhancing effect of remittances. Amponsah et al. (2021) show that financial inclusion exhibits an inverted- U-shaped relationship with inclusive growth in Sub-Saharan Africa. Kim Jong-Hee (2016) finds that financial inclusion improves the relationship between income inequality and economic growth. Financial inclusion increases economic growth by reducing income inequality. Section 2.3 reviews more literature on this issue.

In analyzing the impact of economic development on gender inequality, Duflo (2012) argues that economic development usually leads to gender equality. Often women's empowerment also leads to higher economic development. Financial inclusion can improve gender inequality by improving women's empowerment through employment generation and labor force participation. Studies by Jensen (2010) and Attanasio and Kaufmann (2009) show that increased opportunities for women in the labor market translate into better outcomes for women in China and India. Johnson and Arnold (2012) show that financial inclusion is closely related to employment creation. El-Zoghbi et al. (2019) argue that financial inclusion improves women's bargaining power in the household, which enables women to increase their participation in the labor force. According to the World Bank (World Bank, 2012), if women get access to loans, it can increase women's income, improve their quality of life, and promote the development of their families and communities. According to the International Financial Corporation report (IFC, 2011), women need to access a broader range of financial services, such as loans and credit lines, to achieve full financial empowerment.

Financial inclusion can also alleviate gender inequality through the insurance channel. Rose (1999) finds that providing households with insurance against risk may reduce child mortality and the mortality gap between boys and girls. Jayachandran and Lleras-Muney (2009) argue that if the mortality rate of girls at a young age is high, families tend to spend more on boys' education. Through randomized control trials, Orton et al. (2016) find an association between membership in a microfinance scheme and improvements in the health of women and their children. Demirguc-Kunt et al. (2017), in

their review of randomized control-based studies, identify that financial inclusion provides insurance benefits to the users. Financial products like crop insurance and different borrowing options that smooth consumption allow households to manage risk better and spend more on girls' health and education.

Financial inclusion can reduce gender inequality by expanding market opportunity. Porter, Widjaja, and Nowacka (2015) demonstrate that women's inability to access financial products and services impedes them from taking advantage of market opportunities. Financial inclusion initiatives enable women to utilize new opportunities.

There is a possibility that financial inclusion might increase gender inequality because women face more discrimination in accessing financial services in developing countries. Klapper and Singer (2015) find an inability of women to access formal credit in African countries. Morsy (2020) examines the Global Findex database and shows that women are more likely to be excluded from the financial sector. Xu et al. (2018) find that women have a lower propensity to default on loans than men but face more barriers in obtaining business loans. In India, Sandhu et al. (2012) show that female applicants need to provide higher collateral than men in obtaining credit, and loan rejection rates for female business owners are higher than for male owners. Though these studies suggest that women might face more obstacles than men in utilizing financial inclusion benefits, financial inclusion should disproportionately help women if it has poverty reduction and income enhancement effects.

Gender equality is also affected by social, cultural, and institutional factors. Kim (2021) analyzes critical factors of gender inequality in 34 OECD and non-OECD countries. His study examines the impact of various capabilities, livelihood, cultural, and formal institutional quality-based indicators on gender inequality. Though there are differences in results between OECD and non-OECD countries, the results confirm that a difference in capabilities due to differences in education and experience affects gender equality. Increased opportunities to earn livelihood also reduce gender inequality. In addition, his research finds that the quality of institutions also influences gender inequality by implementing policies that are not discriminatory to women.

Although the impact of financial inclusion on SDGs has been extensively studied from various perspectives, some questions remain unanswered. Existing studies have not adequately analyzed how differently financial inclusion affects poverty in different income groups of countries. Moreover, how inequality in access to financial services affects the effectiveness of financial inclusion on poverty alleviation has not been evaluated. Past studies have proposed several channels through which financial inclusion might affect economic growth but have not adequately investigated the channels. Moreover, why financial inclusion significantly impacts economic growth in developing countries, but not high-income countries has not been evaluated. Previous studies also have not shed light on the interlinkage between financial inclusion and gender inequality in developing countries. This study contributes to the literature by providing new explanations for these issues.

Chapter 3: Data, Variables, Econometric issues, and the Financial Inclusion Index

3.1 Data, variables, and Econometric issues

This research analyzes how financial inclusion affects three sustainable development goals (SDGs). SDG-1 (no poverty) refers to ending poverty everywhere in all its forms, SDG-5 (gender equality) aims to achieve gender equality and empower all women and girls, and SDG-8 (Decent work and economic growth) focuses on promoting sustained, inclusive, and sustainable economic growth, and ensure full and productive employment and decent work for all. The following descriptions explain how key concepts are dealt with as indicators. This research uses two different indicators to measure poverty. It measures extreme poverty using the log poverty headcount ratio at USD 1.9 per day, defined as the percentage of the population living in less than USD 1.9 per day adjusted for 2011 international prices. It relies on the log poverty headcount ratio of USD 3.5 per day to measure moderate poverty. Gender inequality is measured using the gender inequality index (GII) developed by UNDP. The index scores between zero and one, where a higher score indicates higher gender inequality. The research uses real annual growth of GDP per capita measured in constant USD 2010 prices to measure economic growth. The variables' definition and their data sources are presented in Appendix A. In Appendix B, this research depicts the descriptive statistics.

The research applies dynamic and static panel estimation techniques to analyze the impact of financial inclusion on the three SDGs. It uses the two-stage generalized method of moments (GMM) to analyze the poverty-financial inclusion relationship. Due to lower frequency data, it also applies the fixed-effect method to check the robustness. Due to data adequacy, this research applies two-stage GMM to investigate the impact of financial inclusion on economic growth. This research analyzes the conditional relationship between factors affecting poverty and financial inclusion. It applies the two-stage least squared method and uses lag mobile phone subscription rate as an instrument for this analysis. This instrumental variable approach is suitable for addressing possible endogeneity and reverse causality issues. This approach is also used to analyze the gender inequality-financial inclusion relationship.

Before the regression analyses, several statistical tests are performed. Due to the unbalanced panel database with missing values, the Fisher-type unit root tests with Phillips–Perron criteria are applied to assess the stationarity properties of the variables. In most of the cases, tests find that almost all of the variables are stationary at level. The correlation matrix analysis among the variables examines the possibility of multicollinearity. The panel Granger causality test examines causality among the variables. The modified Wald test investigates heteroskedasticity in the disturbance term. The estimated results are based on robust standard errors to address heteroskedasticity.

3.2 Construction of the financial inclusion index[4]

To measure country-wise financial inclusion, this research constructs an equal-weighted composite financial inclusion index. Rather than relying on one specific indicator, the study constructs a composite index using data from commercial banks, credit cooperatives, credit unions, and microfinance institutions. Data for the index construction is gathered from the Financial Access Survey of the IMF. Six different indicators are used for the index construction. The details of the indicators and their standardized scores are presented in Table 1. The composite index has a score of zero and one, where a higher score indicates a higher level of financial inclusion.

Table 1 Indicators used for the construction of financial inclusion index.

SL	Name of the Indicators	Observations
1.	Number of financial institution branches per 100,000 adults	3,040
2.	Number of ATMs per 100,000 adults	2,667
3.	Number of depositors with financial institution per 1,000 adults	3,036
4.	Number of deposit accounts with financial institution per 1,000 adults	1,760
5.	Number of borrowers with financial institutions per 1,000 adults	1,460
6.	Number of loan accounts from financial institutions per 1,000 adults.	1,490

Source: Financial Access Survey (FAS), The IMF. Calculation: Authors' assessment

[4] Part of sections 3.2 and 4.1 are first published in Economic Change and Restructuring, Volume 56, pp. 409-440, 2022 by Springer Nature.

Following Sarma (2012), this study constructs the index of financial inclusion which estimates the standardized score for each indicator by applying equation (1).

$$d_{ijt} = \frac{x_{ijt} - m_i}{M_i - m_i}, \quad (1)$$

where, d_{ijt} measures the standardized value for the indicator/dimension of a country at time *t*, x_{ijt} represents the actual value of indicator *i* for country *j* at time *t*, m_i is the minimum value and M_i is the upper limit of indicator *i*. The study assigns zero as the minimum value. To avoid the influence of extreme values in standardizing, the study uses the 90th-percentile value of each indicator as to the upper limit. If any country score exceeds one due to this upper limit, this study sets that score to one. This standardization ensures an indicator-specific standardized score (d_{ijt}) that lies between zero and one.

After standardizing the indicators, this research aggregates indicators based on normalized Euclidean distance as follows:

$$FII = \frac{1}{2}\,(X_1 + X_2), \quad (2)$$

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \cdots + d_6^2}}{\sqrt{w_1^2 + w_2^2 + \cdots + w_6^2}}, \quad (3)$$

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + \cdots + (w_6 - d_6)^2}}{\sqrt{w_1^2 + w_2^2 + \cdots + w_6^2)}}. \quad (4)$$

In equations (2) – (4), FII represents the financial inclusion index score for each country. The composite index of each country has a value between zero and one, where higher values indicate a greater level of financial inclusion. X_1 is the Euclidian distance from the worst point, X_2 is the inverse distance from an ideal point, d_i represents dimension or indicator-specific scores of the countries obtained from equation (1), and w_i represents the weight assigned to each dimension. As the study uses total of six dimensions and assigns equal weight to each dimension, the weight of each dimension is set as 1/6, i.e., $w_1 = w_2 = w_3 = w_4 = w_5 = w_6 = \frac{1}{6}$.

The method of this study follows Sarma (2012); however, there are notable differences. The study uses six dimensions instead of the three proposed by Sarma (2012).

Moreover, this method treats each indicator as a separate dimension, as opposed to using a weighted average of multiple indicators. The study also assigns equal weights for each dimension and ensure that if any dimension has a missing value in any particular period, the corresponding weights in equations (3) and (4) also remain zero. This approach is better suited for unbalanced panel data with missing values. The rationale for using equal weights is discussed in more detail in Appendix C, where this research also compares the proposed index with an index constructed using Sarma's (2012) methodology.

The composite index has maximum, minimum, and average values of 1, 0.094, and 0.851 for all countries from 2004–2019. The country-wise index is presented in Appendix D. Panel A of Figure 1 shows the gradual increase in financial inclusion level in developing countries over the years, whereas Panel B shows the scenario for different income groups of countries. From Panel B, it is evident that there is scope for more financial inclusion in developing countries. In high-income countries, the current level of financial inclusion is relatively high, and there is not much scope for more financial inclusion.

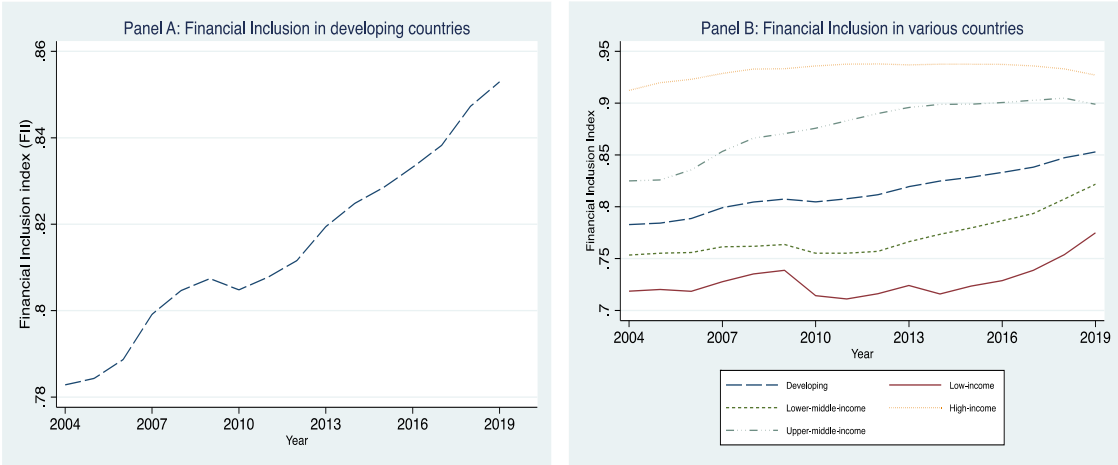

Figure 1 Financial inclusion index in different groups of countries
Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment.

Chapter 4: Poverty alleviation through financial inclusion

This chapter analyzes poverty-financial inclusion in two broad ways. First, section 4.1 examines the impact of financial inclusion on two different poverty levels in different income groups of countries. Second, section 4.2 analyzes the influence of unequal access, inequalities, education level, and institutional quality on poverty reduction through financial inclusion in developing countries.

4.1 Empirical examination of financial inclusion's impact on poverty

Poverty alleviation is a key objective for many countries. The World Bank estimates that roughly 150 million new people may live in extreme poverty due to the recent Covid-19 pandemic (Poverty and Shared Prosperity 2020: Reversals of Fortune). Due to the recent surge in poverty, identifying policy instruments to alleviate poverty is crucial. One such policy tool is financial inclusion.

Randomized studies by Demirguc-Kunt et al. (2017), Aker et al. (2014), and Babatz (2013) suggest that financial inclusion reduces poverty through access to payment, savings, credit, and insurance services. Cross-country studies by Park and Mercado (2018), Swamy (2010), and Omar and Inaba (2020) demonstrate a negative association between financial inclusion and poverty level. Recent studies, including those by Kara et al. (2021) and Aslan et al. (2017), suggest that the efficacy of financial inclusion as a policy tool may be affected by the inequality of access to financial services. In particular, disadvantaged groups such as females, ethnic minorities, disabled people, and immigrants have a lower probability of accessing financial services. Section 2.1 of Chapter 2 provides a more detailed literature review.

This research constructs a novel financial inclusion index to examine the effect of financial inclusion on poverty. The results indicate that financial inclusion contributes to poverty alleviation in developing countries but not in high-income countries. Among developing countries, the impact of financial inclusion on poverty is more substantial in upper-middle-income countries than in lower-middle-income countries and low-income countries. This study also finds that the effect of financial inclusion on moderate poverty is weaker than that on extreme poverty. This research argues that how disadvantaged groups such as women, the poor, and people with less wealth and financial literacy can

access financial services affects the impact of financial inclusion on poverty alleviation. Financial inclusion is more effective in the alleviation of poverty if these disadvantaged groups can access and use financial services.

This investigation follows previous studies with three notable improvements. First, as discussed in the last chapter, the financial inclusion index constructed in this research is more comprehensive than the index used in the previous studies. Second, this study divides countries into different groups according to average income levels, which enables a comparison of the effects of financial inclusion between countries in various stages of development. Finally, the study examines two levels of poverty: extreme and moderate. The sample of this analysis includes data from commercial banks, credit cooperatives, credit unions, and microfinance institutions to assess financial inclusion levels.

This study contributes to the area of research by discussing financial inclusion and poverty in several ways. The findings reveal that the impact of financial inclusion on poverty varies for different national income groups. The study argues that unequal access to financial services might explain this behavior. This analysis also links various inequalities in financial access and shows that financial inclusion can effectively reduce poverty by reducing unequal access.

4.1.1 Financial Inclusion and poverty in different groups of Countries

This segment graphically presents some stylized facts regarding the linkage between extreme poverty and financial inclusion. This research measures extreme poverty using the log poverty headcount ratio at USD 1.9 per day, which is defined as the percentage of the population living on less than USD 1.9 per day adjusted for 2011 international prices. Figure 2 plots log poverty headcount and financial inclusion scores for different country income groups. Following the World Bank's income categories, countries are classified into four groups: high-income, upper-middle-income, lower-middle-income, and low-income countries. Developing countries consist of upper-middle-income, lower-middle-income, and low-income countries.

In panel A of Figure 2, developing countries show a steady increase in financial inclusion and a continuous drop in the poverty rate. Panel B of Figure 2 focuses on low-income countries, and the graph indicates a lower level of financial inclusion and higher

extreme poverty rates in low-income countries compared to other countries. Unequal access to financial services is a possible reason for this result. Previous studies have suggested that less wealthy people, women, and other disadvantaged groups have less opportunity to access financial products, and such disadvantaged groups are assumed to be relatively substantial in low-income countries. Enabling financial inclusion for these disadvantaged groups are expected to advance extreme poverty reduction. In panel C, lower-middle-income and low-income countries present a trend similar to developing countries. The similarity is expected as these countries are also a substantial portion of developing countries. Panel D shows that the poverty rate is meager in high-income countries, but the relation between poverty and financial inclusion is not so apparent.

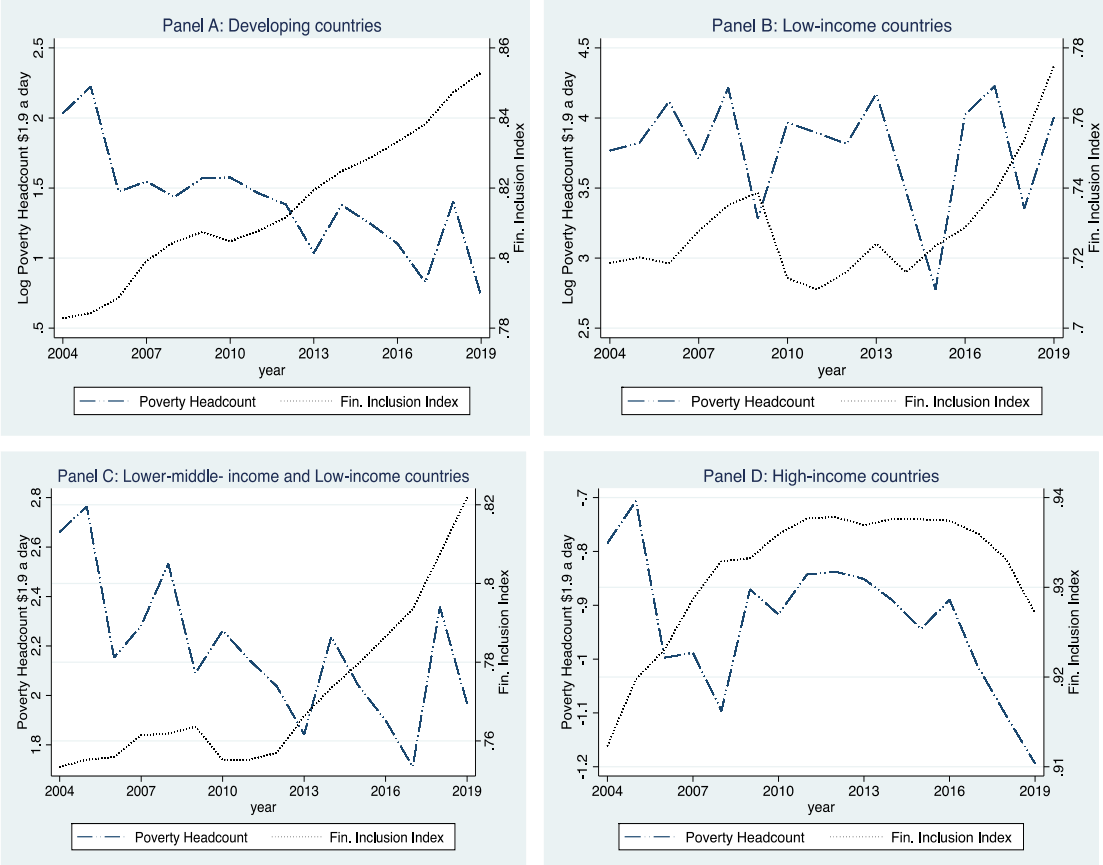

Figure 2 Poverty and financial inclusion across countries in various income groups
Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment.

Figure 2 shows that despite some recent marginal increases, the overall poverty rate appears to be falling in most countries. Although there are some periods when poverty increases despite improvement in financial inclusion. Overall, Figure 2 suggests a negative association between financial inclusion and poverty.

4.1.2 Model specification

This research applies the dynamic two-stage system generalized method of moments (GMM) panel estimation method to analyze the effect of financial inclusion on poverty. As the two-stage system GMM method uses both level and lag value of the variables as instruments, it is more suitable for addressing the endogeneity and serial correlation issues than the fixed-effect method. The model specification for the system GMM method is shown in equation (5).

$$\text{lnpovheadl}_{it} = \alpha + \beta_1 \text{lnpovheadl}_{it-1} + \beta_2 \text{FII}_{it} + \gamma Z_{it} + \varepsilon_{it} \qquad (5)$$

where the dependent variable is the log poverty headcount ratio at USD 1.9 per day (lnpovheadl_{it}), which is a measure of extreme poverty. The composite financial inclusion index (FII_{it}) is an independent variable. The lag dependent variable (lnpovheadl_{it-1}) is used as a separate independent variable, as per the specification of the system GMM method. Z is a vector of control variables, including GDP growth per capita, log Gini, school enrollment, and the rule of law[5].

The study expects a negative coefficient for the financial inclusion index, indicating that financial inclusion can reduce extreme poverty. The control variables are selected from previous studies (Gutiérrez-Romero and Ahamed, 2021; Omar and Inaba, 2020; Park and Mercado, 2018). GDP growth per capita assesses the impact of income growth on poverty, and Log Gini captures the impact of unequal income distribution. This research expects GDP growth to have a negative coefficient because higher income should reduce poverty. Log Gini is expected to have a positive coefficient because higher inequality in income distribution disproportionately favors the rich and is detrimental to poverty reduction. The study uses school enrollment as a proxy for human capital development and expect a negative coefficient. In addition, the rule of law is chosen as a proxy for institutional quality. Adherence to the rule of law should enable poverty reduction by ensuring the smooth functioning of regulatory mechanisms.

[5] Omar and Inaba (2020) use financial development as a control variable. Due to the potential multicollinearity problem, this research does not include financial development. However, the examination suggests that the results of this study remain valid even if financial development is included.

Though this research primarily applies the system GMM method, robustness of results are also examined using the static (fixed-effect) regression method. Data requirements of the system GMM method make it difficult to analyze model (5) for a wide range of countries. In contrast, the fixed-effect method enables the analysis of many countries. Though the fixed-effect method is less suited to address endogeneity than the system GMM method, it is otherwise suitable for analyzing panel data, as it controls for country-specific influence by incorporating country and time fixed effects. Previous studies by Gutiérrez-Romero and Ahamed (2021), Omar and Inaba (2020), and Park and Mercado (2018) have also applied this method in analyzing poverty–financial inclusion linkage. The model specification of the fixed-effect method is shown in equation (6).

$$\text{lnpovheadl}_{it} = \alpha + \beta_1 \text{FII}_{it} + \gamma Z_{it} + \eta_i + \varepsilon_i \qquad (6)$$

where ηi are the country and time fixed-effect coefficient. Control variables in vector Z_{it} are the same as in equation (5).

4.1.3 Impact of financial inclusion on extreme poverty

Table 2 presents the results obtained using the system GMM method. The diagnostic tests indicate that all GMM requirements are satisfied and the model is well specified.[6] Even after incorporating all the relevant control variables, financial inclusion has a significant negative coefficient, suggesting that financial inclusion has a negative association with poverty in developing countries. This result is congruent with the findings of previous cross-country studies (Park and Mercado, 2018; Swamy, 2010; Omar and Inaba, 2020). Previous studies, such as Demirguc-Kunt et al. (2017) and Aker et al. (2014), argue that financial inclusion seems to expand opportunities to involuntarily excluded portions of society by offering credit, savings, insurance, and digital financial services, which smoothens consumption, increases efficiency, and raises labor force participation, leading to poverty reduction. The results in Table 2 align with these arguments.

[6] In Table 2, the number of countries is greater than the number of instruments. Moreover, the null hypothesis of no second-order autocorrelation cannot be rejected. Similarly, the null hypothesis of no over-identification problem cannot be rejected. These tests results confirm that the dynamic two-stage system GMM panel method is applicable for the analysis.

Among other variables, log Gini has a significant and positive coefficient, and GDP growth per capita has expected negative coefficients though the coefficient is not always significant. These results indicate that countries can reduce poverty by lowering income inequality and expanding GDP growth.

Table 2 Extreme poverty and financial inclusion in developing countries: dynamic two-stage system GMM panel method.

Time Frame: 2004–2019, Yearly Panel				
Variables	(1)	(2)	(3)	(4)
	Dependent variable: log poverty headcount ratio at USD 1.9 per day			
Lag dependent variable	0.168	-0.157	0.0141	0.0305
	(0.251)	(0.207)	(0.173)	(0.172)
Financial inclusion index	-16.46***	-15.82***	-9.348***	-8.706***
	(5.147)	(3.745)	(2.517)	(2.085)
GDP growth per capita	-0.0343*	-0.0162	-0.00889	-0.0102
	(0.0194)	(0.0122)	(0.0106)	(0.00955)
Log Gini		4.930***	3.444***	3.348***
		(1.355)	(1.088)	(1.025)
School enrollment			-0.920	-1.286
			(0.798)	(0.798)
Rule of law				0.315
				(0.256)
Constant	15.64***	-3.002	0.734	2.263
	(4.765)	(4.360)	(4.240)	(4.074)
Observations	332	332	275	275
Diagnostic tests:				
Number of countries	35	35	33	33
No. of instruments	29	30	31	32
AR2 statistics	0.177	0.214	0.196	0.155
Hansen J score	0.370	0.257	0.331	0.418

Note: Dynamic two-stage system GMM panel method. The first column analyzes the impact of financial inclusion on poverty using GDP growth per capita as a control variable. In models (2), (3), and (4), the study adds log Gini, school enrollment, and the rule of law as additional control variables, respectively. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

In Table 3, this research presents the results of the fixed-effect analysis, in which the number of countries is much larger than in the system GMM analysis. Even after incorporating all the control variables, the financial inclusion index has a statistically significant negative coefficient. This result supports the findings using the system GMM method and aligns with previous studies (Park and Mercado, 2018; Swamy, 2010). Among the control variables, log Gini is significant with a positive coefficient, while school enrollment is also significant with expected negative sign. Increased school

enrollment is likely to contribute to poverty eradication by improving human resources and cultivating improved skills for boosting productivity.

Table 3 Extreme poverty and financial inclusion in developing countries: fixed effects method.

Time Frame: 2004–2019, Yearly Panel					
Variables	(1)	(2)	(3)	(4)	(5)
	Dependent variable: log poverty headcount ratio at USD 1.9 per day				
Financial inclusion index	-6.676***	-6.686***	-5.279***	-4.050***	-3.780***
	(1.174)	(1.227)	(1.121)	(0.872)	(0.927)
GDP growth per capita		0.00838	0.000567	-0.0138**	-0.0140***
		(0.00751)	(0.00626)	(0.00540)	(0.00525)
Log Gini			4.495***	3.381***	3.377***
			(0.766)	(0.643)	(0.635)
School enrollment				-1.384***	-1.346***
				(0.303)	(0.306)
Rule of law					-0.266
					(0.300)
Constant	7.140***	7.128***	-10.66***	-1.675	-2.182
	(1.006)	(1.056)	(3.116)	(3.268)	(3.297)
Observations	609	603	603	431	431
R-squared	0.231	0.235	0.412	0.432	0.436
Number of countries	114	113	113	94	94

Note: Panel fixed-effect method. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

Table 4 presents the results of the system GMM analysis for different income groups of countries. This analysis is essential because financial inclusion and other control variables might affect countries in various stages of development differently. Classifying countries according to their income levels enable this research to assess the impact of financial inclusion on countries in similar stages of development. The system GMM results in Table 4 demonstrate that the coefficients of financial inclusion with poverty are negative in all countries except the high-income countries.[7] These results broadly support earlier findings in Table 2. In high-income countries, financial inclusion seems not to have a significant association, and the sign of the coefficient is also positive. Since high-income countries have very low existing extreme poverty rates, further poverty reduction through financial inclusion seems challenging.

[7] This method cannot evaluate lower-middle-income and low-income countries due to the limitation of data (the number of countries is smaller than the number of instruments).

Table 4 Extreme poverty and financial inclusion: various groups of countries (GMM)

Time Frame: 2004–2019, Yearly Panel				
Variables	(All countries)	(High-income countries)	(Upper-middle-income countries)	(Lower-middle-income and low-income countries)
	Dependent variable: log poverty headcount ratio at USD 1.9 per day			
Lag dependent variable	0.430*	0.568***	0.297*	1.189
	(0.255)	(0.113)	(0.167)	(1.194)
Financial inclusion index	-5.404*	4.409	-6.311*	-2.071
	(2.991)	(5.512)	(3.119)	(1.870)
GDP growth per capita	-0.0194**	-0.0199**	-0.0122	-0.00715
	(0.00869)	(0.00920)	(0.0106)	(0.0452)
Log Gini	1.820**	1.074**	1.876**	0.748
	(0.874)	(0.439)	(0.673)	(3.168)
School enrollment	-0.367	-0.530	-0.707	1.609
	(0.552)	(0.373)	(1.283)	(1.456)
Rule of law	-0.273	-0.219	0.146	0.120
	(0.191)	(0.190)	(0.289)	(2.311)
Constant	0.260	-5.542	2.737	-8.259
	(2.667)	(5.379)	(4.792)	
Observations	610	253	210	65
Diagnostic tests:				
Number of countries	65	30	24	9
Number of instruments	32	27	32	31
AR2 statistics	0.644	0.110	0.167	0.479
Hansen J score	0.367	0.698	0.789	1.000

Note: Dynamic two-stage system GMM panel method. All countries include high-income, upper-middle-income, lower-middle-income, and low-income countries. Significance, *** p<0.01, and ** p<0.05, * p<0.1. Robust standard errors are in parentheses.

Table 5 adopts the fixed-effect method to investigate the impact of financial inclusion on poverty in different income groups of countries, thus finding that financial inclusion has a significant negative correlation with extreme poverty in all countries except the high-income countries. Among the income-based country groups with significant coefficients, the significance level and magnitude of financial inclusion coefficient in lower-middle-income and low-income countries are weaker than in upper-middle-income countries. Inequality in accessing financial services could explain this issue. As lower-middle-income and low-income countries have lower levels of financial inclusion and higher gender inequality than upper-middle-income countries, financial inclusion has a weaker association with poverty in lower-middle-income and low-income

countries[8]. In addition to unequal financial access, lower-middle-income and low-income countries also have lower average income and lower school enrollment levels than upper-middle-income countries[9]. Kara et al. (2021) indicate that people with less income, education, and financial literacy are less likely to access financial services. So, this research argues that financial services are likely to be more unequally shared in lower-middle-income and low-income countries than in upper-middle-income countries. Section 4.2 discusses the impact of unequal access and different inequalities in more details. In summary, Tables 4 and 5 confirm that financial inclusion has different levels of association with poverty in different income groups of countries, and it does not have a significant association in high-income countries.

Table 5 Extreme poverty and financial inclusion: various groups of countries (fixed-effect method)

Time Frame: 2004–2019, Yearly Panel				
Variables	(All countries)	(High-income countries)	(Upper-middle-income countries)	(Lower-middle-income and low-income countries)
	Dependent variable: log poverty headcount ratio at USD 1.9 per day			
Financial inclusion index	-3.574***	-4.115	-4.999***	-2.357*
	(0.841)	(2.102)	(1.445)	(1.298)
GDP growth per capita	-0.0127***	-0.0126**	-0.0189**	-0.0129
	(0.00415)	(0.00601)	(0.00707)	(0.0107)
Log Gini	3.794***	4.566***	2.958***	3.746***
	(0.500)	(0.785)	(0.956)	(0.747)
School enrollment	-1.160***	-0.580	-1.919***	-1.024***
	(0.273)	(0.581)	(0.488)	(0.300)
Rule of law	-0.508**	-0.784**	-0.255	-0.0375
	(0.240)	(0.378)	(0.360)	(0.439)
Constant	-4.831*	-9.408*	2.945	-5.586**
	(2.771)	(4.849)	(5.628)	(2.745)
Observations	816	385	254	177
R-squared	0.345	0.251	0.469	0.446
Number of countries	133	39	33	61

Note: Panel fixed-effect method. "All countries" includes high-income, upper-middle-income, lower-middle-income, and low-income countries. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors in parentheses.

[8] The average gender inequality index (GII) score is 0.377 in upper-middle-income countries and 0.529 in lower-middle-income and low-income countries, suggesting more gender equality in upper-middle-income countries. Panel B of Figure 1 indicates that upper-middle-income countries also have a higher financial inclusion level.

[9] In upper-middle-income countries, average gross secondary school enrollment ratio is 89.19 percent and per capita GDP is USD 6,483. In lower-middle-income and low-income countries, average school enrollment is 54.89 percent and per capita GDP is USD 1,532.

4.1.4 Impact of financial inclusion on moderate poverty

This section examines the effect of financial inclusion on moderate poverty, which is defined as the log of poverty headcount ratio at USD 3.2 per day, adjusted by 2011 purchasing power parity. Table 6 presents the system GMM results for different income groups of countries. Financial inclusion has a significant negative coefficient only for developing countries. This suggests that reducing moderate poverty through financial inclusion by raising national incomes to a higher level is more challenging than improving extreme poverty.

Table 6 Moderate poverty and financial inclusion: various group of countries (GMM)

Time Frame: 2004–2019, Yearly Panel					
Variables	(All countries)	(High-income countries)	(Developing countries)	(Upper-middle-income countries)	(Lower-middle-income and low-income countries)
	Dependent: Log poverty headcount at USD 3.2 per day				
Lag dependent variable	0.909***	0.845***	0.679***	0.733***	0.675
	(0.190)	(0.244)	(0.105)	(0.127)	(0.427)
Financial inclusion index	-1.818	4.456	-3.405**	-2.102	-9.168
	(1.878)	(5.258)	(1.442)	(1.646)	(2.746)
GDP growth per capita	-0.0205***	-0.0213*	-0.00940**	-0.00980	-0.00956
	(0.00659)	(0.0115)	(0.00447)	(0.00575)	(0.0368)
Log Gini	0.526	0.710	1.133**	0.810	-0.328
	(0.667)	(0.839)	(0.464)	(0.502)	(0.602)
School enrollment	-0.0570	-0.258	-0.674*	-0.780	-2.206
	(0.215)	(0.402)	(0.352)	(0.591)	(3.967)
Rule of law	0.00574	-0.123	0.257*	0.153	0.923
	(0.135)	(0.212)	(0.140)	(0.198)	(3.476)
Constant	0.0940	-5.398	2.634	2.907	20.06
	(0.537)	(4.563)	(1.913)	(2.951)	(30.15)
Observations	700	389	311	234	77
Diagnostic tests:					
Number of Countries	68	34	34	25	9
Number of instruments	32	32	32	32	32
AR2 statistics	0.159	0.246	0.153	0.432	0.465
Hansen J score	0.526	0.296	0.696	0.830	1.00

Note: Dynamic two-stage system GMM panel method. "All countries" include high-income, upper-middle-income, lower-middle-income, and low-income countries. "Developing countries" include upper-middle-income, lower-middle-income and low-income countries. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

Table 7 analyzes the impact of financial inclusion on moderate poverty using the fixed-effect method, revealing that financial inclusion has a negative association with moderate poverty in each income group of countries, except high-income countries.

However, the magnitude of the negative coefficient is weaker in Table 7 than the case of extreme poverty in Table 5. The result suggests that moderate poverty is more difficult to alleviate through financial inclusion than extreme poverty. Tables 6 and 7 lead to conclude that financial inclusion has a significant negative association with moderate poverty, particularly in the case of developing countries, and previous findings of the study are robust.

Table 7 Moderate poverty and financial inclusion: various group of countries (fixed-effect method)

Time Frame: 2004–2019, Yearly Panel					
Variables	(All countries)	(High-income countries)	(Developing countries)	(Upper-middle-income countries)	(Lower-middle-income and low-income countries)
	Dependent: Log poverty headcount at USD 3.2 per day				
Financial inclusion index	-2.349***	-1.757	-2.711***	-3.474***	-1.604**
	(0.609)	(1.452)	(0.608)	(0.943)	(0.612)
GDP growth per capita	-0.00813**	-0.0103	-0.00551	-0.0117**	-0.00181
	(0.00399)	(0.00617)	(0.00396)	(0.00561)	(0.00502)
Log Gini	3.575***	4.554***	3.028***	3.200***	2.725***
	(0.550)	(0.969)	(0.652)	(0.888)	(0.808)
School enrollment	-0.923***	-0.585	-1.052***	-1.828***	-0.519***
	(0.280)	(0.516)	(0.315)	(0.562)	(0.178)
Rule of law	-0.397*	-0.681*	-0.144	-0.228	0.268
	(0.224)	(0.348)	(0.258)	(0.327)	(0.215)
Constant	-5.453**	-11.21**	-1.937	1.378	-3.274
	(2.524)	(4.728)	(2.859)	(4.484)	(3.122)
Observations	899	435	464	277	187
R-squared	0.317	0.239	0.427	0.529	0.382
Number of countries	134	39	95	34	61

Note: Panel fixed-effect method. "All countries" include high-income, upper-middle-income, lower-middle-income, and low-income countries. "Developing countries" include upper-middle-income, lower-middle-income and low-income countries. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

4.1.5 Discussion

Findings of this research have several practical implications for different agents and countries. As panel B of Figure 1 indicates that financial services have not yet reached all groups of people in developing countries, this research recommends that financial institutions expand their business by offering customized financial services that meet the need of the users. To encourage financial institutions to expand financial services to women or the poor, central banks and other regulators of the financial market should

design policies for rewarding financial institutions that provide financial services to the disadvantaged group. Based on the finding of a significant negative association between financial inclusion and poverty, the study recommends that governments in developing countries should utilize financial inclusion initiatives such as digital transfer of financial assistance or expanding SME loans to counter the recent surge in poverty caused by the covid-19 pandemic. The results also suggest that the impact of financial inclusion is more prominent in upper-middle-income countries. Thus, lower-middle-income and low-income countries should adopt policies that expand the reach of financial inclusion by encouraging the disadvantaged group to use financial services.

Financial inclusion expands opportunities for the poor by enabling them to access and use financial services. The use of financial services may reduce poverty by stimulating the income of the poor or by achieving cost savings or efficiency gains that allow the poor to increase their household spending. Previous studies identify that financial inclusion can boost the income of the poor by financing new business establishments (Kara et al., 2021); enabling the poor to take on more risk by offering insurance services (Karlan et al., 2014; Cole et al., 2013); and expanding employment opportunities, especially for women (Cabeza et al., 2019; El-Zoghbi et al., 2019). Savings and digital financial services may also reduce poverty by allowing households to save more and smooth consumption (Demirguc-Kunt et al., 2017). Though this study cannot establish which causal channel works for developing countries, the results suggest a significant negative association between financial inclusion and poverty. Moreover, the results also reveal that the association between financial inclusion and poverty varies with the countries' income levels. Due to a higher level of economic development, countries with higher income usually have a higher demand for and supply of financial services, enabling more people to be financially included and perhaps inducing faster poverty reduction.

4.2 The role of unequal access, inequalities, education level, and institutions on poverty reduction through financial inclusion

This section investigates the relevant factors that affect poverty reduction in developing countries through financial inclusion. Previous studies (Duvendack et al., 2011; Chliova et al., 2015; Kara et al., 2021) indicate that financial inclusion reduces poverty. Nevertheless, unequal access to financial services may limit the effect of financial inclusion on poverty reduction. Sandhu et al. (2012) and Morsy (2020) demonstrate that females face discrimination in accessing financial services. Kara et al. (2021) point out that gender, race, income, and education level affect individuals' ability to access and use financial services. Corrado & Corrado (2015), Klapper & Singer (2015), and Shihadeh (2018) investigate multi-country data and find that poor and low-earning people are less likely to have formal credit. If access to finance does not reach these groups who need it the most, the impact of financial inclusion on poverty might be limited.

This research examines whether various inequalities and country differences in institutional quality and educational attainment affect financial inclusion in reaching its target groups and influence poverty in developing countries. The results show that financial inclusion is more effective in poverty reduction in developing countries when women and the poor have higher access to bank accounts. High levels of income and gender inequality diminish the effect of financial inclusion on poverty. In addition, poor quality institutions and lower education attainment also make financial inclusion less effective. If countries improve these factors, the effect of financial inclusion on poverty is enhanced. This research proposes that this should happen because financial inclusion can reach its target group when these inequalities are alleviated which enables faster poverty reduction. The research also finds threshold levels for the inequalities beyond which financial inclusion is inactive. Section 4.2.5 explains about the threshold levels in detail. This analysis reveals that most countries have lower income and gender inequality levels, higher institutional quality, and better school enrollment than the threshold values. Hence, most countries achieve poverty reduction through financial inclusion to some extent despite having some constraints in access to financial services.

This research expands on previous findings (Kara et al., 2021; Klapper & Singer, 2015) by linking various inequalities in financial access with poverty reduction and

empirically showing that if these inequalities are alleviated, financial inclusion can be effective for poverty reduction. The findings also have some important policy implications. As the study indicates that the financial inclusion of women and the poor significantly affects poverty reduction in developing countries, policymakers can expand financial services targeting these groups.

4.2.1 Factors that affect access to finance in developing countries.

This segment graphically presents some stylized facts about poverty and financial inclusion in developing countries between 2004-2018. The study measures poverty by the poverty headcount ratio at USD 1.9, which shows the percentage of the population living on less than USD 1.9 a day. The financial inclusion index tracks the progress made in financial inclusion.

The trend line in Panel A of Figure 3 suggests that the poverty level is lower for developing countries with high financial inclusion. Panel B also shows this negative relation for the lower-income countries. Figure 3 also suggests that many countries have different poverty levels for a similar level of financial inclusion. This research proposes that inequality in access to financial services might be one key reason behind this relationship. Though a financial inclusion index can identify the expansion of financial services to a broader group of populations, the improvement might happen due to more use of financial services by the rich and middle class who were previously financially excluded instead of the poor. If financial inclusion initiatives do not reach the target group, their poverty reduction effectiveness might differ.

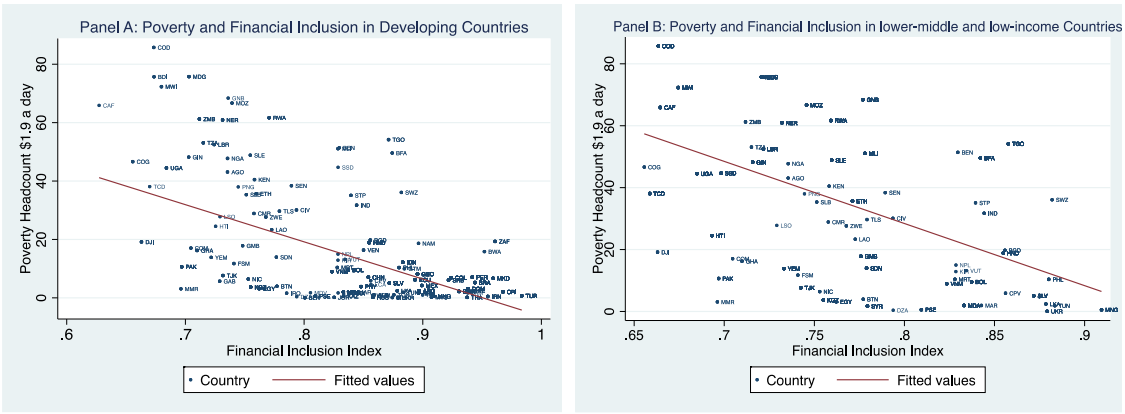

Figure 3 Poverty and Financial Inclusion Relation in different income-groups of countries

Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment.

Figure 4 graphically shows the country experience of developing countries in terms of income inequality and gender inequality. From the previous literature review, this research identifies that women, people with less income, less wealth, and a lower level of education, find difficulty in accessing financial services. Appendix E shows country positions for other inequalities and institutional quality[10].

Panel A of Figure 4, which plots log Gini and financial inclusion, does not show any particular pattern for income inequality and progress in financial inclusion. Despite substantial dispersion among the countries, Panel B shows that countries with lower gender inequality tend to have a higher level of financial inclusion. Appendix E shows that financial inclusion is higher in countries where institutional quality and school enrollment are high.

Figure 4 Factors that affect access to finance in various developing countries.
Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment

In equation (7) the two-stage fixed effect regression with instrumental variables is applied to examine the poverty-financial inclusion relationship. This instrumental variable approach addresses the potential reverse causality between poverty and financial inclusion. Mobile phone subscription rate is used as an instrument. The study also performs conditional analysis to assess how various inequalities affect the access and use of financial services, influencing poverty reduction through financial inclusion. For the conditional analysis, this research applies equation (7).

[10] For income, wealth, and gender inequality, a higher country position indicates a higher level of inequality. A lower value suggests lower institutional quality and less educational attainment for countries.

$$\ln\text{povheadl}_{it} = \propto_0 + \beta_1 \ln FII_{it} + \beta_2\, gdppcgr_{it} + \beta_3 \ln Gini_{it} + \beta_4 \ln Govt_{it} + \beta_5 \ln tradeopen_{it} + \beta_6 \ln inflation_{it} + \beta_7 Z_{it} + \beta_8 (lnFII_{it} * Z_{it}) + \eta_i + \varepsilon_i \qquad (7)$$

In contrast to equation (6), equation (7) uses the log financial inclusion index as an independent variable. Since the dependent variable is in log form, log transformation of most control variables is used. In equation (7), vector Z_{it} includes variables such as income, wealth, and gender inequality, institutional quality, and school enrollment. For the conditional analysis, the study interacts variables in vector Z with the log financial inclusion index and investigates the interaction terms' significance.

4.2.2 Unequal access to bank accounts by women and the poor

This study investigates whether unequal access to financial services affects the poverty level with the hypothesis that if financial services are more equally accessed, financial inclusion initiatives will reduce poverty. To identify unequal access, this model uses two indicators; the ratio of female to male bank accounts per 1000 people and the proportion of accounts held by the poorest 40 percent population. For the first indicator, a value close to one indicates equal access, while low values indicate lower bank access of women than men. Similarly, if the poorest 40 percent of people account for roughly 40 percent of total accounts, access to bank accounts seems to be equally distributed, while lower values indicate unequal access by the poor. From panel A of Figure 5, it is evident that women have a lower level of bank access in developing countries than men. Panel B shows a mixed scenario. Poor people hold a higher than 40 percent share of bank accounts in some countries and a lower share in others.

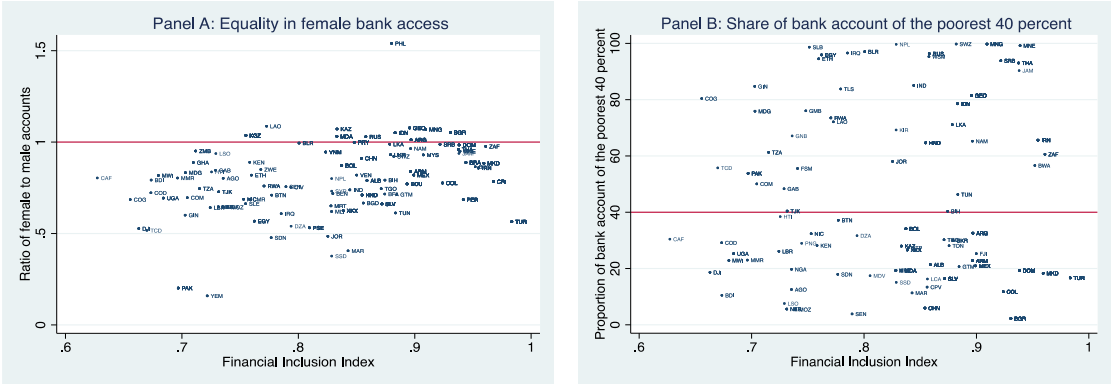

Figure 5 Unequal bank access of women and the poor in various developing countries
Source: World Development Indicators (WDI), the WB. Calculation: Authors' assessment

Table 8 depicts how financial inclusion affects the poverty level in developing countries for unequal bank access by women and the poorest section of the population. For both analyses, this research divides the dataset into two parts using the median value of the indicators[11]. The first two columns analyze female bank access, and the last two columns examine bank access of the poor.

Table 8 Impact of increasing financial access to women and the poorest population. (Second stage IV fixed effect results)

Variables	Equality in female bank access		Share of bank accounts by the poorest 40 percent	
	Below Median (<0.84)	Above Median (>0.84)	Below Median (<30.21)	Above Median (>30.21)
	(1)	(2)	(3)	(4)
	Dependent variable: log Poverty headcount ratio USD 1.9 a day			
Log Financial Inclusion Index	-3.685	-11.60***	-1.763	-14.51***
	(2.451)	(3.547)	(3.148)	(4.874)
GDP growth per capita	-0.0206	-0.0281**	-0.0280***	-0.0251
	(0.0127)	(0.0134)	(0.0107)	(0.0182)
Log Gini	2.948***	3.846***	3.478***	2.324**
	(0.729)	(0.682)	(0.648)	(1.020)
Year fixed effects	Yes	Yes	Yes	Yes
Observations	210	189	143	217
R-squared	0.327	0.396	0.507	0.377
Number of countries	45	31	29	42
Under identification test:				
P-value of the Anderson's stat	0.004	0.000	0.002	0.007
Overidentification test:				
Sargan-Hansen statistics Chi-sq	1.302	1.829	2.35	0.091
Sargan-Hansen statistics P-value	0.254	0.176	0.125	0.763
Endogeneity test:				
Chi-sq	2.816	14.524	0.221	23.848
P-value	0.093	0.000	0.638	0.000

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses

Table 8 demonstrates that financial inclusion significantly reduces poverty in developing countries when women have relatively equal bank access as men. The study finds a significant coefficient in column 2 where the female to male bank account ratio is above its median value. This result supports the idea that when women have a similar level of bank account penetration as men, access to finance is more inclusive, and the

[11] The median values for the female to male bank account ratio and bank accounts held by the poorest 40 percent are 0.84 and 30.21 percent, respectively.

benefits of financial inclusion are more equally shared. This equal access promotes women's empowerment by utilizing financial inclusion opportunities, resulting in poverty reduction.

Column (4) of Table 8 indicates that in countries where the poorest people have relatively higher access to bank accounts (as indicated by the above-median ratio), financial inclusion seems to be more effective in poverty reduction than in countries with relatively lower access. Higher bank access enables the poor to utilize financial services, which helps to reduce poverty.

In Table 8, the research finds endogeneity in most cases. In columns (1), (2), and (4) of Table 8, the null hypothesis of no endogeneity is rejected, which supports the use of the institutional variable approach. The Anderson statistics and Sargan-Hansen statistics in Table 4 also reveal that the model is appropriately specified and the instrument does not have under-identification or over-identification problems. In order to include a large number of countries, this examination consists of a limited number of control variables. Even with the complete set of control variables, the results in Table 8 remain valid. This finding is in line with previous studies (Kara et al., 2021; Morsy, 2020; Klapper & Singer, 2015). The study also confirms that financial inclusion is effective when women and the poor have more access to financial services.

4.2.3 Inequalities and poverty reduction through financial inclusion

Table 9 analyzes the conditional relationship between financial inclusion and income inequality by using the interaction between both variables. Income inequality is measured in two different indicators; log Gini and log of income share held by the top 10 percentiles of the population.

Previous studies find that higher income and wealth inequality causes benefits of financial services to be shared among privileged groups. If only a few people hold a substantial portion of income share in a country, most people will find it challenging to utilize credit facilities since, with their lower income, they cannot meet the collateral requirements of formal financial institutions. The results in Table 9 indicate that a higher level of income inequality reduces the impact of financial inclusion on poverty reduction

in developing countries. For both measures of income inequality, the interaction terms are significantly positive, suggesting that financial inclusion is less effective in poverty reduction if income inequality is high. So, the results support the idea that a significant portion of the population in developing countries cannot fully utilize the benefits of various financial services with high-income inequality. Hence, poverty reduction through financial inclusion is weaker when income inequality is high.

Table 9 Income inequality and poverty reduction through financial inclusion

Variables	Log Gini	Income share of top 10
	(1)	(2)
	Dependent variable: log Poverty headcount ratio USD 1.9 a day	
Log Financial Inclusion Index	-46.00***	-43.98**
	(17.15)	(19.60)
Log Gini	6.014***	
	(1.063)	
Log Fin. Inclusion × Log Gini	11.47**	
	(4.987)	
Log Income top 10		4.556***
		(1.256)
Log Fin. Inclusion × Log Inc. top 10		11.31*
		(6.126)
GDP growth per capita	-0.0191**	-0.0173**
	(0.00788)	(0.00866)
Log Govt. Expenditure	-0.351	-0.194
	(0.256)	(0.288)
Log Trade Openness	0.420**	0.491**
	(0.207)	(0.233)
Log Inflation	-0.0423	-0.0612
	(0.0361)	(0.0396)
Year fixed effects	Yes	Yes
Observations	446	445
R-squared	0.471	0.361
Number of countries	82	82
Under identification test (p-value of Anderson's stat)	0.000	0.000
Overidentification test:		
Sargan-Hansen statistics Chi-sq	3.645	0.846
Sargan-Hansen statistics P-value	0.162	0.655
Endogeneity test:		
Chi-sq	5.984	7.979
P-value	0.014	0.005

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses

In analyzing the impact of wealth and gender inequality on the poverty level, the study uses the interaction of the log financial inclusion index with the relevant indicators. As a proxy indicator of wealth inequality, net personal wealth held by the top 10 percentiles of the population is used. Gender inequality is indicated with the Gender Inequality Index (GII) prepared by UNDP. Table 10 summarizes the results with the instrumental variable method.

Wealth inequality, as with income inequality, is also expected to have a positive interaction coefficient with financial inclusion because wealth concentrated within a few people restricts most of the population from accessing and utilizing financial services. If financial services cannot reach the target group due to high wealth inequality, poverty reduction is difficult. Column 1 of Table 10 shows that the interaction coefficient of wealth inequality is positive but insignificant. This insignificant coefficient suggests that the impact of wealth inequality is less obvious. However, the study gets significant results using alternative financial inclusion measures.

The gender-inequality index (GII) compares secondary school enrollment, parliamentary seats, and the labor force participation rate of men and women in assigning a composite score where a lower value indicates more gender equality. Therefore, if gender inequality is high, women are expected to have lower education levels and labor force participation than men. A reduction in gender inequality suggests an increase in women's empowerment. This empowerment allows the female population to utilize financial services better, leading to poverty reduction.

Column (2) of Table 10 demonstrates that the interaction term of the log financial inclusion index with GII has a significant positive coefficient. The net effect of log financial inclusion ($-9.608 + 13.11 \times GII$) suggests that the lower the gender inequality, the more effective financial inclusion for poverty reduction. The net effect is robust since financial inclusion, and its interaction with gender inequality variables are also jointly significant. Financial inclusion appears to be less effective in poverty reduction in case of high gender inequality because half of the population represented by women will not be properly utilizing financial inclusion opportunities.

Table 10 Role of wealth and gender inequality (GII) on poverty reduction through financial inclusion. (Second stage IV fixed effect results)

Variables	Wealth share of top 10	GII
	(1)	(2)
	Dependent variable: log Poverty headcount ratio USD 1.9 a day	
Log Financial Inclusion Index	-11.16**	-9.608***
	(5.464)	(3.613)
Wealth top 10	-1.347	
	(1.706)	
Log Fin. Inclusion × Wealth top 10	10.19	
	(10.46)	
GII		5.672**
		(2.617)
Log Fin. Inclusion. × GII		13.11*
		(7.421)
GDP growth per capita	-0.0209***	-0.0285**
	(0.00799)	(0.0132)
Log Gini	4.353***	4.641***
	(0.497)	(0.589)
Log Govt. Expenditure	-0.276	-0.614
	(0.256)	(0.382)
Log Trade Openness	0.424**	0.642**
	(0.212)	(0.305)
Log Inflation	-0.0316	-0.0720
Year fixed effects	Yes	Yes
Observations	427	264
R-squared	0.490	0.537
Number of countries	78	51
Underidentification test (p-value)	0.000	0.000
Overidentification test:		
Sargan-Hansen statistics Chi-sq	3.150	3.980
Sargan-Hansen statistics P-value	0.207	0.137
Endogeneity test:		
Chi-sq	7.002	3.953
P-value	0.008	0.047

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses

4.2.4 Impact of institutional quality and education level

This section analyzes how institutional quality and education level affect the impact of financial inclusion on poverty. This study uses “the rule of law” indicator from the World Governance Indicators to measure institutional quality. Gross secondary school enrollment is used as a proxy for educational level. Table 11 summarizes the results with the instrumental variable method.

Table 11 Role of inequality in wealth and education on poverty reduction through financial inclusion. (Second stage IV fixed effect results)

Variables	Institutional Quality	School enrollment
	(1)	(2)
	Dependent variable: log Poverty headcount ratio USD 1.9 a day	
Log Financial Inclusion Index	-8.378***	9.684
	(2.547)	(7.521)
Institution	-0.525*	
	(0.311)	
Log Financial Inclusion × Institution	-4.848***	
	(1.888)	
Log School Enrollment		-0.837
		(0.610)
Log Fin. Inclusion. × Log Sch. Enroll.		-3.100*
		(1.709)
GDP growth per capita	-0.0209**	-0.0132
	(0.0082)	(0.00870)
Log Gini	4.310***	2.856***
	(0.505)	(0.542)
Log Govt. Expenditure	-0.202	-0.198
	(0.251)	(0.305)
Log Trade Openness	0.552***	0.515**
	(0.216)	(0.230)
Log Inflation	-0.045	-0.115***
	(0.0366)	(0.0425)
Year fixed effects	Yes	Yes
Observations	446	331
R-squared	0.454	0.494
Number of countries	82	55
Underidentification test (p-value)	0.000	0.000
Overidentification test:		
Sargan-Hansen statistics Chi-sq	1.533	0.081
Sargan-Hansen statistics P-value	0.465	0.961
Endogeneity test:		
Chi-sq	7.133	4.136
P-value	0.007	0.042

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses

Column (1) of Table 11 demonstrates that the interaction term of the log financial inclusion index with institutional quality has a significant negative coefficient. The net effect of log financial inclusion (-8.378 - 4.848 × Institution) suggests that the higher the institutional quality, the more effective financial inclusion for poverty reduction. The net effect is robust since financial inclusion and its interaction with institutional quality variables are also jointly significant. Financial inclusion appears to be more effective in poverty reduction in case of better institutional quality, perhaps because better quality

institutions ensure adherence to rules and allow the disadvantaged population to utilize financial services with less discrimination.

Column (2) of Table 11 finds a significant negative coefficient for the interaction of school enrollment and financial inclusion. The net effect of education (9.684 – 3.10 × Log Sch. Enroll.) suggests that if the school enrollment is sufficiently high, financial inclusion can reduce poverty. The findings support the idea that a certain level of financial literacy is needed to receive services from formal financial institutions, which can be gained from secondary-level education. Financial literacy gained from school enrollment also allows people to make educated decisions on financial services. Thus, when school enrollment is high, benefits from financial inclusion can be adequately utilized, which enables poverty reduction.

4.2.5 Net effect of financial inclusion and threshold values for gender inequality, income inequality, and school enrollment

Based on the instrumental variable results in the earlier section, this section analyzes the net effect of financial inclusion on poverty. In Table 12, the study estimates threshold levels for income inequality, gender inequality, institution, and school enrollment and compare country-wise actual values of the variables with the benchmarks[12.]

Table 12 Joint-effect and threshold values of financial inclusion in case of conditional analysis

Sl	Interaction Variable	Joint Effect of Financial Inclusion	Threshold value	Distribution of the Interaction Variable in developing countries			
				Minimum	3rd quartile*	Mean	Max
1.	Log Gini	-46.00 + 11.47 × Log Gini	4.010	3.18	3.84	3.68	4.17
2.	GII	-9.608 + 13.11 × GII	0.733	0.11	0.56	0.46	0.82
3.	Institution	-8.378 – 4.848 × Institution	-1.728	-2.61	-1.00	-0.57	1.41
4.	School Enroll	9.684 - 3.100 × Log Sch. Enroll	3.124	1.78	3.85	4.14	4.95

* 1st quartile for institution and log school enrollment

[12] This research identifies the threshold values by setting the joint effect equation equal to zero. If alternative financial inclusion indicators are used, then the threshold values also remain similar to those in Table 12. For example, if the number of bank borrowers is used to measure financial inclusion, the threshold value for log Gini becomes 3.96.

Financial inclusion is likely to reduce poverty if any country has a lower level of income and gender inequality and a higher level of institutional quality and school enrollment than the threshold values. The impact of financial inclusion on poverty is likely to be stronger if countries can improve their income inequality, gender inequality, institutional quality, and school enrollment scenario. The distribution of variables in Table 12 suggests that most developing countries have lower levels of income and gender inequality and higher levels of institutional quality and school enrollment than the threshold levels. The result remains the same if income inequality and school enrollment threshold values are presented, dropping their logarithmic transformation. The threshold value for the Gini coefficient turns out to be 55.15 (on a scale of 0 to 100), and for school enrollment, the value is 22.74 percent. The data for developing countries confirms that most countries have a lower Gini coefficient than 55.15 and a higher secondary school enrollment rate than 22.74 percent. Thus, except in countries with extreme levels of inequality, financial inclusion is expected to reduce poverty in developing countries.

The comparison of actual country positions with the threshold values of the indicators is shown graphically in Appendix E. The reference lines in the figures indicate the threshold values. This examination reveals that most countries have lower gender and income inequality levels, higher institutional quality, and school enrollment than the threshold level. However, the dispersion among the countries is high. Countries with a lower level of inequality are likely to gain the most in poverty reduction through financial inclusion.

This chapter explores how unequal access to financial services and various inequalities affect poverty reduction through financial inclusion in developing countries. The results suggest that financial inclusion is more effective in poverty reduction when women and the poor have higher access to bank accounts. Moreover, higher income and gender inequality, poor quality institutions, and lower education negatively impact poverty reduction through financial inclusion. The results indicate that these inequalities hamper the access to and use of financial services, preventing the poor from fully capitalizing on the benefits of financial inclusion. The findings of this chapter also suggest that financial inclusion initiatives need to be more inclusive and reach the target groups for faster poverty alleviation.

Chapter 5: Impact of financial inclusion on economic growth

This chapter[13] investigates the impact of financial inclusion on economic growth in developing countries. It also compares the impact of financial inclusion and financial development on economic growth in developing countries in comparison to that of high-income ones. The results indicate that financial inclusion affects economic growth primarily by expanding opportunities for lower-income people.

Country-specific studies by Brune et al. (2011), Babajide et al. (2015), and Lenka and Sharma (2017) suggest that financial inclusion encourages economic growth through better resource allocation and intermediation. Cross-country and panel studies propose alternative ways through which financial inclusion affects economic growth. Cabeza-García et al. (2019) argue that greater economic participation of women through financial inclusion contributes to GDP growth in developing countries. Kim et al. (2016) claim that financial inclusion affects economic growth through the reduction of income inequality. Younas et al. (2022) find that financial inclusion can improve economic growth by reducing the size of the shadow economy in developing countries. A more detailed literature review on financial inclusion and economic growth is discussed on section 2.3.

Though past studies propose alternative explanations on how financial inclusion affects economic growth, they do not clarify why financial inclusion affects economic growth differently in different income-group of countries. This study aims to examine this issue. The Global Findex survey (2017) reveals that a large segment of financially excluded people has low income and cannot access formal financial services, primarily due to poverty. Access to financial services allows these people to expand their economic activities, which may help achieve higher economic growth in developing countries. The significant positive impact of financial inclusion is expected only within developing countries because, due to the current level of high financial access in high-income countries, financial inclusion may not offer new opportunities to a larger population segment. This chapter investigates whether financial inclusion affects economic growth

[13] Some part of this Chapter is first published in Journal of Accounting, Business and Finance Research, Vol. 16, No. 1, pp.12-29, 2023.

by expanding opportunities for financially excluded people, particularly lower-income people.

A novel financial inclusion index is constructed to examine the effect of financial inclusion on economic growth. The results demonstrate that financial inclusion has a significant positive impact on economic growth in developing countries but not in high-income countries. This study also investigates the impact of financial inclusion on poverty and income inequality in examining the proposed transmission mechanism. This study argues that if financial inclusion achieves economic growth due to increased economic activities of the poor, the poverty rate and income inequality are likely to fall. The research examination indicates that poverty and income inequality indeed drop due to financial inclusion in developing countries.

This chapter also compares the effect of financial inclusion with that of financial development on economic growth. In contrast to financial inclusion, which has a significant impact only in developing countries, financial development has a significant positive impact on economic growth in both developing and high-income countries. In addition, financial inclusion contributes to more financial development in developing countries by enhancing the depth and access to financial services. Besides access to financial services, the efficiency of financial institutions and markets is also essential for financial development. As developing countries usually do not have active capital markets or very efficient institutions, financial inclusion plays a substantial role in influencing financial development in developing countries.

The findings of this chapter offer some important recommendations for policymakers. This study recommends that developing countries where many are still financially excluded use more financial inclusion to promote economic growth. Especially, disadvantaged groups such as women and the poor should get more access to financial services. To attain a higher financial development level, this study suggests policymakers in developing countries rely on improving the efficiency of financial institutions and capital markets along with more financial inclusion.

5.1 Financial inclusion and financial development in developing and high-income countries

According to the World Bank, the financial sector is the set of institutions, instruments, markets, and the legal and regulatory framework that permits transactions. Financial development generally means reducing costs incurred in the financial system, such as the costs of acquiring information, enforcing contracts, and results in the emergence of financial contracts, markets, and intermediaries. This study uses the financial development index developed by the International Monetary Fund (IMF) to measure financial development. The index summarizes how developed financial institutions and financial markets are in terms of their depth (size and liquidity), access (the ability of individuals and companies to access financial services), and efficiency (the ability of institutions to provide financial services at low cost and with sustainable revenues and the level of activity of capital market). The index values lie between zero and one, where a higher value indicates a higher financial development level.

Panel A of Figure 6 reveals that the financial inclusion (FII) and financial development indices (FD) follow a similar trend in developing countries. Financial inclusion may contribute to more financial development by improving the access component of financial development. As developing countries do not have very active capital markets, improvement in the efficiency of the capital market does not play a significant role in improving financial development. Panel B of Figure 6 shows that financial inclusion and financial development do not always follow a similar trend in high-income countries. Though financial inclusion mostly follows an uptrend, the financial development index is more volatile, especially during the global financial crisis during 2007-2009. In high-income countries, the efficiency of financial institutions and capital markets play a more critical role in achieving higher financial development. As the depth and access to financial services is already high in these countries, financial inclusion has a limited role in improving financial development. Figure 6 shows that the financial development index has higher values in high-income countries compared to developing countries suggesting that financial inclusion may not substantially improve

financial development without improving financial institutions and capital market efficiency[14].

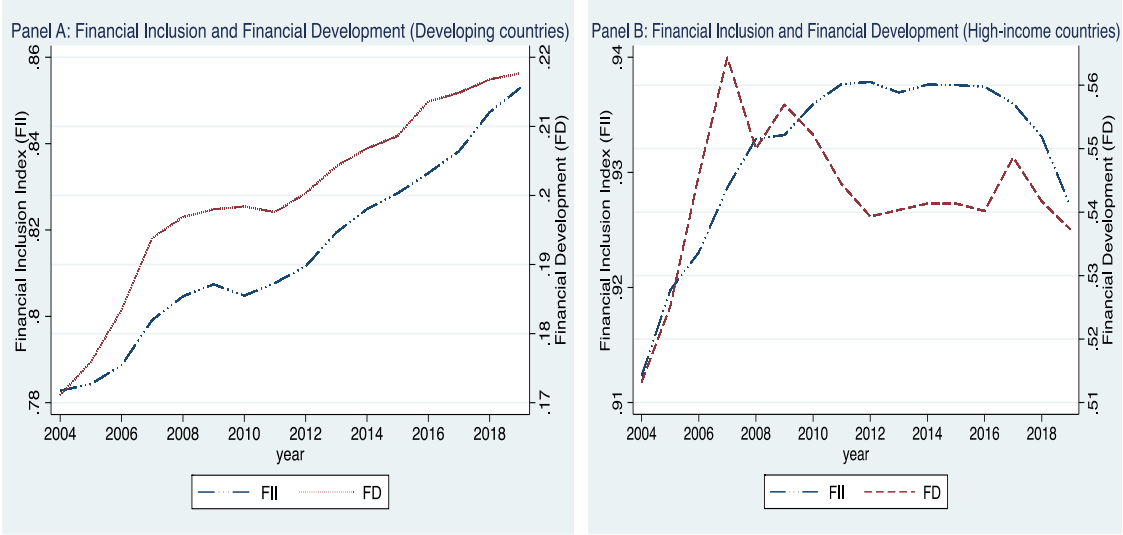

Figure 6 Financial inclusion and financial development in developing and high-income countries

Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment.

Past studies such as Babajide et al. (2015) and Lenka and Sharma (2017) opine that financial inclusion may increase economic growth through improved intermediation. On the other hand, this study argues that better resource allocation and intermediation primarily happen through financial development. Financial inclusion has a limited role because it may not affect the efficiency of the capital market and financial institutions, which are essential for better intermediation. In contrast to improved intermediation, this chapter proposes that financial inclusion may affect economic growth by opening opportunities for lower-income people.

5.2 Model specification

In developing countries, a large segment of financially excluded people are poor and cannot access financial services, primarily due to poverty[15]. When these excluded groups access financial services, they can use them to smooth out consumption, increase savings, and open and expand businesses. Financial inclusion provides these

[14] Figure 6 shows that high-income countries also have a higher level of financial inclusion than developing countries. However, the difference in financial inclusion between high-income and developing countries is substantially smaller than the difference in their financial development levels, highlighting the importance of improving the efficiency of financial institutions and capital markets.

[15] Global Findex Survey (2017) also identifies poverty as a primary reason for financial exclusion.

disadvantaged groups the opportunities to expand their economic activities, which might contribute to higher economic growth. This study examines the possibility that financial inclusion influences economic growth primarily by expanding opportunities for lower-income people[16].

The dynamic two-stage system generalized method of moments (GMM) panel estimation method is applied to investigate the impact of financial inclusion on economic growth. The two-stage system GMM method, which uses both the level and lag value of the variables as instruments, is more suitable for addressing the endogeneity and serial correlation issues. The model for this analysis is shown in equation (8).

$$GDPPCGR_{it} = \alpha + \beta_1 GDPPCGR_{it-1} + \beta_2 FII_{it} + \gamma Z_{it} + \varepsilon_{it} \qquad (8)$$

Here, the dependent variable is per capita real GDP growth (GDPPCGR). In the system GMM method, the lag value of the dependent variable is used as an independent variable. The composite financial inclusion index (FII_{it}) is the primary independent variable. Z_{it} is a vector of control variables, which consists of initial log GDP per capita (initial log GDPPC), trade openness (TRADE), Government expenditure as a percentage of GDP (GOVT), primary school enrollment (HUMAN CAPITAL), gross capital formation (GCF), and inflation (INF) rate.

An expected positive and significant coefficient for the financial inclusion index indicates that financial inclusion stimulates economic growth. The initial log GDP per capita is used to capture the difference in growth rate due to the size differences of the economies. A negative coefficient will support the convergence theory that countries with a low initial GDP tend to grow at a higher rate than those with higher initial GDP. Trade openness (TRADE) captures influence of international factors on economic activity. Government expenditure as a percentage of GDP (GOVT) is used to capture the impact of public spending. The primary school enrollment (HUMAN CAP) rate is used as a proxy for human capital. Gross fixed capital formation (GCF) accounts for investment in physical capital, and inflation (INF) is used as a proxy for macroeconomic environments.

[16] Previous studies suggested several channels through which financial inclusion might affect economic growth in developing countries, such as improved intermediation, greater women's employment, and reduced shadow economy due to a higher level of financial inclusion.

5.3 Impact of financial inclusion on economic growth in developing countries

Table 13 presents the results of the impact of financial inclusion on economic growth in developing countries using the system GMM method.

Table 13 Impact of financial inclusion on economic growth in developing countries: dynamic two-stage system GMM method.

Time Frame: 2004–2019, Yearly Panel		
Variables	(1)	(2)
	Dependent variable: GDPPC growth	
Lag dependent variable	0.133	0.167
	(0.0838)	(0.105)
Initial Log GDPPC	-22.56***	-22.57***
	(4.777)	(6.972)
FII	35.25**	
	(14.79)	
Account in Fin. Institution		0.00631*
		(0.00343)
TRADEOPEN	0.0691*	0.0987
	(0.0416)	(0.0715)
GOVT	-0.196	0.187
	(0.155)	(0.521)
HUMAN CAPITAL	0.308	0.323*
	(0.228)	(0.186)
GCF	0.166*	-0.0395
	(0.0943)	(0.141)
INF	0.0583	-0.0101
	(0.0564)	(0.0873)
Constant	115.7***	134.4***
	(25.28)	(45.03)
Diagnostic Tests:		
Observations	940	481
Number of countries	104	70
No. of instruments	71	69
AR2	0.494	0.319
Hansen J Statistics	0.147	0.506

Note: Dynamic two-stage system GMM panel method. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

Column 1 of the table shows that the financial inclusion index (FII) has a significant positive coefficient with the per capita GDP growth, which suggests that financial inclusion contributes to increasing economic growth. This result supports previous studies (Kim et al., 2018; Emara and Said, 2021; Huang et al., 2021). This study proposes that financial inclusion influences economic growth primarily by facilitating

increased economic activities of lower-income people[17]. Trade openness and gross fixed capital formation (GCF) have significant positive coefficients. The results also support the convergence theory. In column 2, an account in a financial institution is used as a measure of financial inclusion. Even with this simple indicator, the earlier finding remains valid as it also has a significant positive coefficient. Human capital is also found significant in this case. The diagnostic tests indicate that all GMM requirements are satisfied, and the model is well specified. The AR2 statistics in Table 13 indicate that no second-order autocorrelation exists, and the Hansen J statistics also show no over-identification problem in the analysis.

5.4 Comparison of the effect of financial development and financial inclusion on economic growth

This section compares the effect of financial development on economic growth with that of financial inclusion. Table 14 shows that the financial development index has significant positive coefficients in developing and high-income countries. The results align with previous studies (Hassan et al., 2011; Samargandi et al., 2015; Nguyen et al., 2022) that argue that financial development increases economic growth by ensuring an efficient intermediation process. Does financial inclusion similarly affect economic growth as financial development? This study suggests that financial inclusion can partially affect financial development because by enabling the financially excluded people to access and utilize financial services, financial inclusion improves the access component of financial development. However, other factors also affect financial development, such as improving the efficiency of financial institutions and markets. As more financial inclusion does not necessarily contribute to improved efficiency of financial institutions and capital markets, financial inclusion should not influence economic growth in the same way as financial development does.

[17] Past studies (Duvendack et al., 2011; Chliova et al., 2015; El-Zoghbi et al., 2019; Kara et al., 2021) also confirm that access to financial services opens up different opportunities for financially excluded people.

Table 14 Impact of financial development on economic growth in developing and high-income countries: two-stage system GMM method

Time Frame: 2004–2019, Yearly Panel		
Variables	Developing countries	High-income countries
	(1)	(2)
	Dependent variable: GDPPC growth	
Lag dependent variable	0.103	0.232***
	(0.0878)	(0.0808)
Initial Log GDPPC	-18.74***	-25.05***
	(5.191)	(7.784)
FD	59.67**	59.45**
	(33.48)	(26.58)
TRADEOPEN	0.0978**	0.0447
	(0.0479)	(0.0326)
GOVT	-0.258**	0.131
	(0.116)	(0.362)
HUMAN CAPITAL	-0.0757	-0.331
	(0.155)	(0.413)
GCF	0.107	0.132
	(0.109)	(0.201)
Constant	135.9***	245.7**
	(37.18)	(94.34)
Diagnostic Tests:		
Observations	921	570
Number of countries	102	55
No. of instruments	70	44
AR2	0.277	0.114
Hansen J Statistics	0.172	0.143

Note: Note: Dynamic two-stage system GMM panel method. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

In contrast to financial development, which significantly impacts economic growth in both developing and high-income countries, financial inclusion influences economic growth only in developing countries. Table 15 examines financial inclusion's impact on economic growth in developing and high-income countries. Column 1 of Table 15 reveals that financial inclusion (FII) significantly impacts economic growth in developing countries. However, column 2 shows that the financial inclusion index is insignificant in high-income countries. The results are similar to Karim et al. (2021), who also find that financial inclusion is more effective in lower-income countries. If financial inclusion affects economic growth through improved intermediation, it should also significantly impact high-income countries because high-income countries have a higher level of financial inclusion than developing countries. However, Table 15 suggests that financial inclusion might affect economic growth in other ways besides improved

intermediation. This study proposes that financial inclusion expands different income-earning opportunities to lower-income people, which may explain this issue.

Table 15 Impact of financial inclusion on economic growth in developing and high-income countries: two-stage system GMM method

Time Frame: 2004–2019, Yearly Panel		
Variables	Developing countries	High-income countries
	(1)	(2)
	Dependent variable: GDPPC growth	
Lag dependent variable	0.0834	0.249***
	(0.102)	(0.0626)
Initial Log GDPPC	-27.88***	-12.49*
	(7.029)	(6.334)
FII	31.95**	4.741
	(16.61)	(50.11)
TRADEOPEN	0.0745	0.0168
	(0.0581)	(0.0279)
GOVT	-0.262	0.134
	(0.173)	(0.334)
HUMAN CAPITAL	0.854***	0.0895
	(0.267)	(0.253)
GCF	0.0183	-0.0800
	(0.115)	(0.155)
Constant	112.1***	122.4*
	(29.38)	(61.88)
Diagnostic Tests:		
Observations	940	570
Number of countries	104	55
No. of instruments	46	44
AR2	0.967	0.051
Hansen J Statistics	0.170	0.131

Note: Dynamic two-stage system GMM panel method. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

In developing countries, financial inclusion can facilitate the economic activities of lower-income people by offering financial services. This result shows that improved intermediation through financial inclusion should happen due to the increased economic activities of the previously financially excluded people. If financial inclusion affects economic growth by expanding opportunities to lower-income people, it is expected to have a less significant impact in high-income countries than in developing countries. As the financial inclusion level is very high and the poverty level is already deficient in high-income countries, financial inclusion is not likely to offer new opportunities to a larger population segment. Hence, column 2 of Table 15 finds an insignificant impact of financial inclusion. When most people are financially included, further financial

development and improved intermediation can happen only through improving the efficiency of financial institutions and capital markets. Figure 6 also supports the argument that financial inclusion contributes to financial development in developing countries but has a limited role in high-income countries. Past studies (Huang et al., 2021; Karim et al., 2021) also indicate that the influence of financial inclusion is limited within lower-income countries.

5.5 The impact of financial inclusion on economic growth through the expansion of opportunities for lower-income people

This section investigates whether financial inclusion increases economic growth by creating or expanding income-earning opportunities for lower-income people. Two scenarios are expected if financial inclusion increases economic growth by expanding opportunities for lower-income people. First, the poverty rate must fall as the rise in the income level of the lower-income people is the driver of economic growth, according to this channel. Second, financial inclusion should reduce income inequality due to the income rise of lower-income people.

As financial inclusion enables lower-income people to enhance their economic activities, the resulting income rise may help reduce poverty. Table 16 analyzes impact of financial inclusion on developing countries' poverty levels. This section uses the log poverty headcount of USD 1.9 per day to measure poverty. The other control variables are taken from previous studies (Park and Mercado, 2018; Omar and Inaba, 2020). Table 16 shows that the financial inclusion index (FII) has a significant negative coefficient suggesting that more financial inclusion contributes to poverty reduction. The result supports the argument that financial inclusion expands opportunities for the poor.

Table 16 Impact of financial inclusion on poverty level in developing countries: two-stage system GMM method.

Time Frame: 2004–2019, Yearly Panel	
Variables	Dependent variable: Log poverty headcount at $1.9 a day
Lag dependent variable	0.129
	(0.189)
FII	-9.946***
	(3.039)
Log Gini	3.443***
	(1.000)
TRADEOPEN	0.000135
	(0.00450)
GOVT	-0.0586
	(0.0435)
School Enroll.	0.0140
	(0.0190)
INF	0.0317***
	(0.0106)
Rule	0.338
	(0.329)
Constant	-3.145
	(3.904)
Diagnostic Tests:	
Observations	262
Number of countries	34
No. of instruments	32
AR2	0.72
Hansen J Statistics	0.48

Note: Dynamic two-stage system GMM panel method. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

Studies (Kim et al.,2016; Omar and Inaba, 2020; Romero and Ahamed, 2021) find that financial inclusion reduces income inequality in developing countries. This section examines the impact of financial inclusion on income inequality in developing countries using the control variables from the Kim et al. (2016) study[18]. Table 17 reveals that financial inclusion contributes to reduction of income inequality as the financial inclusion index has a significant negative coefficient. This result also supports the second hypothesis that financial inclusion causes the income rise of lower-income people. By offering new opportunities, financial inclusion encourages higher economic activities of lower-income people, and the rise in income in this lower tier perhaps contributes to income inequality reduction.

[18] Unemployment rate (UNEMP), inflation (INF), and population growth (POP GR) are used as control variables.

Table 17 Impact of financial inclusion on income inequality in developing countries: two-stage system GMM method.

Time Frame: 2004–2019, Yearly Panel	
Variables	Dependent Variable: Log Gini
Lag dependent variable	0.746***
	(0.0977)
FII	-0.445*
	(0.259)
UNEMP	0.000789
	(0.00132)
INF	-0.00149*
	(0.000819)
POP GR	0.0234*
	(0.0137)
Constant	1.319**
	(0.540)
Diagnostic Tests:	
Observations	352
Number of countries	36
No. of instruments	30
AR2	0.698
Hansen J Statistics	0.534

Note: Dynamic two-stage system GMM panel method. Significance, ***p < 0.01, **p < 0.05, and *p < 0.1. Robust standard errors are in parentheses.

5.6 Discussion

The Global Findex Survey (2017), as well as studies (Kara et al., 2021; Klapper & Singer, 2015), reveal that lower-income people are often financially excluded. Accessing and utilizing financial services opens up opportunities for the financially excluded population to start or expand businesses, increasing overall economic growth. The results support this argument. The findings of this study support that financial inclusion increases economic growth in developing countries by expanding opportunities for lower-income people. Table 16 shows that financial inclusion significantly reduces poverty. Poverty reduces because the economic activities of the financially excluded also increase their income level, which contributes to poverty reduction. If economic growth had happened without a significant contribution from lower-income people, poverty reduction would not have happened. This study also finds that financial inclusion brings reduction of income inequality, which supports lower-income people's income rise. If economic growth is induced by the reduction of shadow economy and tax revenue increase, income inequality should not have been reduced.

If financial inclusion improves economic growth by ensuring better resource allocation and intermediation, it should significantly impact economic growth both in developing and high-income countries. However, the results indicate that the impact of financial inclusion is limited within developing countries. The expansion of opportunities channel better explains this scenario. This study suggests that the increase in economic activities of lower-income people induced by financial inclusion is one of the primary reasons for improved intermediation and economic growth in developing countries. Panel B of Figure 1 shows that the proportion of financially excluded people is high in developing countries but not in high-income countries[19]. As most people are already financially included in high-income countries, financial inclusion cannot offer new opportunities to many people and cannot substantially boost economic activities.

The Global Findex Database (2021) reveals that financial inclusion improves women's economic empowerment. Cabeza-García et al. (2019) show that women's financial inclusion improves GDP growth in developing countries. The data of this research reveal that females have proportionally lower account ownership in formal financial institutions than men in developing countries[20]. This study acknowledges the importance of the financial inclusion of women but argues that not only women but men also contribute to economic growth. It suggests that opportunities used by financially excluded people, irrespective of gender, influence economic growth, and financial inclusion expands opportunities for both men and women.

There is a possibility that financial inclusion does not induce economic growth. Instead, improved economic growth enables financial services to expand. This study examines this possible reverse causality issue and finds that financial inclusion Granger causes economic growth, and there is no reverse causality. Financial services can reach previously financially excluded people as policymakers adopt policies targeting this group. The advancement of mobile money and affordable mobile phone-based digital services have also expanded, helping more rapid financial inclusion.

[19] The graph for the developing countries is well below the upper limit of financial inclusion, which is one. The high-income countries have financial inclusion levels close to the upper limit.
[20] The average female-to-male bank account ratio is 0.787, suggesting that women have approximately 21 percent less account ownership than men.

This study also finds that financial inclusion has a significant positive impact on economic growth in sub-groups of developing countries. The results remain valid for lower-middle and low-income countries. The robustness checks of the results using alternative control variables are applied using FDI instead of trade openness and incorporate population growth rate and institutional quality as additional control variables. The results with these alternative sets of control variables also finds a significant positive impact of financial inclusion on economic growth in developing countries.

The findings of this chapter offer some important recommendations for policymakers. Policymakers in developing countries can strive for more financial inclusion to promote economic growth. This tool should be more effective in countries where many are still financially excluded. Past studies (Andrianaivo and Kpodar, 2011; Kim et al., 2018; Karim et al., 2021) also propose that financial inclusion can be used to increase economic growth in developing countries. Cabeza-García et al. (2019) argue that greater economic participation of women through financial inclusion improves GDP growth in developing countries. This study also finds that females have lower account ownership than men. So, policymakers should ensure that disadvantaged groups such as women access financial services. As panel B of Figure 1 indicates that there is a scope for expanding financial services to untapped customers in developing countries, this study recommends that financial institutions grow their business by offering customized financial services that meet the need of the users. To attain economic growth through financial development, this study suggests that policymakers in developing countries should focus on improving the efficiency of financial institutions and capital markets along with more financial inclusion.

This study acknowledges that other transmission channels might be valid to some extent but argues that expanding opportunities for the poor channel better explains economic growth through financial inclusion. There is one possible limitation. This study does not examine whether financial inclusion contributes by reducing the size of the shadow economy channel. This issue can be investigated in the future when more information on the size of the shadow economy in developing countries is available.

Chapter 6: Impact of financial inclusion on gender inequality

This chapter investigates the role of financial inclusion in influencing gender equality in developing countries. According to United Nations Development Programme (UNDP), gender equality measures women's reproductive health, empowerment, and economic status compared to men. Ensuring gender equality is one of the key Sustainable Development Goals (SDG-5). Financial inclusion indicates the ability of individuals and businesses to access valuable and affordable financial products that serve their needs. Due to its positive influence on poverty alleviation, economic growth, women empowerment, and income inequality reduction, financial inclusion may help reduce gender inequality.

Duflo (2012) argues that poverty reduction and income enhancement policies disproportionately help women even without targeting them. Rose (1999) identifies that in a crisis, families disproportionately sacrifice the welfare of girls. This study also finds that poverty reduction and economic growth reduce gender inequality by relaxing poor households' constraints. Since financial inclusion helps poverty reduction and income growth, it should also reduce gender inequality by removing constraints for the households.

Previous studies show that financial inclusion improves women's health, empowerment, and economic status. Orton et al. (2016) find that microfinance schemes have a positive impact on the health of women and their children. El-Zoghbi et al. (2019) identify that financial inclusion improves women's bargaining power in the household, and enables women to increase their participation in the labor force. Demirguc-Kunt et al. (2017), in their review of randomized control-based studies, identify that financial inclusion provides savings, payment, and insurance benefits to the female users.

There is a possibility that financial inclusion might increase gender inequality if men gain more from utilizing the services than women. Klapper and Singer (2015) show that women face more difficulty accessing formal credit than men in African countries. Xu et al. (2018) find that women have to provide more collateral in getting business loans. As men have more opportunities to utilize financial services than women, increasing financial inclusion may favor men and increase gender inequality. In contrast to this argument, Duflo (2012) demonstrates that women gain more from economic development.

Thus, if the utilization of financial services by men results in economic development, gender inequality is likely to be reduced.

This chapter empirically examines the impact of financial inclusion on gender inequality in developing countries. The results indicate that financial inclusion significantly impacts reduction of gender inequality in developing countries. The finding remains valid for alternative financial inclusion indicators and lag values of the financial inclusion index. The results also indicate that financial inclusion improves gender equality primarily through economic development channels.

The results do not suggest that financial inclusion magnifies gender inequality even in the sub-groups of developing countries. In the low-income and lower-income countries, financial inclusion has significant negative coefficients with the gender inequality index. Financial inclusion has a positive impact only in the upper-middle-income countries. However, as the coefficient is insignificant, it does not confirm that financial inclusion increases gender inequality.

The chapter also analyzes the non-linear relationship between gender inequality and financial inclusion by incorporating the squared term of the financial inclusion index. By categorizing countries into two sub-samples according to their income levels, this investigation reveals that increasing financial inclusion benefits the lower-income countries. The research finds a diminishing impact of more financial inclusion on gender inequality in higher-income countries.

The results indicate that though financial inclusion has an overall significant impact on gender inequality reduction, its impact is more significant when women and the poor have low access to financial services. The chapter also examines the effect of women's financial access on gender inequality but does not find evidence supporting a more significant role of female financial inclusion. Apart from financial inclusion, compulsory education and institutional quality are found as significant determinants of gender equality.

Though previous studies explore different ways financial inclusion affects women's development, this study examines the non-linear relationship between financial inclusion and gender inequality on which the previous studies did not focus. The findings

of this study have some important policy implications and the study prescribes that policymakers can use financial inclusion to reduce gender inequality in lower-income countries and countries where women and the poor have low financial access. Policymakers in other countries should combine financial inclusion initiatives with educational support and institutional quality improvements to achieve gender equality.

6.1 Gender inequality and financial inclusion in developing countries.

The gender-inequality index measures women's reproductive health, empowerment, and economic status compared to men. This index compares secondary school enrollment, parliamentary seats, and labor force participation rate of men with those of women in assigning a composite score. The score lies between zero and one, where a lower value indicates more gender equality.

Table 18 Gender inequality index and its sub-components (average value)

Name of the Indicators	All countries		Developing countries	
	2005	2019	2005	2019
Gender inequality index (GII)	0.418	0.345	0.521	0.438
Maternal mortality ratio (deaths per 100,000 live births)	232	161	319	221
Adolescent birth ratio (births per 1,000 women ages 15-19)	58.12	45.51	74.95	59.94
Female secondary school enrollment (% gross)	76.85	79.95	62.68	76.51
Female share of parliamentary seats (%)	15.65	22.98	14.06	21.27
Female labor force participation rate (% of female, age 15+)	50.66	52.05	50.55	51.19

Source: United Nations Development Program (UNDP), United Nations and World Development Indicators (WDI), The World Bank.

Table 18 shows the indicators used to construct the gender inequality index and compares average indicator scores between 2005 and 2019. The columns of all countries in Table 18 depicts information for all countries, while the developing countries column shows information for developing countries. Table 18 shows that all the gender inequality indicators have improved in 2019 compared to their values in 2005 for all countries. In contrast, despite some improvements, developing countries still have higher inequality than in the case of all countries. Table 18 also reveals that developing countries made

substantial progress in reducing maternal mortality and adolescent birth rate while improving female school enrollment. Even the financial inclusion of men can improve these indicators if male financial inclusion results in poverty reduction and economic growth, allowing households to spend more on these aspects.

Due to the higher gender inequality, this study focuses on analyzing gender inequality in developing countries. Financial inclusion can be one solution for gender inequality reduction in developing countries.

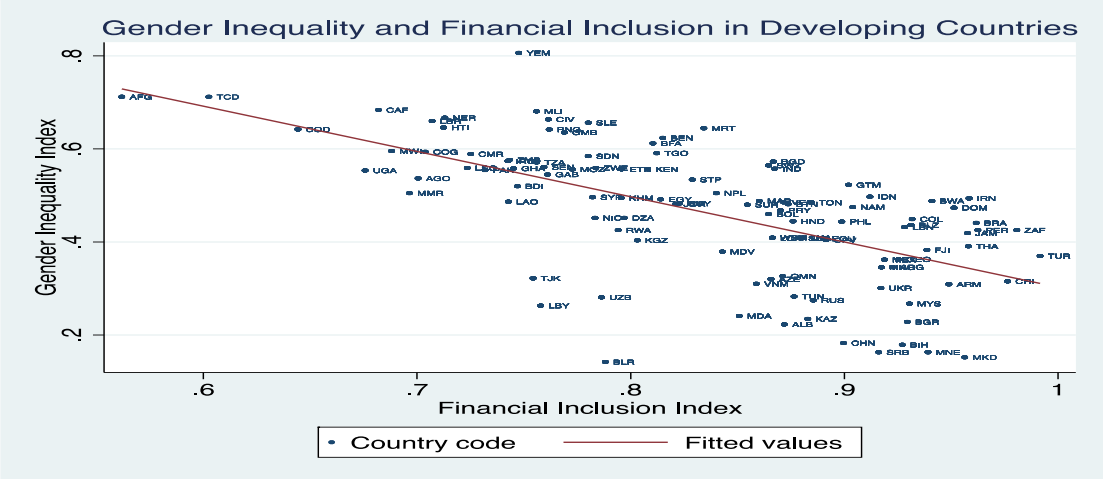

Figure 7 Gender Inequality and Financial Inclusion relation in developing countries.
Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment.

Figure 7 shows a negative relationship between financial inclusion and gender inequality in developing countries. Financial inclusion initiatives may allow households to spend more on health and school enrollment of female children because studies find that financial inclusion positively influences poverty alleviation and income growth. In addition, previous studies also find financial inclusion associated with the increased role of women in household decisions, which should also affect the empowerment component of gender inequality. This study applies panel estimation techniques incorporating other relevant control variables to examine the effect of financial inclusion on gender inequality in developing countries.

6.2 Estimation framework

The study uses the gender inequality index developed by UNDP in measuring the country-wise gender equality situation. Following Sarma (2012), this study constructs a composite financial inclusion index to examine the impact of financial inclusion on

gender inequality. Kim (2021) examines capability-based, livelihood-based, and institutional quality indicators in identifying critical determinants of gender inequality. The study uses these indicators as additional control variables.

Equation (9) shows the model specification for analyzing the impact of financial inclusion on gender inequality. The fixed effect panel regression is primarily applied for this analysist as well as the two-stage fixed-effect regression using instrumental variables to address possible endogeneity issues. Appendix A contains the definition of variables used in this model.

$$\mathrm{GII}_{it} = \alpha_0 + \beta_1 FII_{it} + \beta_2 fertility_{it} + \beta_3 comedu_{it} + \beta_4 expedu_{it} + \beta_5 unemp_{it} + \beta_6 gdppcgr_{it} + \beta_7 instquality_{it} + \eta_i + \varepsilon_{it} \qquad (9)$$

In equation 9, the dependent variable is the gender inequality index (GII_{it}). The financial inclusion index (FII_{it}) is the primary independent variable. Other control variables are fertility rate ($\mathrm{fertility}_{it}$), compulsory school education in years (comedu_{it}), education expense as a percentage of GDP (expedu_{it}), unemployment rate (unemp_{it}), GDP growth per capita ($\mathrm{gdppcgr}_{it}$), and institutional quality ($\mathrm{instquality}_{it}$), and η_i indicates country and time fixed effect.

A significant negative coefficient of the financial inclusion index β_1 in equation (9) suggests that financial inclusion reduces gender inequality. As suggested by earlier studies (Becker et al., 1990), the decision to have children affects the decision of women to take an active part in economic activities. Both compulsory education and government spending on education should decrease gender inequality. Compulsory education allows female children to access to education as male ones. Higher government spending on education helps everyone to develop human capital. So, the coefficients β_3 and β_4 are both expected to be negative. The unemployment rate and GDP growth per capita are proxies for the macroeconomic situation. If economic growth is high and the unemployment rate is low, female labor force participation should be high, reducing gender inequality. Using GDP growth per capita as a control variable partially dampens impact of financial inclusion through the economic development channel. As an alternative, livelihood-based indicators by Kim (2021) are applied as control variables in place of per capita GDP growth. The livelihood-based indicators include the unemployment rate, employers, and

employees as a proportion of the labor force as control variables. Kim (2021) finds all three indicators significant for OECD countries, while the number of employees is significant in non-OECD countries. Lastly, this study uses institutional quality as a control variable. If institutional quality is high in a country, policies are not likely to be discriminatory toward women. Hence, the coefficient β_7 is expected to be negative, that is, institutional quality improvement will help reduce gender inequality.

Women and the poorest people in developing countries usually have unequal access to financial services. This chapter examines how unequal access to financial services affects gender equality in developing countries. Proxy indicators are used to track unequal financial access. The dataset is divided into two sub-samples using the median value of the indicators to examine whether financial inclusion affects gender inequality differently in different sub-samples.

For developing countries, this study separately examines the impact of financial inclusion on gender equality using control variables from capability-based and livelihood-based models (Kim, 2021). The capability-based model includes fertility, compulsory schooling, government spending on education, and institutional quality as control variables.

The study analyzes how financial inclusion affects gender inequality in different sub-groups of developing countries by applying equation (9). Finally, Section 6.6 investigates the non-linear relationship between financial inclusion and gender inequality by adding a financial inclusion index squared term.

6.3 Impact of financial inclusion on gender inequality in developing countries

Table 19 reports the impact of financial inclusion on gender inequality using different model specifications. Column one of Table 19 includes control variables from capability-based models, while column two includes control variables from livelihood-based models. The third column combines control variables from both models, and column four shows the model specification of this study.

The financial inclusion index has significant negative coefficients in all four cases, suggesting that financial inclusion reduces gender inequality in developing countries. Among the control variables, compulsory school enrollment and institutional quality have

significant negative coefficients in all cases. This result supports the findings of earlier studies (Kim, 2021) that compulsory education can improve the capabilities of women and sound regulatory quality helps in implementing policies targeted at women empowerment. Hence, gender quality improves with improvement in these two variables. In column four, income growth has significantly impact on gender inequality. Higher income allows households to spend more on health care and education of the female child, which helps in improving gender inequality.

Table 19 Financial inclusion and gender inequality in developing countries under different model specifications.

Variables	(1)	(2)	(3)	(4)
	Dependent Variable: Gender Inequality Index (GII)			
Financial Inclusion Index	-0.126**	-0.0364*	-0.0895*	-0.132**
	(0.0613)	(0.0215)	(0.0460)	(0.0645)
Fertility	-0.0216		-0.0251	-0.0211
	(0.0204)		(0.0197)	(0.0213)
Compulsory education	-0.00223**		-0.00261**	-0.00225*
	(0.00107)		(0.00102)	(0.00116)
Education expense	-0.000484		-0.000625	-0.000822
	(0.00151)		(0.00139)	(0.00149)
Institutional quality	-0.0265**		-0.0214*	-0.0258**
	(0.0116)		(0.0117)	(0.0120)
Unemployment rate		0.000043	-0.000889	-0.000939
		(0.000617)	(0.000968)	(0.000851)
Employers		0.000534	0.000943	
		(0.00197)	(0.00343)	
Employees		-0.00112*	-0.00191	
		(0.000594)	(0.00120)	
Per capita GDP growth				-0.000262**
				(0.000121)
Year fixed effect	Yes	Yes	Yes	Yes
Constant	0.707***	0.589***	0.787***	0.721***
	(0.110)	(0.0344)	(0.136)	(0.110)
Observations	367	1,140	367	365
R-squared	0.611	0.447	0.629	0.614
Number of countries	69	110	69	69

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses. Number of countries in each column represents developing countries. The number varies due to different sets of control variables used.

Table 20 analyzes the impact of financial inclusion on gender inequality using the two-stage fixed-effect regression method. The model specifications and control variables are precisely the same as in Table 19, but Table 20 addresses the potential endogeneity

problem using instrumental variable approach and lag mobile phone subscription rate as the instrument.

Table 20 Financial inclusion and gender inequality in developing countries using instrumental variable approach.

Variables	(1)	(2)	(3)	(4)
	Dependent Variable: Gender Inequality Index (GII)			
Financial Inclusion Index	-0.292**	-0.618***	-0.235*	-0.283*
	(0.141)	(0.208)	(0.163)	(0.152)
Fertility	-0.018**		-0.0206**	-0.0159**
	(0.0074)		(0.00753)	(0.0079)
Compulsory education	-0.0022**		-0.0024**	-0.00198**
	(0.00096)		(0.00094)	(0.000977)
Education expense	-0.00052		-0.000079	-0.00065
	(0.00134)		(0.00133)	(0.00134)
Institutional quality	-0.0242***		-0.0238***	-0.0254***
	(0.00135)		(0.00748)	(0.0076)
Unemployment rate		0.00049	-0.000572	-0.000523
		(0.000845)	(0.00101)	(0.00106)
Employers		0.00116	-0.00127	
		(0.00195)	(0.00088)	
Employees		0.000058	0.00061	
		(0.000606)	(0.00218)	
Per capita GDP growth				-0.00029*
				(0.000154)
Year fixed effect	Yes	Yes	Yes	Yes
Observations	342	956	342	340
R-squared	0.574	0.096	0.598	0.584
Number of countries	55	103	55	55
Underidentification test (Anderson's p-value)	0.000	0.0004	0.000	0.000
Weak instrument (Crag-Donald Wald F stat)	10.823	7.84	8.310	10.154
Overidentification test:				
Sargan-Hansen statistics Chi-sq	0.170	0.125	0.009	0.556
Sargan-Hansen statistics P-value	0.681	0.724	0.923	0.456
Endogeneity test:				
Chi-sq	1.545	13.465	0.975	1.097
P-value	0.214	0.0002	0.323	0.294

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

The results in Table 20 are similar to the findings in Table 19. In all cases, financial inclusion has a significant negative impact on gender inequality. So, the findings of fixed-effect analysis remain valid even after addressing potential endogeneity issues using instrumental variables. The diagnostics tests suggest that instruments are well-specified in all cases without any over-identification or under-identification problems. In

Table 20, Anderson's p-values reject the null hypothesis of the under-identification problem, and Sargan-Hansen statistics p-values fail to reject the null hypothesis of the no over-identification problem. The endogeneity tests do not suggest endogeneity or reverse causality issues in any model specification except column two. The insignificant test result of reverse causality makes it possible to primarily apply the conventional fixed-effect regression to analyze the gender inequality and financial inclusion relationship from different aspects.

6.4 Lag effect of financial inclusion on gender inequality in developing countries.

Financial inclusion may not have an immediate impact on gender inequality. Financial inclusion initiatives might require more time to change the socio-economic behavior of people and affect gender inequality. Lagged values of the financial inclusion index are used to examine this effect. Appendix F shows the results for up to seven lags of the financial inclusion index. The results indicate that past values of the financial inclusion index have a significant effect on the current gender inequality situation. Apart from lag 2, all other lag values of the index have a significant negative coefficient, suggesting that financial inclusion initiatives are likely to reduce gender inequality with more time.

6.5 Financial inclusion and gender inequality in different sub-groups of developing countries

This section analyzes how financial inclusion affects gender inequality in different sub-groups of developing countries. This study categorizes developing countries into two sub-samples according to their income levels for the analysis.

Table 21 reveals that financial inclusion significantly impacts gender inequality in low- and lower-middle-income countries. In column 1 of Table 21, financial inclusion has a significant negative coefficient. In upper-middle-income countries, financial inclusion seems inactive as its coefficient in column 2 is positive and insignificant[21]. Column 2 also reveals that educational investment, income growth, and institutional quality improvement significantly impact gender equality in upper-middle-income countries.

[21] The low to moderate correlations among the explanatory variables suggest that multicollinearity problem is not a serious issue in this analysis.

Table 21 Financial inclusion and gender inequality in different sub-groups of developing countries

Variables	Low and lower-middle income countries	Upper-middle income countries
	(1)	(2)
	Dependent Variable: Gender Inequality Index (GII)	
Financial Inclusion Index	-0.230***	0.011
	(0.0593)	(0.0763)
Fertility	-0.0409	-0.005
	(0.0331)	(0.0208)
Compulsory education	0.00153	-0.003***
	(0.00195)	(0.0012)
Education expense	-0.00154	-0.00159*
	(0.00322)	(0.0009)
Unemployment rate	-0.00341	-0.0011
	(0.00394)	(0.0009)
Per capita GDP growth	-0.00117	-0.00017***
	(0.000738)	(0.00006)
Institutional quality	-0.0161	-0.0245**
	(0.0244)	(0.0104)
Year fixed effect	Yes	Yes
Constant	1.002***	0.461**
	(0.195)	(0.075)
Observations	183	409
R-squared	0.636	0.760
Number of countries	36	32

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

The results suggest that financial inclusion affects different sub-groups of developing countries through the economic development channel. In low-and lower-middle-income countries, the poverty rate is higher. So, economic development induced by financial inclusion effectively improves gender inequality in these countries. Duflo (2012) also finds that economic development improves gender inequality in countries with high poverty rates. As upper-middle-income countries have a lower poverty rate than low or lower-middle-income countries, financial inclusion has less scope to affect gender equality through poverty reduction.

6.6 Non-linear relation between financial inclusion and gender inequality in different income group of countries

This section analyzes the non-linear relation between financial inclusion and gender equality by adding a squared term of the financial inclusion index. Since the original financial inclusion index values lie between zero and one, this analysis uses the

log form of the financial inclusion index and its squared term as explanatory variables[22]. For this analysis, this research categorizes all countries into two sub-samples according to their income levels. Table 22 shows the results for the two sub-samples.

Table 22 Non-linear impact of financial inclusion on gender inequality

Variables	Low and lower middle-income countries	Upper middle- and high-income countries
	(1)	(2)
	Dependent Variable: Gender Inequality Index (GII)	
Log Financial Inclusion Index	-0.627***	-0.0835
	(0.162)	(0.133)
Log Fin. Inclusion Squared	-0.791***	0.0542
	(0.268)	(0.338)
Fertility	-0.0300	0.0915
	(0.0339)	(0.0600)
Compulsory education	0.00202	-0.00127
	(0.00207)	(0.00149)
Education expense	-0.00225	-0.00345
	(0.00334)	(0.00238)
Unemployment rate	-0.00321	0.00006
	(0.00368)	(0.00124)
Per capita GDP growth	-0.000960	-0.000153**
	(0.000663)	(0.00007)
Institutional quality	-0.0169	-0.0107
	(0.0242)	(0.0142)
Constant	0.670***	0.147
	(0.182)	(0.123)
Time effect	Yes	Yes
Observations	183	409
R-squared	0.652	0.425
Number of countries	36	72

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

The results support the earlier finding that financial inclusion is more effective in low and lower-middle-income countries. Both the log financial inclusion and the squared term are significant and negative in low and lower-middle-income countries. Moreover, the squared term of log financial inclusion has a larger negative coefficient than the log financial inclusion. This nonlinear relation indicates that the marginal effect of financial inclusion on gender inequality is getting larger in absolute value, which suggests that the

[22] Since the original index values lie between zero and one, the index values' squared term is lower than the original index value. The log transformation brings the index values within the negative to zero range and the squared terms positive. The square of the value zero is zero. So, this exercise performs the test excluding the values with zero squared terms.

higher the financial inclusion initiative, the more gender inequality is reduced in low and lower-middle-income countries. In contrast, in upper-middle and high-income countries, the coefficients are not significant, and the squared term is also positive, suggesting a limit to gender inequality reduction through financial inclusion initiatives.

The findings again confirm that financial inclusion improves gender inequality in lower-income countries. The significant impact only in lower-income countries suggests that financial inclusion affects gender inequality through the economic development channel. Countries with less income face more constraints, resulting in higher gender inequality (Duflo, 2012). By alleviating poverty and increasing income, financial inclusion reduces constraints in lower-income countries and improves gender equality. As income increases, countries face fewer constraints, and financial inclusion appears less effective in influencing gender inequality in higher-income countries.

6.7 Impact of unequal financial access to women and the poorest population

The section investigates how unequal access to financial services affects gender equality in developing countries by applying two indicators; the ratio of female to male bank accounts per 1000 people and the proportion of accounts held by the poorest 40 percent of the population. For both analyses, the study divides the dataset into two parts using the median value of the indicators[23]. Table 23 demonstrates how unequal bank access by women and the poorest section of the population affects gender inequality in developing countries.

Financial inclusion significantly impacts gender inequality when females and the poorest people have low access to financial services. The first two columns in Table 23 analyze female bank access, and the last two columns examine bank access of the poor. The results suggest that when women and the poor have higher bank account penetration, the impact of financial inclusion on gender inequality is insignificant.

In column 2 of Table 23, women have low bank account penetration as indicated by the below-median female to male bank account ratio. Financial inclusion significantly improves gender inequality in column 2 but not in column 1, where females have higher

[23] The median values for the female to male bank account ratio and bank accounts held by the poorest 40 percent are 0.79 and 32.57 percent, respectively.

access to bank accounts. Similarly, in column 4, where the poorest people have lower access to bank accounts (as indicated by the below-median ratio), financial inclusion significantly affects gender inequality. However, financial inclusion is insignificant when the poor have higher bank access (above median), as shown in column 3.

Table 23 Impact of unequal financial access to women and the poorest population

Variables	Ratio of female to male bank accounts		Bank account held by poorest 40 percent	
	Above Median (>0.79)	Below Median (<0.79)	Above Median (>32.57)	Below Median (<32.57)
	(1)	(2)	(3)	(4)
	Dependent Variable: Gender Inequality Index (GII)			
Financial Inclusion Index	-0.101	-0.194**	-0.0866	-0.126*
	(0.0949)	(0.0772)	(0.0723)	(0.0642)
Fertility	-0.0187	0.00737	-0.0570	-0.00336
	(0.0278)	(0.0246)	(0.0349)	(0.0138)
Compulsory education	-0.00139	-0.00241	-0.00502***	0.000415
	(0.00149)	(0.00150)	(0.00165)	(0.00161)
Education expense	-0.00331	0.00101	-0.00292	-7.31e-05
	(0.00245)	(0.00160)	(0.00238)	(0.00144)
Unemployment rate	-0.00109	0.00144	-0.00236	-0.00157
	(0.00113)	(0.00205)	(0.00146)	(0.00183)
Per capita GDP growth	-0.000216	-0.000371	-0.000252**	-0.000458
	(0.000129)	(0.000515)	(0.000120)	(0.000518)
Institutional quality	-0.0330**	-0.00801	-0.0234	-0.0258***
	(0.0140)	(0.0163)	(0.0160)	(0.00750)
Constant	0.638***	0.703***	0.840***	0.645***
	(0.146)	(0.111)	(0.172)	(0.0735)
Year fixed effect	Yes	Yes	Yes	Yes
Observations	211	154	219	146
R-squared	0.629	0.706	0.595	0.805
Number of countries	40	29	41	28

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses. The number of countries in each column represents developing countries.

The results suggest that financial inclusion can improve gender equality in developing countries only when women and the poor have low financial access. The economic development channel may help explain the results. At a lower level of economic development, households are likely to face more constraints. Rose (1999) finds that faced with more constraints, families disproportionately sacrifice the welfare of girls. Financial inclusion reduces inequality by relaxing poor households' constraints. When the females and the poor have lower bank account penetration, they do not have the tools to overcome the constraints. In that situation, new financial inclusion initiatives enable the

removal of constraints and are more effective. The results show that when households already have higher financial access, further reduction of constraints through financial inclusion seems difficult. The section also applies the instrumental variable approach in examining the relationship. Appendix G demonstrates that the results are similar to Table 23.

This limited role of financial inclusion suggests that policymakers need to combine other gender inequality reduction strategies such as compulsory education and institutional quality improvements along with increasing financial inclusion to achieve gender equality.

6.8 Impact of financial access to men and women on gender inequality in developing countries

This section analyzes how male and female financial inclusion affects gender inequality. This study uses two separate variables. Account ownership of males above 15 years of age in a financial institution as a percentage of the total population is used to measure male financial inclusion. Similarly, the account ownership ratio of females above 15-years is used to measure female financial inclusion. Table 24 shows the analysis results for developing countries and all-countries cases.

Table 24 shows that male and female financial inclusion has an insignificant negative coefficient with gender inequality in developing countries. The insignificant coefficient is probably due to a lack of observations, as data on these gender-specific indicators is limited. The insignificant results do not support the argument that female financial inclusion is more effective than male financial inclusion in improving gender equality.

For the all-countries case, male financial inclusion has a significant negative coefficient. This negative coefficient of male account ownership also suggests that even the financial inclusion of males can help reduce gender inequality. The economic development channel can explain this result. If poverty decreases or income increases due to the financial inclusion of men, households can afford to spend more on girls' welfare, which can improve various components of the gender inequality index such as maternal mortality ratio, adolescence birth rate, and female secondary school enrollment.

Table 24 Impact of account ownership of men and women on gender inequality

Variables	Developing countries		All countries	
	(1)	(2)	(3)	(4)
	Dependent Variable: Gender Inequality Index (GII)			
Male account ownership	-0.000485		-0.000532*	
	(0.000350)		(0.000285)	
Female account ownership		-0.000837		-0.000338
		(0.00135)		(0.000364)
Fertility	-0.0311*	0.0576**	-0.0297*	0.0213
	(0.0182)	(0.0280)	(0.0160)	(0.0154)
Compulsory education	-0.00404**	0.0259*	-0.00369**	0.00794**
	(0.00171)	(0.0133)	(0.00183)	(0.00378)
Education expense	-0.000285	-0.00499	-0.000687	-0.00506
	(0.00164)	(0.0120)	(0.00141)	(0.0113)
Unemployment rate	0.000452	0.0138**	-0.000471	-0.000172
	(0.00123)	(0.00556)	(0.000796)	(0.00259)
Per capita GDP growth	0.000449	-0.000828	0.000599	0.000452
	(0.00122)	(0.00166)	(0.000910)	(0.00212)
Institutional quality	-0.0298**	-0.0183	-0.0257**	0.0104
	(0.0137)	(0.0355)	(0.0119)	(0.0333)
Constant	0.626***	-0.0439	0.520***	0.242***
	(0.0677)	(0.225)	(0.0566)	(0.0562)
Year fixed effect	Yes	Yes	Yes	Yes
Observations	86	70	138	118
R-squared	0.719	0.758	0.717	0.438
Number of countries	47	42	76	73

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

Male financial inclusion should also have a substantial impact in developing countries through the economic development channel as these countries are experiencing a higher level of economic growth than high-income countries. However, column 1 of Table 24 finds an insignificant coefficient. One probable reason for this insignificant coefficient is the lack of observations in developing countries compared to the all-countries case. Moreover, by applying cross-country analysis, this analysis finds the expected significant impact of male account ownership in developing countries. This result supports the idea that male financial inclusion improves gender equality through the economic development channel, even in developing countries.

6.9 Additional checks

This section checks the robustness of the results using alternative indicators of financial inclusion and different measures of institutional quality.

Table 25 Gender inequality and different indicators of financial inclusion in developing countries.

Variables	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Gender Inequality Index (GII)				
Fertility	-0.0211	-0.0248	0.0259	-0.0204	0.0145
	(0.0213)	(0.0213)	(0.0168)	(0.0246)	(0.0135)
Compulsory education	-0.00225*	-0.00223*	-0.000114	-0.00214	-0.00104
	(0.00116)	(0.00120)	(0.00123)	(0.00131)	(0.000918)
Education expense	-0.000822	-0.00188	0.000877	-0.00122	-0.000728
	(0.00149)	(0.00158)	(0.00129)	(0.00184)	(0.00101)
Unemployment rate	-0.000939	-0.00111	0.00114	-0.00132	0.00149*
	(0.000851)	(0.000805)	(0.00120)	(0.000915)	(0.000816)
Per capita GDP growth	-0.000262**	-0.000251**	-0.000692	-0.000252**	-0.00115***
	(0.000121)	(0.000108)	(0.000599)	(0.000117)	(0.000423)
Institutional Quality	-0.0258**	-0.0231*	-0.000284	-0.0269*	-0.0362***
	(0.0120)	(0.0124)	(0.0180)	(0.0137)	(0.0124)
Financial Inclusion Index	-0.132**				
	(0.0645)				
Sarma Index		-0.0738*			
		(0.0435)			
No. of Bank Borrowers			-0.000092*		
			(0.000053)		
No. of bank branches				-0.000931	
				(0.00122)	
Loan account in fin. institutions					-0.000027*
					(0.000013)
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Constant	0.721***	0.678***	0.406***	0.626***	0.462***
Observations	365	365	242	351	234
R-squared	0.614	0.617	0.452	0.604	0.603
Number of countries	69	69	49	66	48

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

Table 25 analyzes the impact of financial inclusion on gender inequality in developing countries using alternative financial inclusion indicators. This section uses the index proposed by Sarma (2012), number of bank borrowers per 1000 people, number of bank branches, and number of loan accounts in financial institutions per 1000 people as alternative indicators. Except for the number of bank branches, the study finds significant negative coefficients for the financial inclusion indicator. This finding confirms that the significant impact of financial inclusion on gender inequality reduction is not specific to any particular index and results remain valid for other indicators of financial inclusion.

The section primarily uses regulatory quality as the indicator for institutional quality. Appendix H shows that the study uses six alternative indicators of institutional quality. All the indicators except political stability show a significant negative coefficient with gender inequality, suggesting that improvement in institutional quality helps to reduce gender inequality.

Inclusion of per capita GDP growth as a control variable may dampen the impact of financial inclusion through the economic development channel. As an additional check, the study applies livelihood-based indicators used by Kim (2021) as control variables in place of per capita GDP growth and finds that all the results are valid even for the alternative indicators. Appendix I demonstrates the results of this exercise.

A panel granger causality test finds unidirectional causality where financial inclusion granger causes gender inequality. So, financial inclusion can be used as a tool to reduce gender inequality in developing countries. Thus, the study concludes that the original findings remain robust for alternative financial inclusion and institutional quality indicators. The additional checks also acknowledge the role of financial inclusion in promoting gender equality.

Chapter 7: Financial inclusion and SDGs: Bangladesh Experience

This chapter examines the evolution of financial inclusion and its impact on attaining key Sustainable Development Goals (SDGs) in Bangladesh. The findings suggest that financial inclusion contributes to improving economic growth and lowering poverty and gender inequality in Bangladesh.

7.1 Financial inclusion and SDGs in Bangladesh

Figure 8 shows the financial inclusion situation in Bangladesh using the financial inclusion index (FII) developed in this study. It is evident from the figure that Bangladesh has achieved gradual progress in financial inclusion, especially since 2008.

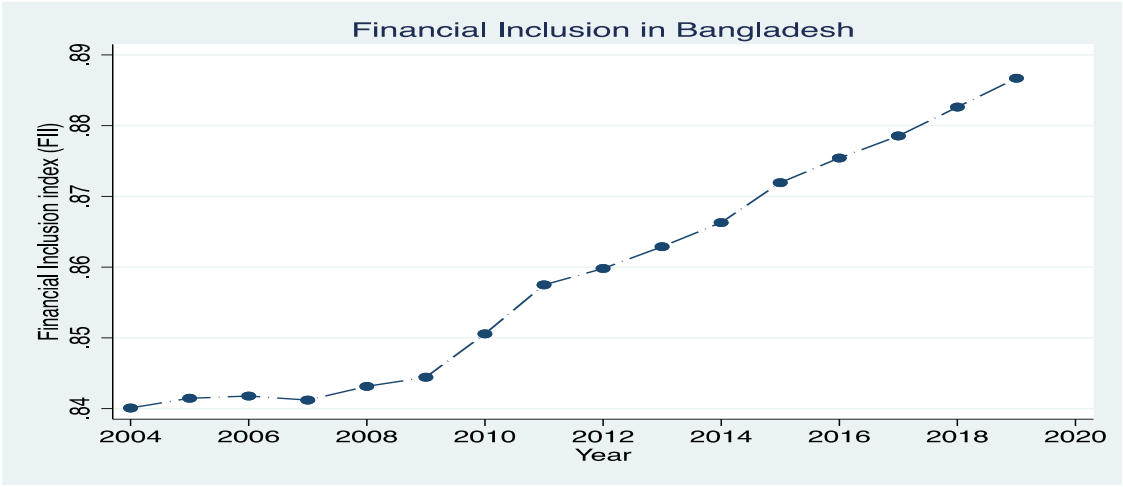

Figure 8 Financial Inclusion in Bangladesh
Source: Financial Access Survey (FAS), the IMF. Calculation: Author's assessment.

The analysis of the preceding chapters suggests that the steady growth in financial inclusion should help Bangladesh to achieve higher economic growth and reduce poverty and gender inequality. The correlation matrix in Table 26 indicates that financial inclusion (FII) has an expected impact on economic growth (GDPPCGR), poverty (Pov. Headcount), and gender inequality (GII) in Bangladesh. Financial inclusion has a strong positive correlation with economic growth and negative coefficients with poverty and gender inequality. These correlation coefficients support the findings that financial inclusion increases economic growth and helps to reduce poverty and gender inequality in Bangladesh.

Table 26 Correlation Matrix in Bangladesh

	GDPPCGR	Pov. Headcount	GII	FII
GDPPCGR	1			
Pov. Headcount	-0.65	1		
GII	-0.51	0.98	1	
FII	0.81	-0.97	-0.92	1

Source: World Development Indicators (WDI), World Bank. Calculation: Authors' assessment

Figure 9 graphically expresses the effect of financial inclusion on economic growth and gender inequality in Bangladesh. Panel A of Figure 9 indicates a positive trend line between financial inclusion and economic growth in Bangladesh. This relationship seems to be more prominent from 2009 onwards, when financial inclusion flourished more in Bangladesh, as suggested in Figure 8. Panel B of Figure 9 shows a negative relation between financial inclusion and gender inequality. Though not reported due to a lack of observations, a similar negative trend line is identified for poverty and financial inclusion in Bangladesh.

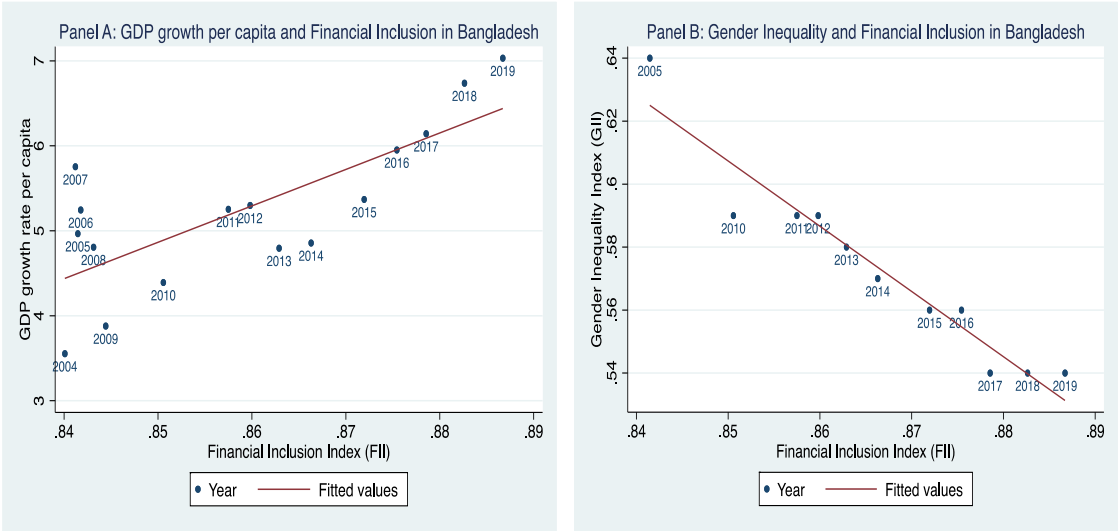

Figure 9 Financial inclusion, economic growth, and Gender inequality in Bangladesh
Source: Financial Access Survey (FAS), the IMF. Calculation: Author's assessment.

Figure 9 and the correlation matrix in Table 26 suggest that financial inclusion has expected impacts on the three SDGs in Bangladesh. This application of simple regression analysis finds that financial inclusion positively affects economic growth and helps reduce poverty and gender inequality in Bangladesh. However, as the financial inclusion index is unavailable before 2004, these relationships could not be investigated in detail using limited time series data. Bangladesh-specific issues can be explored in

more detail in the future by constructing a financial inclusion index for Bangladesh and including other relevant control variables.

7.2 Threshold value analysis for Bangladesh

The analysis of section 4.2.5 identifies some threshold values of income inequality, gender inequality, institutional quality, and educational level. Financial inclusion will effectively reduce poverty in countries with improved indicator values than the threshold level. This section compares indicators of Bangladesh with their respective threshold values.

Table 27 Comparison of indicators of Bangladesh with their respective threshold values

SL	Name of the indicator	Threshold Values	Indicator Values for Bangladesh	
			Latest value	Range
1	Log Gini	4.010	3.48	3.47 to 3.50
2	GII	0.733	0.54	0.54 to 0.64
3	Institution	-1.728	-0.64	-1.02 to -0.64
4	Log School Enrollment	3.124	4.28	3.83 to 4.29

Source: World Development Indicators (WDI), World Bank. Calculation: Author's assessment

As the empirical research identified, financial inclusion will be effective in a country if the country has a lower level of income and gender inequality and a higher level of institutional quality and school enrollment than the threshold levels. Table 27 compares the threshold values identified in section 4.2.5 for developing countries with the main indicators in Bangladesh. Table 27 reveals that the latest value and range for income inequality (log Gini) and gender inequality (GII) indicators are lower in Bangladesh than the threshold values. So, financial inclusion in Bangladesh should effectively reduce poverty in Bangladesh. Similarly, Bangladesh has higher indicator values for institutional quality and school enrollment, which again confirms that financial inclusion is likely to reduce poverty in Bangladesh[24].

This chapter reveals that the previous chapters' findings also apply to the case in Bangladesh. Bangladesh has made steady progress in financial inclusion. The income and gender inequality, institutional quality, and school enrollment levels in Bangladesh are

[24] The result remains the same if income inequality and school enrollment threshold values are presented, dropping their logarithmic transformation. The threshold value for the Gini coefficient turns out to be 55.15 (on a scale of 0 to 100), and for school enrollment, the value is 22.74 percent. The range of the Gini coefficient for Bangladesh is 32.1 - 33.2, while the range for school enrollment is 46.24 - 72.69.

better than the minimum threshold values, suggesting that financial inclusion can effectively alleviate poverty. Thus, this chapter finds that Bangladesh may rely on more financial inclusion to attain the three SDGs.

7.3 Comparison of financial access in Bangladesh with other South Asian Countries

Although Bangladesh has made significant progress in financial inclusion over the last decade, the overall level of financial access in Bangladesh still lags behind most other neighboring South Asian countries. Table 28 presents account ownership information of adults in a financial institution or mobile money service provider in different South Asian countries.

Table 28 Level of Financial Access in South Asian Countries in 2021

SL	Name of the indicator	South Asia	Bangladesh	India	Nepal	Pakistan	Sri Lanka
1	Account (% age 15+)	68%	53%	78%	54%	21%	89%
2	Account, female (% age 15+)	66%	43%	78%	50%	13%	89%
3	Account, secondary education, or more (% ages 15+)	73%	57%	81%	63%	35%	93%
4	Account, the income of the poorest 40% (% ages 15+)	67%	49%	78%	45%	18%	91%

Source: The Global Findex Database 2021, World Bank.

According to Table 28, only 53% of adults in Bangladesh have an account in a financial institution or mobile money service provider in 2021, which is lower than the overall average of South Asian countries. Moreover, Bangladesh lags behind most other South Asian countries in account ownership of women and people with secondary education or more. However, Bangladesh has higher account ownership of the poorest 40% of people than Pakistan and Nepal, suggesting that the lower-income people in Bangladesh share the benefits of financial inclusion more than those in these two countries. The relatively lower current financial access level is also an opportunity for Bangladesh to create new opportunities for the financially excluded people through financial inclusion initiatives.

As this thesis identifies, the financial inclusion of women and the poorest helps to achieve the SDGs. Therefore, Bangladesh should strive to improve account ownership

among females and the poorest 40% of the population. Table 28 shows that Bangladesh also has a lower proportion of financially included people with secondary education, suggesting that financial literacy might be lower in Bangladesh compared to other neighboring countries. To address this, policymakers should focus on increasing financial literacy through various measures, such as providing information on different financial products and services and how to use them effectively. The government can also organize awareness-building programs for disadvantaged groups, such as women and lower-income people, and incorporate financial literacy education into school curriculums. This can help children assist their parents in understanding and utilizing financial products and services properly.

Chapter 8: Summary, conclusions, and policy recommendations

This research investigated the impact of financial inclusion on three key sustainable development goals (SDGs), namely, no poverty (SDG-1), gender equality (SDG-5), and economic growth (SDG-8). The study argues that financial inclusion can influence these SDGs by offering new opportunities for the financially excluded people. The results reveal that the three SDGs are interlinked in developing countries. Financial inclusion can alleviate poverty by enhancing the economic activities of lower-income people. Moreover, poverty reduction and economic development through financial inclusion also improve gender equality.

Section 4.1 examined the impact of financial inclusion on extreme and moderate poverty in different income groups of countries. The results suggest that financial inclusion has a significant negative association with extreme poverty in developing countries but not high-income countries. Moreover, the coefficient of financial inclusion is smaller in lower-middle-income and low-income countries than in upper-middle-income countries. The study argues that inequality in accessing financial services explains the variation in results. Low-income countries have higher inequality in access to financial services; therefore, the coefficient of financial inclusion is weaker in these countries. The research also finds that the association between financial inclusion and moderate poverty is weaker than that of extreme poverty. Section 4.2 explored how unequal access to financial services and various inequalities affect poverty reduction through financial inclusion in developing countries. The results suggest that financial inclusion is more effective in poverty reduction when women and the poor have higher access to bank accounts. Moreover, higher income and gender inequality, poor quality institutions, and lower education negatively impact poverty reduction through financial inclusion. The study argues that these inequalities hamper the access to and use of financial services, preventing the poor from fully capitalizing on the benefits of financial inclusion.

Chapter 5 examined the impact of financial inclusion on economic growth and found that financial inclusion has a significant positive effect on economic growth in developing countries. The study argues that financial inclusion affects economic growth

primarily by expanding opportunities to lower-income people in developing countries. It supports this argument by showing that financial inclusion also reduces poverty and income inequality, indicating that increased economic activities of lower-income people contribute to stimulating economic growth. Section 5.1 compared financial inclusion and financial development and found that financial development may affect economic growth in developing countries through financial inclusion, as financial inclusion enhances the depth of and access to financial services. The study analyzed financial inclusion's impact on gender inequality in chapter 6. The results indicate that financial inclusion initiatives effectively reduce gender inequality in low-and lower-middle-income countries and countries where women and the poor have low financial access. The study also examines the effect of women's financial access on gender inequality but does not find evidence supporting a more significant role of female financial inclusion. By categorizing countries into two sub-samples according to their income levels and incorporating a squared term of the financial inclusion index, this research found a diminishing impact of more financial inclusion on gender inequality in higher-income countries. Apart from financial inclusion, the study found that compulsory education and institutional quality significantly affect gender inequality in developing countries.

Chapter 7 analyzed the impact of financial inclusion in Bangladesh and found that financial inclusion helps attain high economic growth and lower poverty and gender inequality in Bangladesh. The research also showed that although Bangladesh made significant progress in financial inclusion over the last decade, the overall level of financial access in Bangladesh still lags behind most other neighboring South Asian countries.

The findings of the study offer some important recommendations for policymakers. Policymakers in developing countries can use financial inclusion to attain the SDGs. However, the findings also suggest that improving financial inclusion alone is insufficient to increase the income levels of the poor substantially. Policymakers in developing countries should make financial services more accessible to disadvantaged groups such as women and the poor. The research prescribes that countries like Bangladesh should focus on improving financial literacy and institutional quality as improvement in these factors enhances financial inclusion’s impact on the three SDGs.

In countries where many are still financially excluded, financial inclusion can be used as a tool for ensuring economic growth. However, this research recommends that after achieving a higher level of financial inclusion, countries should focus on improving the financial development level by adopting policies that enhance the efficiency of financial institutions and capital markets. As there is a scope for expanding financial services to untapped customers in developing countries, the study recommends that financial institutions grow their business by offering customized financial services that meet the need of the users. The study proposes that policymakers in lower-income countries and in countries where women and the poor have low financial access should rely on expanding financial inclusion initiatives to reduce gender inequality. Policymakers should combine financial inclusion, compulsory education, and institutional quality improvement strategies to reduce gender inequality in developing countries.

Acknowledgement

I would like to express my heartiest gratitude to my supervisor Professor QIN Jie for the invaluable guidance, advice and encouragement during the analysis and writing process of this thesis. I also want to thank my sub-supervisor Professor INABA Kazuo for his valuable suggestions which reshape the nature of my research.

I must acknowledge various reviewers who reviewed my papers. The insights and observations immensely helped me improve my articles and complete this thesis. Part of sections 3.2 and 4.1 are first published in Economic Change and Restructuring, Volume 56, pp. 409-440, 2022 by Springer Nature. Similarly, a part of Chapter 5 is first published in Journal of Accounting, Business and Finance Research, Vol. 16, No. 1, pp.12-29, 2023. Analysis related to chapter 6 is first published in Social System Studies, No.45, pp.95-126, 2022. I want to thank all these publishers.

Furthermore, I would like to thank Japan Government for giving me the opportunity to research in Japan. I feel grateful to the authorities of Bangladesh Government and Bangladesh Bank who ensured necessary official assistance for me which allowed me to enrich myself in Japan.

I want to thank various conference participants and fellow doctoral students in Ritsumeikan University for the lively discussions about my thesis work. Your ideas have immensely helped me in finalizing my research work.

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Appendices

Appendix A Brief definition of variables and data sources

Variable Name	Definition	Source
Financial Inclusion Index (FII)	An equal weighted composite financial inclusion index. The index value remains between zero and one, where a higher value indicates higher financial inclusion.	Authors' calculation. Financial Access Survey (FAS), IMF.
Gender Inequality Index (GII)	Composite index measuring gender inequality in terms of reproductive health, empowerment, and economic status. The value remains between zero and one.	United Nations Development Project, UN.
Extreme poverty	Log poverty headcount ratio at USD 1.9 per day measured in 2011 international prices.	WDI, WB (2020)
Moderate poverty	Log poverty headcount ratio at USD 3.2 per day measured in 2011 international prices.	WDI, WB (2020)
Fertility	Total fertility rates (births per women)	WDI, WB (2020)
School enrollment	Log of gross secondary school enrollment ratio.	WDI, WB (2020)
Compulsory education	Compulsory education in years.	WDI, WB (2020)
Education expense	Government spending on education as percentage of GDP.	WDI, WB (2020)
Unemployment rate	Unemployment rate (%)	WDI, WB (2020)
Govt. Expenditure	Government consumption expenditure as percentage of GDP.	WDI, WB (2020)
Trade Openness	The sum of export and import as a percentage of GDP.	WDI, WB (2020)
Inflation	Annual change in price level.	WDI, WB (2020)
GDP growth per capita	Real annual growth of GDP per capita measured in constant USD 2010 prices.	WDI, WB (2020)
Employee	Salaried workers as percentage of the labor force.	WDI, WB (2020)
Employer	Employers as percentage of the labor force.	WDI, WB (2020)
Gini	Gini coefficient which measures income inequality.	WDI, WB (2020)
Gross Capital Formation (GCF)	Additions to the fixed assets of the economy plus net changes in the level of inventories.	WDI, WB (2020)
Financial Development Index (FD)	Index constructed by the IMF. The index values lie between zero and one.	Fin. Development Index Database, IMF
Wealth share top 10	Net personal wealth share of top 10 percentile.	World Inequality Database
Regulatory Quality	Perceptions of the ability of the government to formulate and implement sound policies and regulations. Country's score ranging from approximately –2.5 to 2.5.	World Governance Indicators (WGI), WB (2020)
Rule of law	Perceptions of the extent to which agents have confidence in and abide by the rules of society.	WGI, WB (2020)
Control of corruption	Perceptions of the extent to which public power is exercised for private gain.	WGI, WB (2020)
Government effectiveness	Perceptions of the quality of public services, policy implementation, and government credibility.	WGI, WB (2020)
Political stability	Perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.	WGI, WB (2020)
Voice and accountability	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, and a free media.	WGI, WB (2020)

Appendix B Descriptive Statistics of the key variables

Variable	Observation	Mean	Std. deviation	Minimum	Maximum
Log poverty headcount at USD 1.9	1074	0.431	1.838	-2.303	4.546
Log poverty headcount at USD 3.2	1175	1.167	2.013	-2.303	4.590
GDP growth per capita (GDPPCGR)	2089	2.60	5.466	-62.38	121.78
Financial Inclusion Index (FII)	2064	0.814	0.100	0.094	1
Gender Inequality Index (GII)	1,151	0.46	0.14	0.11	0.82
Fertility	2,116	3.42	1.47	1.21	7.63
Unemployment rate	2,048	8.13	6.45	0.13	37.25
Compulsory education	1,790	9.56	2.34	0.00	17.0
Education expense	978	4.51	1.70	0.62	14.06
Trade Openness (TRADE)	1940	79.82	37.41	0.167	347.99
Govt. Expenditure (GOVT)	1812	16.03	10.37	2.047	115.93
Human Capital (HUMAN CAP)	1193	88.74	12.65	35.25	100.00
Gross Capital Formation (GCF)	1799	24.81	9.56	-3.945	79.401
Inflation (INF)	2095	7.23	10.206	-26.70	174.86
Financial Development (FD)	2000	0.199	0.133	0	0.74
Rule of law	2169	-0.572	0.647	-2.606	1.41
Regulatory quality	1,657	-0.51	0.64	-2.53	1.24

Source: World Development Indicators (WDI), World Governance Indicators (WGI), The World Bank, and Financial Access Survey (FAS), The IMF. Computation of Financial Inclusion Index: Authors' calculation.

Appendix C Comparison of equal weighted index and unequal weighted index

The use of equal weighting is preferable because assigning different weights for different indicators according to economic logic is challenging. Because of missing values in many indicators, assigning different weights affects countries' financial inclusion index scores disproportionally. Due to missing values, the covariance matrix of the principal-component analysis will also be affected. This study constructs an unequal-weighted financial inclusion index using weights proposed by Sarma (2012) and compares it with the equal-weighted index.

Exhibit 1 Financial inclusion index with equal weight and unequal weight.

Type of Index	Observations	Mean	Standard deviation	Minimum	Maximum
FII (equal weighted)	3,008	0.852	0.103	0.094	1
FII (weights of Sarma's index)	3,008	0.669	0.209	0.074	1

Exhibit 1 shows that both the indices have the same range, but the unequal weighted index has a lower mean and higher standard deviation than the equal-weighted index. This research argues that this high dispersion results from assigning different weights in an unbalanced dataset with missing values. The low standard deviation also suggests that the equal-weighted index is better suited to handle missing values.

Appendix D Country wise financial inclusion index (FII). (Constructed for all but only scores of developing countries are reported)

SL	Country	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
1	Afghanistan	0.094	0.148	0.149	0.151	0.670	0.671	0.602	0.601	0.608	0.605	0.609	0.610	0.611	0.610	0.612	0.613
2	Albania	0.693	0.725	0.764	0.788	0.830	0.838	0.851	0.858	0.865	0.862	0.864	0.862	0.941	0.926	0.916	0.920
3	Algeria	0.816	0.778	0.782	0.789	0.791	0.782	0.788	0.794	0.798	0.800	0.800	0.802	0.799	0.798	0.802	0.807
4	Angola	0.733	0.736	0.743	0.749	0.756	0.765	0.774	0.783	0.792	0.697	0.704	0.708	0.710	0.721	0.714	0.646
5	Argentina	0.805	0.828	0.844	0.863	0.879	0.890	0.900	0.913	0.925	0.934	0.937	0.940	0.944	0.946	0.948	0.949
6	Armenia	0.710	0.737	0.760	0.824	0.857	0.857	0.888	0.926	0.957	0.973	0.987	0.990	0.992	0.993	0.996	0.998
7	Azerbaijan	0.828	0.748	0.752	0.781	0.799	0.777	0.803	0.834	0.869	0.905	0.916	0.894	0.890	0.888	0.887	0.887
8	Bangladesh	0.840	0.841	0.842	0.841	0.843	0.844	0.851	0.857	0.860	0.863	0.866	0.872	0.875	0.879	0.883	0.887
9	Belarus	0.776	0.793	0.806	0.828	0.840	0.848	0.858	0.864	0.872	0.879	0.883	0.706	0.705	0.706	0.704	0.705
10	Belize	0.864	0.885	0.946	0.953	0.959	0.964	0.964	0.943	0.939	0.932	0.934	0.929	0.937	0.925	0.933	0.922
11	Benin	0.849	0.841	0.839	0.825	0.924	0.923	0.886	0.838	0.822	0.867	0.854	0.821	0.828	0.730	0.741	0.737
12	Bhutan	0.731	0.689	0.694	0.704	0.719	0.732	0.783	0.820	0.741	0.840	0.859	0.873	0.885	0.887	0.946	0.960
13	Bolivia	0.814	0.811	0.823	0.778	0.750	0.770	0.789	0.818	0.829	0.841	0.851	0.861	0.920	0.926	0.930	0.934
14	Bosnia and Herzegovinian	0.804	0.817	0.812	0.896	0.909	0.924	0.917	0.923	0.926	0.929	0.931	0.932	0.930	0.929	0.929	0.929
15	Botswana	0.911	0.916	0.926	0.956	0.960	0.961	0.952	0.940	0.937	0.933	0.938	0.943	0.930	0.949	0.951	0.961
16	Brazil	0.875	0.916	0.920	0.908	0.920	0.938	0.948	0.949	0.961	0.963	0.973	0.973	0.973	0.974	0.975	0.975
17	Bulgaria	0.830	0.902	0.922	0.932	0.935	0.934	0.931	0.929	0.931	0.931	0.932	0.931	0.930	0.930	0.933	0.944
18	Burkina Faso	0.828	0.828	0.828	0.983	0.982	0.988	0.869	0.869	0.867	0.878	0.761	0.761	0.756	0.761	0.759	0.755
19	Burundi	0.606	0.608	0.612	0.696	0.702	0.713	0.719	0.723	0.732	0.735	0.746	0.743	0.726	0.828	0.828	0.828
20	Cabo Verde	0.775	0.784	0.802	0.825	0.843	0.853	0.862	0.867	0.860	0.858	0.880	0.888	0.888	0.888	0.894	0.899
21	Cambodia	0.828	0.729	0.733	0.735	0.653	0.659	0.664	0.789	0.794	0.799	0.808	0.816	0.825	0.833	0.842	0.852
22	Cameroon	0.760	0.760	0.764	0.767	0.769	0.610	0.732	0.624	0.629	0.634	0.748	0.751	0.753	0.754	0.762	0.828
23	Central African Rep.	0.730	0.667	0.668	0.671	0.627	0.629	0.632	0.635	0.636	0.639	0.607	0.607	0.616	0.612	0.828	0.828
24	Chad	0.730	0.730	0.730	0.730	0.668	0.731	0.669	0.670	0.670	0.600	0.599	0.601	0.603	0.602	0.605	0.601
25	China	0.828	0.828	0.705	0.714	0.725	0.738	0.752	0.766	0.906	0.917	0.924	0.933	0.935	0.936	0.999	0.998
26	Colombia	0.858	0.876	0.895	0.898	0.934	0.915	0.920	0.922	0.935	0.941	0.941	0.942	0.941	0.942	0.944	0.945
27	Comoros	0.674	0.741	0.738	0.744	0.785	0.804	0.724	0.739	0.738	0.738	0.735	0.735	0.726	0.726	0.719	0.721
28	Congo, Dem. Rep.	0.734	0.734	0.729	0.737	0.737	0.629	0.596	0.606	0.613	0.614	0.616	0.623	0.605	0.606	0.608	0.828

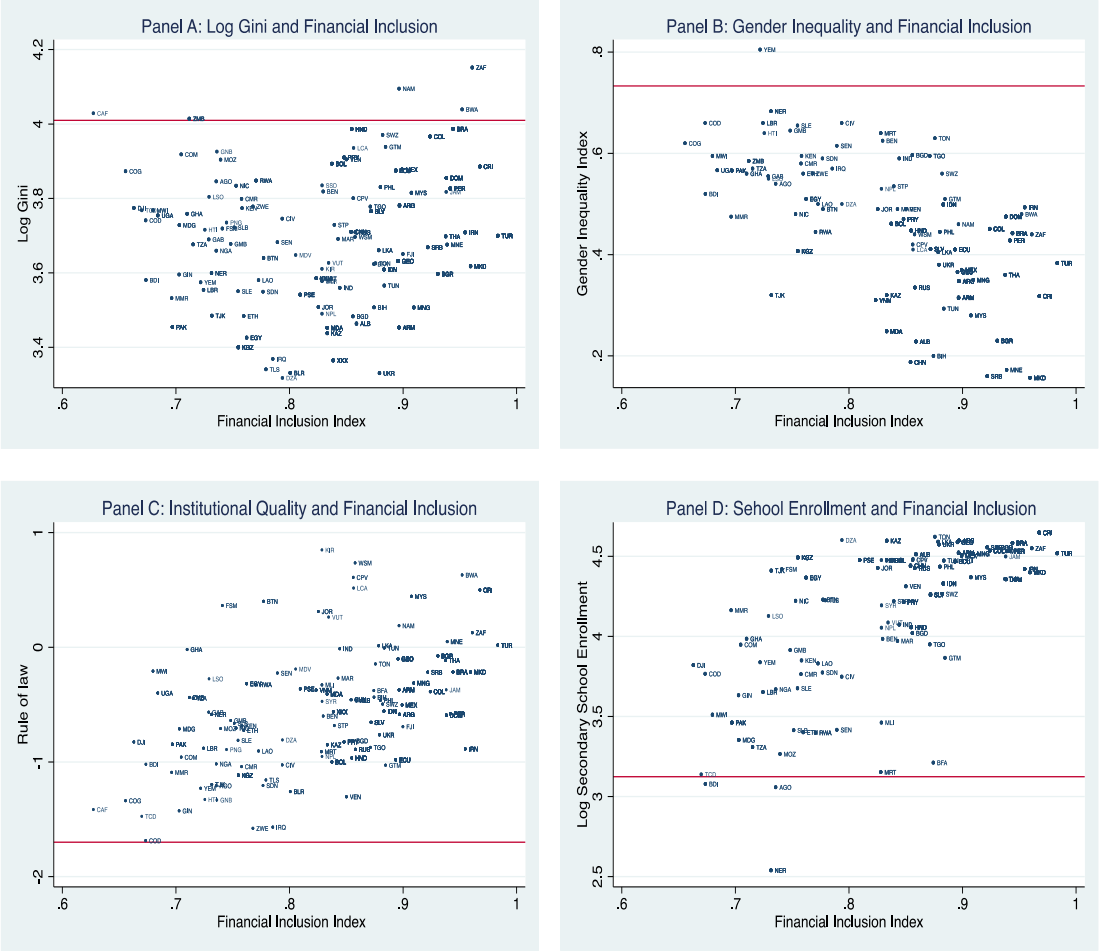
SL	Country	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
29	Congo, Rep.	0.670	0.671	0.672	0.675	0.630	0.634	0.637	0.640	0.643	0.676	0.701	0.708	0.703	0.706	0.828	0.828
30	Costa Rica	0.905	0.933	0.959	0.967	0.964	0.967	0.966	0.972	0.973	0.980	0.983	0.982	0.985	0.987	0.990	0.989
31	Cote d'Ivoire	0.828	0.828	0.828	0.828	0.828	0.828	0.746	0.749	0.748	0.754	0.758	0.759	0.759	0.760	0.759	0.756
32	Djibouti	0.733	0.733	0.734	0.734	0.606	0.615	0.623	0.626	0.632	0.667	0.683	0.699	0.668	0.690	0.674	0.675
33	Dominica	0.809	0.815	0.815	0.803	0.815	0.854	0.841	0.873	0.872	0.877	0.874	0.866	0.862	0.855	0.854	0.850
34	Dominican Republic	0.917	0.933	0.899	0.914	0.920	0.926	0.932	0.940	0.936	0.944	0.951	0.963	0.966	0.966	0.965	0.968
35	Egypt, Arab Rep.	0.741	0.708	0.705	0.718	0.732	0.736	0.743	0.728	0.733	0.766	0.767	0.773	0.833	0.851	0.871	0.888
36	El Salvador	0.851	0.858	0.866	0.862	0.869	0.860	0.848	0.860	0.860	0.863	0.872	0.899	0.901	0.904	0.904	0.904
37	Equatorial Guinea	0.634	0.637	0.639	0.608	0.613	0.617	0.619	0.629	0.637	0.629	0.634	0.648	0.657	0.675	0.685	0.693
38	Eswatini	0.776	0.801	0.815	0.837	0.880	0.880	0.886	0.826	0.849	0.877	0.896	0.874	0.884	0.893	0.896	0.829
39	Ethiopia	0.729	0.779	0.710	0.714	0.712	0.720	0.721	0.726	0.727	0.829	0.829	0.829	0.829	0.829	0.829	0.829
40	Fiji	0.827	0.843	0.868	0.861	0.880	0.877	0.891	0.901	0.904	0.920	0.949	0.958	0.963	0.956	0.953	0.947
41	Gabon	0.829	0.629	0.635	0.640	0.652	0.655	0.664	0.674	0.702	0.799	0.829	0.829	0.829	0.829	0.829	0.829
42	Gambia, The	0.823	0.773	0.774	0.775	0.792	0.791	0.781	0.797	0.795	0.706	0.712	0.715	0.722	0.818	0.818	0.820
43	Georgia	0.695	0.731	0.801	0.874	0.913	0.920	0.932	0.940	0.949	0.942	0.946	0.947	0.948	0.948	0.947	0.948
44	Ghana	0.721	0.737	0.740	0.740	0.715	0.716	0.726	0.730	0.675	0.681	0.703	0.719	0.717	0.783	0.827	0.829
45	Grenada	0.849	0.854	0.856	0.862	0.868	0.871	0.875	0.873	0.855	0.870	0.843	0.861	0.867	0.864	0.868	0.870
46	Guatemala	0.796	0.830	0.855	0.879	0.891	0.890	0.893	0.898	0.908	0.912	0.915	0.914	0.915	0.915	0.911	0.911
47	Guinea	0.660	0.662	0.663	0.664	0.679	0.683	0.692	0.736	0.741	0.763	0.744	0.738	0.750	0.757	0.754	0.766
48	Guinea-Bissau	0.829	0.829	0.829	0.829	0.829	0.829	0.736	0.736	0.739	0.747	0.748	0.748	0.751	0.751	0.750	0.754
49	Guyana	0.756	0.763	0.751	0.768	0.793	0.802	0.810	0.822	0.825	0.828	0.829	0.833	0.834	0.836	0.833	0.838
50	Haiti	0.648	0.652	0.657	0.661	0.666	0.669	0.667	0.667	0.725	0.723	0.678	0.713	0.710	0.710	0.717	0.829
51	Honduras	0.779	0.785	0.790	0.821	0.822	0.844	0.847	0.872	0.886	0.887	0.892	0.898	0.899	0.899	0.901	0.903
52	India	0.855	0.812	0.815	0.821	0.828	0.831	0.844	0.846	0.852	0.859	0.874	0.881	0.886	0.893	0.895	0.899
53	Indonesia	0.801	0.807	0.807	0.837	0.857	0.865	0.871	0.885	0.901	0.912	0.918	0.940	0.940	0.954	0.952	0.952
54	Iran, Islamic Rep.	0.977	0.870	0.886	0.905	0.920	0.935	0.959	0.971	0.984	0.989	0.989	0.991	0.990	0.987	0.984	0.829
55	Iraq	0.829	0.829	0.829	0.833	0.736	0.738	0.743	0.742	0.742	0.737	0.739	0.740	0.743	0.744	0.749	0.748
56	Jamaica	0.938	0.945	0.952	0.952	0.957	0.956	0.956	0.957	0.958	0.959	0.962	0.962	0.964	0.957	0.956	0.957
57	Jordan	0.823	0.826	0.829	0.826	0.827	0.837	0.821	0.820	0.820	0.817	0.812	0.810	0.823	0.830	0.827	0.828
58	Kazakhstan	0.772	0.791	0.808	0.856	0.880	0.884	0.888	0.890	0.891	0.892	0.893	0.892	0.893	0.893	0.894	0.894
59	Kenya	0.645	0.654	0.676	0.696	0.715	0.735	0.756	0.748	0.752	0.795	0.832	0.863	0.877	0.871	0.869	0.873

SL	Country	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
60	Kiribati	0.829	0.829	0.829	0.829	0.829	0.829	0.829	0.652	0.653	0.679	0.829	0.829	0.829	0.829	0.829	0.829
61	Kosovo	0.753	0.737	0.751	0.784	0.818	0.837	0.848	0.866	0.867	0.852	0.856	0.857	0.859	0.893	0.899	0.829
62	Kyrgyz Republic	0.673	0.675	0.675	0.679	0.687	0.718	0.719	0.741	0.755	0.771	0.792	0.824	0.861	0.869	0.885	0.942
63	Lao PDR	0.829	0.829	0.829	0.829	0.741	0.691	0.701	0.709	0.717	0.708	0.728	0.729	0.734	0.742	0.745	0.829
64	Lebanon	0.846	0.888	0.901	0.913	0.924	0.930	0.933	0.933	0.933	0.929	0.926	0.925	0.923	0.925	0.927	0.927
65	Lesotho	0.681	0.706	0.716	0.728	0.690	0.696	0.683	0.699	0.695	0.719	0.732	0.713	0.718	0.729	0.737	0.829
66	Liberia	0.829	0.829	0.829	0.829	0.635	0.648	0.656	0.657	0.663	0.665	0.633	0.735	0.712	0.728	0.746	0.754
67	Libya	0.752	0.750	0.749	0.747	0.749	0.774	0.778	0.765	0.746	0.746	0.746	0.746	0.746	0.746	0.745	0.829
68	Madagascar	0.650	0.654	0.654	0.658	0.716	0.718	0.727	0.725	0.728	0.732	0.739	0.740	0.742	0.748	0.768	0.829
69	Malawi	0.636	0.636	0.639	0.650	0.644	0.654	0.658	0.680	0.677	0.677	0.648	0.682	0.745	0.719	0.726	0.720
70	Malaysia	0.883	0.883	0.884	0.910	0.913	0.923	0.924	0.923	0.923	0.944	0.942	0.942	0.940	0.939	0.938	0.937
71	Maldives	0.745	0.786	0.793	0.829	0.826	0.805	0.797	0.843	0.840	0.829	0.843	0.851	0.859	0.873	0.875	0.875
72	Mali	0.829	0.829	0.829	0.829	0.829	0.829	0.742	0.744	0.744	0.747	0.748	0.749	0.750	0.751	0.750	0.752
73	Marshall Islands	0.829	0.829	0.829	0.742	0.742	0.742	0.742	0.755	0.755	0.755	0.755	0.755	0.755	0.756	0.756	0.755
74	Mauritius	0.902	0.907	0.911	0.919	0.921	0.923	0.932	0.936	0.935	0.935	0.930	0.940	0.935	0.931	0.928	0.927
75	Mexico	0.846	0.853	0.865	0.872	0.901	0.906	0.917	0.908	0.918	0.922	0.924	0.926	0.932	0.930	0.936	0.939
76	Micronesia, Fed. Sts.	0.715	0.716	0.717	0.715	0.713	0.720	0.747	0.749	0.767	0.766	0.767	0.754	0.750	0.747	0.745	0.746
77	Moldova	0.784	0.806	0.822	0.845	0.859	0.849	0.851	0.821	0.828	0.835	0.843	0.834	0.842	0.856	0.916	0.926
78	Mongolia	0.816	0.836	0.846	0.874	0.853	0.856	0.867	0.890	0.906	0.914	0.926	0.935	0.945	0.941	0.957	0.973
79	Montenegro	0.829	0.789	0.829	0.913	0.938	0.940	0.940	0.939	0.938	0.939	0.939	0.939	0.940	0.938	0.939	0.939
80	Morocco	0.831	0.848	0.845	0.854	0.862	0.812	0.818	0.826	0.834	0.840	0.847	0.881	0.888	0.892	0.894	0.896
81	Mozambique	0.680	0.643	0.651	0.686	0.693	0.709	0.719	0.740	0.755	0.773	0.786	0.805	0.821	0.820	0.824	0.826
82	Myanmar	0.650	0.651	0.651	0.651	0.651	0.651	0.652	0.651	0.624	0.643	0.658	0.674	0.704	0.719	0.779	0.863
83	Namibia	0.758	0.768	0.768	0.775	0.843	0.861	0.850	0.894	0.907	0.920	0.926	0.932	0.942	0.939	0.942	0.945
84	Nepal	0.829	0.829	0.829	0.829	0.829	0.829	0.829	0.839	0.812	0.822	0.831	0.837	0.841	0.849	0.861	0.872
85	Nicaragua	0.701	0.710	0.717	0.727	0.774	0.756	0.744	0.754	0.764	0.776	0.792	0.807	0.816	0.823	0.821	0.809
86	Niger	0.829	0.829	0.829	0.731	0.749	0.754	0.692	0.692	0.687	0.687	0.674	0.675	0.676	0.737	0.737	0.737
87	Nigeria	0.829	0.733	0.737	0.749	0.718	0.730	0.730	0.730	0.731	0.734	0.748	0.747	0.744	0.741	0.741	0.829
88	North Macedonia	0.740	0.715	0.800	0.889	0.961	0.961	0.963	0.962	0.959	0.959	0.958	0.959	0.958	0.955	0.954	0.956
89	Oman	0.824	0.830	0.836	0.843	0.850	0.854	0.881	0.884	0.881	0.885	0.878	0.877	0.877	0.882	0.879	0.829

SL	Country	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
90	Pakistan	0.660	0.665	0.676	0.692	0.696	0.697	0.700	0.702	0.709	0.717	0.730	0.742	0.753	0.763	0.782	0.788
91	Papua New Guinea	0.740	0.741	0.737	0.736	0.740	0.745	0.745	0.757	0.759	0.758	0.761	0.751	0.753	0.757	0.769	0.829
92	Paraguay	0.872	0.811	0.788	0.808	0.810	0.800	0.825	0.838	0.857	0.871	0.878	0.868	0.868	0.908	0.921	0.928
93	Peru	0.856	0.850	0.878	0.910	0.938	0.940	0.951	0.962	0.969	0.972	0.983	0.977	0.979	0.979	0.981	0.985
94	Philippines	0.846	0.853	0.859	0.860	0.866	0.869	0.875	0.884	0.885	0.897	0.901	0.908	0.915	0.919	0.925	0.926
95	Russian Federation	0.796	0.819	0.846	0.871	0.888	0.893	0.893	0.892	0.892	0.892	0.892	0.892	0.892	0.892	0.892	0.892
96	Rwanda	0.587	0.706	0.701	0.666	0.705	0.751	0.770	0.785	0.794	0.800	0.806	0.806	0.806	0.805	0.818	0.839
97	Samoa	0.807	0.826	0.823	0.828	0.832	0.836	0.843	0.886	0.873	0.884	0.883	0.885	0.898	0.902	0.910	0.740
98	Sao Tome and Principe	0.829	0.829	0.829	0.801	0.806	0.813	0.817	0.814	0.833	0.802	0.796	0.846	0.840	0.862	0.849	0.829
99	Senegal	0.829	0.829	0.829	0.829	0.829	0.829	0.747	0.750	0.751	0.751	0.752	0.754	0.754	0.754	0.754	0.756
100	Serbia	0.829	0.787	0.818	0.872	0.883	0.884	0.892	0.893	0.926	0.921	0.920	0.920	0.924	0.920	0.922	0.923
101	Sierra Leone	0.737	0.737	0.737	0.739	0.679	0.680	0.680	0.681	0.684	0.829	0.829	0.829	0.829	0.829	0.829	0.829
102	Solomon Islands	0.771	0.773	0.775	0.777	0.781	0.784	0.762	0.760	0.729	0.730	0.750	0.746	0.745	0.742	0.829	0.829
103	South Africa	0.911	0.915	0.929	0.941	0.960	0.971	0.977	0.982	0.991	0.993	0.992	0.990	0.987	0.987	0.986	0.988
104	South Sudan	0.829	0.829	0.829	0.829	0.829	0.829	0.829	0.591	0.592	0.594	0.598	0.599	0.601	0.598	0.597	0.600
105	Sri Lanka	0.919	0.917	0.921	0.849	0.861	0.870	0.880	0.890	0.895	0.929	0.929	0.930	0.829	0.829	0.829	0.829
106	St. Lucia	0.840	0.839	0.841	0.847	0.845	0.839	0.869	0.871	0.872	0.871	0.869	0.869	0.856	0.867	0.866	0.865
107	St. Vincent	0.812	0.812	0.815	0.827	0.826	0.822	0.829	0.829	0.809	0.844	0.843	0.849	0.851	0.853	0.852	0.851
108	Sudan	0.857	0.854	0.753	0.755	0.758	0.760	0.763	0.765	0.767	0.767	0.793	0.781	0.736	0.737	0.789	0.829
109	Suriname	0.760	0.764	0.780	0.787	0.790	0.797	0.776	0.775	0.778	0.778	0.784	0.944	0.945	0.947	0.946	0.963
110	Syrian Arab Republic	0.829	0.829	0.829	0.829	0.683	0.699	0.708	0.699	0.691	0.705	0.829	0.829	0.829	0.829	0.829	0.829
111	Tajikistan	0.733	0.679	0.697	0.716	0.722	0.715	0.720	0.736	0.750	0.768	0.770	0.763	0.758	0.760	0.765	0.829
112	Tanzania	0.829	0.829	0.646	0.662	0.634	0.637	0.644	0.654	0.655	0.654	0.792	0.660	0.829	0.829	0.829	0.829
113	Thailand	0.895	0.902	0.930	0.943	0.950	0.944	0.947	0.950	0.953	0.964	0.968	0.969	0.970	0.970	0.972	0.973
114	Timor-Leste	0.757	0.773	0.770	0.765	0.700	0.701	0.706	0.743	0.787	0.784	0.794	0.803	0.803	0.842	0.835	0.859
115	Togo	0.829	0.829	0.967	0.996	1.000	0.998	0.894	0.893	0.896	0.898	0.754	0.754	0.756	0.747	0.756	0.756
116	Tonga	0.908	0.931	0.896	0.886	0.900	0.895	0.889	0.890	0.890	0.912	0.897	0.856	0.872	0.887	0.876	0.829

SL	Country	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
117	Tunisia	0.751	0.869	0.884	0.894	0.900	0.905	0.913	0.920	0.850	0.856	0.862	0.868	0.873	0.877	0.878	0.875
118	Turkey	0.959	0.965	0.968	0.972	0.976	0.978	0.986	0.990	0.993	0.995	0.996	0.997	0.996	0.996	0.996	0.996
119	Uganda	0.688	0.701	0.705	0.707	0.710	0.715	0.646	0.652	0.643	0.646	0.648	0.670	0.676	0.684	0.729	0.737
120	Ukraine	0.810	0.875	0.888	0.905	0.917	0.918	0.919	0.921	0.922	0.921	0.922	0.921	0.921	0.922	0.922	0.922
121	Uzbekistan	0.627	0.636	0.654	0.668	0.681	0.687	0.715	0.716	0.730	0.744	0.754	0.776	0.816	0.842	0.867	0.903
122	Vanuatu	0.751	0.757	0.756	0.774	0.808	0.822	0.834	0.836	0.851	0.854	0.839	0.864	0.866	0.870	0.872	0.877
123	Venezuela, RB	0.829	0.847	0.874	0.892	0.895	0.897	0.904	0.905	0.906	0.905	0.901	0.904	0.829	0.829	0.829	0.829
124	Vietnam	0.738	0.744	0.747	0.765	0.782	0.793	0.803	0.841	0.856	0.864	0.874	0.882	0.890	0.890	0.899	0.903
125	West Bank and Gaza	0.829	0.829	0.764	0.774	0.797	0.792	0.802	0.827	0.835	0.839	0.845	0.851	0.859	0.859	0.869	0.879
126	Yemen, Rep.	0.732	0.735	0.686	0.693	0.698	0.698	0.682	0.684	0.693	0.701	0.709	0.706	0.829	0.829	0.829	0.829
127	Zambia	0.699	0.703	0.709	0.720	0.742	0.708	0.679	0.719	0.738	0.760	0.766	0.760	0.758	0.762	0.770	0.762
128	Zimbabwe	0.779	0.757	0.718	0.695	0.687	0.702	0.716	0.733	0.763	0.782	0.772	0.780	0.781	0.803	0.874	0.860

Appendix E Threshold values of inequality indicators in various developing countries



Source: Financial Access Survey (FAS), the IMF. Calculation: Authors' assessment.

Appendix F Lag effect of financial inclusion on gender inequality in developing countries.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Gender Inequality Index (GII)							
Fertility	-0.0211	-0.0195	-0.00821	-0.0109	-0.0124	-0.0135	-0.0146	-0.0103
	(0.0213)	(0.0219)	(0.0170)	(0.0155)	(0.0150)	(0.0128)	(0.0124)	(0.0134)
Compulsory education	-0.00225*	-0.00219*	-0.00149	-0.00159	-0.00166	-0.00173	-0.00180*	-0.00104
	(0.00116)	(0.00119)	(0.00106)	(0.00108)	(0.00107)	(0.00107)	(0.00107)	(0.000929)
Education expense	-0.000822	-0.000916	0.000259	0.000191	0.000290	0.000221	0.000152	0.000371
	(0.00149)	(0.00154)	(0.000984)	(0.000988)	(0.00102)	(0.000981)	(0.000957)	(0.000910)
Unemployment rate	-0.000939	-0.000780	0.000367	0.000263	0.000216	0.000117	4.79e-05	-0.000200
	(0.000851)	(0.000826)	(0.000863)	(0.000846)	(0.000830)	(0.000809)	(0.000794)	(0.000861)
Per capita GDP growth	-0.000262**	-0.000240*	-0.000189**	-0.000202**	-0.000207***	-0.000217***	-0.000204***	-0.000165
	(0.000121)	(0.000122)	(7.91e-05)	(7.75e-05)	(7.47e-05)	(7.80e-05)	(7.54e-05)	(0.000101)
Institutional quality	-0.0258**	-0.0257**	-0.0220*	-0.0200	-0.0186	-0.0174	-0.0178	-0.0232
	(0.0120)	(0.0122)	(0.0117)	(0.0120)	(0.0122)	(0.0113)	(0.0114)	(0.0168)
Fin. Inclusion Index	-0.132**							
	(0.0645)							
L1. Fin. Inclusion Index		-0.129**						
		(0.0498)						
L2. Fin. Inclusion Index			-0.0630					
			(0.0390)					
L3. Fin. Inclusion Index				-0.0453*				
				(0.0259)				
L4. Fin. Inclusion Index					-0.0446*			
					(0.0240)			
L5. Fin. Inclusion Index						-0.0631***		
						(0.0190)		
L6. Fin. Inclusion Index							-0.0619***	
							(0.0145)	
L7. Fin. Inclusion Index								-0.0431***
								(0.0112)
Constant	0.721***	0.712***	0.567***	0.564***	0.569***	0.589***	0.593***	0.550***
Observations	365	365	333	333	333	333	333	300
R-squared	0.614	0.614	0.524	0.524	0.526	0.539	0.540	0.487
Number of countries	69	69	62	62	62	62	62	62

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

Appendix G Impact of unequal financial access to women and the poorest population in developing countries using instrumental variable approach.

Variables	Ratio of female to male bank accounts		Bank account held by poorest 40 percent	
	Above Median (>0.79)	Below Median (<0.79)	Above Median (>32.57)	Below Median (<32.57)
	(1)	(2)	(3)	(4)
	Dependent Variable: Gender Inequality Index (GII)			
Financial Inclusion Index	-0.236	-0.651***	-0.623	-0.178*
	(0.238)	(0.268)	(0.464)	(0.1023)
Fertility	-0.015	0.0369*	-0.029	0.0079
	(0.0115)	(0.0208)	(0.0318)	(0.00699)
Compulsory education	-0.0011	-0.000093	-0.0032	-0.00035
	(0.00155)	(0.00171)	(0.0022)	(0.0012)
Education expense	-0.00247	0.00213	-0.0033	0.0011
	(0.00235)	(0.0016)	(0.0024)	(0.00139)
Unemployment rate	-0.000692	0.0017	-0.00097	-0.00164
	(0.00154)	(0.0018)	(0.0018)	(0.0014)
Per capita GDP growth	-0.000263	-0.0012*	-0.00032	-0.00060
	(0.00018)	(0.00069)	(0.00020)	(0.00053)
Institutional quality	-0.0317***	0.019	-0.0113	-0.0412***
	(0.0104)	(0.0183)	(0.0143)	(0.0096)
Year fixed effect	Yes	Yes	Yes	Yes
Observations	196	144	203	137
R-squared	0.589	0.492	0.424	0.759
Number of countries	30	25	32	23
Underidentification test (Anderson's p-value)	0.013	0.032	0.091	0.000
Overidentification test:				
Sargan-Hansen statistics Chi-sq	0.105	0.034	0.079	0.399
Sargan-Hansen statistics P-value	0.746	0.854	0.779	0.528
Endogeneity test:				
Chi-sq	0.324	4.436	1.607	2.585
P-value	0.569	0.035	0.204	0.108

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

Appendix H Gender inequality, financial inclusion, and different indicators of institutional quality in developing countries.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Gender Inequality Index (GII)					
Financial Inclusion Index	-0.132**	-0.149**	-0.134**	-0.125**	-0.121*	-0.134**
	(0.0645)	(0.0605)	(0.0647)	(0.0605)	(0.0633)	(0.0654)
Fertility	-0.0211	-0.0188	-0.0223	-0.0217	-0.0231	-0.0268
	(0.0213)	(0.0210)	(0.0224)	(0.0226)	(0.0229)	(0.0224)
Compulsory education	-0.00225*	-0.00198*	-0.00204*	-0.00265**	-0.00226*	-0.00201
	(0.00116)	(0.00101)	(0.00117)	(0.00106)	(0.00131)	(0.00123)
Education expense	-0.000822	-0.000764	-0.00185	-0.00119	-0.00145	-0.00115
	(0.00149)	(0.00138)	(0.00162)	(0.00151)	(0.00155)	(0.00146)
Unemployment rate	-0.000939	-0.000362	-0.000475	-0.000636	-0.00108	-0.000210
	(0.000851)	(0.000984)	(0.000874)	(0.000819)	(0.000963)	(0.000901)
Per capita GDP growth	-0.000262**	-0.000162	-0.000268**	-0.000276**	-0.000279***	-0.000220*
	(0.000121)	(0.000117)	(0.000106)	(0.000110)	(0.000100)	(0.000123)
Regulatory quality	-0.0258**					
	(0.0120)					
Rule		-0.0182*				
		(0.00988)				
Control of corruption			-0.0246**			
			(0.00931)			
Government effectiveness				-0.0280***		
				(0.00889)		
Political Stability					-0.00933	
					(0.00715)	
Voice and Accountability						-0.0296*
						(0.0163)
Constant	0.721***	0.720***	0.724***	0.719***	0.731***	0.732***
	(0.110)	(0.111)	(0.116)	(0.119)	(0.116)	(0.112)
Observations	365	427	365	365	365	365
R-squared	0.614	0.462	0.608	0.617	0.603	0.611
Number of countries	69	84	69	69	69	69

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.

Appendix I Impact of financial inclusion using alternative control variables.

Variables	Sub-groups of developing countries		Non-linear Analysis	
	Low and lower-middle income countries	Upper-middle income countries	Low and lower-middle income countries	Upper middle and high income countries
	(1)	(2)	(3)	(4)
	Dependent Variable: Gender Inequality Index (GII)			
Financial Inclusion Index	-0.186***	0.0153		
	(0.0474)	(0.0562)		
Log Fin. Inclusion Index			-0.402***	-0.0457
			(0.145)	(0.125)
Log Fin. Inclusion Squared			-0.450*	0.134
			(0.265)	(0.331)
Fertility	-0.0342	-0.00394	-0.0294	0.0881
	(0.0292)	(0.0196)	(0.0308)	(0.0584)
Compulsory education	0.000548	-0.00340***	0.000957	-0.00133
	(0.00221)	(0.00106)	(0.00235)	(0.00148)
Education expense	-0.00264	-0.00147	-0.00284	-0.00294
	(0.00308)	(0.000952)	(0.00318)	(0.00208)
Unemployment rate	-0.00301	-0.00112	-0.00295	-0.000212
	(0.00422)	(0.000896)	(0.00405)	(0.00116)
Employers	-0.000902	-0.000173	-0.000815	-0.00693*
	(0.00498)	(0.00301)	(0.00498)	(0.00370)
Employees	-0.00421***	3.34e-05	-0.00361**	0.000364
	(0.00145)	(0.000905)	(0.00153)	(0.00112)
Institutional quality	-0.00251	-0.0258**	-0.00488	-0.0106
	(0.0208)	(0.0108)	(0.0206)	(0.0148)
Constant	1.065***	0.453***	0.810***	0.160
	(0.171)	(0.0916)	(0.175)	(0.130)
Year fixed effect	Yes	Yes	Yes	Yes
Observations	183	182	183	411
R-squared	0.666	0.763	0.669	0.429
Number of countries	36	32	36	72

Note: Significance, *** p<0.01, ** p<0.05, * p<0.1. Robust Standard errors in parentheses.