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Article

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Research in Globalization

Provided in Cooperation with:

Elsevier

Suggested Citation: Azmeh, Chadi (2025) : Financial globalization, Poverty, and inequality in developing countries: The moderating role of Fintech and financial inclusion, Research in Globalization, ISSN 2590-051X, Elsevier, Amsterdam, Vol. 10, pp. 1-10, <https://doi.org/10.1016/j.resglo.2025.100277>

This Version is available at:

<https://hdl.handle.net/10419/331198>

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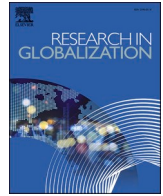
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Financial globalization, Poverty, and inequality in developing countries: The moderating role of Fintech and financial inclusion

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ARTICLE INFO

JEL:

G21

O16

Keywords:

Foreign bank entry

Fintech

Financial inclusion

Poverty

Inequality

ABSTRACT

As financial globalization continues to evolve, it has played a pivotal role in the development of financial sectors in developing countries, enhancing efficiency and fostering competition. However, this trend has also raised concerns regarding its socio-economic impacts, particularly in relation to poverty and inequality. In this context, the emergence of financial technology (Fintech) and targeted financial inclusion initiatives has marked a significant turning point in addressing these challenges. This comprehensive study investigates the intricate dynamics between foreign bank entry, Fintech innovations, and financial inclusion, assessing their combined effects on poverty and inequality across 108 developing countries. Utilizing an advanced panel regression model backed by Panel-Corrected Standard Errors (PCSE) and Feasible Generalized Least Squares (FGLS) estimation techniques, we reveal that the relationship between foreign bank entry and socio-economic outcomes is multifaceted and influenced by the moderating roles of Fintech and financial inclusion initiatives. Our findings indicate that while the initial introduction of foreign banks may initially exacerbate poverty levels, their interaction with robust financial inclusion strategies and advanced Fintech solutions can significantly alleviate poverty and inequality. The study results indicate that, for every 1% increase in the interaction of Fintech with foreign banks, poverty has decreased by approximately 0.017%. Interestingly, the presence of Automated Teller Machines (ATMs) demonstrates a countervailing effect, mitigating the adverse impacts of foreign bank operations on income inequality. Moreover, we show that the effectiveness of Fintech in reducing inequality is closely linked to the extent of foreign bank penetration, highlighting a duality of effects where the advantages and disadvantages of foreign bank presence become increasingly pronounced in the era of Fintech. These insights underscore the imperative for policymakers to create an environment that not only promotes financial inclusion but also leverages Fintech innovations to optimize the opportunities presented by foreign bank entry in combating poverty and inequality.

Introduction

Reforming the financial sector is crucial for economic development because it makes financial services more accessible, encourages investment, and supports sustainable economic growth (Sassi & Goaid, 2013; Al Samman & Azmeh, 2016; Azmeh et al., 2017; Guru & Yadav, 2019; Ustarz & Fanta, 2021; H. M. Nguyen et al., 2022; Abbas et al., 2022; Asante et al., 2023; Dhingra, 2023; Azmeh & Al-Raei, 2025). In the context of globalization, these important changes directly contribute to the reduction of poverty and inequality by increasing the effectiveness and inclusivity of financial institutions in a competitive global market, allowing underprivileged people to engage in the economy and accumulate wealth (Park & Mercado, 2018; Neaime & Gaysset, 2018; Zhang

& Naceur, 2019; Omar & Inaba, 2020; Ratnawati, 2020; Ouechtati, 2020; Polloni-Silva et al., 2021; Khan et al., 2022; Chowdhury & Chowdhury, 2023). Moreover, as globalization intensifies, the emergence of financial technology, or fintech, has significantly transformed the landscape of financial services, especially in developing countries. By enabling digital financial services via mobile devices and the internet, fintech fosters a more inclusive financial environment, thereby facilitating globalization by connecting disparate markets and demographics (Dabla-Norris et al., 2015; Sodokin et al., 2023). As a result of this dismantling of traditional financial barriers, digital financial inclusion (DFI) has amplified service accessibility, promoted savings and investments, driven economic development, and moderated poverty and inequality through globally integrated systems (Sassi & Goaid, 2013;

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<https://doi.org/10.1016/j.resglo.2025.100277>

Received 1 December 2024; Received in revised form 16 February 2025; Accepted 24 February 2025

Available online 26 February 2025

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Senou et al., 2019; Tchamyou et al., 2019; Yu & Wang, 2021; Yao & Ma, 2022; Kouladoum et al., 2022; Azmeh & Al-Raei, 2024; Azmeh, 2025).

The World Bank aims to end extreme poverty by 2030 and improve shared prosperity for the poorest 40 % of the population (Cardoso & Teixeira, 2020). However, globalization has exacerbated existing issues of poverty and income inequality in developing countries. Persistent issues, including excessive income inequality and unequal financial stability, continue to challenge globalization's intended economic benefits (Enowbi Batuo & Asongu, 2015; Neaime & Gaysset, 2018). The way globalization reshapes the financial landscape has led to a central question in today's financial discourse: how does foreign bank penetration facilitate or hinder these issues in developing countries? Critical considerations about foreign bank penetration's complex role in influencing financial systems—and by extension, social consequences—are raised against the backdrop of income inequality and poverty reduction (Azmeh, 2018; Delis et al., 2020; Iddrisu, 2024; Ullah et al., 2024). Proponents argue that foreign banks contribute to financial development by introducing advanced banking technologies, increasing competition, and widening access to global capital (Wu et al., 2010; Boamah et al., 2022). However, this optimistic viewpoint often conflicts with the concerns of “cherry-picking,” where foreign banks prefer larger, established companies over small and medium-sized enterprises (SMEs) and vulnerable communities, effectively sidelining those who may need assistance the most (Saleh, 2015; Azmeh, 2018; Beck et al., 2018; Nanivazo et al., 2021).

This discussion takes on added significance in the context of globalization when compounded by the dynamic interplay of fintech, financial inclusion, and the presence of foreign banks. Previous research highlights contradictory results; while some studies confirm that foreign banks might promote greater access to financial services in a globalized context, others proclaim that their existence can unintentionally exacerbate financial exclusion (Özşuca, 2019; Kebede et al., 2021). The convergence of fintech developments may actively contribute to mitigating some of the adverse effects of foreign bank presence, providing opportunities for developing countries to fully benefit from the positive effects of globalization on financial sector development. For example, fintech platforms have the potential to close the gap between underserved communities and traditional financial institutions, creating an environment conducive to equitable access to finance in a globalized world (Iddrisu et al., 2022).

Given the significant presence of foreign banks in the financial sectors of developing countries—where their assets make up over 45 % of total bank assets—their role in driving financial sector reform within a globalized context requires careful examination. As fintech innovations grow and policymakers focus on financial inclusion, this study explores how the entry of foreign banks interacts with these trends to affect poverty and inequality on a global scale. Utilizing panel data from 108 low-, lower-middle-, and upper-middle-income countries across four time periods (2011, 2014, 2017, 2021), we apply Panel-Corrected Standard Errors (PCSE) and Feasible Generalized Least Squares (FGLS) methods to analyze the complex relationships between foreign bank penetration, fintech adoption, financial inclusion, and socio-economic outcomes. This approach not only fills a crucial gap in the existing literature but also offers policymakers practical strategies to align financial globalization with inclusive development objectives, ensuring that the entry of foreign banks and technological progress work together to reduce poverty and inequality in an increasingly interconnected world.

To this end, the objectives of this study are twofold: first, to investigate the direct effects of financial globalization, proxied by foreign bank presence, on multiple dimensions of socio-economic outcomes, specifically poverty and inequality, while analyzing the moderating roles of Fintech and financial inclusion. Second, to develop a theoretical framework that elucidates the mechanisms through which foreign bank presence influences poverty and inequality, ultimately advancing our understanding of the interplay between foreign banking practices,

fintech, and financial inclusion in the realm of globalization.

Literature Review

Foreign bank penetration and Socio-Economic outcomes

The influence of foreign banks on the financial systems and socio-economic conditions in developing countries has sparked considerable discussion. Supporters claim that foreign banks improve the efficiency of the financial sector by bringing in advanced technologies, promoting competition, and increasing access to international capital (Wu et al., 2010; Bonin & Louie, 2017; Azmeh, 2018; Yin, 2021). For example, Boamah et al. (2022) show that foreign banks enhance operational efficiency in local banking sectors, leading to reduced costs and increased profitability. This is echoed by Nguyen (2022), who points out their role in boosting competitiveness in a globalized context. Likewise, Hartwell (2018) connects their presence to greater competitiveness and lower transaction costs in the economies they enter. On the other hand, critics point out the dangers of “cherry-picking,” where foreign banks tend to favor established corporations over small and medium-sized enterprises (SMEs) and low-income households, which worsens financial exclusion (Saleh, 2015; Azmeh et al., 2017; Beck et al., 2018). This issue is particularly alarming in developing nations, where marginalized groups often struggle to access credit (Kleymentova et al., 2016; Nanivazo et al., 2021), a situation made worse by global economic inequalities (Detragiache et al., 2008; Claessens & Van Horn, 2014).

The evidence regarding the impact of foreign banks on socio-economic outcomes is quite mixed. For instance, Özşuca (2019) suggests that foreign banks enhance access to essential banking services in transition economies, yet they do not seem to improve per capita borrowing. On the other hand, Iddrisu et al. (2022) indicate that while foreign banks in Africa may increase financial exclusion, they also strengthen the connection between fintech and financial inclusion. The effects on inequality are similarly unclear: Delis et al. (2020) link foreign bank presence to higher Gini coefficients, whereas Koudalo and Wu (2022) contend that financial liberalization worsens income inequality by benefiting wealthier clients. These conflicting results highlight the importance of examining contextual factors, such as institutional quality (Kebede et al., 2021) and the adoption of fintech, to better understand these varying outcomes.

Hypothesis 1 (H1): The entry of foreign banks into developing countries is positively associated with a decrease in poverty levels, particularly when fintech innovations and enhanced financial inclusion measures are present.

The role of financial inclusion in mitigating exclusionary practices

Financial inclusion, indicated by access to formal accounts, ATMs, and bank branches, has become an essential safeguard against the negative impacts of financial globalization. Research emphasizes its importance in empowering marginalized groups, promoting savings, and supporting entrepreneurship (Park & Mercado, 2018; Senou et al., 2019; Tchamyou et al., 2019). For instance, Leon and Zins (2020) illustrate how Pan-African banks enhance credit access for small and medium-sized enterprises (SMEs), while Gopalan and Rajan (2018) connect foreign banks to inclusive finance in emerging markets. However, the effectiveness of financial inclusion is contingent upon the strength of institutional frameworks. Kebede et al. (2021) reveal that high levels of foreign bank penetration can hinder inclusion in Africa unless there is robust institutional quality to balance it out. Moreover, financial inclusion is influenced by the strategies of foreign banks. Although these banks might overlook low-income segments, initiatives aimed at inclusion, such as increasing the number of ATMs and bank branches, can help mitigate this exclusion (Özşuca, 2019; Polloni-Silva et al., 2021). A notable example is mobile money services like

M–Pesa, which have allowed unbanked individuals to engage with formal financial systems, thereby alleviating poverty (Wachira & Njurguna, 2023). Nonetheless, there are still gaps in our understanding of how these mechanisms interact with foreign bank operations to affect inequality, especially in areas where financial intermediation is inconsistent (Yin, 2021; Boamah et al., 2022).

Hypothesis 2 (H2): Enhanced financial inclusion, indicated by a greater number of formal accounts and improved ATM access, acts as a protective factor against the negative consequences of foreign bank entry on both poverty and inequality.

Fintech innovations as a Catalyst for inclusive financial systems

Fintech, which includes digital payments, mobile banking, and peer-to-peer lending, has significantly changed the financial landscape in developing countries. By circumventing traditional banking systems, fintech helps improve access, especially for rural and low-income communities (Dabla-Norris et al., 2015; Sodokin et al., 2023; Allen et al., 2021). For instance, mobile accounts and digital payment solutions lower transaction costs and facilitate immediate financial interactions, encouraging savings and investments (Yao & Ma, 2022; Kouladoun et al., 2022). Cumming et al. (2023) point out the importance of crowdfunding in supporting small and medium-sized enterprises (SMEs), while Najaf et al. (2022) highlight the adaptability of peer-to-peer lending for underserved borrowers, a trend that is further enhanced by platforms like M–Pesa in areas with limited banking services (Oyebola Etudaiye-Muhtar et al., 2024). Fintech also influences the socio-economic effects of foreign banks. Iddrisu et al. (2022) demonstrate that fintech strengthens the connection between foreign banks and financial inclusion in Africa, helping to reduce exclusionary practices. Likewise, digital platforms help combat inequality by making credit and insurance more accessible (Yáñez-Valdés & Guerrero, 2024). However, the mixed effects of fintech are clear: while it empowers marginalized communities, its advantages depend on regulatory environments and digital literacy (Oyebola Etudaiye-Muhtar et al., 2024), highlighting the necessity for comprehensive policy integration.

Hypothesis 3 (H3): The growth of fintech services, including mobile accounts and digital payment systems, lessens the adverse effects of foreign bank entry on income inequality in developing nations, fostering more equitable economic results.

The dual Nature of Globalization: Opportunities and challenges

The relationship between globalization and financial systems presents a complex paradox. On one hand, the integration of foreign banks and fintech can enhance market connectivity and efficiency; on the other hand, it may exacerbate existing inequalities. Ashenafi and Dong (2024) suggest that financial openness based on outcomes tends to reduce inequality, while principle-based approaches can worsen it. This tension is reflected in the varying impacts of foreign bank strategies (Detragiache et al., 2008; Claessens & Van Horn, 2014). Ullah et al. (2024) show that foreign bank ownership in BRICS countries increases inequality, although capital account liberalization can help mitigate this effect. Likewise, Iddrisu (2024) points out that there is a threshold beyond which foreign bank penetration can negate income gains in Africa, depending on the level of economic freedom. These dynamics highlight the necessity for policies that strike a balance between the advantages of globalization and the need for inclusive protections. For example, Ratnawati (2020) underscores the importance of targeted financial inclusion in harmonizing globalization with poverty alleviation, while Azmeh and Al-Raei (2024) emphasize the potential of fintech to address exclusionary trends. However, many existing studies often consider foreign banks, fintech, and inclusion as separate entities, overlooking their potential for synergy (Nanivazo et al., 2021; Beck

et al., 2018).

Hypothesis 4 (H4): The impact of globalization on local financial markets presents a dual effect, where the entry of foreign banks increases economic competitiveness but also intensifies income inequality and poverty, unless accompanied by strong fintech solutions and inclusive financial policies.

This study aims to bridge critical research gaps in understanding the dual role of foreign banks in driving financial development while simultaneously exacerbating exclusion, particularly in relation to fintech and financial inclusion, a relationship that remains insufficiently explored in existing literature. By examining the moderating effects of fintech and financial inclusion on the socio-economic impacts of foreign banks across 108 developing countries, this research employs advanced methodologies, including panel data analysis with PCSE and FGLS, to elucidate the complex interplay between globalization, fintech, financial inclusion, and socio-economic outcomes. Furthermore, it highlights the synergistic potential of these factors in shaping poverty and inequality, thereby offering valuable insights and policy pathways for fostering equitable economic development.

Materials and methods

Data

The main objective of this study is to investigate how financial globalization, proxied by foreign bank entry, affect poverty and inequality in developing countries, while also looking at the moderating role of fintech and financial inclusion. An analysis is carried out on data covering 108 low, lower-middle, and upper-middle income countries, throughout the years 2011, 2014, 2017, and 2021, using a panel regression model with Panel-Corrected Standard Errors (PCSE) and Feasible Generalized Least Square Methods (FGLS). The dataset incorporates key variables including foreign bank entry, Fintech, financial inclusion (access and usage), and other determinants of poverty and inequality. Foreign bank entry is proxied by the percentage of foreign bank assets among total bank assets.¹ Fintech is measured in two ways: the percentage of people over 15 who have made or received digital payments and the percentage of people who have mobile accounts. The number of formal commercial bank accounts per 1,000 persons (Use) and the density of ATMs and commercial bank branches per 100,000 adults (access), are used to evaluate financial inclusion. The Poverty headcount ratio, which calculates poverty as a proportion of the entire population at \$2.15 per day, is used to quantify poverty levels, while the Gini index is used to evaluate inequality. Additional determinants such as credit to private sector, GDP growth, government expenditure, investment, inflation, trade, school enrollment, and population growth are sourced from the World Bank database (WDI). Data related to foreign bank entry, Fintech, and financial inclusion is drawn from the Global Findex Database. For further statistical details, please refer to Table 1.

To assess multicollinearity, a correlation matrix was built by examining the degree of correlation between the variables. The results, which are shown in Table 2, provide a comprehensive examination of the correlations between all variables.

Upon assessing the multicollinearity between the variables in Table 2, no noteworthy concerns were identified. The correlation coefficients demonstrated a modest degree of intercorrelation between the variables, often falling below 0.70. However, there was a significant correlation between: MoRDig*Gini, Accounts*CreTPriv, GovEx*GDPG, MoRDig*GovEx, and MoRDig*Accounts, which has a value above the 0.7 threshold. A Variance Inflation Factor (VIF) test was performed in order to look into the possibility of multicollinearity further. The results showed that the mean VIF value for all independent variables was 3.86,

¹ A foreign bank is a bank where 50 percent or more of its shares are owned by foreigners.

Table 1
Descriptive Statistics.

Variable	Abbreviation	Definition	Mean	Std. Dev.	Min	Max
Poverty	Pov	Headcount ratio at \$2.15 a day as a percentage of the total population	9.292	14.585	0	65.7
Inequality	Gini	Gini index	38.81	7.769	24	63
Domestic credit to private sector	CreTPriv	Domestic credit to private sector by banks refers to financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks)	36.389	30.737	0.005	177.267
GDP growth (annual %)	GDPG	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars.	4.746	8.958	-50.339	153.493
General government final consumption expenditure (% of GDP)	GovEx	Includes all government current expenditures for purchases of goods and services (including compensation of employees)	14.602	5.908	2.36	43.702
Gross capital formation (% of GDP)	Invest	Consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories	24.953	9.216	-15.917	69.603
Inflation, GDP deflator (annual %)	Inflation	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole.	8.99	16.752	-26.7	235.515
Trade (% of GDP)	Trade	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	74.18	35.216	4.128	305.968
School enrollment, secondary (% gross)	School	Ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education	70.95	27.305	5.46	141.203
Population growth (annual %)	PopG	Annual population growth rate for year t is the exponential rate of growth of midyear population from year/t to t, expressed as a percentage	1.647	1.455	-6.852	11.794
Foreign banks Assets	FAss	Percentage of the total banking assets that are held by foreign banks.	45.343	31.363	0.4	100
No. of ATMs	ATM	Number of Automated teller machines (ATMs) (per 100,000 adults)	28.24	26.393	0.32	117.93
No. of Branches	Branches	Number of Commercial bank branches (per 100,000 adults)	11.845	11.7	0.31	72.07
No. of Accounts	Accounts	Account ownership at a financial institution or with a mobile-money-service provider (% of population ages 15 +)	41.664	23.267	0.4	98.46
Made or received a digital payment	MoRDig	The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make or receive a payment from an account	37.133	21.135	4.17	97.41
Mobile Accounts	MobAcc	The percentage of people who have mobile accounts	15.024	16.216	0	72.93

which is much below the generally recognized threshold of 10. Table 3 contains the comprehensive results of the VIF test.

Methodology

To efficiently handle autocorrelation in the dataset, the present study employs the panel corrected standard error (PCSE) approach, which provide objective parameter estimations and precise standard errors. Dynamic heterogeneous panel data with individual variation and temporal correlations are especially well suited for this approach. The PCSE approach effectively accounts for unobserved heterogeneity and time-varying influences on variable associations by incorporating panel-specific and time-specific fixed effects. This strengthens the validity and reliability of the model results. The feasible generalized least squares (FGLS) approach, which tackles heteroscedasticity and cross-sectional dependency and improves the accuracy of parameter estimations, is also included in the research as a robustness check (Bailey & Katz, 2011; Adeleye et al., 2023).

Numerous empirical studies have specified that a robust quantitative model incorporating variables such as foreign bank entry, Fintech, financial inclusion, and economic and social indicators can provide valuable insights into analyzing poverty and inequality. To explore the specific influence of foreign bank entry, Fintech, and financial inclusion on these aspects, a mathematical framework is developed to comprehensively capture their impact.

The accurate model takes the following form:

$$P-I_{it} = \lambda + \varphi FBE_{it} + \psi FT_{it} + \phi FI_{it} + \int Zit + \nu_{it}, (1).$$

In this framework of analysis, the relevant variables are P-I, representing poverty and inequality; FBE denoting foreign bank entry, FT reflecting Fintech, FI refers to financial inclusion, and Z includes a set of all control variables. Furthermore, ν represents the error term and λ stands for the intercept term. φ , ψ , ϕ represents foreign bank entry, Fintech, and financial inclusion coefficients respectively, and $\int$ includes a vector of coefficients related to all control variables. The subscripts (i) and (t) denote the particular country being studied and the corresponding time frame, respectively.

As a result, the model assumes the forms that follow:

$$Poverty_{it} = \alpha + \beta FAss_{it} + \gamma Fintech_{it} + \varphi FinInclusion_{it} + \phi Invest_{it} + \psi Trade_{it} + \phi GovEx_{it} + \lambda PopG_{it} + \int Inflation_{it} + \delta school_{it} + \chi GDPG_{it} + \gamma CreTPriv_{it} + \mu_{it} (2).$$

$$Inequality_{it} = \alpha + \beta FAss_{it} + \gamma Fintech_{it} + \varphi FinInclusion_{it} + \phi Invest_{it} + \psi Trade_{it} + \phi GovEx_{it} + \lambda PopG_{it} + \int Inflation_{it} + \delta school_{it} + \chi GDPG_{it} + \gamma CreTPriv_{it} + \mu_{it} (3).$$

The incorporation of foreign bank entry, Fintech, and financial inclusion enhances our study paradigm and allows us to investigate their intricate link with poverty and inequality in more detail. We quantify this dynamic interplay by include interaction terms as independent variables in our regression analysis. We are able to assess its impact on our study findings statistically by looking at the interaction coefficient.

We use the panel corrected standard error (PCSE) and feasible generalized least square (FGLS) methodologies to analyze how foreign bank entry affect poverty and inequality, while taking into consideration the moderating role of Fintech and financial inclusion. We examine the effects of several factors on our dependent variables, poverty and inequality, over twelve iterations—six PCSE and six FGLS approaches. The study starts with estimating the impact of foreign bank entry and all control variables and moves on to Fintech and financial inclusion variables. In the present study, our main focus relies on the five interaction terms between foreign bank entry, Fintech, and financial inclusion. The results of these studies are presented in Tables 4 and 5.

Results and discussion

Foreign bank entry and poverty: Moderating role of Fintech and financial inclusion

Analyzing Table 4's results using yearly data that concentrates on our dependent variable (poverty) is the first step in evaluating the model estimations in the context of globalization. The study utilized Panel-Adjusted Standard Errors (PCSE) and Feasible Generalized Least Squares (FGLS) techniques for robustness checks. The findings indicate a significant relationship between foreign bank entry and poverty,

Table 2
Matrix of correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Pov	1.000															
(2) Gini	0.627	1.000														
(3) CreTPriv	0.293	0.275	1.000													
(4) GDPG	0.146	-0.083	-0.292	1.000												
(5) GovEx	0.116	0.401	0.593	-0.705	1.000											
(6) Invest	0.031	-0.462	-0.199	0.363	-0.348	1.000										
(7) Inflation	-0.203	0.137	-0.166	-0.643	0.271	-0.464	1.000									
(8) Trade	-0.164	-0.454	0.475	0.150	0.021	0.222	-0.516	1.000								
(9) School	-0.147	0.328	0.560	-0.492	0.442	-0.401	0.461	-0.059	1.000							
(10) PopG	0.459	0.229	-0.243	0.243	-0.063	-0.437	-0.024	-0.510	-0.085	1.000						
(11) FAss	-0.220	-0.289	-0.092	-0.260	-0.082	-0.151	-0.098	0.106	0.734	-0.490	1.000					
(12) ATM	-0.149	0.172	0.689	-0.486	0.519	-0.256	0.153	0.049	0.029	-0.474	-0.112	1.000				
(13) Branches	0.000	0.142	-0.132	0.277	-0.172	-0.392	0.011	-0.070	-0.137	-0.009	-0.313	0.003	1.000			
(14) Accounts	0.158	0.507	0.705	-0.384	0.639	-0.350	0.268	0.064	0.617	-0.009	-0.429	0.689	-0.066	1.000		
(15) MoRDig	0.422	0.782	0.511	-0.429	0.720	-0.410	0.310	-0.297	0.475	0.108	-0.317	0.509	-0.120	0.843	1.000	
(16) MobAcc	0.782	0.502	0.422	-0.032	0.420	0.001	-0.246	0.165	-0.120	0.405	-0.037	-0.162	-0.282	0.249	0.502	1.000

Table 3

Variance Inflation Factor (VIF).

Variable	VIF	1/VIF
MoRDig	8.53	0.117264
Accounts	8.11	0.123304
GDPG	4.26	0.234692
PopG	3.99	0.250829
CreTPriv	3.74	0.267135
ATM	3.53	0.283523
GovEx	2.93	0.340954
Invest	2.84	0.351836
Inflation	2.61	0.382809
School	2.47	0.405221
FAss	2.41	0.414611
Trade	2.40	0.416793
Branches	2.37	0.422732
Mean VIF	3.86	

underscoring that the entry of foreign banks can initially exacerbate poverty levels in developing countries, particularly in the early stages of globalization (regressions (1) and (7)). However, once we incorporate Fintech and financial inclusion metrics, this relationship reverses, entering a phase where we observe a substantial reduction in poverty through the positive influence of these innovations (regressions (4), (10), and (11)).

The consistent integration of Fintech and financial inclusion variables indicates not only a positive influence on poverty reduction but also hints at the rise of complementary systems interlinked with globalization, including improved access to mobile banking and digital payments that allow underserved communities greater economic participation. The results further confirm the importance of ATMs and formal accounts as mechanisms that significantly alleviate poverty levels, thereby indicating that foreign bank entry, when coupled with enhanced financial inclusion and innovative fintech solutions, can yield positive socioeconomic outcomes.

Moreover, our exploration of interaction terms sheds light on the interplay between foreign bank entry and financial inclusion initiatives, suggesting that greater ATM accessibility and a rise in digital payment solutions effectively moderate the adverse impacts associated with foreign bank presence. For instance, our estimation results indicate that, for every 1 % increase in the interaction of fintech with foreign bank entry, poverty has decreased by approximately 0.0035 % (F*MoRDig) and by 0.017 % (F*MobAcc). This interaction highlights the necessity of fostering environments conducive to fintech innovations to maximize their potential benefits in the face of globalization pressures.

Foreign bank entry and Inequality: Moderating role of Fintech and financial inclusion

Turning to Table 5, we investigate the impact of foreign bank entry on inequality, presenting an overarching view of how globalization steers disparities among populations in developing nations. Initially, foreign bank entry appears to correlate positively with inequality without the inclusion of fintech and financial inclusion variables (regressions (1) and (7)). However, the dynamics shift marginally once we introduce relevant fintech measures, showcasing that foreign banks can indeed have a more pronounced negative impact on inequality when guided by an appropriately regulated fintech environment.

The statistical significance of ATMs, digital payments, and mobile accounts further corroborates the moderating role of fintech and financial inclusion initiatives in reshaping inequality dynamics as influenced by foreign banks. The interaction effect between foreign bank penetration and the proliferation of automated teller machines (ATMs) exerts a statistically significant mitigating influence on income inequality, with each 1 % increase in the combined interaction term associated with a 0.004 % reduction in inequality levels. Enhanced access to ATMs enables wider participation in the financial ecosystem,

Table 4
Impact of foreign bank entry, Fintech, financial inclusion on Poverty in developing countries for the period (2011, 2014, 2017, 2021): PCSE and FGLS methods. Dependent variable: Poverty (headcount ratio at \$2.15 a day as a percentage of the total population).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	PCSE	PCSE	PCSE	PCSE	PCSE	PCSE	FGLS	FGLS	FGLS	FGLS	FGLS	FGLS
CreTPriv	0.0717 (0.0440)	0.0756 (0.0532)	0.138*** (0.0477)	0.130*** (0.0369)	0.108** (0.0489)	0.170*** (0.0282)	0.0504** (0.0255)	0.0752** (0.0301)	0.0842*** (0.0296)	0.0731*** (0.0196)	0.0951*** (0.0264)	0.147*** (0.0251)
GDPG	−0.131 (0.367)	−0.182 (0.362)	−0.0257 (0.348)	0.0398 (0.160)	0.497** (0.208)	1.671*** (0.626)	−0.0382 (0.124)	−0.0245 (0.152)	−0.0502 (0.200)	0.0607 (0.104)	0.370*** (0.133)	0.826* (0.472)
GovEx	0.447 (0.363)	0.440 (0.355)	0.407 (0.302)	−0.248* (0.138)	−0.122 (0.262)	−0.0296 (0.407)	0.147 (0.151)	0.209 (0.158)	0.217 (0.167)	−0.197** (0.0864)	−0.338** (0.168)	−0.521 (0.329)
Invest	0.606*** (0.215)	0.601*** (0.217)	0.826*** (0.198)	0.202** (0.0962)	0.0399 (0.0859)	0.0198 (0.0697)	0.334*** (0.100)	0.409*** (0.105)	0.636*** (0.123)	0.162*** (0.0560)	−0.00134 (0.0514)	−0.0246 (0.0664)
Inflation	0.0589 (0.0750)	0.0531 (0.0697)	0.151** (0.0770)	0.0934** (0.0463)	0.0647 (0.0843)	0.293*** (0.0882)	0.0356 (0.0326)	0.0410 (0.0334)	0.0603 (0.0405)	0.0575* (0.0330)	0.0528 (0.0500)	0.170*** (0.0655)
Trade	−0.09*** (0.0341)	−0.09*** (0.0342)	−0.14*** (0.0382)	−0.0876*** (0.0224)	−0.07*** (0.0228)	−0.11*** (0.0190)	−0.06*** (0.0211)	−0.078*** (0.0217)	−0.116*** (0.0226)	−0.0665*** (0.0108)	−0.0404*** (0.0127)	−0.12*** (0.0186)
School	−0.117** (0.0588)	−0.108 (0.0720)	−0.122** (0.0509)	−0.0585* (0.0317)	−0.076* (0.0323)	−0.08*** (0.0177)	−0.10*** (0.0273)	−0.0845* (0.0356)	−0.123*** (0.0222)	−0.0757*** (0.0173)	−0.0483*** (0.0139)	−0.08*** (0.0162)
PopG	4.155*** (1.467)	4.014*** (1.432)	3.836*** (1.167)	2.672*** (0.825)	2.044** (0.905)	5.139*** (1.464)	2.501*** (0.692)	3.067*** (0.794)	2.655*** (0.782)	1.878*** (0.402)	2.191*** (0.408)	3.172*** (1.082)
FAss	0.113** (0.0532)	0.124 (0.0974)	0.218** (0.0944)	−0.161*** (0.0560)	−0.0163 (0.0661)	0.226*** (0.0856)	0.0490** (0.0220)	−0.0265 (0.0423)	0.117** (0.0462)	−0.135*** (0.0313)	−0.0636* (0.0373)	0.119* (0.0642)
ATM		−0.00466 (0.0945)						−0.105** (0.0523)				
F*Atm		−0.00036 (0.00178)						0.00211** (0.000994)				
Branches			0.381** (0.175)						0.218** (0.0884)			
F*Bra			−0.00564 (0.00392)						−0.00361* (0.00202)			
Accounts				−0.262*** (0.0712)						−0.164*** (0.0407)		
F*Acc				0.00516*** (0.00135)						0.00371*** (0.000703)		
MoRDig					−0.0165 (0.0979)						−0.0802 (0.0615)	
F*MoRdig					0.00256 (0.00191)						0.00353*** (0.00133)	
MobAcc						1.046*** (0.155)						1.056*** (0.152)
F*MobAcc						−0.030** (0.0126)						−0.0172* (0.0103)
Constant	−9.930 (10.73)	−10.01 (10.83)	−20.89** (10.63)	15.26*** (3.935)	6.778 (5.012)	−7.840 (11.82)	1.522 (4.040)	0.569 (4.330)	−6.285 (5.794)	15.34*** (2.984)	9.564*** (3.270)	8.835 (8.695)
Observations	48	48	47	47	24	14	48	48	47	47	24	14
R-squared	0.640	0.641	0.720	0.577	0.610	0.950						
Number of Country	33	33	32	32	24	14	33	33	32	32	24	14
p	0.00132	0.000224	1.45e-05	1.12e-09	0	0	0.00	0.00	0.00	0.00	0.00	0.00

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

Table 5
Impact of foreign bank entry, Fintech, financial inclusion on Inequality in developing countries for the period (2011, 2014, 2017, 2021): PCSE and FGLS methods. Dependent variable: Inequality (Gini index).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	PCSE	PCSE	PCSE	PCSE	PCSE	PCSE	FGLS	FGLS	FGLS	FGLS	FGLS	FGLS
CreTPriv	0.0959** (0.0383)	0.0964** (0.0400)	0.136*** (0.0459)	0.0783* (0.0435)	0.100*** (0.0209)	0.00910 (0.0295)	0.0828*** (0.0259)	0.0801*** (0.0308)	0.128*** (0.0316)	0.0621*** (0.0204)	0.0954*** (0.0153)	−0.00822 (0.0282)
GDPG	0.221 (0.454)	0.0603 (0.396)	0.224 (0.398)	0.614 (0.390)	1.305*** (0.120)	−0.0584 (0.839)	0.221 (0.157)	0.0921 (0.168)	0.387** (0.197)	0.810*** (0.149)	1.312*** (0.0634)	−0.387 (0.795)
GovEx	−0.0760 (0.388)	−0.171 (0.389)	−0.118 (0.388)	−0.618* (0.341)	0.0235 (0.181)	−0.352 (0.490)	0.0755 (0.223)	−0.125 (0.197)	0.127 (0.225)	−0.470*** (0.171)	0.0144 (0.127)	−0.716 (0.450)
Invest	−0.0951 (0.172)	−0.118 (0.165)	0.00886 (0.210)	−0.36*** (0.0969)	−0.414*** (0.0835)	−0.60*** (0.0523)	−0.235** (0.0976)	−0.261*** (0.0931)	−0.0810 (0.124)	−0.400*** (0.0397)	−0.397*** (0.0342)	−0.632*** (0.0498)
Inflation	−0.0781 (0.0896)	−0.108 (0.0915)	0.00633 (0.0948)	−0.0706 (0.0806)	−0.0979** (0.0458)	−0.39*** (0.107)	−0.0904** (0.0378)	−0.123*** (0.0419)	−0.0148 (0.0465)	−0.0523 (0.0387)	−0.0812** (0.0319)	−0.434*** (0.104)
Trade	−0.10*** (0.0349)	−0.09*** (0.0356)	−0.12*** (0.0396)	−0.09*** (0.0299)	−0.19*** (0.0214)	−0.19*** (0.0132)	−0.066*** (0.0195)	−0.064*** (0.0201)	−0.10*** (0.0252)	−0.101*** (0.0108)	−0.190*** (0.0124)	−0.188*** (0.0119)
School	0.0946 (0.0778)	0.118 (0.0890)	0.0904 (0.0779)	0.101 (0.0679)	0.0873*** (0.0268)	0.226*** (0.0196)	0.0718** (0.0355)	0.0942* (0.0488)	0.0562 (0.0447)	0.0879*** (0.0141)	0.0813*** (0.0157)	0.236*** (0.0182)
PopG	5.603*** (1.533)	4.563*** (1.549)	6.701*** (1.655)	5.268*** (1.529)	6.151*** (0.745)	4.932** (1.991)	6.196*** (1.171)	4.606*** (1.121)	6.412*** (1.155)	5.169*** (0.637)	5.777*** (0.440)	3.799** (1.903)
FAss	0.0392 (0.0442)	0.140* (0.0785)	0.0119 (0.0794)	−0.0455 (0.0865)	−0.00315 (0.0372)	−0.152 (0.124)	0.0371 (0.0246)	0.174*** (0.0499)	−0.0008 (0.0526)	0.0103 (0.0398)	0.00978 (0.0283)	−0.227* (0.118)
ATM		0.0668 (0.0753)						0.123** (0.0477)				
F*Atm		−0.0032* (0.00189)						−0.004*** (0.00132)				
Branches			0.0227 (0.189)						0.0314 (0.127)			
F*Bra			0.00294 (0.00389)						0.00206 (0.00268)			
Accounts				0.0545 (0.116)						0.113* (0.0621)		
F*Acc				0.00211 (0.00192)						0.00124 (0.000925)		
MoRDig					0.0917 (0.0559)						0.111*** (0.0379)	
F*MoRdig					0.00334*** (0.000888)						0.00289*** (0.000701)	
MobAcc						0.109 (0.134)						0.111 (0.130)
F*MobAcc						0.0346** (0.0170)						0.0435*** (0.0163)
Constant	32.75*** (11.93)	32.35*** (12.16)	28.30** (12.87)	43.44*** (10.35)	36.34*** (3.595)	53.49*** (15.47)	33.89*** (6.105)	34.53*** (7.518)	30.09*** (7.911)	40.11*** (2.712)	36.30*** (2.032)	63.19*** (14.59)
Observations	48	48	47	47	24	14	48	48	47	47	24	14
R-squared	0.489	0.516	0.522	0.616	0.957	0.982						
Number of Country	33	33	32	32	24	14	33	33	32	32	24	14
p	4.12e-08	4.61e-10	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00

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

contrasting positively with the presence of foreign banks. Additionally, the interactions among foreign bank entry and Fintech variables (MoRDig and MobAcc), suggest that the influence of these financial technologies on inequality is affected by the presence of foreign banks. Where Fintech are becoming more and more important, the benefits and drawbacks of having foreign banks become more apparent. For instance, our estimation results indicate that, for every 1 % increase in the interaction of fintech with foreign bank entry, Inequality has increased by approximately 0.0028 % (F*MoRDig) and by 0.043 % (F*MobAcc).

Thus, the overarching narrative suggests that fostering inclusive fintech solutions is critical to leveling the playing field, particularly in the context of globalization. By enhancing access to technology-enabled financial resources, developing countries can better navigate the complexities brought about by foreign bank presence and income inequality, ultimately resulting in more holistic financial outcomes.

The study's conclusions carry significant policy recommendations for policymakers in developing countries, particularly in the context of globalization and its effects on financial sector reforms and socioeconomic challenges like inequality and poverty. The research underscores the importance of strategically integrating Fintech and financial inclusion initiatives into national financial policies, highlighting that the influx of foreign banks—an outcome of globalization—can adversely impact poverty levels. However, it also emphasizes the positive moderating role of financial technology solutions. Specifically, the expansion of Fintech through mobile accounts and digital payment systems can offer developing countries a pathway to alleviate income inequality exacerbated by global financial flows. Therefore, to harness the benefits of foreign bank entry while addressing issues of inequality and poverty, policymakers should focus on fostering an environment conducive to Fintech development and enhancing financial inclusion initiatives, such as increasing the number of official accounts and promoting digital payment networks. This approach not only aligns with the realities of globalization but also aims to empower local economies and improve financial access for underserved populations.

Conclusion

In this study, we have examined the impact of foreign bank entry, Fintech, and financial inclusion on Inequality and Poverty in developing countries using a panel regression model with PCSE and FGLS estimation techniques. Our analysis covered 108 developing countries over the years 2011, 2014, 2017, and 2021. Key variables such as foreign bank entry level, Fintech, indicators of financial inclusion, poverty, and inequality were considered, with Fintech measured by digital payments and number of mobile accounts, and financial inclusion assessed through access indicators and formal account ownership. Poverty levels were examined using the Poverty headcount ratio, while inequality was measured using the Gini index. Various economic and social determinants were also included in our analysis.

The study results gave evidence of an important moderating role of Fintech and financial inclusion in the relationship between foreign bank entry and the level of poverty and inequality in developing countries. The complementarity observed between the number of official accounts, ATMs, and Fintech innovations confirm that the mutual impact of foreign bank entry and Fintech and financial inclusion on poverty reduction, outweighs the contributions of each factor alone. Conversely, foreign bank entry, number of branches, and number of mobile accounts have a detrimental influence on poverty when analyzed separately; however, their combined effect ultimately lowers poverty levels. In the process of modernizing and reforming the financial sector, policymakers in developing countries should prioritize improving financial inclusion and make greater use of financial technology (Fintech). This strategy is necessary to guarantee the best possible benefit of the foreign bank entry as a means of eradicating poverty. In terms of inequality, the study findings indicate a significant positive (detrimental) impact of foreign bank entry, ATMs, digital payments, and mobile accounts of the

level of inequality. Specifically, the interaction between the number of ATMs and foreign bank entry reveals a negative impact, implying that increased ATMs mitigate the adverse effects of foreign bank presence on inequality. Additionally, the interactions among foreign bank entry and Fintech variables (MoRDig and MobAcc), suggest that the influence of these financial technologies on inequality is affected by the presence of foreign banks. Where Fintech are becoming more and more important, the benefits and drawbacks of having foreign banks become more apparent. Hence, in order to maximize the benefits of foreign bank entry on inequality and poverty in developing countries, policymakers should concentrate on creating an atmosphere that supports the development of Fintech solutions and strengthening initiatives for financial inclusion.

Policy Implications

The findings of this study underline the significant moderating roles of fintech and financial inclusion initiatives within the broader context of globalization. Policymakers should take the following actions:

- **Prioritize Global Financial Inclusion:** Given the increasing global interconnectedness, it is imperative for policymakers to enact policies that boost the number of formal financial accounts and broaden access to various financial services, including ATMs and digital payment systems that connect local communities to a global financial network.
- **Leverage Global Fintech Innovations:** Encourage the development of fintech solutions tailored to the specific needs of underserved populations to ensure equitable access to financial resources. Strategies that integrate local fintech innovations with global financial trends can significantly enhance inclusion.
- **Monitor Foreign Bank Dynamics in a Globalized Context:** Establish mechanisms to monitor the effects of foreign bank entry on local economies within the context of globalization, allowing for timely interventions that appropriately address adverse impacts on poverty and inequality.

By implementing these targeted strategies, informed by our findings, policymakers in developing countries can effectively harness the benefits of foreign bank entry while minimizing potential drawbacks in a globally interconnected financial landscape, fostering improved economic outcomes for marginalized communities.

Future insights

Future research could give critical importance of accounting for clustering of standard errors by both country and time in panel data analyses. This methodological enhancement will not only improve the robustness of results but also provide clearer insights into the temporal dynamics of the interplay between foreign bank entry, fintech innovations, and socio-economic outcomes in developing countries. Moreover, future research could investigate the causal mechanisms through which foreign bank presence and fintech innovations interact in different regional settings. Moreover, the longitudinal design might allow for an exploration of how these relationships may change over time, thereby providing more detailed insights into the transformative potential of fintech to change the financial landscape of developing countries.

Statements & Declarations.

Funding.

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

Ethical statement.

This article does not contain any studies with human participants performed by any of the authors.

CRediT authorship contribution statement

Chadi Azmeh: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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