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Financial inclusion and macroeconomic outcomes in developing economies: pre-COVID insights on growth, stability, and inequality

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Abstract

This study examines the impact of financial inclusion on key socio-economic outcomes, namely economic growth, financial stability, and income inequality, during the pre-COVID era. We develop a composite Financial Inclusion Index (FII) using a multidimensional framework encompassing indicators of availability, usage, and penetration dimensions. The analysis covers 60 developing countries from 2005 to 2019 and employs the two-step System Generalised Method of Moments (GMM) to address potential endogeneity and dynamic panel bias. The results reveal that financial inclusion significantly promotes economic growth, particularly by improving access to banking. However, it shows no statistically significant relationship with financial stability. In contrast, higher financial inclusion appears to widen income inequality, likely due to unequal access to financial services and uneven distribution of benefits. By applying a unified FII across three macroeconomic outcomes using a consistent sample and methodology, this study provides comprehensive insights into the multifaceted effects of financial inclusion in developing economies. The findings underscore the need for policies that enhance access to finance, strengthen financial literacy, and promote responsible lending to ensure that financial inclusion contributes to inclusive and stable economic development.

Keywords Financial inclusion, Economic growth, Financial Stability, Income Inequality, Developing Economies, Cross-Country Panel Data, Financial Development

JEL Classification G21, O16, D63

Introduction

The role of financial inclusion (FI) in promoting inclusive economic development has attracted increasing attention from policymakers and scholars, particularly in developing economies. The momentum intensified in the aftermath of the Global Financial Crisis, where vulnerabilities in financial systems highlighted the need for more equitable access to financial services. Financial inclusion, in

general, is defined as a concept of ensuring people to have access to and to be included in the formal financial system. A lack of finance is often linked to the underlying causes of persistent income inequality and slower growth [18]. As a result, FI has been recognised as a critical enabler for at least 10 SDGs, including poverty reduction, reduced inequalities, and better economic growth [44].

Despite steady progress, significant gaps in financial access remain. The global share of adults with access to formal financial services increased from 51% in 2011 to 76% in 2021, yet approximately 1.4 billion adults remain unbanked, most of whom reside in developing countries such as India, Pakistan, Indonesia, Bangladesh, Egypt, and Nigeria [23]. Literature argues that financial inclusion enhances economic efficiency by improving capital allocation, managing risk, and encouraging productive

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investment. At the micro level, it empowers individuals by providing access to savings, credit, and insurance, enabling greater financial stability and livelihood opportunities. Nevertheless, its broader macroeconomic implications, especially its impact on economic growth, financial stability and income inequality, remain empirically contested [9, 19]. Existing research leaves several gaps. Most studies examine a single macroeconomic outcome, either growth, stability, or inequality, rather than analysing these dimensions jointly, which limits understanding of potential trade-offs and synergies. Measurement inconsistencies further complicate comparisons, as FI is often proxied by isolated indicators rather than comprehensive indices. Moreover, the theoretical pathways linking financial inclusion to macroeconomic outcomes are seldom clearly outlined, even though it is plausible that the effects may differ, for example, savings could enhance resilience, while credit-driven inclusion might instead create fragility.

Hence, to address this gap, this study aims to empirically examine the impact of financial inclusion on three key macroeconomic goals: economic growth, financial stability, and income inequality by using the same measure of financial inclusion. This study constructs a Financial Inclusion Index (FII) for 90 developing countries over 15 years to measure FI conditions in our sample countries, which is one of the study's contributions. Furthermore, by employing a unified measure of FI across all three outcomes, this study offers a holistic, comparative assessment that advances theoretical understanding and supports practical policymaking in development finance, especially in developing countries. Additionally, our analysis covers the period from 2005 to 2019, representing a meaningful pre-COVID era that allows the examination of long-term structural relationships in the absence of pandemic-related distortions. While this period encompasses episodes such as the 2007–2009 global financial crisis (GFC), the GFC is accounted for by including a crisis dummy variable in the empirical model. This historical baseline is especially valuable for policymakers seeking to evaluate the resilience and effectiveness of financial systems during the post-pandemic recovery. It also provides essential context for identifying which financial inclusion mechanisms were most strongly associated with macroeconomic improvement before the pandemic disruptions in 2020 and beyond.

The remainder of the paper is structured as follows. The next section reviews the theoretical foundations and past literature on the impact of financial inclusion. This is followed by the research methodology section, detailing the construction of the FII and the approach to analysing its effects on growth, stability, and inequality. The following sections present and discuss the results. Lastly, the

paper concludes by summarising the findings and outlining policy implications.

Literature review

Theoretical foundation: financial development – growth nexus

The impact of financial inclusion is rooted in the broader link between financial development and economic growth. Schumpeter [68] argued that financial intermediaries are crucial for technological progress and economic development by mobilizing savings, allocating capital efficiently, and managing risk. Building on this, Gurley and Shaw [26] and Goldsmith [25] highlighted that well-developed financial systems accelerate growth by creating institutions that channel resources more effectively. The financial repression hypothesis by [49] further showed that restrictive policies distort credit allocation and slow down growth, emphasising the need for liberalization. Empirical studies, such as those by King and Levine [43], confirmed that financial development predicts long-term growth and boosts productivity through better resource allocation and risk diversification.

At the same time, recent research questions the simple "more finance, more growth" idea. Evidence suggests an inverted U-shaped relationship, in which excessive financial deepening can threaten stability and growth [10, 61, 65]. This argument shifts attention from quantity to quality and inclusiveness. Since the early 2000s, studies have shown that inclusive financial systems help distribute resources more fairly, reduce volatility, and support entrepreneurship, thereby linking financial development to broader goals such as poverty reduction and income equality [8, 11]. Modern approaches now emphasize not just depth, but efficiency and inclusion, positioning financial inclusion as a key foundation for resilient and equitable economic development. Recent literature argues that inclusive systems enhance allocative efficiency by channelling credit to SMEs and households, promote entrepreneurship and human capital investment. This reduces vulnerability through savings and insurance, which stabilise consumption and aggregate demand. At scale, inclusion diversifies risk and strengthens policy transmission, linking finance to poverty reduction and sustainable, equitable growth [11, 20].

Empirical studies: financial inclusion impacts on economic growth

Economic growth symbolises the prosperity of a nation. It is often associated with better conditions in a country where a growing GDP is always taken as evidence of a progressing society. FI is increasingly introduced as another determinant of economic growth, and much literature investigates the relationship

between the two [58]. A handful of studies select India as a sample country and demonstrate a positive relationship between them [46, 69, 71, 74]). Furthermore, empirical studies are also being done on cross-country samples. For example, a survey of 42 African countries [47] and 37 countries in Sub-Saharan Africa [35] suggests a positive relationship between FI and economic growth. A study by Ali et al. [3] focuses on the Islamic Development Bank (IsDB) member countries and finds that FI positively affects economic growth, recommending it as a driver of growth in the short and long run. A recent study by Siddiki and Bala-Keffi [73] reassesses the relationship between FI and economic growth using data from 153 countries from 2011 to 2020. It extends the study of Abdul Karim et al., [1] by increasing the sample countries and examining the impact of FI based on the level of development and institutional environment of the countries. Through threshold analysis, the study finds that once a developing country reaches a certain level of FI, the benefits from FI are higher, implying a significant role of FI in developing economies. Overall, the empirical evidence largely supports the view that financial inclusion contributes positively to economic growth.

Empirical studies: financial inclusion impacts on financial stability

Although complex, the linkage between FI and financial stability can be categorised into synergies or trade-offs. Khan [40] argued that FI and financial stability must co-exist, as it is challenging to have inclusive finance without financial system stability. Meanwhile, continuous financial stability is impossible if a large portion of society remains financially excluded. A group of literature discusses channels through which FI and financial stability could work in tandem [17, 24, 30, 40]. Furthermore, some studies reaffirmed the argument by finding some evidence that an increased share of lending to SMEs aids financial stability by reducing non-performing loans and the probability of default by financial institutions [53, 72]. Nevertheless, there are always risks associated with expanding access. The participation of previously excluded households in the financial system is associated with high transaction and information costs, leading to inefficiencies that are difficult to resolve due to a lack of collateral or credit history [24, 50]. This implication is supported by a recent empirical study on 19 African countries for the period 2006–2022, which it finds that the FI-financial stability nexus exhibits non-linearity, meaning that after a certain threshold, FI reduces financial stability [39].

Empirical studies: financial inclusion impacts on income inequality

Global data shows a strong link between financial inclusion and income equality. For example, Sweden has a low Gini coefficient (28) and equal access to bank accounts across income groups, while Indonesia exhibits higher inequality and a financial inclusion gap between the rich and poor [15]. It was argued that FI could help mitigate the barriers to expanding economic opportunities, improve the efficiency of capital allocation, and consequently reduce the inequality gap in society [11, 22]. A majority of studies investigating the relationship between FI and income inequality on a cross-country level demonstrated a negative relationship between them; a higher FI level results in lower income inequality [31, 42, 52, 54, 57, 59, 60]. Kebede et al., [38] in their study on 23 African countries, find that FI reduces income inequality and has a more favourable distributional effect at higher quantiles of inequality and in countries with higher institutional quality. Nevertheless, some findings suggest that not all financial products are equally effective in reducing poverty and income inequality. A study on more than 100,000 households in China found that access to savings accounts mitigates the investment gap in education. Expansion of credit access, such as microcredit loans, has a less clear impact on poverty and inequality reduction [45]. As summarised by Banerjee et al., [7] the effect of microcredit is "modestly positive, but not transformative."

Research methodology

Financial inclusion index (FII)

This study constructs its own FII by following Sarma's (66, 67) multidimensional approach, as it is straightforward and easy to compute. Sarma's "distance-based" approach has been used widely in the literature and it is similar to well-known indexes such as the Human Development Index (HDI) and the Gender Development Index (GDI) [66, 67]. This method first calculates a sub-index for each dimension and then aggregates them as the normalised inverse of the Euclidean distance from an ideal reference point. Then, it is normalised by the number of dimensions included in the aggregate index. Based on previous studies, we employ six proxy indicators and categorise them into three primary and widely used dimensions of FI [2, 51, 55, 60, 67, 75].

This reconstruction of our own FII is due to several factors. First, FI is a multidimensional concept; therefore, measuring it requires a comprehensive approach that encompasses several aspects, including availability, penetration, and usage. Furthermore, FI challenges differ from country to country or region to region. Hence, we

customise our FII by including the most relevant indicators for our sample countries. Lastly, with our self-developed index, we are able to improve comparability across regions, as in our case, across developing countries. There is a need to develop a consistent measure of FI for a large sample of developing economies, which will be used to standardise the measure of FI so that a concrete result can be achieved. Hence, the dimensions, proxies and their weightage in the FII are shown in Table 1.

The selection of the above dimensions and proxies is mainly motivated by data availability and a strong emphasis in the literature. The data for the construction of the FII is mainly sourced from the IMF's FAS database. Following Sarma [67], the dimension index, d_i , is computed as:

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i} \quad (1)$$

where A_i is the actual value, m_i is the minimum value, M_i is the maximum value of dimension i , and w_i is the weight assigned to each indicator. The FII for country i is then measured by the average of the normalised Euclidean distance between X and O (the first part of Eq. (2)) and the normalised inverse of Euclidean distance of point di computed in Eq. (1) from the ideal point I which is equal to 1 (the second part of Eq. (2)). Hence, the formula for constructing the index is as follows:

$$FII = \frac{1}{2} \frac{\sqrt{d_1^2 + d_2^2 + \dots + d_n^2}}{\sqrt{w_1^2 + w_2^2 + \dots + w_n^2}} + \left(1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + \dots + (w_n - d_n)^2}}{\sqrt{w_1^2 + w_2^2 + \dots + w_n^2}} \right) \quad (2)$$

Table 2 presents the results of the FII calculation and the countries' ranks based on the average 15-year period from 2005 to 2019. Several observations are noted. First, most of the top ten countries are high-income or upper-middle-income, except Lebanon. On the other hand, the bottom ten countries are primarily from low- and

lower-middle-income countries, except for Gabon and Equatorial Guinea, which are upper-middle-income economies. As also found by Sarma [67], this indicates that a country's income is a crucial factor in determining access to finance and that the two are positively related. Second, we also notice that some countries have tremendous changes in FI levels. For example, in 2011, there were 136 deposit accounts per 1,000 adults, which rose to 700 by 2019, while loan accounts grew from 20 to 108 per 1,000 adults during the same period in Zimbabwe. Finally, there are fewer countries categorised as the low FII group in 2019 than at the beginning of the study, indicating an overall improvement in the FI level.

Data and variables

This study adopts macro-level analysis. Our sample focuses on developing countries, and our data is on the country level. To estimate the impact of FI, we employed unbalanced panel data from 60 developing countries for 15 years, from 2005 to 2019. Our primary data source for the FII is the IMS's FAS, whereas, for controlled variables, the primary data sources are the WDI and the GFDD. These variables are widely used in the extant literature [15, 29, 37, 53, 64, 77]. A brief description of the data is shown in Table 3.

Empirical approach

This study utilises dynamic panel models to estimate the

impact of FI and the factors that influence it. Hence, the following baseline model is written as follows:

$$Y_{it} = \alpha Y_{it-1} + \beta FI_{it} + \gamma X_{it} + \lambda_i + \varepsilon_{it} \quad (3)$$

where Y_{it} is the measure of economic growth or income inequality for country i in period t , FI_{it} is the measure of

Table 1 FII dimensions, proxies and weightage

Dimension	Proxies	Weightage ^a
Availability	Number of commercial bank branches per 1,000 km ²	2/3
	Number of ATMs per 1,000 km ²	1/3
Penetration	Number of deposit accounts with commercial banks per 1,000 adults	½
	Number of loan accounts with commercial banks per 1,000 adults	½
Usage	Outstanding deposits with commercial banks (% of GDP)	½
	Outstanding loans from commercial banks (% of GDP)	½

^a From 2005 to 2019, the ratio of ATMs to branches per 1000 km² is 2.21, indicating an average of 2 ATMs per branch in the sample countries. Therefore, the branch index is weighted 2/3, and the ATM index 1/3 in the banking availability dimension, similar to Sarma's [67] method. For the banking penetration dimension, equal weights of ½ are assigned to the number of deposit and loan accounts, reflecting their equal importance, supported by Mialou et al. [51]. Similarly, for the banking usage dimension, equal weights are given to outstanding deposits and loans as a percentage of GDP, aligning with the approach of Mialou et al. [51] and Sarma [67]

Table 2 Countries rank based on FII average (2005–2019). *Source:* Author's own calculation

Rank	Country	Fii average	Rank	Country	Fii average
1	Poland	0.84180	46	Namibia	0.39929
2	Malaysia	0.80246	47	Indonesia	0.39906
3	Mauritius	0.77922	48	Saudi Arabia	0.39026
4	Brunei Darussalam	0.75074	49	Bhutan	0.37520
5	North Macedonia	0.74472	50	Argentina	0.35162
6	The Bahamas	0.73924	51	Egypt, Arab Rep	0.34496
7	Chile	0.73409	52	Kenya	0.34287
8	Bulgaria	0.72351	53	Micronesia	0.32902
9	United Arab Emirates	0.71225	54	Botswana	0.32208
10	Lebanon	0.70909	55	Uzbekistan	0.32019
11	Trinidad and Tobago	0.69953	56	Peru	0.30636
12	Costa Rica	0.68194	57	Cambodia	0.28729
13	Seychelles	0.67007	58	Lao PDR	0.26900
14	Panama	0.64936	59	Ecuador	0.26297
15	Latvia	0.64858	60	Nicaragua	0.25686
16	Montenegro	0.64625	61	Pakistan	0.25440
17	Thailand	0.63170	62	Algeria	0.25263
18	Hungary	0.62625	63	Djibouti	0.25233
19	Guatemala	0.60918	64	Guyana	0.25040
20	Bosnia and Herzegovina	0.60597	65	Eswatini	0.23428
21	Morocco	0.60295	66	Kyrgyz Republic	0.22824
22	West Bank and Gaza	0.59750	67	Bolivia	0.22121
23	Maldives	0.58840	68	Haiti	0.21102
24	El Salvador	0.58295	69	Rwanda	0.19082
25	Georgia	0.56033	70	Lesotho	0.17524
26	India	0.55339	71	Gambia, The	0.17365
27	Moldova	0.53752	72	Solomon Islands	0.16061
28	South Africa	0.53050	73	Zimbabwe	0.15800
29	Armenia	0.51124	74	Myanmar	0.13666
30	Bangladesh	0.50232	75	Malawi	0.13030
31	Brazil	0.50185	76	Tanzania	0.12198
32	Jordan	0.50151	77	Comoros	0.12177
33	Colombia	0.48754	78	Burundi	0.11922
34	Dominican Republic	0.48644	79	Uganda	0.11401
35	Sao Tome and Principe	0.48264	80	Zambia	0.11150
36	Tonga	0.45202	81	Gabon	0.10281
37	Honduras	0.45200	82	Cameroon	0.08825
38	Jamaica	0.44619	83	Madagascar	0.07827
39	Suriname	0.44225	84	Afghanistan	0.07710
40	Mauritania	0.42996	85	Equatorial Guinea	0.07587
41	Nepal	0.42752	86	Chad	0.06494
42	Mongolia	0.42669	87	Central African Rep	0.05515
43	Belize	0.42142	88	Guinea	0.05371
44	Samoa	0.40677	89	South Sudan	0.04878
45	Fiji	0.40558	90	Congo, Dem. Rep	0.03840

Table 3 Variables, source and summary statistics

Variables	Source	Obs	Mean	Std. dev
Real GDP per capita (US\$)	WDI	577	6076.24	6416.25
GINI index	SWIID	577	46.02	6.971
Financial inclusion index	Author's calculation	577	0.433	0.235
Inflation (%)	WDI	557	5.658	11.83
Private credit by Deposit money banks (%)	GFDD	566	41.34	25.54
Trade openness (%)	WDI	567	81.93	37.48
Gross fixed capital formation (%)	WDI	561	23.90	6.783
Unemployment (%)	WDI	569	8.445	6.898

FI for country i in period t , X_{it} is a vector of controlled variables for country i in period t , λ_i is a country-specific effect, and ε_i is a white noise disturbance. We begin our analysis by estimating Eq. (3) using an unbalanced panel dataset of 60 developing countries covering 15 years from 2005 to 2019. Due to data unavailability, especially in income inequality data, we exclude 30 countries from the FII index, leaving us with 60 sample countries for the estimation procedure.

We employ the system generalised method of moments (GMM) estimator with Windmeijer [78] corrected standard errors based on the methodology developed by Arellano and Bover [4] and Blundell and Bond [12] to address potential endogeneity and dynamic panel bias caused by the inclusion of lagged dependent variables. Compared to Difference GMM, System GMM is more efficient when variables are persistent over time, as it uses both levels and differences as instruments. Unlike Fixed Effects or OLS, it provides consistent estimates in the presence of endogenous regressors while controlling for unobserved heterogeneity. Additionally, System GMM is known for handling unbalanced panels, allowing the inclusion of countries or periods with missing data without discarding entire observations. This approach is also appropriate given that prior studies suggest a largely linear relationship between financial inclusion and macroeconomic outcomes. Nevertheless, the consistency of the parameter estimates by the GMM estimators depends critically on the absence of serial correlation in ε_{it} and the validity of the instruments. Therefore, we conduct two specification tests: (i) the Arellano-Bond serial correlation test and (ii) Hansen's (1982) J-statistic. The test for the second-order serial correlation (AR2) and Hansen's J-statistic should not be rejected to ensure that the model does not suffer from serial correlation and that the instruments are valid. Our estimations pass all diagnostics tests needed for the System GMM estimation.

Results: socio-economic outcomes of financial inclusion

Financial inclusion and economic growth

Table 4 presents the relationship between FI and economic growth measured by real GDP per capita. Due to the high correlation¹ between the FII and Private Credit, we run two models, one with and one without the Private Credit variable, to observe whether combining them affects our main result. Based on our estimation, FI is significant and positively related to the real GDP per capita, as shown in the left panel of Table 4. This positive and significant relationship demonstrates the crucial role of FI in the development of the economy in our sample countries, where one standard deviation increase in FII leads to a rise of 3.6% ($0.153 \times 0.235 = 0.036$)² in the GDP per capita. For example, if Guatemala increases its FI level by 0.235 from 0.609³ to 0.844, similar to Poland's FI level, the GDP per capita is expected to grow by 3.6%. This result aligns with numerous cross-country studies that find a positive relationship between FI and economic growth [35, 41, 47, 70, 76]; to name a few. Several studies also noted that the impact of FI on economic growth is more substantial in developing and emerging countries with lower growth and lower FI rates, where there is significant room to expand and develop the market [32, 56, 76]. As for the control variables, trade openness and gross fixed capital formation are positively correlated with GDP per capita and significant at 10% level. The dummy GFC, which controls for the impact of the global crisis on the world's economy from 2007 to 2009, is significant and negatively affects the economy, consistent with our expectations.

¹ Refer to the correlations table attached in Appendix I.

² The standard deviation for FII, as reported in Table 3, is 0.235.

³ Refer to Table 2 on FII average for all countries.

Table 4 Impact of financial inclusion on economic growth

Dependent variable: Log of GDP per capita (LGDPPEC)								
Variables	Fii		Dimensions					
LLGDPPEC	0.928*** (0.0304)	0.916*** (0.0319)	0.947*** (0.0225)	0.939*** (0.0247)	0.919*** (0.0348)	0.906*** (0.0382)	0.955*** (0.0200)	0.950*** (0.0208)
Fii	0.153* (0.0870)	0.143* (0.0853)						
Availability			0.103** (0.0458)	0.112** (0.0526)				
Penetration					0.147 (0.103)	0.161 (0.107)		
Usage							−0.0130 (0.0566)	0.0574 (0.0538)
Inflcpi	−0.000881 (0.000654)	−0.000777 (0.000663)	−0.000784 (0.000646)	−0.000783 (0.000712)	−0.000730 (0.000660)	−0.000627 (0.000622)	−0.000609 (0.000656)	−0.000736 (0.000494)
Ltrdopn	0.0733* (0.0421)	0.0786* (0.0414)	0.0865* (0.0524)	0.0870** (0.0435)	0.0666 (0.0486)	0.0652 (0.0428)	0.0683* (0.0388)	0.0798** (0.0371)
Lfixcap	0.0495* (0.0279)	0.0412 (0.0260)	0.0434 (0.0304)	0.0395 (0.0285)	0.0544** (0.0256)	0.0462* (0.0262)	0.0534** (0.0251)	0.0540** (0.0267)
DGFC	−0.0127** (0.00620)	−0.0142** (0.00632)	−0.0138** (0.00689)	−0.0150** (0.00714)	−0.0120* (0.00681)	−0.0130* (0.00675)	−0.0112* (0.00665)	−0.0138** (0.00625)
Lprivcred	−0.0120 (0.0184)		−0.00226 (0.0188)		−0.00218 (0.0182)		0.0344* (0.0188)	
Constant	0.117 (0.260)	0.183 (0.257)	−0.0681 (0.217)	−0.00564 (0.201)	0.188 (0.338)	0.313 (0.355)	−0.181 (0.159)	−0.102 (0.174)
Observations	477	482	477	482	477	482	477	482
Number of countries	57	58	57	58	57	58	57	58
No. of instruments	45	44	45	44	45	44	45	44
AR(2)	0.171	0.187	0.170	0.196	0.178	0.184	0.165	0.162
Hansen's test	0.199	0.173	0.251	0.239	0.178	0.153	0.110	0.167

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; LGDPPEC = logarithm of real GDP per capita, LLGDPPEC = logarithm of initial real GDP per capita, FII = financial inclusion index, AVAILABILITY, PENETRATION, USAGE = financial inclusion index's dimensions, INFLCPI = Inflation, consumer prices, LPRIVCRED = logarithm of private credit by deposit money banks to GDP, LTRDOPN = logarithm of trade, LFIXCAP = logarithm of gross fixed capital formation, DGFC = dummy variable for GFC that equals to 1 for year 2007, 2008 and 2009, and 0 otherwise

The bold shows the variables that are significant based on the p-value

We find that availability is the only dimension that significantly impacts economic growth at a 5% level, as shown in the right panel of Table 4. Therefore, our findings underscore the importance of extending financial access for economic development, especially through banking availability. Access to financial services, such as accounts, deposits, withdrawals, and credit, enables individuals and businesses to save, invest, and manage risks more effectively, thereby contributing to sustained economic growth and greater economic resilience. Despite the growing adoption of digital banking, our findings highlight that physical branches and ATMs remain relevant, especially in the pre-COVID era, due to limited internet connectivity, the need for in-person

assistance in complex transactions, and customer preferences rooted in trust and security.

Financial inclusion and financial stability

Table 5 presents the relationship between FI and financial stability, and we find that the FI variable is insignificant, indicating no concrete evidence of a role for FI in financial stability. Furthermore, none of the FII dimensions shows a significant relationship with financial stability, as shown in the right panel of Table 5. These insignificant results may reflect differences in the quality of financial services, variations in institutional and regulatory frameworks across countries, or time lags before inclusion translates into systemic stability. Moreover, the nexus between FI and financial stability

Table 5 Impact of financial inclusion on financial stability

Dependent variable: Log of Z-score (LZSCORE)								
Variables	Fii		Dimensions					
LLZSCORE	0.785*** (0.0991)	0.771*** (0.106)	0.722*** (0.117)	0.699*** (0.0995)	0.776*** (0.0907)	0.782*** (0.0823)	0.782*** (0.107)	0.730*** (0.111)
Fii	−0.191 (0.376)	0.0128 (0.298)						
Availability			0.146 (0.167)	0.189 (0.179)				
Penetration					−0.268 (0.288)	−0.197 (0.325)		
Usage							0.0511 (0.228)	0.142 (0.149)
LLIQST	−0.0226 (0.0434)	−0.0345 (0.0433)	−0.0361 (0.0465)	−0.0406 (0.0467)	−0.0279 (0.0429)	−0.0431 (0.0451)	−0.0311 (0.0437)	−0.0296 (0.0441)
LGDPCC	0.0775 (0.0975)	0.0507 (0.0781)	0.0236 (0.0655)	0.0581 (0.0729)	0.115 (0.113)	0.104 (0.102)	0.0252 (0.0630)	0.0455 (0.0711)
INFLCPI	0.00167*** (0.000603)	0.00130** (0.000555)	0.00165*** (0.000483)	0.00146*** (0.000506)	0.00173*** (0.000416)	0.00142*** (0.000474)	0.00146** (0.000688)	0.00117*** (0.000454)
DGFC	0.00321 (0.0145)	−0.00392 (0.0178)	0.00590 (0.0146)	−0.00103 (0.0177)	0.00647 (0.0159)	−0.000674 (0.0182)	−0.000376 (0.0146)	−0.00591 (0.0163)
LPRIVCRED	0.0589 (0.0951)		0.00914 (0.0729)		0.0605 (0.0746)		0.0130 (0.0971)	
Constant	−0.126 (0.923)	0.284 (0.617)	0.580 (0.562)	0.382 (0.566)	−0.397 (0.896)	−0.0822 (0.768)	0.399 (0.548)	0.372 (0.501)
Observations	483	490	483	490	483	490	483	490
Number of countries	58	59	58	59	58	59	58	59
No. of instruments	45	48	45	44	45	44	45	44
AR(2)	0.372	0.346	0.371	0.348	0.372	0.341	0.364	0.355
Hansen test	0.461	0.365	0.575	0.501	0.518	0.361	0.503	0.422

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; LZSCORE = logarithm of z-score, LLZSCORE = logarithm of initial z-score, FII = financial inclusion index, AVAILABILITY, PENETRATION, USAGE = financial inclusion index's dimensions, LLIQST = Liquid assets to deposits and short term funding, LPRIVCRED = logarithm of private credit by deposit money banks to GDP, LGDPCC = logarithm of real GDP per capita, INFLCPI = Inflation, consumer prices, DGFC = dummy variable for GFC that equals to 1 for year 2007, 2008 and 2009, and 0 otherwise

The bold shows the variables that are significant based on the p-value

has always been discussed on the premise that it can be either a synergy or a trade-off, with some even finding more trade-offs than synergies [14]. While FI, through a broader depositor base and diversified borrowers, can enhance stability [28, 30, 53], rapid credit expansion, particularly in weakly regulated financial environments, poses systemic risks [40, 50, 64]. In developing economies, regulatory challenges such as weak governance, limited supervisory capacity, and underdeveloped financial infrastructure may impede the effectiveness of FI initiatives. Empirical findings suggest that FI initially fosters stability but transitions into a trade-off as it expands, with governance playing a crucial moderating role [62, 63]. Moreover, access to credit products has been linked to heightened financial instability,

whereas access to savings products exhibits a stabilising effect. Instances such as the U.S. subprime crisis and microfinance repayment crises in multiple countries underscore the risks associated with unregulated credit growth [13].

Financial inclusion and income inequality

As for the impact of FI on income inequality, we find a significant impact, as shown in Table 6. Interestingly, the direction of the coefficient estimate is positive, indicating that an increase in FI is associated with higher income inequality. As our main independent variable,

Table 6 Impact of financial inclusion on income inequality

Dependent variable: GINI Index (GINI_MKT)								
Variables	Fii		Dimensions					
L.GINI_MKT	0.968*** (0.0229)	0.976*** (0.0242)	0.990*** (0.0271)	0.992*** (0.0290)	0.944*** (0.0285)	0.953*** (0.0249)	0.972*** (0.0324)	0.974*** (0.0285)
Fii	2.325*** (0.703)	1.776*** (0.488)						
Availability			1.616*** (0.428)	1.554*** (0.398)				
Penetration					1.726** (0.798)	1.498** (0.682)		
Usage							2.007** (0.875)	1.722*** (0.612)
LGDPPC	−0.662*** (0.162)	−0.688*** (0.136)	−0.481*** (0.168)	−0.547*** (0.178)	−0.636*** (0.166)	−0.665*** (0.152)	−0.528*** (0.195)	−0.592*** (0.178)
INFLCPI	−.00233*** (0.000780)	−.00169*** (0.000469)	−0.000399 (0.000298)	−0.000360 (0.000426)	−0.000470 (0.000620)	−0.000276 (0.000732)	−0.00443** (0.00189)	−0.00317 (0.00204)
LUNEMP	0.267* (0.157)	0.290** (0.141)	0.169 (0.127)	0.170 (0.136)	0.357* (0.216)	0.355* (0.198)	0.282 (0.186)	0.357 (0.225)
DGFC	0.00484 (0.0313)	0.00983 (0.0261)	−0.00236 (0.0272)	−0.000523 (0.0275)	−0.00352 (0.0331)	−0.000682 (0.0312)	−0.0356 (0.0443)	−0.0219 (0.0475)
LPRIVCRED	−0.265 (0.178)		−0.0553 (0.124)		−0.115 (0.170)		−0.130 (0.181)	
Constant	6.232*** (1.954)	5.340*** (1.663)	3.648* (2.014)	3.915* (2.007)	6.881*** (1.799)	6.393*** (1.495)	4.654** (2.180)	4.596*** (1.701)
Observations	482	489	482	489	482	489	482	489
Number of countries	57	58	57	58	57	58	57	58
No. of instruments	45	48	45	45	45	45	45	45
AR(2)	0.315	0.274	0.246	0.241	0.276	0.259	0.240	0.258
Hansen test	0.385	0.611	0.679	0.714	0.523	0.656	0.383	0.316

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; GINI_MKT = SWIID's Gini index, L.GINI_MKT = initial Gini index, FII = financial inclusion index, AVAILABILITY, PENETRATION, USAGE = financial inclusion index's dimensions, LGDPPC = logarithm of real GDP per capita, INFLCPI = inflation, consumer prices, LPRIVCRED = logarithm of private credit by deposit money banks to GDP, LUNEMP = logarithm of unemployment, DGFC = dummy variable for GFC that equals to 1 for year 2007, 2008 and 2009, and 0 otherwise

The bold shows the variables that are significant based on the p-value

the FII, and the dependent variable, the GINI coefficient, are both in index form, it is more intuitive to discuss the result in terms of one standard deviation change. Hence, based on the coefficient estimate of 2.325 in the full model in Column (3), one standard deviation increase in FI is associated with an increase in income inequality of 0.546 points, which is 7.83% of the standard deviation of income inequality.⁴ For example, if Indonesia's FI level

grows by 0.235 from 0.399⁵ to 0.634, the country's income inequality is expected to increase by 0.546 points. The positive link between FI and income inequality is consistent with our correlation result, which shows a positive correlation between the FII and Gini coefficients.⁶ Our result contradicts most of the literature, which finds a negative relationship between FI and income inequality; in other words, FI helps reduce income inequality. Nevertheless, some studies on financial development find that more finance increases income inequality, such as the study by [27]. Some others find that finance narrows income inequality only up to a certain point, and beyond that, it worsens the inequality gap [21, 37].

The positive relationship between FI and income inequality also reveals that while access to finance has

⁴ The standard deviation of FII in our sample is 0.235, while that of the Gini coefficient is 6.97. Therefore, one standard deviation increase in financial inclusion ($2.325 \times 0.235 = 0.546$) which means an increase in income inequality by 0.546 points, which is 7.83% of the standard deviation of the Gini coefficient ($0.546/6.97 = 0.0783$).

⁵ Refer to the FII average in Table 2.

⁶ Refer to correlation table in Appendix I.

expanded, inequality in access persists [5, 6]. These inequalities often stem from high fixed costs of delivering financial services, regulatory barriers to entry, and information or transaction costs [16]. Vulnerable groups, such as the poor or small enterprises lacking collateral, credit histories, or established networks, are disproportionately excluded, thereby exacerbating income inequality. To investigate which FI channel impacts income inequality most, we decompose the FII into its dimensions, as shown in the right panel of Table 6. As shown, all three dimensions are significant, with the banking usage dimension contributing the most, based on its coefficient value. Banking penetration ranks second, while banking availability ranks third. As both usage and penetration dimensions include credit indicators, these findings align with our earlier discussion, in which increased access to credit can lead to over-indebtedness among the vulnerable. This potentially widens the income inequality gap, especially in developing countries, as in our sample, where limited financial literacy and relatively weak governance structures constrain the equitable distribution of financial benefits. Therefore, our findings provide additional evidence supporting the notion that including more people in the formal financial system does not necessarily reduce income inequality, and that not all financial products are equally effective at reducing inequality [19].

Robustness checks

We use the pooled OLS (POLS) and fixed effect (FE) estimators as a yardstick to ensure consistency of our GMM estimations. The POLS estimation of a dynamic panel model yields an upward bias of the coefficient of the lagged dependent variable. Meanwhile, the FE estimator tends to result in a downward bias. Therefore, the consistent estimate of the lagged dependent variable should lie between the POLS and the FE estimates of the lagged dependent variable [34]. Some studies, such as Jha [36] and Marrero [48], have demonstrated the use of this approach. Therefore, we present the lagged dependent variable of the POLS, FE, and the two-step system GMM method in Appendix II. Additionally, due to the high correlation between FII and Private Credit, we provide estimation results with and without the Private Credit variable to assess whether combining them affects our main result.

Conclusion and policy implications

This study investigates the macroeconomic consequences of financial inclusion in developing economies during the pre-COVID period, constructing a composite Financial Inclusion Index and estimating its effects on economic growth, financial stability, and income inequality using

dynamic panel techniques on 60 developing countries. We find that FI positively impacts economic growth, and the banking availability dimension, proxied by the number of commercial bank branches and ATMs, significantly contributes to better economic growth before the COVID-19 pandemic. However, we find no evidence to support the role of FI in impacting financial stability, and none of the dimensions exhibit a significant relationship. Interestingly, our results show that an increase in FI leads to a rise in income inequality, with the banking usage and penetration dimensions contributing the most. This result supports the notion that not every financial product effectively reduces inequality; for instance, credit products could increase inequality if not adequately regulated and supervised, leading to over-indebtedness.

This study contributes in several ways. First, this study constructs an FI index (FII) for 90 developing countries over a 15-year period, where we find that FI levels in many developing countries in our sample have improved significantly, indicating an increased awareness of the importance of FI for more prosperous socio-economic growth. Secondly, this study also contributes to the body of literature by investigating the impact of FI on multiple macroeconomic goals, i.e., economic growth, financial stability, and income inequality, by using a consistent measurement of FI on the same sample of countries. This approach provides a comprehensive understanding of how FI affects the social and economic development, particularly in developing countries. Furthermore, by decomposing FI into availability, penetration, and usage dimensions, the study reveals that physical access remains critical for growth, while credit-driven inclusion can exacerbate inequality without necessarily improving stability. These insights highlight the need for policies that extend access responsibly, promote savings-led inclusion, and strengthen financial literacy and governance to ensure that inclusion translates into equitable and sustainable development. Moreover, by focusing on the 2005–2019 timeframe, this research captures the evolution of FI in a relatively stable macro-financial context, before the unprecedented shocks of the COVID-19 pandemic. As such, the study provides a valuable benchmark to understand the structural relationship between FI and macroeconomic outcomes, enabling policymakers and researchers to better assess how inclusion mechanisms performed before the pandemic and where resilience or fragility existed.

From a policy perspective, the findings highlight several implications. First, as FI positively influences economic growth, particularly through improved banking accessibility, it underscores the need for physical and digital expansion, especially in the post-pandemic era. However, FI does not significantly impact financial stability

Table 7 Correlation Matrix of Main Variables. Source: Authors' own calculation

Variables	GDP	Z-score	GINI	Fii	Inflation	Private Credit	Trade Openness	Fixed Capital Formation	LADSTF	Unemployment
GDP per capita	1									
Z-score	0.1016	1								
GINI index	0.0034	-0.1028	1							
FII	0.5451	0.0588	0.0289	1						
Inflation	-0.1413	-0.0158	-0.0005	-0.1479	1					
Private Credit	0.4362	0.1934	-0.0504	0.7673	-0.1344	1				
Trade Openness	0.3537	0.182	0.1154	0.4459	-0.0764	0.507	1			
Fixed Capital Formation	0.0593	0.1477	0.0498	0.0887	-0.0838	0.1157	0.1972	1		
Liquid Assets to Depo. & STF	-0.0324	-0.0397	-0.0524	-0.2518	0.0501	-0.2441	0.1035	0.0059	1	
Unemployment	0.0122	-0.0074	0.4698	0.1687	-0.0629	0.0067	0.298	0.0552	0.1016	1

The bold shows the high value of correlation between the FII and Private Credit variable

and may increase income inequality, requiring careful policy design. Policymakers should implement robust risk management frameworks, responsible lending practices, and transparent credit options to prevent excessive debt accumulation, particularly among vulnerable groups. Beyond access, government support, especially in financial literacy, is crucial in ensuring individuals can effectively utilise financial services [33]. Without adequate financial education, individuals may struggle to understand financial products and services, leading to poor financial decision-making and exclusion from the formal financial system. Strengthening financial literacy initiatives through targeted policies and educational programs can empower individuals, enhance financial stability, and reduce economic disparities.

One key limitation of this study is the exclusion of digital finance from the FII despite its growing importance in financial accessibility, especially in the post-pandemic era. Future studies should include digital finance metrics, such as mobile money, fintech usage and digital banking, when more data becomes available. Additionally, the data gaps in FI and income inequality limited the sample to 60 countries. Future studies could explore country-specific or regional analyses to better understand how local regulations, financial infrastructure, and socio-economic conditions shape FI outcomes.

In conclusion, this study finds that financial inclusion, as it evolved in the pre-pandemic decade and a half, supports economic growth but may have unintended consequences for inequality and has no clear effect on financial system stability. As countries rebuild and redesign financial systems in the post-COVID landscape, the lessons from this pre-crisis period are critical. A resilient and inclusive financial future will depend not just on expanding access but on ensuring that access is equitable, responsible, and accompanied by the knowledge and protections needed for long-term development.

Competing Interests

The authors declare no competing interests.

Ethical approval and consent to participate

Not applicable (no human or animal subject has been used in this study).

Consent for publication

Not applicable (no person's data in any form has been used in this study).

Appendix

See Table 7 and 8

Author contribution

Amiratul N. Hasan wrote the main manuscript text. Mansor Ibrahim and Kinan Salim contribute to the concept of the paper, the flow of writing, and the discussion of the findings. All authors reviewed the manuscript.

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Data availability

The datasets analysed during the current study are available in the World Bank [<https://data.worldbank.org/>], and International Monetary Fund database website [<https://data.imf.org/en/Data-Explorer>].

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Table 8 Robustness checks: Lagged dependent variable of POLS, FE and two-step System GMM

	POLS	Fixed effect	Two-step system GMM	
VARIABLES	(1)	(2)	(3)	(4) (without PrivCred)
L.LGDPPC	0.996*** (0.00190)	0.883*** (0.0102)	0.928*** (0.0304)	0.916*** (0.0319)
L.LZSCORE	0.964*** (0.0104)	0.532*** (0.0380)	0.785*** (0.0991)	0.771*** (0.106)
L.GINI_MKT	0.996*** (0.00190)	0.883*** (0.0102)	0.968*** (0.0229)	0.976*** (0.0242)

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