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Financial Inclusion and Economic Growth as Pathways to Poverty Reduction: Evidence from OECD Countries

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Abstract: Financial Inclusion (FI) and Economic Growth (EG) are widely documented as crucial elements in Poverty (POV) alleviation; however, evidence on their linkages with POV remains scant in advanced economies. This study examines the linkages among FI, EG, and POV OECD countries from 2008 to 2019. The study aims to assess the short-run and long-run relationships among these factors and determine the direction of causality. Panel data for the principal variables were obtained from the World Bank's World Development Indicators (WDI). Panel cointegration analysis and the Mean Group (MG) estimator were employed to determine the existence of long-run equilibrium relationships and to estimate long-run and short-run linkages. Further, a Granger causality test was conducted to analyze the possible causal relations among variables. The results confirm a long-run negative relationship among FI, EG, and POV across countries. The results indicate that FI and EG negatively affect POV in the long run, whereas the short-run evidence is not convincing. In the short run, only one FI indicator is significantly associated with poverty, while the other remains insignificant. The Granger causality results show that FI, EG, and POV have two-way relationships. These findings suggest that policies aimed at expanding access to and use of formal financial services, alongside practices that promote economic progress, can contribute to poverty reduction. This study contributes to the empirical literature by examining the associations between FI, EG and POV alleviation in the OECD nations over time.

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INTRODUCTION

Financial inclusion has emerged as a phenomenon attracting the attention of academics, policymakers, and regulators over the past decade. Substantial initiatives have been made globally to encourage financial inclusion, and the topic has received considerable interest. It generally refers to ensuring that all individuals in an economy can access accessible and

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affordable formal financial systems, services, and products at an affordable cost. According to Sarma (2016), financial inclusion is a process that enables individuals to access, use, and participate effectively in the formal financial system. Formal financial services of essential nature include account facilities for receipts and payments, savings and credit, money transfer services, insurance, and remittance services. Because it can reduce poverty and stimulate economic growth, financial inclusion has remained prominent in development finance and economics over the years. Two core reasons underlie the growing interest in financial inclusion. First, inadequate financial infrastructure caused by financial exclusion can inhibit economic growth by constraining financial intermediation and efficient capital allocation (Greenwood & Jovanovic, 1990; Angadi, 2003). Secondly, policymakers have increasingly recognized that financial inclusion can play a crucial role in alleviating poverty and fostering economic and social development (Cull et al., 2014). However, financial inclusion's contribution to poverty alleviation may depend on its association with other macroeconomic conditions, including economic growth. The relationship between financial inclusion and economic growth therefore is relevant to the extent to which broader financial access contributes to poverty reduction.

Increasing financial inclusion across all income groups can enhance participation in economic activities and help to achieve more inclusive growth. Greater access to financial services is also believed to foster capital accumulation and credit creation, thereby supporting investment and economic activity. According to Martinez (2011), expanding access to financial services can serve as a crucial policy mechanism for promoting economic growth. Ganti and Acharya (2017) argue that financial inclusion is positively related to economic growth. They also place financial inclusion at the center of supply-side approaches to financial sector development. Formal credit access promotes self-employment, which therefore helps address the economy's unemployment problem. Moreover, economic growth is positively related to financial inclusion, as shown by increased banking penetration, the spread of banking services, and greater use of deposit services (Sharma, 2016). In addition, other studies focusing on individual countries, such as Ghosh (2011), Andrianaivo and Kpodar (2011), Hariharan and Marktanner (2012), Angadi (2003), and Van et al. (2021), indicate that expanding financial inclusion contributes to higher levels of economic growth. Although financial inclusion and economic growth are considered key drivers of poverty reduction, empirical evidence on the link between poverty, financial inclusion, and economic growth in OECD member countries remains limited.

Expanding access to formal financial services has emerged as an important pathway toward poverty reduction. It enables individuals to use essential financial facilities, such as savings, loans, insurance, and payment services. Extant empirical evidence has demonstrated that poverty is adversely influenced by access to formal financial services (see e.g., Beck et al., 2007; Burgess & Pande, 2005; Honohan, 2004; Honohan, 2008). Erlando et al. (2020) demonstrate that socioeconomic development positively promotes financial inclusion and reduces poverty in Indonesia. Similarly, Khan et al. (2022) find that greater financial inclusion

reduces poverty and income inequality and improves financial stability. Limited access to essential financial services may compel low-income individuals to rely on expensive informal financial providers, placing additional financial burdens on vulnerable households. Therefore, Inoue (2018) argues that expanding the depth of public-sector banking can strengthen poverty alleviation through greater financial inclusion. As vulnerable individuals gain improved access to financial facilities, they may invest in human capital and small businesses to lift themselves out of poverty and reduce overall poverty (Shukhla et al., 2012).

Additionally, Omar and Inaba (2020) assert that financial inclusion reduces poverty and inequality in developing economies. Similar evidence of poverty and inequality reduction through financial inclusion has been found for Asian countries (Park & Mercado, 2015). Emara and Mohieldin (2020) demonstrate that policies to extend access to financial services can also reduce extreme poverty. Evidence shows that financial inclusion directly and significantly reduces poverty by providing essential financial services (Lal, 2018). Recently, Kelikume (2021) demonstrated that enhanced financial inclusion may also influence the informal economy, with higher levels of financial inclusion leading to significant poverty alleviation.

In addition to financial inclusion, economic growth is another widely studied determinant of poverty reduction. Using data from 92 countries over four decades, Dollar and Kraay (2002) show that the incomes of the deprived segment tend to increase in proportion to a country's average income, suggesting that higher economic growth leads to faster poverty reduction. Consistent with these findings, Agrawal (2007) found that a higher economic growth rate negatively affects poverty in Kazakhstan. Moreover, Fosu (2015) argued that in Sub-Saharan African (SSA) nations, income growth is the main driver of poverty reduction, while in some countries of the region, inequality also matters. Additionally, Fosu (2017) identified economic growth as an important determinant of poverty dynamics in developing countries. He provided empirical evidence that economic growth can significantly influence poverty, either positively by reducing it or negatively by increasing it. Similarly, Ebunoluwa and Yusuf (2018) found that higher economic growth is significantly associated with lower poverty levels in Nigeria, indicating that growth is a crucial tool for poverty reduction. Using post-crisis data, Suryahadi et al. (2012) found that the annual rate of poverty reduction declined significantly. However, the growth elasticity of the poverty trend did not differ before and after the Asian financial crisis in Indonesia.

Therefore, conducting a cross-country panel data study on this topic is necessary. Building on the preceding discussion, this study investigates the interrelations among financial inclusion, economic growth, and poverty reduction in a cross-country sample of OECD countries. This study uses the Mean Group (MG) and Granger causality to examine long-run and short-run relationships among financial inclusion, economic growth, and poverty. This study extends the literature by addressing a gap: few empirical studies have used cross-country panel data to assess the relationship between financial inclusion and economic growth, and between financial inclusion and poverty reduction, in relatively advanced countries. The rest of the article is organized as follows—section 2 reviews relevant literature

and theoretical frameworks. Section 3 explains the research methodology, data, variables, and model specification. Section 4 reports and discusses the empirical results. Section 5 concludes the study by summarizing the main results, implications, and conclusions.

Theoretical Review

Financial inclusion has emerged as an important policy objective for fostering growth and lowering poverty in both advanced and emerging nations. Opening an account at a bank or other formal financial institution is a primary entry point into the financial system, allowing customers to store money safely and make transactions. Demirgüç-Kunt et al. (2017) and Babajide et al. (2015) demonstrate that financial inclusion involves access to and use of formal financial services, such as deposit accounts, credit, payment and transfer services, insurance and remittances by individuals and firms. Access to diverse formal financial services can improve the financial capacity of low-income households by allowing them to manage cash flows more effectively, invest in productive activities, and deal with financial shocks. Access to a wide range of financial services can enhance economic welfare and reduce poverty by creating more opportunities for individuals' economic activities and enabling them to access the formal financial system.

Views on financial inclusion are grounded in Ozili's (2020) theoretical perspectives on financial inclusion. Public good theory highlights the importance of making formal financial services widely available to all individuals in a society, as it serves the interests of society as a whole when individuals can access financial services through the formal system. The theory suggests that, regardless of status or economic standing, everyone would benefit from financial inclusion, and formal financial services are viewed as a public utility that should be accessible to everyone. Additionally, extending formal financial services to everyone may generate wider social benefits because one individual’s access to such services does not reduce the availability of those services to others. The dissatisfaction theory focuses on individuals who previously accessed formal financial services but later withdraw because they are dissatisfied with the financial institutions, their rules, conditions, services offered, and interactions with financial agents. From this perspective, financial inclusion policies must focus on the barriers to financial access that push people out of the formal financial services system. The vulnerable-group perspective on financial inclusion, as discussed by financial expert Ozili (2020), encourages formal financial services to reach financially vulnerable groups and economically vulnerable groups, such as low-income individuals, children, women, and elderly individuals, who may face financial difficulties under economic shocks.

The linkages among financial inclusion and poverty alleviation can be theoretically grounded in Schumpeter’s (1912) theory of economic development. The theory emphasizes the importance of credit and financial institutions in providing entrepreneurs with the resources to start new production activities and introduce innovations. Access to finance enables investment, entrepreneurship, and innovation, fostering economic activity and creating employment and income opportunities. Increased household opportunities can translate into higher incomes and better living standards, providing a significant route

through which greater financial development and broader financial inclusion may contribute to lower poverty levels.

Extant empirical research supports the view that broader financial inclusion can promote economic growth and alleviate poverty. According to Sahay et al. (2015), greater financial inclusion among households and firms can support economic growth, while Nanda and Kaur (2016), Park and Mercado (2015), and Agnello et al. (2012) provide empirical evidence linking financial inclusion to lower poverty and reduced income inequality. These findings suggest that access to savings and credit enables households and enterprises to invest productively, while financial services such as payment and insurance help them manage and mitigate risks and endure external shocks. These mechanisms offer a theoretical explanation for why broader financial inclusion can be linked to reduced poverty.

Building on these theoretical arguments, this study applies Ozili's (2020) financial inclusion framework, viewed through three angles: the public good, dissatisfaction, and vulnerable group perspectives. In these perspectives, access to financial services and their contributions to welfare at individual and societal levels are examined. Furthermore, it draws on Schumpeter's (1912) arguments about financial resources, productive activity, and economic growth to establish the link between economic growth and poverty in OECD nations. Accordingly, the empirical analysis assesses the role of financial inclusion and economic growth in explaining poverty across OECD nations and tests whether better performance in these dimensions is associated with lower poverty.

RESEARCH METHOD

The empirical investigation used balanced annual panel data for the 12-year period from 2008 to 2019 across OECD countries. The data for the variables used in the empirical analysis were obtained from the world bank WDI database. Table 1 details the variables selected for the study, including their definition, measurement, symbols, and data sources.

Table 1. *Variables Description and Data Sources*

Variables	Symbols	Definition	Measurement	Source
Dependent Variable				
Poverty	POV	The poverty gap at $2.15 per day (2017 PPP) measures the average difference between income or consumption and the poverty line ($2.15 per day) for the poor, expressed as a percentage of the poverty line; non-poor individuals have no difference.	Measured by poverty gap at $2.15/day	WDI
Independent Variables				
Financial Inclusion	FI1	An Automated Teller Machine (ATM) is an electronic machine provided by a financial services organization that allows customers to carry out financial transactions at any time, from any location, 24/7.	Measured by the total number of ATMs for every 100,000 adults	WDI
Financial Inclusion	FI2	A commercial bank branch of a resident bank is a retail outlet of a resident bank that offers banking and financial services, operates from a place other than the bank's main office, and is not a separate legal entity (subsidiary).	Measured by the number of branches of commercial	WDI

			banks for every 100,000 adults	
Economic Growth	EG	GDP growth rate is the annual change in an economy's gross domestic product, measured in constant local currency, in percentage terms.	Measured by GDP growth (annual %)	WDI

Source: *Author's compilation of data sources from WDI.*

The primary objective of this study is to determine both the short-run and long-run linkages among FI, EG, and POV and to identify the causal relationships between these variables in OECD countries. Below is the study's general model (Lefatsa et al., 2021).

$$POV_{it} = \alpha + \beta_0 FI_{it} + \gamma Control_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

In the above-mentioned Equation 1, POV_{it} stands for poverty, FI_{it} for financial inclusion, $Control_{it}$ for the control variables that affect poverty, β_0 and γ for the coefficients (percentages) of the corresponding independent variables, μ_i is for the unobserved country-specific effect, ε_{it} denotes the error, and *i* and t stand for the country and time.

Equation (1) has been modified for this study as follows:

$$POV_{it} = \alpha_i + \lambda_t + \beta_1 FI1_{it} + \beta_2 FI2_{it} + \beta_3 GDP_{it} + \varepsilon_{it} \quad (2)$$

In Equation 2, POVit denotes poverty; αi and λt are country-specific and year-specific effects; FI1it represents the total number of ATMs; FI2it represents the number of bank branches; GDPCit denotes economic growth; and ε_{it} denotes the error term.

This study uses a panel data estimation approach, which is superior to country-specific time-series econometric techniques (Bhujabal et al., 2021). The analysis primarily tests for panel unit roots and cointegration. It then moves on to estimate long-run and short-run relationships and panel causality.

Panel Unit Root Tests

Panel unit root tests are used to assess whether the variables are stationary before proceeding with further analysis. Because many macroeconomic variables are non-stationary, we must test their order of differencing before establishing a long-run relationship. Here, we use established stationarity tests, specifically the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, to examine the stationarity properties of the variables (Lefatsa et al., 2021). The general ADF model is as under:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta * \Delta Y_{t-1} + \sum_{i=1}^{n} \alpha i \, \Delta Y_{t-1} + e_t \quad (3)$$

With, $\alpha_i = -\sum_{i=0+1}^{n} \delta_k \; and \; (\delta = \sum_{i=1}^{n} \delta_t) - 1$

In Equation 3, t specifies the time period. β is the intercept coefficient. In contrast, et represents a Gaussian white-noise disturbance. The non-stationarity of variables under investigation has been tested using the ADF and PP tests, with the alternative hypothesis in both cases being that at least one panel is stationary.

Cointegration

The subsequent step is to examine whether a stable long-run equilibrium relationship exists among the variables under study. Panel datasets can be subjected to cointegration analysis using the Kao (1999) and Pedroni (2004) tests. All these tests are carried out under the assumption that the dependent variable Yit is integrated of order one, i.e., I(1). Here, i = 1,..., N represents the individual cross-sectional units and t = 1,..., T signifies the corresponding time periods.

$$Y_{it} = x'_{it}\,\beta_i + z'_{it}\,\gamma_i + e_{it} \quad (4)$$

All covariates in vector xit are assumed to be integrated of order I(1). To apply the tests above to a given panel i, all variables in xit must not be cointegrated. In Eq. (4), β_i is a cointegrating vector, while γ_i denotes the vector of coefficients from the regressed variables to the exogenous variables z_{it}, and e_{it} is the error term. The Kao test model is as follows:

$$Y_{it} = \gamma_i + x'_{it}\,\beta + e_{it} \quad (5)$$

In Equation 5, γi are the panel-specific fixed effects. β symbolizes the common cointegrating vector. We first test the null hypothesis of no cointegration amongst a set of variables over the panel using the Kao test. We then test the null hypothesis of no cointegration against the alternative of cointegration using the Pedroni test.

Panel long-run estimates

After establishing cointegration between the variables in the model, the analysis assesses their short-run and long-run linkages. In this study, the Mean Group (MG) estimator proposed by Pesaran and Smith (1995), the Pooled Mean Group (PMG) estimator, and the Fixed Effects (FE) estimator are employed to assess the short-run and long-run linkages, while assuming slope heterogeneity and cross-sectional dependence. The MG estimator estimates individual units' regressions and then averages the resulting coefficients to obtain the equation's overall coefficients. An alternative approach for assessing short-run and long-run linkages is the PMG estimator proposed by Pesaran et al. (1999). This estimator is applied to estimate an Autoregressive Distributed Lag (ARDL) model within the framework of a panel Error-Correction Model (ECM). The short-run coefficients are allowed to vary between panels, whereas the long-run coefficients are assumed to be common across all panels. Finally, FE estimation of Weinhold (1999) is used; the slopes are permitted to vary for each cross section, while the intercepts are fixed. According to Pesaran et al. (1999), equation (3) can be reformulated in an ARDL form as follows:

$$POV_{it} = \beta_o + \sum_{j=i}^{p1} \beta_{1\,ij} POV_{i,t-j} + \sum_{j=i}^{p2} \beta_{2\,ij} FI1_{i,t-j} + \sum_{j=i}^{p2} \beta_{2\,ij} FI2_{i,t-j} + \sum_{j=i}^{p3} \beta_{3\,ij} GDP_{i,t-j} + \varepsilon_{i\,t} \quad (6)$$

Equation 6 is estimated using the MG, PMG, and FE estimators. In a comparative analysis of the results of the MG estimator obtained in the study, the Hausman's test is employed to

determine which of the three estimators offer the most appropriate and efficient estimates. When comparing the MG and PMG estimators using the Hausman test, H0 states that both MG and PMG are consistent, while H1 states that the PMG estimator is consistent. In this case, H0 that FE is inefficient for both PMG and FE estimators is contrasted with H1 that PMG is efficient. The Hausman test is then used to select the most appropriate model.

Panel Causality Tests

The previous panel estimations do not adequately determine the direction of causality among the variables incorporated in the model. Accordingly, the Granger causality test is used to analyze the causal associations between POV and the other model variables. The Granger causality test assesses the null hypothesis (H0) of no Granger causality against the alternative hypothesis (H1) of Granger causality between POV and the other variables in the model.

FINDINGS

The empirical analysis begins by presenting descriptive statistics for the variables in the study. These findings provide an overview of the data's characteristics and distributional properties. Table 2 presents the statistical distribution of four variables used in this research: POV, EG, FI1, and FI2. The descriptive analysis is conducted employing 432 annual observations from OECD nations for 12 years, ranging from 2008 to 2019. POV has a mean of 0.242 and a standard deviation (SD) of 0.131, suggesting moderate variation in poverty levels across nations. The minimum (min) value for POV is 0, and the maximum (max) value is 0.443, respectively. It is also indicated that for all the countries under study, EG has a mean of 1.769 with a substantial SD of 3.225. The min and max values range from -1.839 to 2.176, showing that economic growth varies across nations, and some countries even have negative growth. Moreover, FI1 has a mean of 20.777 and an SD of 37.971, respectively. FI1 ranges from 0 to 100, indicating that some nations have more ATMs and others have fewer. Similarly, FI2 has a mean of 89.906 and an SD of 53.87, indicating considerable variation in commercial bank branches across nations. The minimum value of FI2 is 0, while the maximum value is 288.59; this suggests that some regions experience high financial inclusion.

Table 2. *Descriptive Statistics*

Variable	Obs	Mean	Std. Dev.	Min	Max
POV	432	.242	.131	0	.443
EG	432	1.769	3.225	-1.839	2.176
FI1	432	20.777	37.971	0	100
FI2	432	89.906	53.87	0	288.59

Source: *Authors' calculation.*

Table 3 presents the Pearson correlation coefficients for pairwise comparisons of the variables to assess their linear relationships. The table shows a positive, significant correlation (i.e., 0.700, $p < 0.05$) between POV and FI1. Similarly, POV shows a moderate, significant positive correlation with FI2 ($r = 0.37$, $p < 0.05$). Moreover, EG shows a positive correlation of 0.456 with POV, which is also statistically significant at the 5% significance level (i.e., P =

0.038). Table 3 also presents the correlation coefficients among the explanatory variables. The results show that EG is positively correlated with FI2 (i.e., 0.205, $p < 0.01$), which is statistically significant at the 1% level, and is not significantly correlated with FI1 (i.e., 0.007, $p = 0.878$). In addition, FI2 exhibits a favorable correlation with FI1 (0.200, $p < 0.01$), which is statistically significant at the 1% level. According to Knock and Lynn (2012), conclusions drawn from highly correlated variables may be skewed, and regression estimates may be inaccurate. The correlation results among explanatory variables show that no pairwise correlation between independent variables exceeds 0.80, thus ruling out the possibility of multicollinearity. Overall, the correlations suggest interrelationships among POV, FI, and EG, with significant variations and directions that guide further analysis.

Table 3. *Pairwise Correlation Matrix*

Variables	(1)	(2)	(3)	(4)
(1) POV	1,000			
(2) FI1	0.700	1.000		
	(0.046)			
(3) FI2	0.37	0.200	1.000	
	(0.047)	(0.000)		
(4) EG	0.456	0.007	0.205	1.000
	(0.038)	(0.878)	(0.000)	

Source: *Authors' calculation.*

Next, Table 4 reports the findings of the cross-sectional dependence (CD) test. CD analysis based on Pesaran's (2004) CD test shows significant cross-sectional correlation among the variables. CD-test values indicate that all the variables under study, i.e., POV, FI1, FI2, and EG, are significant, with the p-values below the 5% level. Therefore, the null hypothesis of the CD test is rejected, suggesting that the variables are interdependent across cross-sections, a critical factor to consider when performing panel data analysis. The correlation coefficients further suggest that EG (0.546) and FI2 (0.605) have stronger correlations than FI1 (0.173) and POV (0.147). These analyses are reinforced by the absolute correlation coefficients with EG (0.580) and FI2 (0.668), which are higher than those with FI1 (0.471) and POV (0.363). These findings suggest that FI2 and EG are significantly interconnected across cross-sections.

Table 4. *Average Correlation Coefficients & Pesaran (2004) Cross-Sectional Dependence test*

Variable	CD-test	p-value	Corr	abs(corr)
FI1	11.510	0.003	0.173	0.471
FI2	52.640	0.000	0.605	0.668
POV	12.800	0.000	0.147	0.363
EG	49.050	0.000	0.564	0.580

Notes: Under Ho of cross-sectional independence, the CD statistic follows a standard normal distribution, CD ~ N(0,1)

Source: *Authors' calculation.*

Furthermore, Table 5 demonstrates Fisher-type unit root test outcomes based on the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests. Both tests provide empirical evidence on the stationarity properties of the variables at levels and first differences. For the PP test, the results indicate that all variables (POV, FI1, FI2, and EG) are non-stationary at level

I(0) but become stationary after first differencing, i.e., I(1). The ADF test results similarly confirm that all variables are non-stationary at level I(0) and become stationary after first differencing, I(1). These unit root test findings are essential for the subsequent analysis, as the presence of non-stationarity suggests that regression analysis would yield spurious results. Hence, this study adopts an integration approach to obtain efficient results.

Table 5. *Result of Fisher-type unit root tests based on Phillips-Perron and Augmented Dickey-Fuller tests*

Variables	Phillips-Perron tests				Augmented Dicky Fuller tests			
	Level		First Difference		Level		First Difference	
	P-Statistics	P-Value	P-Statistics	P-Value	P-Statistics	P-Value	P-Statistics	P-Value
POV	32.30982	0.35000	470.8183	0.0000	19.363	0.941	195.898	0.000
FI2	75.9948	0.1090	118.7622	0.0000	72.1040	0.1784	231.1143	0.0000
FI3	14.30478	0.840000	220.3266	0.0000	70.7631	0.2084	297.5819	0.0000
EG	24.7036	0.753	294.277	0.0000	21.4277	0.9673	167.482	0.0000

Source: *Authors' calculation.*

This analysis is continued by a panel cointegration analysis of the long-term relations between the variables under investigation. The Kao and Pedroni cointegration tests provide significant insights into long-run linkages among POV, FI, and EG. These tests examine the null hypothesis of no cointegration against the alternative hypothesis of at least one cointegrating vector for the panels under investigation. Table 6 reports the results of the Kao and Pedroni cointegration tests. The Kao and Pedroni cointegration tests were used to test for long-run relationships among the variables POV, FI1, FI2, and EG. The results from both tests suggest the presence of a long-run relationship among the variables under investigation. The test statistics were significant at the 5% significance level, thus refuting the null hypothesis of no cointegration among the variables. This supports the alternative hypothesis that a long-run cointegrating relationship exists among the variables across the panel. Thus, although there may be short-run deviations from the long-run relationship, the variables move together in the long run. However, the ADF test value of 1.3778 with a sig-value of 0.0840 is less conclusive, as it is insignificant at the 5% significance level; thus, H1 is rejected, and H0 is not rejected in this case. Overall, based on the Kao and Pedroni cointegration test results, despite short-run fluctuations, all variables (POV, FI1, FI2, and EG) share a stable, equilibrium long-run relationship, which is crucial for further analysis while focusing on their dynamics over time.

Table 6. *Kao and Pedroni tests for Cointegration*

	Kao Cointegration Test		Pedroni Cointegration Test	
	t-statistics	t-statistics	t-statistics	p-value
Modified Phillips-Perron	-5.3697	0.0000	4.6423	0.0000
Phillips-Perron	-9.0452	0.0000	-24.7893	0.0000
Augmented Dickey-Fuller	1.3784	0.0840	-11.1888	0.0000
Unadjusted Modified Dickey-Fuller	-9.8378	0.0000		
Unadjusted Dickey-Fuller	-10.6092	0.0000		

Note: 5% significance level

After testing for cointegration among the variables under investigation, we estimate the long-run and short-run relationships between POV and the explanatory variables in the study, namely FI1, FI2, and EG. To this end, the study employs FE, MG, and PMG estimators to analyze the links between POV and the three explanatory variables, i.e., FI1, FI2, and EG, in the short and long run. The Hausman test in Table 7 is used to choose between the MG and PMG models. This test verifies the null hypothesis that PMG estimates differ significantly from the corresponding MG estimates. The p-value of 0.076 is greater than 0.05, so we cannot reject the null hypothesis. Thus, the appropriate estimator is PMG. The PMG model allows heterogeneity in short-run dynamics but imposes homogeneity in long-run coefficients across all units in the panel. Similarly, the Hausman test for the MG model against the corresponding FE model yields a p-value of 0.996, well above the 5% significance level. Hence, the null hypothesis cannot be rejected, and the MG model is selected to represent the interaction between POV and core explanatory variables in the subsequent analysis.

Table 7. *Hausman (1978) test results for selecting a model: PMG, MG, and FE*

Ho: No significant difference between the PMG & MG and MG & FE estimators.	PMG vs MG	MG vs FE
Chi-Square	5.164	0.008
P-Value	0.076	0.996
Decision	Failed to reject Ho	Failed to reject Ho
Good model	PMG	MG

Source: *Authors' calculation*

In the next step, Table 8 reports the estimates from the MG, PMG, and FE estimators in the ARDL model. Even though the results for the MG, PMG, and FE estimators are reported in Table 8, the Hausman test result indicates that the MG estimator is the most suitable model for further analysis. Thus, the subsequent analysis focuses only on the results from the MG estimator. In the first portion of the table, the study reports long-run estimates between FI, EG, and POV. Across OECD countries, long-run estimates show a strong, significant negative association between economic growth and financial inclusion and poverty. This holds not only for the two financial inclusion indicators, LFI1 (number of bank branches) and LFI2 (number of ATMs), but also for EG and the poverty indicator POV. All coefficients are negative and significant at the 5%, 10%, and 1% levels, respectively. The estimated coefficients of the explanatory variables, namely FI1, FI2, and EG, are elastic. While LFI2 is the most elastic with respect to poverty among the four variables, LFI1 and LEG show relatively low elasticity over the period considered. These findings indicate that a 1% increase in LFI1 and LFI2 reduces poverty by 0.021% and 0.016%, respectively, suggesting that as financial inclusion rises, poverty falls. The results also show that a 1% increase in EG reduces poverty by 0.002% across countries, implying that as economic growth rises, poverty falls.

The short-run associations among POV, FI, and EG are reported in the lower portion of Table 8. The error correction term (ECT) is employed to capture the short-run adjustment dynamics among the variables of interest following deviations from their long-run equilibrium relationships. The MG model offers an ECT statistic of -1.443, which is statistically significant

at the 1% level. This indicates that a substantial share of short-run disequilibrium is corrected toward the long-run equilibrium in the subsequent period. These results confirm a stable long-run relationship among the variables in the study, with consistent empirical evidence across the MG, PMG, and FE model specifications. The short-run coefficient for the MG estimator is significant at the 5% level for FI2 (financial inclusion's indicator), implying that short-run changes in financial inclusion have a small, positive effect on poverty alleviation. The coefficients on the remaining exogenous variables are statistically insignificant in the short run, suggesting they have no immediate impact on poverty. But because poverty is mostly a long-run phenomenon, sustained and proactive policy measures are required to achieve meaningful, lasting reductions in poverty.

Table 8. *Long-Run and Short-Run Estimators*

	(FE)	(MG)	(PMG)
	D.pov1	D.pov1	D.pov1
EG	-.003***	-.002**	-.007***
	(.001)	(.001)	(.001)
FI1	-.002**	-.021*	-.004***
	(.001)	(.011)	(.001)
FI2	-.004**	-.016***	-.001***
	(.002)	(.001)	(.00)
ECT	-.973***	-1.443***	-1.31***
	(.065)	(.1213)	(.376)
SR: D.EG	.004	0.031	.012
	(.003)	(.01)	(.008)
SR:D.FI1	.001	0.000	.002
	(.001)	(.008)	(.004)
SR:D.FI2	0.000	.031*	-.006
	(.004)	(.019)	(.013)
SR:_cons	.202***	.148	-.058
	(.076)	(.852)	(.166)
Observations	279	279	279

**** p<.01, ** p<.05, * p<.1. Standard errors are in parentheses.*

Source: *Authors' calculation*

The empirical analysis further analyzes the causal associations among the variables chosen for the study. The coefficients of long-run relationships from the MG estimator describe the effects and their direction but not the causal relationship. Table 9 presents the pairwise Dumitrescu and Hurlin (2012) Granger non-causality tests to assess potential causal relations between the dependent variable, POV, and the two explanatory variables, financial inclusion and economic growth. The results indicate significant two-way causal associations among all variables, meaning each is influenced by the others. These bi-directional causal relationships are confirmed by the calculated p-values for all the variables under study. In conclusion, the Dumitrescu and Hurlin test findings suggest that all variables show significant causal relationships with one another, specifically among FI measures and POV, as well as between EG and POV. These findings suggest interdependency among the chosen variables, emphasizing the importance of considering these connections in economic analysis and policymaking.

Table 9: *Pairwise Dumitrescu & Hurlin (2012) Granger Non-Causality Test Results*

	Causal Relationship	W. Stat	Z-bar Stat	P-Value
1	EG ⟷ POV	2.2530	4.9329	0.0000
	POV ⟷ EG	2.4551	5.1011	0.0000
2	FI1 ⟷ POV	6.7974	22.8243	0.0000
	POV ⟷ FI1	6.2320	21.9092	0.0000
3	FI2 ⟷ POV	4.2632	12.8472	0.0000
	POV ⟷ FI2	4.1014	12.5155	0.0000
4	FI1 ⟷ EG	2.9928	7.8458	0.0000
	EG1 ⟷ FI1	1.8576	3.3764	0.0007
5	FI2 ⟷ EG	2.7896	7.0458	0.0000
	EG ⟷ FI2	2.0169	4.0037	0.0001

Source: *Authors' calculation*

DISCUSSION

The results confirm a significant, negative relationship between financial inclusion and poverty alleviation across OECD countries. The empirical results show that increased reach and effective use of formal financial services can reduce poverty. This finding supports the theoretical arguments underlying financial inclusion. In Ozili's (2020) perspectives on financial inclusion, the public good theory highlights that when broad access to formal finance is granted to people across all socioeconomic groups, they can all participate in the financial system to seize financial opportunities that were not available to them before. Likewise, the vulnerable group perspective extends financial services to economically underprivileged individuals, helping them save, borrow, make payments, and use other financial services to manage economic shocks better and engage in productive activities. Therefore, the negative links between financial inclusion and poverty alleviation across OECD nations highlight the role that financial inclusion can play in increasing economic capacity and reducing poverty of individuals and households.

The empirical outcomes of this research are consistent with extant evidence across countries and regions. Our findings align with Khan et al. (2022), who found that broader financial inclusion reduces poverty while improving financial stability. Similar findings are also reported by Inoue (2018), who argues that broader access to financial services and improved financial deepening through public sector banks decrease poverty in India. A study in emerging countries by Omar and Inaba (2020) further demonstrates that financial inclusion can reduce poverty and inequality, while Kelikume (2021) found that higher levels of financial inclusion lead to lower poverty in African economies. Evidence from Asia also confirms this negative relationship, as Park and Mercado (2015) found that enhanced financial inclusion encourages reduced poverty and lower income inequality. Likewise, Emara and Mohieldin (2020) found that improved access to finance substantially reduces extreme poverty, while Lal (2018) found a direct and positive contribution of financial inclusion to poverty reduction.

Although most prior empirical work on the poverty-reduction role of financial inclusion focuses on developing nations, our findings for OECD countries suggest that financial inclusion's poverty-reduction role may extend beyond low- and middle-income economies. Our empirical results suggest that financial participation in relatively developed financial systems can be broader and more efficient, supporting households' saving, access to credit, investment, and payment services, thereby enhancing economic resilience and fostering higher living standards.

Our results also highlight a significant negative association between economic progress and poverty, indicating that higher economic activity and income reduce poverty in OECD countries. These findings can be explained through Schumpeter's (1912) argument that productive investment, entrepreneurship, credit, and innovation drive economic development. Schumpeter noted that financial means enable entrepreneurs to put new production means into action, expand production and employment, and increase income; the ensuing rise in economic activity improves the standard of living and generates greater income opportunities for households, thus contributing to poverty alleviation. Our findings are consistent with Dollar and Kraay (2002), who found that average income growth tends to be accompanied by proportional income gains for people experiencing poverty. Their finding supports the insight that economic growth can translate into improved economic circumstances for lower-income populations. Our findings are further supported by empirical literature from distinct geographical contexts. Similarly, Agrawal (2007) asserts that higher growth promotes poverty alleviation in Kazakhstan. In Sub-Saharan Africa, Fosu (2015) identified economic progress as a major driver of poverty reduction, and found that income distribution had a greater impact on how much growth reduced poverty than the level of growth itself. Similarly, Fosu (2017) concluded that economic growth is key in influencing poverty outcomes across developing countries. In line with our findings, another study in Nigeria by Ebunoluwa and Yusuf (2018) demonstrates a significant adverse linkage between economic progress and poverty alleviation. An earlier study of Indonesia also finds that economic growth contributed substantially to poverty reduction, with service-sector growth particularly effective at reducing poverty in rural and urban areas (Suryahadi et al., 2012). This empirical evidence supports the findings of the present research and suggests that economic growth is an important factor in alleviating poverty across different economic contexts.

From the perspective of Islamic economics, Islamic finance plays an important role in promoting social justice, equitable wealth distribution, and poverty alleviation. Islamic jurisprudence (Fiqh al-Muamalat) emphasizes ethical financial transactions and explicitly prohibits Riba (interest), as stated in the Holy Qur'an (Al-Baqarah, 2:275). This prohibition aims to prevent exploitation and ensure fairness in financial relationships. Instead, Islamic finance promotes profit-and-loss sharing, asset-backed financing, and productive investment, encouraging entrepreneurship and the equitable distribution of economic resources. These principles highlight the potential contribution of Islamic finance to inclusive economic development and poverty reduction.

CONCLUSION

This study examined the dynamic relationship between financial inclusion, economic growth, and poverty reduction across OECD countries from 2008 to 2012. The study uses panel cointegration analysis, the Mean Group (MG) estimator, and the Granger causality test to provide long-run and short-run results on the relationships among the variables. The cointegration test results confirm a long-run association among financial inclusion, economic growth, and poverty. The MG estimates further show that financial inclusion and economic growth are negatively and significantly associated with poverty reduction in the long run across OECD nations. In the short run, only one indicator of financial inclusion (FI2) is significant, and all other relationships are insignificant. These findings indicate that poverty reduction is predominantly a long-run phenomenon, in which improvements in financial inclusion and growth require time to translate into poverty reduction. The Granger causality results also show bidirectional relationships among financial inclusion, economic growth, and poverty, revealing interdependencies among these variables.

The findings also have significant practical implications. Policies that increase access to and effective use of formal financial services should be considered as part of long-term strategies to reduce poverty. Specifically, this includes strengthening financial access, improving the affordability and usability of financial services, and fostering financial inclusion models that allow growth benefits to reach disadvantaged groups. However, sustaining productive economic growth and creating employment and income opportunities are essential for financial inclusion policies to achieve desired long-run outcomes, as economic growth and financial inclusion are interrelated and interdependent over time. Because the short-run effects of financial inclusion and growth may be limited, policymakers may adopt a long-term perspective rather than expecting quick poverty reduction from financial inclusion and economic progress.

This study extends extant research by jointly analyzing financial inclusion, economic growth, and poverty in the OECD using a dynamic analytical framework. Existing empirical research on this issue has focused on developing and emerging economies. This study, by contrast, focuses on relatively advanced economies and distinguishes between short- and long-term relationships. Our results therefore extend understanding of the relationships among financial inclusion, growth, and poverty by showing that the poverty-reducing effects of financial inclusion and growth are stronger in the long run and that these variables mutually reinforce one another.

Additional studies may extend this research into other regions of the world. Further analysis may also be directed at examining whether the relationships identified in the analysis also hold for individual countries and for groups of countries in other regions. Future research can focus on the other dimensions of financial inclusion, such as the extent of digital financial services, financial literacy, mobile payments, and access to fintech services by customers. Additionally, it would be useful to explore the role of income inequality, institutional quality,

technological development, and social protection as moderating or mediating factors that influence the relationship between financial inclusion and economic growth and poverty reduction. Further extensions of this research would provide a more comprehensive understanding of the conditions under which financial inclusion and economic growth can translate into inclusive, sustainable improvements in living standards.

Author contribution

Imran Rafiq: Contributed to the conceptualization and development of the research idea, formulation of the research objectives, methodology, data collection and preparation, literature review, interpretation of the findings, and preparation of the original manuscript. He also coordinated the incorporated revisions into the final manuscript.

Hamid Ullah: Contributed to the empirical analysis and interpretation of the study results. He conducted the econometric analysis, assessed the robustness and validity of the empirical findings, and provided critical feedback on the manuscript.

Salahuddin Ayoobi: Contributed primarily to the critical review and editing of the manuscript. He provided constructive comments on the manuscript's organization, clarity, academic presentation, and overall quality, and helped refine the final version.

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Data Availability Statement

The data used in this research is openly available at World bank's World Development Indicators (WDI) Database. No primary datasets involving human participants were generated or analyzed during the current study.

Conflict of Interest

The authors of the study declare they have no conflict of interest regarding this study.

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