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Road to Prosperity: Investigating the Impact of Financial Development on Economic Growth

Zenginliğe Giden Yol: Finansal Gelişmenin Ekonomik Büyüme Üzerindeki Etkisini İnceleme

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Abstract: This study highlights the crucial role of financial development in driving economic growth across different income groups, emphasizing the need for targeted policy approaches to maximize its impact. For this purpose, the finance-growth relationship in 65 countries of five income groups, from 2001 to 2020 are investigated. Utilizing panel models, including unit root tests, panel cointegration, and robustness checks via FMOLS and CCE methods, findings from 65 countries from five different income groups from indicate that financial development significantly boosts income in high-income countries, despite some inconsistencies. In these income groups, factors like investment expenditure, labor, and trade positively influence GDP per capita, while government expenditure and CPI negatively impact it. For lower- and upper-middle-income countries, financial structure also enhances GDP, albeit with the varying significance of trade openness and CPI. However, financial development does not significantly affect income in low-income countries, suggesting a prerequisite development level for finance to stimulate growth. The findings demonstrate that the general development of financial structure substantially impacts economic growth. In light of these findings, developing comprehensive but separate policy implications that address all five income groups is imperative.

Keywords: Economic Growth, Financial Development, Panel Data Analysis

JEL Classification: E44, C23, O47

Öz: Bu çalışma, finansal gelişmenin farklı gelir gruplarında ekonomik büyümeyi yönlendirmedi kritik rolünü vurgulamakta ve etkisini en üst düzeye çıkarmak için hedeflenmiş politika yaklaşımlarını ortaya koymaktadır. Bu amaçla beş farklı gelir grubuna ait 65 ülkede, 2001-2020 yılları arasında finans-büyüme ilişkisi incelenmiştir. Panel veri modelleri, birim kök testleri, panel eşbütünleşme analizi ve FMOLS ile CCE yöntemleriyle yapılan sağlamlık kontrolleri gibi yöntemler kullanılarak elde edilen bulgular, finansal gelişmenin yüksek gelir grubuna ait ülkelerde geliri artırdığını, ancak bazı tutarsızlıklarında bulunduğunu göstermektedir. Bu gelir gruplarında yatırım harcamaları, iş gücü ve ticaret gibi faktörler kişi başına düşen GYSİH üzerinde olumlu etki yaratırken, kamu harcamaları ve TÜFE olumsuz etki yaratmaktadır. Orta-alt ve orta-üst gelir grubundaki ülkelerde ise finansal yapı, ticaret açıklığı ve TÜFE'nin farklı derecelerde anlamlılık göstermesiyle birlikte GSYİH'yi artırmaktadır. Ancak, düşük gelir grubundaki ülkelerde finansal gelişmenin gelir üzerinde anlamlı bir etkisi bulunmamaktadır; bu durum, finansın büyümeyi teşvik edebilmesi için belirli bir gelişmişlik seviyesinin gerekli olduğunu göstermektedir. Bulgular, finansal yapının genel gelişiminin ekonomik büyüme üzerinde önemli bir etkisi olduğunu ortaya koymaktadır. Bu sonuçlar doğrultusunda, beş gelir grubunun her birine ayrı ayrı hitap eden kapsamlı ancak ayrıştırılmış politika önerilerinin geliştirilmesi zorunludur.

Anahtar Kelimeler: Ekonomik Büyüme, Finansal Gelişme, Panel Veri Analizi

JEL Sınıflandırması: E44, C23, O47

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1. Introduction

The connection between finance and growth has been a significant focus of economic research with varying perspectives on whether finance drives growth or responds to economic expansion. Early contributions to this debate, such as those by Schumpeter and Opie (1934), claimed that financial institutions are essential to promoting growth by funding productive investments and stimulating innovation. However, Robinson (1952) asserted that the need for financial services results from economic growth and implies a more reactive role for finance. Lucas (1988) also questioned the financial sector's overall influence on growth, suggesting that finance and growth may evolve independently by opposing the hypothesis and positing the neutrality hypothesis. Regarding the growth, financial development has gained renewed interest with the rise of endogenous growth theory from the 1990s onward (Greenwood and Jovanovic, 1990). Conclusively, the following empirical studies have concentrated on this link's diverse aspects (Pagano, 1993). Financial development has recently been recognized as crucial since it facilitates capital accumulation, tech innovation, and practical resource allocation (Apergis et al., 2007).

Numerous studies (Roubini and Sala-i-Martin, 1992; Miller, 1998) have been conducted during 1990s on the the relationship between finance and growth, but few have examined it across country groups with different income levels while comparing traditional and newer financial development indicators. To address this gap, our study explores this connection across 65 countries of varying income groups from 2001 to 2000, using panel cointegration techniques like Pedroni and Westerlund's regressions, Fully Modified Ordinary Least Squares (FMOLS), and Common Correlated Effects (CCE) analyses. While much research exists on the finance-growth nexus, we focus on unraveling the variables behind GDP per capita differences across five income groups to offer policy recommendations. We also separate high-income countries into EU and non-EU due to the EU's unique financial landscape (Decressin and Kudela, 2007). Finally, we compare Svirydzenka's (2016) financial development index (FD) with total private credit to GDP (PSC) to examine their impact on economic growth, making this study pioneering in comparing these two indicators across different income groups.

The study continues as follows. The next section extensively reviews of financial development and growth within the related literature. Section 2 provides data and model selection. Empirical results are displayed in section 3. Last section discusses policy implications and concludes the study.

2. Literature Review

2.1 Theoretical Background

There are four predominant perspectives on the finance-growth connection. Patrick (1966) introduced the earliest effort to discuss whether growth and finance are causally related. He described two key concepts of the link between them: "supply-leading" and "demand-following." The "supply-leading" approach occurs when financial institutions mobilize savings and convert them into investments, fueling the expansion of modern sectors. This perspective argues that financial intermediation drives growth by either increasing the savings rate, thereby boosting investment (Shaw, 1973), or enhancing capital accumulation's effectiveness (Goldsmith, 1969).

The "demand-following" approach posits that financial systems develop in response to the need for external financing to support growth, encapsulating Robinson's (1952) phrase, "Where enterprise leads, finance follows," which suggests that financial development is a response to changes in the real sector. A third perspective argues for a mutual influence between finance and growth, with evidence of two-way causality found (Demetriades and Hussein, 1996). Lastly, Lucas (1988) dismisses the idea of a causal relationship between finance and growth, asserting that economists exaggerate the impact of finance on growth.

The introduction of endogenous growth theory in the 1980s, particularly through Romer's (1987) "production process model", renewed interest in finance's role in growth. Research highlights that finance promotes growth by improving resource allocation (Choong and Chan, 2011), reducing transaction and information costs (Vaez and Mirfendereski, 2011), and facilitating technological innovation (Aghion and Howitt, 1992). Bencivenga and Smith (1991) further demonstrated that financial intermediaries have the potential to improve investment efficiency and stimulate higher rates of economic growth. Additionally, finance and growth share a reciprocal link, where financial intermediation both supports and is driven by growth and rising demand for financial services (Law, Kutan, and Naseem, 2018).

2.2 Empirical Review

In multi-country analyses, extensive research has revealed the significance of finance-growth nexus. Keep in mind that financial structures differ across countries based on income levels. The mechanisms through which financial development impacts economic growth vary significantly depending on a country's income bracket (Swamy and Dharani, 2019). Studies indicate that high-income countries, with their well-developed financial systems, are more adept at efficiently mobilizing capital among economic agents to promote economic growth,

whereas the benefits of financial development in lower-income countries are less conclusive (Korkmaz, 2015). Likewise, Rioja and Valev (2004) showed the beneficial impacts of financial advancement on growth are more pronounced in countries with high- and middle-income levels; in contrast, these effects are weaker or negligible for countries with lower-income levels.

The EU's financial structure differs from other high-income countries due to its high integration, single currency, harmonized regulations, and centralized institutions such as the ECB, ensuring financial policies and supervision (ECB, 2022). In contrast, non-EU high-income countries, such as the U.S. and Japan, have independent financial systems with diverse regulations and currencies. These structural differences influence how financial development affects growth, necessitating the separation of high-income EU and non-EU countries in panel data analysis to avoid obscuring region-specific effects (IMF, 2019). Empirical studies, including Korkmaz (2015) and Mtar and Belazreg (2011), highlight the significance of financial development in European economies, emphasizing the role of regulations in promoting growth.

In the context of middle-income countries, Hassan et al. (2011) provided robust evidence that highlights the significance of developing financial structure for achieving higher growth rates in developing countries. Similarly, Musabeh et al. (2020) revealed that higher development levels in financial structure positively influences economic growth, with Turkey showing the most potent effect, followed by Poland, Hungary, and Brazil from 2000 to 2013.

Low-income developing countries, on the other hand, are generally characterized by less efficient financial structures and lower levels of domestic private credit to the market. Despite some improvements in credit availability and GDP per capita since the 1990s, the connection between financial advancements and growth in these countries remains ambiguous (Kar et al., 2011). Ibrahim and Alagidede (2018) showed that financial progress has a positive impact on the economies of 29 Sub-Saharan nations from 1980 to 2014, however, their results also found that risky investments can have an adverse effect. More recently, Adeyemi (2024) analyzed financial depth and its impact on growth in 54 African countries from 1980 to 2019 and found that financial depth indicators positively influence growth across the continent.

Apart from classifying country groups based on income levels, we can further categorize the empirical studies utilized in literature into three groups based on the datasets used as cross-sectional, time-series, and panel data analysis. Earlier research on the finance-growth nexus primarily relied on cross-sectional data and OLS estimation methods, confirming a positive correlation between finance and growth (King and Levine, 1993). However, these

methods faced criticism for their inability to capture the dynamic relationship between finance and growth and for their limitations in addressing issues such as heterogeneity issue (Chuah and Thai, 2004), endogeneity problems (Favarra, 2003) and the presence of cross-sectional dependence (Christopoulos and Tsionas, 2004).

Panel data analysis offers significant advantages over cross-sectional or time-series data by increasing degrees of freedom and enabling multivariate analysis (Hassan et al., 2011). Consequently, it is widely used in studying the finance-growth nexus, though empirical findings remain mixed. While Samargandi et al. (2015) and Ductor and Grechyna (2015) found no consistent relationship between finance and growth, other studies, including Lee and Chang (2009) and Dudian and Popa (2013), suggest a statistically significant link. The following sections detail the study's data and econometric methods, considering these prior findings.

3. Data and Methodology

3.1 Data Description

For the estimation of the finance-growth nexus in the long run, we analyze relatively homogenous country group panel data covering seven low-middle, 17 lower-middle, 14 upper-middle, 9 high, and 18 high-income EU countries categorized by the World Bank (2023) over the period between 2001 and 2020. Table 1 lists country groups by their income levels used in our data sample.

Table 1. Country Groups by Income Levels

Low-income[a] (7)	Lower-middle-income[b] (17)		Upper-middle-income[c] (14)		High-income[d] (9)	High-income-EU[d] (18)	
Burundi	Algeria	Kyrgyz Rep.	Botswana	Jordan	Australia	Austria	Hungary
CAR	Bangladesh	Mongolia	Brazil	Malaysia	Chile	Belgium	Ireland
Chad	Cambodia	Nepal	Bulgaria	Mexico	Hong Kong	Croatia	Italy
The Gambia	Cameroon	Nigeria	China	Paraguay	Israel	Czechia	Netherlands
GNB	Congo	Pakistan	Colombia	Peru	Japan	Denmark	Poland
Mali	Egypt	Philippines	Gabon	S. Africa	S. Korea	Finland	Portugal
Sudan	Ghana	Senegal	Jamaica	Türkiye	Norway	France	Romania
	India	Tunisia			UK	Germany	Spain
	Kenya				US	Greece	Sweden

Source: World Development Indicators (World Bank, 2023)

Note: The World Bank classification is based on the country's gross national income (GNI) per capita in 2015 (World Bank, 2023). CAR and GNB represent the Central African Republic, and the Republic of Guinea-Bissau, respectively. The World Bank classification of income groups of countries are categorized as follows: [a] Low-middle-income countries have a GNI per capita below $1,045; [b] Lower-middle-income countries' GNI per capita falls within the range of $1,046 to $4,095; [c] Upper-middle-income countries have GNI per capita between $4,096 to $12,695; and [d] High-income-countries, including both EU and non-EU countries, have a GNI per capita exceeding $12,695.

Our growth regression model uses two main proxies: the Financial Development Index (FD) and total private credit as a percentage of GDP (PSC). By drawing from Svirydzenka's (2016) foundational work, we assess the effectiveness of financial systems in different countries. Higher financial development often leads to more efficient financial markets, boosts investment, and increases economic productivity (Ekanayake and Thaver, 2021). However, in cases where financial development is accompanied by inefficiencies or instability—particularly in underregulated or underdeveloped markets—it can potentially hinder growth, negatively impacting specific subgroups of countries (Sethi et al., 2022). The second proxy, private sector credit (PSC), refers to the ratio of credit services provided to the private sector for investment purposes (Laeven et al., 2015). Financial institutions with robust capital adequacy are seen as more secure and better positioned to fulfill financial obligations, leading to a positive correlation between total credit to the private sector and growth. In other words, increasing capital adequacy will significantly benefit economic growth, as researchers expect this variable to significantly benefit growth (Prah, 2022).

In the baseline growth regression, we include the log of GDP per capita as the dependent variable, financial development index (FD) and total private credit (in %GDP) PSC as proxy variables, and control variables (in %GDP) listed as investment (INV), government expenditure (GOV), trade openness (TO), the log of the total labor force (LAB), and the log of the consumer price index (CPI). In both publicly available datasets, the World Bank (2023) serves as the primary database for all variables, except for FD, obtained from the International Monetary Fund (IMF, 2023). Table 2 defines the variables.

Table 2. Definitions of Variables

Dependent Variable	Definition	Measurement	Source
GDP	Economic Growth	GDP per capita (constant 2015 US dollars)	WDI
Proxy Variables			
FD	Financial Development	Financial development index	IMF
PSC	Financial Depth	Total private credit to GDP (in %GDP)	WDI
Control Variables			
INV	Investment	The investment expenditure to GDP (in %GDP)	WDI
GOV	Government Expenditure	The government expenditure to GDP (in %GDP)	WDI
LAB	Human Capital	Labor force participation, total	WDI
TO	Trade Openness	Sum of exports and imports to GDP (in %GDP)	WDI
CPI	Overall Price Change of Goods	Consumer price index (constant 2010 US dollars)	WDI

Source: World Development Indicators (World Bank, 2023) and International Monetary Fund (IMF, 2023).

3.2. Preliminary Investigation

Table 3 provides descriptive statistics for five country groups. High-income countries show the highest FD (0.759), followed by high-income EU countries (0.621), with a significant gap compared to other groups. FD volatility is highest in high-income (0.167) and upper-middle-income (0.163) groups. PSC is also highest in high-income countries (136.55). GDP per capita is much higher in high-income and high-income EU countries—nearly six and 20 times higher than upper-middle-income nations. The investment is relatively similar among high-income EU, high-income, and lower-middle-income countries, but higher than in upper-middle and low-income groups. Government spending is highest in high-income nations, while the labor force is largest in high-income countries and smallest in low-income ones. Trade openness is highest in high-income and high-income EU countries, with the lowest CPI found in high-income EU and upper-middle-income groups.

Table 3. Descriptive statistics

High-income-EU Countries	Obs.	Mean	Std. Dev.	Min	Max
GDP	360	10.182	0.611	8.492	11.278
INV	360	22.907	4.265	11.892	54.955
GOV	360	20.695	3.053	12.014	27.935
LAB	360	15.776	0.916	14.388	17.610
TO	360	96.424	40.013	45.419	252.25
CPI	360	4.591	0.129	3.761	4.845
FD	360	0.621	0.167	0.11	0.9
PSC	360	86.345	39.771	8.653	201.259
High-income Countries					
GDP	180	10.504	0.517	9.074	11.248
INV	180	24.043	4.081	14.978	33.667
GOV	180	17.098	4.283	8.418	26.134
LAB	180	16.485	1.349	14.697	18.934
TO	180	88.866	100.291	19.56	442.62
CPI	180	4.613	0.130	4.332	4.912
FD	180	0.759	0.151	0.400	0.97
PSC	180	136.552	41.658	64.89	258.949
Upper-middle-income Countries					
GDP	280	8.734	0.303	7.766	9.399
INV	280	24.549	6.779	12.4	46.66
GOV	280	15.779	4.807	7.43	36.143
LAB	280	16.105	1.967	12.867	20.476
TO	280	-0.180	12.918	-41.500	36.068
CPI	280	4.595	0.306	3.459	5.573
FD	280	0.385	0.163	0.06	0.730
PSC	280	56.63	40.321	8.21	182.868
Lower-middle-income Countries					
GDP	340	7.402	0.540	6.251	8.386

INV	340	25.891	9.764	11.83	79.401
GOV	340	11.624	4.28	.952	22.793
LAB	340	16.349	1.450	13.801	20.032
TO	340	-6.700	12.054	-50.868	30.457
CPI	340	4.611	0.428	3.303	5.724
FD	340	0.192	0.107	0.03	0.52
PSC	340	29.906	20.934	2.01	139.597
Low-income Countries					
GDP	140	6.464	0.582	5.574	7.776
INV	140	17.633	8.269	3.949	60.156
GOV	140	11.835	5.56	3.588	31.344
LAB	140	14.697	1.050	12.896	16.348
TO	140	-10.715	11.162	-100.971	10.108
CPI	140	4.686	0.567	3.598	8.121
FD	140	0.079	0.026	0.030	0.160
PSC	140	10.949	6.04	0.000	26.426

Source: Own constructions

In Table 4, the correlation matrix shows that FD is statistically significant and has a positive correlation with GDP per capita across all country groups. However, as the income level decreases, the strength of this correlation weakens, with the lowest correlation observed in low-income countries. FD has a positive and substantial correlation with INV in upper-middle, lower-middle, and low-income groups, with GOV in all but lower-middle-income group, with LAB across all groups, with TO in upper-middle-income group, and with CPI in all groups except high-income country groups.

Table 4. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High-income-EU Countries								
(1) GDP	1.000							
(2) INV	0.006	1.000						
(3) GOV	0.437***	-0.278***	1.000					
(4) LAB	-0.046	-0.227***	-0.133**	1.000				
(5) TO	0.206***	0.345***	-0.052	-0.449***	1.000			
(6) CPI	0.276***	-0.155***	0.149***	0.027	0.236***	1.000		
(7) FD	0.785***	-0.191***	0.375***	0.270***	-0.054	0.243***	1.000	
(8) PSC	0.601***	-0.300***	0.453***	-0.018	-0.166***	0.199***	0.725***	1.000
High-income Countries								
(1) GDP	1.000							
(2) INV	-0.207***	1.000						
(3) GOV	0.454***	-0.110	1.000					
(4) LAB	0.054	-0.106	-0.086	1.000				
(5) TO	-0.030	-0.085	-0.592***	-0.452***	1.000			
(6) CPI	0.159**	-0.045	0.032	-0.025	0.180**	1.000		
(7) FD	0.578***	-0.083	0.003	0.630*	-0.091	0.067	1.000	

(8) PSC	0.362***	-0.182***	0.320***	0.502***	0.335***	0.402***	0.584***	1.000
Upper-middle-income Countries								
(1) GDP	1.000							
(2) INV	0.009	1.000						
(3) GOV	-0.095	0.163***	1.000					
(4) LAB	0.259***	0.235***	-0.202***	1.000				
(5) TO	0.272***	-0.104*	-0.300***	0.027	1.000			
(6) CPI	0.394***	0.019	0.091	0.137**	-0.014	1.000		
(7) FD	0.399***	0.125**	0.243***	0.598***	-0.196***	0.266***	1.000	
(8) PSC	0.141**	0.322***	0.088	0.528***	-0.052	0.269***	0.782***	1.000
Lower-middle-income Countries								
(1) GDP	1.000							
(2) INV	0.184***	1.000						
(3) GOV	0.379***	0.288***	1.000					
(4) LAB	-0.093*	-0.185***	-0.476***	1.000				
(5) TO	0.359***	-0.171***	-0.182***	0.179***	1.000			
(6) CPI	0.332***	0.100*	0.001	0.082	-0.112**	1.000		
(7) FD	0.292***	0.007	-0.174***	0.647***	0.083	0.135**	1.000	
(8) PSC	0.185***	0.074	-0.023	0.086	-0.183***	0.229***	0.459***	1.000
Low-income Countries								
(1) GDP	1.000							
(2) INV	0.127	1.000						
(3) GOV	-0.494***	-0.253***	1.000					
(4) LAB	0.402***	0.324***	0.133	1.000				
(5) TO	0.492***	-0.433***	-0.277***	0.122	1.000			
(6) CPI	0.235***	-0.090	-0.029	0.260***	0.075	1.000		
(7) FD	-0.027	0.029	0.483***	0.409***	-0.102	0.270***	1.000	
(8) PSC	-0.260***	-0.086	0.664***	0.365***	-0.192**	0.063	0.673***	1.000

Note: ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

The cross-dependence test (Pesaran, 2004) in Table 5 shows cross-sectional dependence for all variables except investment in high-income countries. In low-income countries, there is no evidence of cross-sectional dependence for some variables. Therefore, second and third-generation unit root tests are needed, and the cross-sectionally augmented Im-Pesaran-Shin (CIPS) test is suitable for most variables, except in low-income countries. We also used LLC and Maddala-Wu (2002) ADF tests, prioritizing CIPS when results conflicted.

Table 5. Cross-sectional Dependence Tests

	High-Income EU		High-Income		Upper-Middle Income		Lower-Middle Income		Low-Middle Income	
Variables	Stat	Prob	Stat	Prob	Stat	Prob	Stat	Prob	Stat	Prob
GDP	32.108***	0.000	24.029***	0.000	20.971***	0.000	41.122***	0.000	-0.956	0.339
INV	19.086***	0.000	1.621	0.105	10.849***	0.000	2.543**	0.011	-1.472	0.141
GOV	18.925***	0.000	6.652***	0.000	7.749***	0.000	3.297***	0.001	0.235	0.814
LAB	18.04***	0.000	21.984***	0.000	30.583***	0.000	49.857***	0.000	20.099***	0.000
TO	41.796***	0.000	7.013***	0.000	1.351	0.177	6.060***	0.000	-0.689	0.491
CPI	53.765***	0.000	24.159***	0.000	41.788***	0.000	51.247***	0.000	19.277***	0.000
FD	19.47***	0.000	9.321***	0.000	24.619***	0.000	19.704***	0.000	5.140***	0.000
PSC	17.473***	0.000	4.710***	0.000	20.910***	0.000	19.437***	0.000	7.700***	0.000

Note: ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

When the unit count is lower than the time dimension, the Breusch-Pagan (1980) LM and Pesaran et al. (2008) NLM tests assess unit correlations. Table 6 shows autocorrelation in most country groups except high-income EU countries. Models for all groups, except high-income EU countries, should account for autocorrelation. Homogeneity tests, namely Delta and Delta-adjusted (Pesaran, 2004; 2008), reveal heterogeneity in all groups. For high-income and middle-income countries, the tests are highly significant (p-values = 0.000). In low-income countries, heterogeneity is confirmed, though slight homogeneity appears in the PSC model (p=0.107).

Table 6. Autocorrelation and homogeneity tests

	Base Model		FD		PSC	
	Stat	**Prob**	**Stat**	**Prob**	**Stat**	**Prob**
High-income-EU Countries						
Breusch-Pagan LM	41.720	0.236	44.94	0.146	49.31*	0.069
Delta	6.660***	0.000	12.969***	0.000	5.536***	0.000
Delta adj.	8.261***	0.000	16.743***	0.000	7.146***	0.000
High-income Countries						
Breusch-Pagan LM	332.2***	0.000	291.1***	0.000	237.4***	0.000
Delta	6.704***	0.000	6.216***	0.000	8.732***	0.000
Delta adj.	8.316***	0.000	8.025***	0.000	11.273***	0.000
Upper-middle-income Countries						
Breusch-Pagan LM	138.20***	0.001	136.2***	0.002	123.5**	0.013
Delta	15.006***	0.000	12.223***	0.000	14.088***	0.000
Delta adj.	18.613***	0.000	15.779***	0.000	18.187***	0.000
Lower-middle-income Countries						
Breusch-Pagan LM	256.30***	0.000	190.80***	0.001	170.10**	0.025
Delta	10.181***	0.000	16.007***	0.000	14.943***	0.000
Delta adj.	12.628***	0.000	20.665***	0.000	19.292***	0.000
Low-income Countries						
Breusch-Pagan LM	49.310***	0.001	48.850***	0.001	47.280***	0.001
Delta	5.316***	0.000	4.652***	0.000	1.613	0.107
Delta adj.	6.594***	0.000	6.005***	0.000	2.082**	0.037

Note: LM (Breusch and Pagan, 1980) test is employed for autocorrelation check while homogeneous tests delta and delta adj (Pesaran et al. 2008) are utilized. ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

3.3. Model Specification

We estimated the model specification for cointegration on the finance-growth nexus was developed by Barro (1991), is the following:

$$lnGDPpc_{it} = \beta_{0i} + \beta_{1i}F_{it} + \beta_{2i}X_{it} + e_{it} \quad (1)$$

where $lnGDPpc_{it}$ is the logarithm for the GDP per capita; F_{it} is for both financial development measures; X_{it} is the set of control variables as described in Table 2, and e_{it} is error term. We expanded the conventional Barro (1991) growth regression model (Eq. 2) by adding financial development indicators such as FD (Eq. 3), and PSC (Eq. 4). All models estimated with FMOLS and CCE (Pesaran, 2006) can be re-written as follows:

$$lnGDPpc_{it,g} = \beta_{0i,g} + \delta_{i,g}t + \beta_{1i,g}INV_{it,g} + \beta_{2i,g}GOV_{it,g} + \beta_{3i,g}lnLAB_{it,g} + \beta_{4i,g}TO_{it,g} + \beta_{5i,g}lnCPI_{it,g} + e_{it,g} \quad (2)$$

$$lnGDPpc_{it,g} = \beta_{0i,g} + \delta_{i,g}t + \beta_{1i,g}INV_{it,g} + \beta_{2i,g}GOV_{it,g} + \beta_{3i,g}lnLAB_{it,g} + \beta_{4i,g}TO_{it,g} + \beta_{5i,g}lnCPI_{it,g} + \beta_{6i,g}FD_{it,g} + e_{it,g} \quad (3)$$

$$lnGDPpc_{it,g} = \beta_{0i,g} + \delta_{i,g}t + \beta_{1i,g}INV_{it,g} + \beta_{2i,g}GOV_{it,g} + \beta_{3i,g}lnLAB_{it,g} + \beta_{4i,g}TO_{it,g} + \beta_{5i,g}lnCPI_{it,g} + \beta_{6i,g}PSC_{it,g} + e_{it,g} \quad (4)$$

where $i = 1,\ldots, N;\ t = 1,\ldots., T,\ and\ g = 1,\ldots G$. i represents cross-sectional units, t represents time, and g represents country goups. β_{0i} is a unit-specific intercept that changes across cross-sectional units. All variables should be integrated into degree one. Furthermore, δ_i represents a deterministic trend—the slope coefficients ($\beta_{1i}, \ldots, \beta_{6i}$) can be changed from one country to another. Thus, we employ a method employed to allow the cointegration vectors to be heterogeneous across panel units.

3.3.1 Unit Root Tests

Within the scope of the study, cointegration analysis was conducted to determine the relationship between financial development and economic growth. In order to conduct cointegration analysis, the first differences of the selected variables must be stationary. Therefore, three panel unit root tests, LLC (Levin et al., 2002), Fisher ADF and CIPS (Im et al. 2003), are applied to determine the integration order of the dependent and independent variables, ensuring the stationarity of selected variables. First, LLC unit root test is employed by assuming the homogeneity in the dynamics of the autoregressive coefficients for all panel units. Secondly, Fisher ADF and CIPS unit root test are proposed. The reason for applying these tests is the possibility of correlation between units in the data set. O'Connell (1998) highlighted the importance of controlling for cross-sectional dependence in panel unit root tests, as correlations between panel units can negatively impact statistical size and power. Since absence of correlation between panel units is quite a restrictive assumption, second and third-generation tests are developed (Breitung and Das, 2005). To address cross-sectional dependence, Im et al. (2003) introduced CIPS test, which augments the standard ADF test by including cross-sectional averages of lagged levels and first differences of individual series. This approach is based on a linear, dynamic and heterogeneous panel data (Pesaran, 2007). For all of three unit root tests, the null hypothesis indicates that time series have unit root and the alternative hypothesis implies that time series are stationary.

3.3.2 Panel Cointegration Tests

After defining the stationarity order, the next step is analyzing the presence of a long-run relationship between selected variables. Two cointegration tests are employed, namely, Pedroni cointegration test and Westerlund cointegration test. In the Pedroni (1999) cointegration test, seven distinct tests are employed to examine in-section (within) and cross-sectional (between) effects in panel data, which are classified into two separate categories. The first category comprises four tests aggregated within the dimension, whereas the second category contains three tests in the "between" dimension. The within-dimension test statistics considered in this study are the panel v-statistics, panel rho-statistics, panel PP-statistics, and panel augmented Dickey-Fuller (ADF) statistics. In contrast, the between-dimension test statistics include the group rho-statistics, group PP-statistics, and group ADF-statistics. Some of these seven tests are parametric and some are non-parametric. For the non-parametric statistics, Equation 5 is used, and Equation 6 is used for the parametric statistics.

$$\hat{e}_{it} = \hat{\gamma}_i \hat{e}_{it-1} + \hat{v}_{it} \quad (5)$$

$$\hat{e}_{it} = \hat{\gamma}_i \hat{e}_{it-1} + \sum_{k=1}^{K_i} \hat{\gamma}_{ik} \Delta \hat{e}_{it-k} + \hat{v}_{it}^{*} \quad (6)$$

In the within-dimension framework, the null hypothesis for the panel cointegration test states that there is no cointegration, represented as $H_0 = \gamma_i = 1$ for all i. The alternative hypothesis, $H_1 = \gamma_i = \gamma < 1$ for all i, assumes a common value for γ_i, denoted as γ. Conversely, in the between-dimension framework, the panel cointegration test defines the null hypothesis as $H_0 = \gamma_i = 1$ for all i, indicating no cointegration. The alternative hypothesis, $H_1 = \gamma_i = \gamma < 1$ for all i, differs from the within-dimension approach by not imposing a common value for $\gamma_i = \gamma$ under the alternative hypothesis.

This cointegration test is notable for allowing variability in the cointegration model and autoregressive parameter across units (Kao, 1999; Pedroni, 2004) and it offers reliable results when there's no unit autocorrelation. However, in the presence of autocorrelation, alternative tests like Westerlund's (2005) methods are recommended for robustness.

$$y_{it} = d_{it}^{'} \hat{\delta}_i + x_{it}^{'} \hat{\beta}_i + \hat{e}_{it} \text{ and } \hat{e}_{it} = \rho_i \hat{e}_{it-1} + u_{it} \quad (7)$$

d_t is a vector of deterministic component, which includes both a constant and a linear trend over time. For this reason, the two cases are distinguished, $d_t = 1$ and $d_t = (1, t)'$. The hypothesis that there is no cointegration originates from the regression shown in equation (6). The residuals are stationary if y_{it} and x_{it} are cointegrated, if not, the residuals have unit root. According to Westerlund (2005), testing regression residuals for a unit root using

autoregression, for which Westerlund devised variance ratio statistics based on the ρ_i autoregressive parameter value.

3.3.3 Panel Cointegration Estimations

After identifying the cointegration relationship, the next step is estimating the cointegration parameters using various empirical methods. FMOLS and DOLS estimate only long-run relationships, while panel error correction methods like CCE captures both long- and short-run dynamics. To ensure robustness, we employ an estimator from each method. However, since the focus is on long-run relationships, short-run dynamics and causality, though detectable in the panel error correction model, are not analyzed.

Pedroni and Westerlund panel cointegration tests confirm the presence of cointegration among the variables. When selecting estimators for the long-run relationship, cross-section dependence and heterogeneity must be considered. Table 5 indicates cross-section dependence, while homogeneity tests in Table 6 suggest using heterogeneous estimators. Therefore, FMOLS (Pedroni, 1996; 2000) was employed as a heterogeneous estimator, and the CCE method (Pesaran, 2006) was used for robustness analysis, as it accounts for cross-sectional dependence. Since unit root tests in Table 8 confirm non-stationary and cointegration, the CCE estimator is appropriate, considering potential correlations in the error term due to common factors or shocks.

4. Empirical Findings

4.1. Panel Unit Root Test Results

Even though we obtained results from three different unit root tests, we focused our analysis on the CPIS test, which addresses cross-correlation between units. We also used panel unit roots when determining the lag numbers based on the Akaike Information Criteria (AIC). According to the results in Table 7, the selected variables exhibit unit roots, specifically I(1), and their first differences are stationary. Furthermore, all selected variables become stationary when we consider their first differences. This suggests the potential presence of a long-run relationship between the selected variables.

4.2. Panel Cointegration Analysis Results

After conducting the unit root test, we must verify that the variables are cointegrated by applying the Pedroni and Westerlund cointegration tests. Table 8 presents the outcomes of these cointegration tests. While the base models for high-income EU countries and high-income countries do not exhibit cointegration, adding private credit and FD leads to cointegration in the models. The models for both upper-middle and lower-middle-income

countries show cointegration. For low-middle-income countries, the base model and the model with added FD display cointegration, but the model with added private credit does not.

Unit root tests indicated that all selected variables are integrated at I(1), suggesting a potential long-term equilibrium. Pedroni (1999; 2005) and Westerlund (2005) cointegration tests confirmed a long-term relationship. The results show that the base model, without financial development indicators, only shows cointegration in the upper-middle-income group. Incorporating FD into the base model shows long-term cointegration for all country groups, and adding PSC yields similar results, except for the low-income group, confirming that financial development has a long-run relationship with the variables, except in the low-income PSC model.

Table 7. Results of panel unit root tests

			LLC				ADF Fisher				CIPS			
Country Group	Variables	Obs.	Level		1st Dif.		Level		1st Dif.		Level		1st Dif.	
High-income-EU Countries	GDP	18	-1.205	0.114	-5.445***	0.000	17.243	0.997	54.301**	0.026	1.320	0.907	-2.569***	0.005
	INV	18	-2.260**	0.012	-12.297***	0.000	33.368	0.594	190.007***	0.000	-0.286	0.387	-7.392***	0.000
	GOV	18	-1.170	0.132	-10.331***	0.000	20.086	0.985	94.613***	0.000	1.166	0.878	-3.224***	0.001
	LAB	18	-0.636	0.262	-8.692***	0.000	68.350***	0.001	133.034***	0.000	0.015	0.506	-5.560***	0.000
	TO	18	-2.598***	0.005	-10.526***	0.000	46.939	0.105	160.874***	0.000	-0.784	0.216	-2.902***	0.002
	CPI	18	-1.045	0.148	-7.812***	0.000	34.209	0.554	91.779***	0.000	0.599	0.725	-2.885***	0.002
	FD	18	-4.158***	0.000	-17.624***	0.000	28.176	0.821	308.800***	0.000	-0.899	0.184	-7.263***	0.000
	PSC	18	-0.465	0.321	-5.561***	0.000	5.855	1.000	132.110***	0.000	1.064	0.856	-5.265***	0.000
High-income Countries	GDP	9	-3.386***	0.000	-2.349***	0.009	7.196	0.988	45.320***	0.000	0.433	0.667	-1.752**	0.048
	INV	9	-1.091	0.138	-8.528***	0.000	16.745	0.541	105.928***	0.000	0.917	0.820	-1.953**	0.025
	GOV	9	-1.663**	0.048	-3.627***	0.000	2.843	1.000	43.521***	0.001	-0.546	0.293	1.602*	0.073
	LAB	9	-2.174**	0.015	-2.508***	0.006	2.005	1.000	29.315**	0.045	0.373	0.646	-0.483	0.315
	TO	9	-2.497***	0.006	-6.514***	0.000	18.196	0.443	102.910***	0.000	-1.214	0.112	-1.852**	0.032
	CPI	9	-4.802***	0.000	-5.558***	0.000	19.838	0.342	73.117***	0.000	-0.009	0.496	-1.550*	0.061
	FD	9	-3.722***	0.000	-1.146	0.175	38.160***	0.004	217.723***	0.000	-1.023	0.177	-6.050***	0.000
	PSC	9	-1.530*	0.063	-5.677***	0.000	5.995	0.996	64.080***	0.000	-0.987	0.162	-2.707***	0.003
Upper-middle-income Countries	GDP	14	-1.369*	0.086	-4.707***	0.000	10.132	0.999	62.732***	0.000	1.167	0.878	1.167*	0.066
	INV	14	-3.235***	0.001	-10.746***	0.000	16.063	0.965	159.285***	0.000	-1.151	0.775	-4.013***	0.000
	GOV	14	-1.468*	0.071	-11.193***	0.000	32.825	0.242	149.017***	0.000	2.244	0.988	-2.324**	0.010
	LAB	14	-0.091	0.464	-6.299***	0.000	19.090	0.895	60.977***	0.000	-1.159	0.787	-2.151**	0.010
	TO	14	-2.300**	0.011	-7.288***	0.000	18.801	0.904	108.158***	0.000	-0.245	0.403	-2.917***	0.002
	CPI	14	-4.387***	0.000	-5.520***	0.000	50.847***	0.005	160.208***	0.000	0.647	0.741	-5.489***	0.000
	FD	14	-4.440***	0.000	-1.218	0.125	43.098**	0.034	229.736***	0.000	-1.520	0.127	-7.090***	0.000
	PSC	14	-0.349	0.364	-8.770***	0.000	32.154	0.268	102.351***	0.000	-1.394	0.976	-3.797***	0.000
Lower-middle-income Countries	GDP	17	3.142	0.999	-5.587*	0.000	33.710	0.482	52.247**	0.024	0.158	0.563	-1.355*	0.088
	INV	17	-0.839	0.201	-10.450*	0.000	21.712	0.949	172.966***	0.000	-0.084	0.467	-3.698***	0.000
	GOV	17	-0.611	0.271	-11.446*	0.000	29.755	0.676	164.034***	0.000	1.536	0.938	-3.259***	0.001
	LAB	17	-0.402	0.344	-7.529*	0.000	15.372	0.997	171.933***	0.000	1.020	0.846	-1.394*	0.057
	TO	17	-3.101*	0.001	-15.700*	0.000	48.086*	0.055	272.936***	0.000	-0.632	0.264	-5.771***	0.000
	CPI	17	-0.937	0.175	-7.929*	0.000	7.673	1.000	110.389***	0.000	-1.413	0.578	-4.404***	0.000
	FD	17	-3.065***	0.001	1.470	0.118	60.678***	0.003	288.113***	0.000	0.822	0.795	-5.606***	0.000
	PSC	17	5.414	1.000	-8.677*	0.000	18.413	0.986	184.211	0.000	1.762	0.961	-1.869**	0.031
Low-income Countries	GDP	7	-2.072**	0.020	-7.546*	0.000	12.224	0.588	74.331***	0.000	1.274	0.899	-1.932**	0.027
	INV	7	-3.417*	0.000	-8.006*	0.000	18.244	0.196	111.704***	0.000	-0.672	0.251	-3.536***	0.000
	GOV	7	-0.351	0.363	-9.469*	0.000	13.047	0.523	84.351***	0.000	1.572	0.942	-2.308**	0.011
	LAB	7	-1.253	0.212	-3.756*	0.000	3.730	0.997	11.468***	0.000	-1.678	0.865	-2.732***	0.003
	TO	7	-13.432***	0.000	-6.700*	0.000	12.326	0.601	147.090***	0.000	-1.316	0.965	-4.698***	0.000
	CPI	7	9.186	1.000	0.014	0.506	10.066	0.757	66.295***	0.000	1.449	0.998	-1.758**	0.039
	FD	7	-5.157*	0.000	-10.939*	0.000	9.888	0.770	71.977***	0.000	-0.771	0.220	-5.284***	0.000
	PSC	7	-1.093	0.310	-7.621*	0.000	1.932	0.109	11.707***	0.000	-1.146	0.976	-3.844***	0.000

Note: Statistics and p-values are given in columns under level and 1st Difference headlines. ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

Table 8. Pedroni and Westerlund cointegration tests

	Base Model		FD		PSC	
	Stat	**Prob**	**Stat**	**Prob**	**Stat**	**Prob**
	High-income-EU Countries					
Panel v-Statistic	0.689	0.246	0.054	0.478	-0.549	0.709
Panel rho-Statistic	2.168	0.985	3.247	0.999	3.573	0.999
Panel PP-Statistic	-1.537*	0.062	-2.716***	0.003	-1.511*	0.065
Panel ADF-Statistic	-2.300**	0.011	-3.158***	0.000	-1.559*	0.065
Group rho-Statistic	4.264	1.000	5.049	1.000	4.965	1.000
Group PP-Statistic	0.025	0.510	-1.663**	0.048	-4.563***	0.000
Group ADF-Statistic	-1.566*	0.060	-2.032**	0.021	-2.800***	0.003
Variance Ratio	-0.556	0.289	2.593***	0.005	2.817***	0.002
	Not Cointegrated		Cointegrated		Cointegrated	
	High-income Countries					
Panel v-Statistic	2.559***	0.005	1.654**	0.049	2.269**	0.012
Panel rho-Statistic	4.573	1.000	5.287	1.000	3.816	0.999
Panel PP-Statistic	6.612	1.000	-1.459*	0.068	-2.112**	0.019
Panel ADF-Statistic	-3.557***	0.000	-1.434*	0.076	-2.102**	0.018
Group rho-Statistic	4.487	1.000	5.230	1.000	5.190	1.000
Group PP-Statistic	0.248	0.598	0.138	0.555	0.054	0.522
Group ADF-Statistic	-3.407***	0.000	-1.032	0.151	-1.637*	0.051
Variance Ratio	-0.129	0.448	2.157**	0.016	1.814**	0.035
	Not Cointegrated		Cointegrated		Cointegrated	
	Upper-middle-income Countries					
Panel v-Statistic	-0.504	0.693	-1.265	0.897	-0.490	0.688
Panel rho-Statistic	2.003	0.977	2.923	0.998	2.814	0.998
Panel PP-Statistic	-2.611***	0.005	-1.721**	0.043	-3.175***	0.001
Panel ADF-Statistic	-2.601***	0.005	-2.149**	0.016	-4.864***	0.000
Group rho-Statistic	3.672	0.999	4.664	1.000	4.416	1.000
Group PP-Statistic	-2.988***	0.001	-2.444***	0.007	-5.006***	0.000
Group ADF-Statistic	-2.974***	0.002	-3.433***	0.000	-4.767***	0.000
Variance Ratio	1.652**	0.049	3.228***	0.000	2.670***	0.004
	Cointegrated		Cointegrated		Cointegrated	
	Lower-middle-income Countries					
Panel v-Statistic	-0.407	0.658	-0.957	0.831	-1.079	0.860
Panel rho-Statistic	2.988	0.999	3.469	0.999	3.453	0.999
Panel PP-Statistic	0.180	0.571	-1.694**	0.043	-2.601***	0.005
Panel ADF-Statistic	-2.060**	0.019	-1.580*	0.057	-3.772***	0.000
Group rho-Statistic	4.821	1.000	5.593	1.000	5.307	1.000
Group PP-Statistic	-0.438	0.331	-1.489*	0.082	-3.574***	0.000
Group ADF-Statistic	-2.859***	0.002	-1.577*	0.057	-3.536***	0.000
Variance Ratio	0.005	0.497	2.815***	0.002	1.334*	0.091
	Not Cointegrated		Cointegrated		Cointegrated	
	Low-income Countries					
Panel v-Statistic	-0.255	0.601	-0.279	0.610	-0.655	0.744
Panel rho-Statistic	0.329	0.629	1.565	0.941	1.804	0.964
Panel PP-Statistic	-4.805***	0.000	-3.823***	0.000	-1.529*	0.063
Panel ADF-Statistic	-4.796***	0.000	-3.534***	0.000	-1.585*	0.057
Group rho-Statistic	2.522	0.994	2.996	0.999	3.268	0.999
Group PP-Statistic	-1.630*	0.052	-2.373***	0.009	-0.606	0.272
Group ADF-Statistic	-1.711**	0.044	-2.263**	0.012	-0.484	0.314
Variance Ratio	0.074	0.471	-1.530***	0.063	0.254	0.399
	Not Cointegrated		Cointegrated		Not Cointegrated	

Note: Panel v, rho, PP, and ADF with group rho, PP, and ADF stand for Pedroni (1999, 2005) cointegration tests. Westerlund (2005) cointegration test result is shown by variance ratio. ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

4.3. Robustness Checks with Panel Cointegration Estimations

In our analysis, we applied cointegration tests and utilized FMOLS and CCE methods to examine the long-term relationship between various factors and GDP per capita, as detailed in our findings (Table 9a). Our research shows that the impact of financial development (FD) and private sector credit (PSC) on growth varies across different income-level country groups. In high-income EU countries, FD has a positive and significant effect on growth, especially in

the CCE model. Additionally, PSC has a modest but significant positive influence on both FMOLS and CCE estimations. In high-income countries outside the EU, FD also has a positive effect, although it is somewhat weaker than in the EU. On the other hand, PSC plays a minimal role and only has marginal significance in the FMOLS models.

Table 9a. Results of panel FMOLS and CCE estimations

	(1) Base		(2) FD		(3) PSC	
	FMOLS	**CCE**	**FMOLS**	**CCE**	**FMOLS**	**CCE**
	High-income-EU Countries					
INV	0.013*** (0.000)	0.003** (0.014)	0.013*** (0.000)	0.008*** (0.000)	0.138** (0.013)	0.003** (0.014)
GOV	-0.003 (0.170)	-0.013*** (0.000)	-0.004* (0.089)	-0.011*** (0.007)	-0.115** (0.025)	-0.012*** (0.004)
LAB	0.270*** (0.003)	0.374** (0.047)	0.205* (0.068)	1.08*** (0.005)	0.510*** (0.000)	0.379** (0.035)
TO	0.001** (0.015)	0.001** (0.012)	0.004** (0.030)	0.001** (0.056)	0.111** (0.020)	-0.001 (0.117)
CPI	-0.197*** (0.002)	-0.413** (0.014)	0.033 (0.634)	-0.142 (0.476)	-0.251*** (0.000)	-0.528** (0.021)
FD	--	--	0.298*** (0.000)	0.155** (0.029)	--	--
PSC	--	--	--	--	0.067* (0.088)	0.002*** (0.007)
	High-income Countries					
INV	0.005*** (0.003)	0.006*** (0.004)	0.005*** (0.003)	0.005** (0.026)	0.006*** (0.001)	0.035* (0.055)
GOV	-0.009*** (0.001)	-0.011** (0.073)	-0.009*** (0.003)	-0.013** (0.021)	-0.006* (0.080)	-0.020*** (0.000)
LAB	0.845*** (0.000)	0.655** (0.013)	0.864*** (0.000)	0.993** (0.021)	0.936*** (0.000)	0.150 (0.579)
TO	0.001*** (0.000)	0.0002 (0.814)	0.001*** (0.000)	0.0002 (0.960)	0.001*** (0.000)	-0.001 (0.348)
CPI	-0.083 (0.437)	-0.322** (0.093)	-0.068 (0.517)	0.147 (0.508)	-0.042 (0.691)	-0.502*** (0.083)
FD	--	--	0.455** (0.043)	0.179** (0.015)	--	--
PSC	--	--	--	--	0.0004* (0.098)	0.001* (0.085)
	Upper-middle-income Countries					
INV	0.011*** (0.000)	0.010*** (0.001)	0.186*** (0.002)	0.010*** (0.000)	0.008*** (0.000)	0.009*** (0.000)
GOV	-0.014*** (0.001)	-0.011* (0.082)	0.074 (0.158)	-0.008 (0.214)	-0.008*** (0.006)	-0.008* (0.098)
LAB	0.141 (0.298)	0.298 (0.165)	0.066 (0.249)	0.340* (0.093)	0.092 (0.379)	0.462** (0.022)
TO	0.002 (0.236)	-0.001 (0.877)	-0.053 (0.313)	-0.0002 (0.938)	0.003** (0.021)	0.0002 (0.912)
CPI	0.256*** (0.001)	-0.479** (0.046)	0.225*** (0.000)	0.265 (0.130)	0.026* (0.083)	0.225 (0.220)
FD	--	--	0.230*** (0.000)	0.479** (0.053)	--	--
PSC	--	--	--	--	0.001** (0.027)	0.003* (0.065)
	Lower-middle-income Countries					
INV	0.005*** (0.000)	0.006** (0.021)	0.005*** (0.000)	0.005** (0.026)	0.005*** (0.000)	0.006** (0.036)
GOV	0.001 (0.650)	-0.009** (0.019)	0.001 (0.730)	-0.011** (0.027)	0.001 (0.624)	-0.013*** (0.000)
LAB	0.374** (0.011)	0.680*** (0.000)	0.429*** (0.003)	0.546*** (0.002)	0.361** (0.015)	0.872*** (0.001)
TO	0.002*** (0.009)	0.002 (0.221)	0.002** (0.010)	0.001 (0.740)	0.002*** (0.009)	0.002 (0.116)
CPI	0.069 (0.293)	0.199** (0.018)	0.113* (0.087)	0.200** (0.027)	0.062 (0.350)	0.167* (0.098)
FD	--	--	0.458*** (0.005)	0.458* (0.059)	--	-- --
PSC	--	--	--	--	0.001 (0.566)	0.001 (0.400)
	Low-income Countries					
INV	0.005** (0.027)	0.004 (0.232)	0.005** (0.029)	0.005* (0.075)	0.004** (0.037)	0.005* (0.086)
GOV	-0.006* (0.055)	0.006 (0.374)	-0.006* (0.058)	-0.004* (0.065)	-0.006* (0.074)	-0.005* (0.065)
LAB	2.008*** (0.000)	3.733* (0.077)	2.031*** (0.000)	3.315* (0.077)	1.999*** (0.000)	1.518* (0.075)
TO	0.005*** (0.000)	0.002* (0.092)	0.005*** (0.000)	0.002* (0.097)	0.005*** (0.000)	0.003* (0.095)
CPI	-0.121*** (0.008)	0.041 (0.865)	-0.131*** (0.005)	0.053 (0.869)	-0.129*** (0.009)	0.042 (0.861)
FD	--	--	-0.053 (0.944)	0.123 (0.984)	--	-- --
PSC	0.005** (0.027)	--	--	--	0.001 (0.811)	-0.011 (0.204)

Note: Results are shown as coefficients (p-values in parentheses). ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

For upper-middle-income countries, FD has a robust positive relationship with growth, particularly in the CCE model, while PSC also significantly contributes to growth in both estimations. In lower- and middle-income countries, FD remains a key factor for growth and positively influences the FD models. However, the role of PSC diminishes, showing weaker or insignificant effects. Finally, in line with the findings of Appiah et al. (2020), neither FD nor PSC substantially impacts low-income countries, with results showing weak or insignificant contributions to growth. This result supports the hypothesis that selected countries should reach a particular level of financial development to have a considerable effect on growth.

The impact of investment (INV), government spending (GOV), labor force participation (LAB), trade openness (TO), and inflation (CPI) varies across income-level groups. In high-income EU and non-EU countries, investment consistently drives growth, while government spending has a negative influence. Labor force participation plays a crucial role, and trade openness contributes positively, though its significance declines in some models, with inflation negatively affecting growth. For upper-middle-income countries, investment remains a strong growth driver, but the effects of government spending and inflation are mixed, with trade openness showing weaker results. In lower-middle and low-income countries, investment and labor force participation are key growth drivers, while government spending is generally negative, and inflation's negative impact is more pronounced, reflecting the vulnerability of these economies to inflationary pressures.

Table 9b. Results of panel FMOLS and CCE estimations.

	(1) Base		**(2) FD**		**(3) PSC**	
	FMOLS	**CCE**	**FMOLS**	**CCE**	**FMOLS**	**CCE**
	High-income-EU Countries					
Adj. R^2	0.9986	--	0.9985	--	0.9986	--
Wald Test	156.927***(0.000)	38.98*** (0.000)	143.646***(0.000)	47.846*** (0.000)	163.844***(0.000)	48.96*** (0.000)
RMSE	--	0.006	--	0.005	--	0.004
	High-income Countries					
Adj. R^2	0.9986	--	0.9985	--	0.9986	--
Wald Test	156.927***(0.000)	220.73*** (0.000)	143.646***(0.000)	316.96*** (0.000)	163.844***(0.000)	93.36*** (0.000)
RMSE	--	0.004	--	0.003	--	0.003
	Upper-middle-income Countries					
Adj. R^2	0.9811	--	0.9813	--	0.9897	--
Wald Test	136.168***(0.000)	14.76** (0.012)	67.333*** (0.000)	31.87*** (0.000)	61.225***(0.000)	13.31** (0.038)
RMSE	--	0.010	--	0.008	--	0.007
	Lower-middle-income Countries					
Adj. R^2	0.9935	--	0.9937	--	0.9935	--
Wald Test	58.433*** (0.000)	10.71** (0.057)	68.274*** (0.000)	17.42*** (0.001)	58.864*** (0.000)	13.29** (0.039)
RMSE	--	0.012	--	0.009	--	0.009
	Low-income Countries					
Adj. R^2	0.9907	--	0.9905	--	0.9906	--
Wald Test	89.894*** (0.000)	25.72*** (0.000)	92.491*** (0.000)	9.08 (0.169)	90.175*** (0.000)	22.43*** (0.000)
RMSE	--	0.024	--	0.020	--	0.018

Note: Results are shown as coefficients (p-values in parentheses). ***, **, * stand for p<0.01, p<0.05, p<0.1, respectively.

Source: Own construction

Table 9b presents statistical values for the Wald test and root mean square errors (RMSE). The Wald test's null hypothesis is rejected for all estimated models except the one including financial development for low-income countries. Including financial development indicators reduces RMSE values, indicating enhanced explanatory power. Explanatory power diminishes as per capita income decreases, with the highest RMSE values found in low-income country groups. This underscores that for financial development to impact economic growth positively, countries must achieve a certain development level.

5. Concluding Remarks

Our study investigates the impact of financial development on growth. It starts by constructing a Romer growth model that incorporates the level of financial development, following Barro (1991). The initial empirical analysis compares total credits to the private sector with the Financial Development Index to further investigate the finance-growth nexus in long-term. The second part of the study estimates an empirical model for a panel of 65 countries in five income groups from 2001 to 2020 using FMOLS and CCE estimation methods, which account for heterogeneity and cross-sectional dependencies.

Our findings show that the link between finance and growth is not uniform in the long-term due to countries' different GDP per capita levels. Even so, growth in high-income countries is positively affected by financial development, particularly within the EU; it may also hinder growth in lower-income countries, where excessive financial deepening can lead to diminishing returns (Arcand et al., 2015). Beyond a certain income level, financial development seems to have no significant effect on growth, challenging the conventional belief in a universally positive finance-growth correlation. These results emphasize the need for tailored financial policies considering each country's economic context. The findings provide the following policy implications:

- For high-income and high-income EU countries, policymakers should prioritize enhancing trade openness and labor market efficiency to drive GDP per capita growth. Strengthening financial regulation can mitigate risks in advanced financial systems, while investment in innovation and digital finance can bolster competitiveness. Balancing fiscal discipline and public investment is crucial for sustainable growth by controlling inflation and government spending.
- In upper-middle-income countries, financial sector reforms should focus on improving access to private sector credit (PSC) and fostering financial development (FD). Governments should work on deepening capital markets and enhancing financial inclusion, especially for small and medium enterprises (SMEs). Given the reduced impact of trade openness and inflation in the long run, policies should concentrate on diversifying exports and managing inflation to build economic resilience.
- For lower-middle-income countries, policies should prioritize infrastructure, education, and technology investment to drive productivity. Strengthening financial development and improving access to financial services, particularly in underserved areas, is crucial. Addressing inefficiencies in government spending and controlling

inflation can support macroeconomic stability while fostering entrepreneurship can drive job creation and growth.

- To lay the foundation for growth, governments should initially focus on fundamental development goals in low-income countries, such as education, healthcare, and infrastructure. Expanding financial literacy and access to banking services will pave the way for future financial development. In the short term, policies promoting trade openness and labor market improvements can drive growth and attract foreign direct investment (FDI), aiding long-term development.

Acknowledging the various substitute factors as significant for financial development is paramount. Future studies could amalgamate these substitute factors, such as reconsidering the weight of financial depth, to create a composite financial development index. Additionally, researchers should further focus on the roles of the bond and stock markets in a country's economic growth, as these are often overlooked. Lastly, developing countries across different global regions experience widespread poverty and inequality, and future studies should also explore the regional effects on them.

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