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Does Economic Development Reshape Financial Structure? Evidence from BRICS Economies

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Highlights

- **Economic development shifts BRICS financial systems toward market-based finance.**
- **GM-FMOLS and AMG estimators confirm robust long-run relationships.**
- **The findings provide strong support for New Structural Financial Economics.**

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Abstract

This study examines whether economic development reshapes financial structure in line with the predictions of New Structural Financial Economics (NSFE). The theory argues that financial systems evolve endogenously alongside changes in industrial structure and financing needs, gradually shifting from bank-based to more market-oriented arrangements as economies develop. Using a panel of BRICS economies over the period 1998–2024, this paper analyzes how economic development and financial structure are related over the long run. A composite financial structure index is constructed through Principal Component Analysis based on financial structure size and activity indicators. Before estimation, cross-sectional dependence, slope heterogeneity, panel unit roots, and panel cointegration are systematically examined to ensure the validity of the empirical analysis. The Group-Mean Fully Modified Ordinary Least Squares (GM-FMOLS) estimator is applied to estimate the long-run coefficients, while the Augmented Mean Group (AMG) estimator serves as a robustness check. The empirical results reveal a positive and statistically significant effect of real GDP per capita on financial structure across alternative model specifications. The findings provide robust empirical support for the New Structural Economics framework and suggest that financial systems evolve in line with structural transformation and the dynamic financing needs of the real economy, while institutional quality variables and pandemic conditions are controlled throughout the analysis consistently.

1. Introduction

Financial systems constitute an essential component of the development process because they influence the availability of finance, the efficiency of capital allocation, and the capacity of the economy to support productive investment. Differences in the composition of financial systems have therefore become an important topic in development economics. In particular, scholars have long

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debated whether economic growth is better supported by financial structures dominated by banks or by capital markets. This debate has motivated extensive research on the interaction between financial structure and economic development and on the conditions under which financial systems evolve as economies advance (Allen & Gale, 2000; Beck et al., 2001b).

Early scholarship largely treated financial structure as exogenous, emphasizing either the superior role of banks in mobilizing capital and mitigating information asymmetries (Stiglitz, 1985; Singh, 1997) or the advantages of financial markets in promoting innovation and risk diversification (Greenwood & Jovanovic, 1990; Allen & Gale, 2000). A third strand of thought later stressed the complementarity between banks and markets, suggesting that overall financial development—rather than its composition—matters most for growth (Beck & Levine, 2002; Arize et al., 2018).

Over the past decade, however, this exogenous perspective has been increasingly challenged by a new theoretical framework termed New Structural Financial Economics (NSFE)—a branch of New Structural Economics (NSE) established by Justin Yifu Lin and colleagues. NSFE offers a dynamic and demand-driven explanation for the evolution of financial systems, particularly in developing and emerging economies. It dismisses both the idea that developing countries should mimic the financial structures of advanced economies (the benchmark view) and the claim that only the total level of financial development matters, regardless of structure (the irrelevance view). Instead, NSFE argues that the financial system must evolve endogenously in line with an economy's factor endowments, industrial composition, and stage of development (Lin et al., 2013; Lin et al., 2024; Gong et al., 2019).

At the core of NSFE lies the concept of the optimal financial structure, defined as the set of financial institutions, financial markets, and financial arrangements that best serve the financing needs generated by a country's industrial structure at a given stage of development. Unlike conventional approaches that regard financial systems as universally applicable institutional arrangements, NSFE emphasizes that the optimal financial structure varies across countries and over time as factor endowments, production technologies, and industrial structures evolve (Lin et al. 2023).

According to this framework, the principal role of finance is to serve the needs of the real economy. An optimal financial architecture must therefore be tailored to the distinctive financing requirements of the production structure at each stage of development. As the economy transforms—typically from agriculture toward manufacturing and, later, services—the production base shifts from labor-intensive to capital- and technology-intensive activities. These structural transitions alter the scale, risk, and maturity of financing needs, giving rise to different forms of financial intermediation. NSFE classifies the evolution of financial structures into three broad stages (Lin et al., 2024):

1. At low levels of economic development, the productive sector is largely composed of smaller firms operating in labor-intensive activities. Since these

enterprises typically seek relatively small amounts of capital and face significant information asymmetries, financing arrangements based on close lender–borrower relationships become particularly important. As a result, financial systems in which commercial banks play the dominant role are generally more effective than capital markets in supporting economic activity during this stage of development.

2. In the intermediate stage, as industries become more capital-intensive and technologically advanced, both banks and emerging capital markets coexist. The share of banks declines relative to markets as financial needs become larger and more diversified.

3. At the advanced stage, innovation-driven industries require large-scale, long-term, and high-risk financing. Consequently, capital markets expand and take on a more prominent role in providing equity and long-term funds.

This evolution reflects changes not only in the scale of financing demand but also in its risk profile, information characteristics, and maturity structure (Lin et al., 2023). As firms become larger, more innovative, and increasingly dependent on long-term risk capital, financial markets gradually assume a greater role in resource allocation (Lin, Sun, & Jiang, 2013). Similarly, Gong et al. (2019) argue that rapid industrial upgrading generates demand for increasingly diversified financial arrangements, leading to the expansion of market-based financing channels. Consequently, the transition from bank-based to market-based finance can be understood as a natural outcome of economic development, technological upgrading, and structural transformation.

From this perspective, the optimal financial structure within a country is endogenously molded by its productive structure, which itself is a function of the economy's factor endowments, including labor, capital, land, and technology. When financial systems evolve in harmony with the real economy, they enhance productivity and growth. Conversely, when finance becomes detached from production and operates independently, financialization emerges, leading to speculative behavior, resource misallocation, and systemic instability (Lin et al., 2024).

Another important implication of NSFE concerns the interaction between markets and governments in shaping financial development. While market mechanisms play the primary role in allocating resources, information asymmetries, externalities, and coordination failures may prevent the spontaneous emergence of the financial arrangements required by structural transformation. In such cases, governments can play a facilitating role by supporting institutional innovation, improving regulatory frameworks, and addressing market failures. Therefore, the evolution of financial structure is viewed as the joint outcome of market forces, industrial upgrading, and appropriate government facilitation rather than purely market-driven processes (Lin et al. 2023).

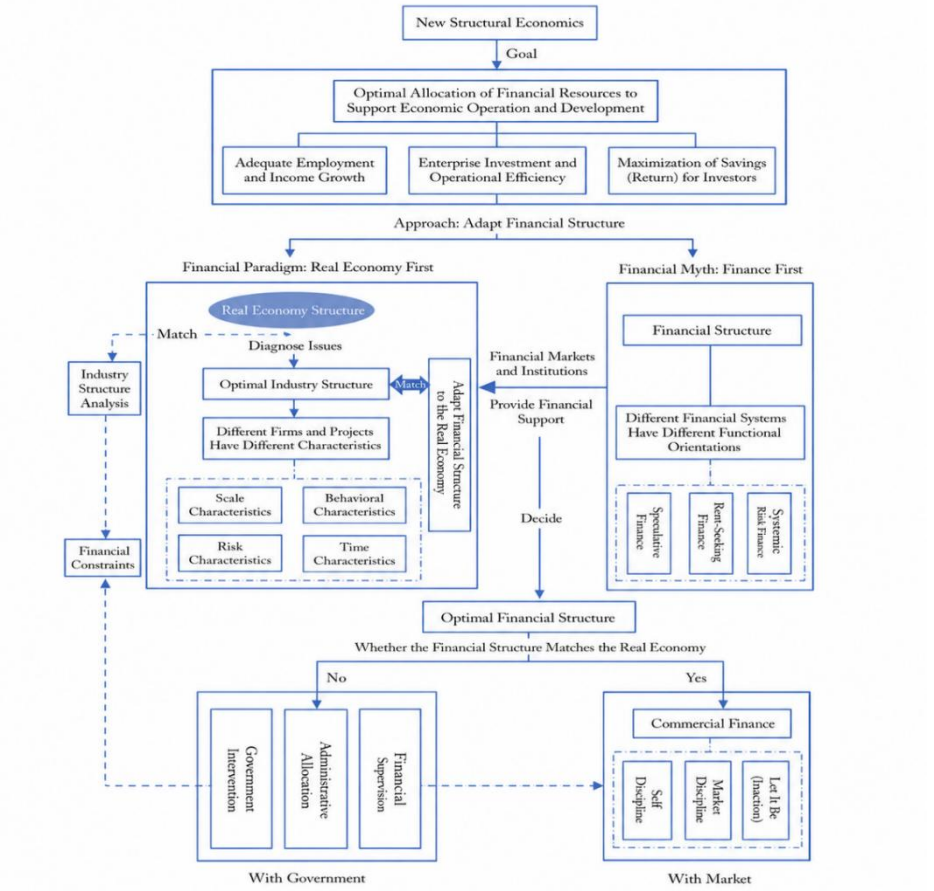

Figure 1. The Basic Analytical Framework of New Structural Financial Economics
***Source**: Research Findings*

Empirical studies support the endogenous view. Demir and Hall (2017) tested the new structuralism hypothesis using NARDL analysis for Germany, the USA, France, and Turkey (1989–2012). They found evidence that financial structure evolves dynamically in response to economic development, supporting the view that bank-based systems dominate early stages while market-based systems gain importance at advanced stages of development. Allen et al. (2018) provided empirical evidence that financial structure evolves in response to real-sector dynamics. Using cross-country data and natural experiments from India, Finland, Sweden, and South Korea, they showed that changes in industrial structure drive the evolution of financial systems, implying that financial institutions adapt to the financing demands of the real economy. Using panel data for 115 countries, Lin, Yang, and Zhang (2022) show that the adoption of comparative-advantage-defying

(CAD) development strategies tends to promote capital-intensive industries and large state-owned enterprises, resulting in a concentrated banking system and a distorted allocation of financial resources. Under such conditions, large firms receive a disproportionate share of bank credit at preferential borrowing costs, while micro, small, and medium-sized enterprises (MSMEs) face persistent financing constraints. Their findings indicate that financial distortions and financing gaps are not merely financial-sector phenomena but are rooted in development strategies that are inconsistent with a country's factor endowments and stage of development. Ye et al. (2021) investigated the growth effects of structural matching between finance and the real economy. Using an assortative matching model and panel data from 81 countries (1980–2015), they showed that the alignment between financial structure and technological structure significantly promotes GDP growth—particularly in developed countries—mainly through productivity enhancement rather than capital accumulation. In a subsequent study, Ye et al. (2023) investigated the growth effects of structural matching between financial structure and technology using Chinese provincial panel data. They found that the alignment between financial structure and technology level significantly promotes economic growth, with mismatching reducing growth relative to the optimum. The effect is stronger in developed regions and operates through both capital accumulation and technological progress. Li and Duan (2024) demonstrated that the relative efficiency of banks and capital markets depends on the technological characteristics of firms. Using a theoretical model and evidence from Chinese listed firms between 2000 and 2019, they found that bank financing is more effective when technological risks are low, whereas market-based financing becomes increasingly important as productivity and technological risk rise. In such environments, equity financing allows risks to be shared among investors and supports the upgrading of human capital. Their findings provide a microeconomic foundation for the NSFE argument that financial structures evolve alongside changes in production technology and financing needs.

Collectively, these studies suggest that financial structure is not an exogenous institutional choice but rather an endogenous outcome of economic development, industrial evolution, and changing financing needs. Despite the growing empirical support for NSFE, evidence from major emerging economies remains relatively limited. In particular, few studies have examined whether the ongoing structural transformation observed in BRICS economies has been accompanied by a systematic shift from bank-based toward market-based financial systems. This gap is especially important because BRICS countries differ substantially in their levels of income, industrial sophistication, and financial development, making them an ideal setting for testing the central predictions of the NSFE framework.

Hence, the present study empirically tests the NSFE hypothesis covering the BRICS countries—namely Brazil, Russia, India, China, and South Africa—from 1998 through 2024. Consistent with NSFE, it is expected that as real-sector sophistication and productivity increase, financial systems will gradually transition from bank-based toward market-based structures. Given that rising real GDP per capita reflects

this advancement in the real economy, it serves as an empirical proxy for structural transformation in the model as Demir and Hall (2017). This research contributes to the literature in three ways. First, this study extends the empirical application of NSFE to a panel of major emerging economies, an area that has received limited attention in the literature. Second, it constructs a composite indicator of financial structure using principal component analysis, allowing a broader assessment of the relative importance of market-based versus bank-based finance. Third, it provides new evidence on whether economic development, proxied by real GDP per capita, systematically drives financial structural transformation in the selected economies over the period 1998–2024.

The remainder of this study is arranged as follows. The evolution of financial structures across the selected economies is examined in Section 2. Section 3 describes the data, variables, and econometric approach. Section 4 presents the empirical results and robustness analysis, and Section 5 offers concluding remarks, along with policy implications and directions for future work.

2. The BRICS Financial Structure

In this section, the evolution of the financial structures of the countries is examined individually over the period 1998–2024. For this purpose, two key indicators—financial structure–size (FSS) and financial structure–activity (FSA)—are employed to measure the relative importance of capital markets compared to the banking system. Based on the statistical evidence, several patterns emerge:

Brazil: Brazil's financial structure has remained predominantly bank-based throughout the period. The FSS index reached its peak in 2007 before entering a persistent downward trend, indicating a declining relative importance of capital markets compared with banking assets. In contrast, the FSA index exhibited two notable surges in 2007 and 2020 and showed a modest upward trend over time. The simultaneous rise of both indicators in 2007 coincided with Brazil's pre-crisis economic expansion driven by strong commodity exports and capital inflows (Cuevas et al. 2019). Overall, despite temporary improvements in market activity, the long-run trend suggests that banks continue to dominate financial intermediation in Brazil.

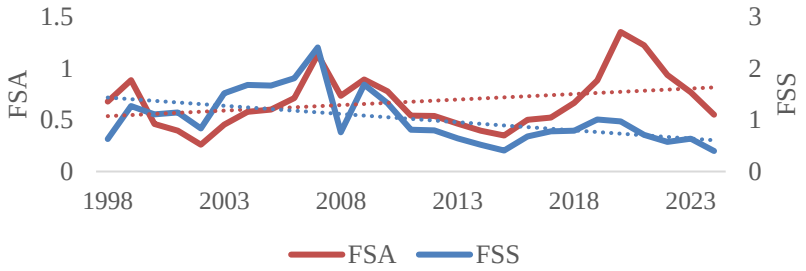

Figure 2. Evolution of Financial Structure Indicators in Brazil
***Source**: Research Findings*

Russia: Russia's financial structure exhibits a clear downward trend in both FSS and FSA indices. Both indicators peaked around 2006–2007, after which they declined, although FSS displayed greater fluctuations over time. The early 2000s were characterized by rapid capital market expansion, supported by privatization reforms, rising oil revenues, and strong foreign capital inflows (Winnie, 2011). However, the 2008 global financial crisis and subsequent international sanctions following the 2014 Crimea annexation weakened investor confidence and restricted access to external finance (Borozna and Kochtcheeva, 2024). Overall, the long-run trend indicates a shift toward a more centralized and bank-dominated financial system in Russia.

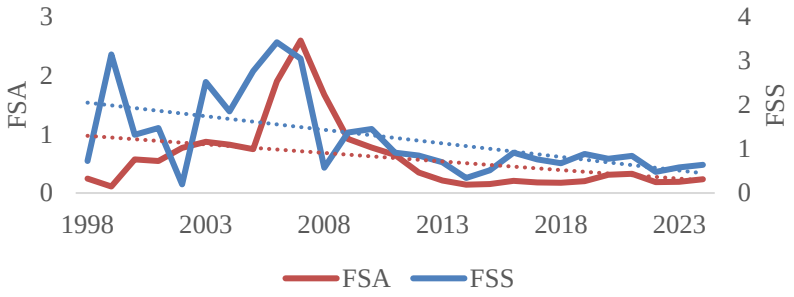

Figure 3. Evolution of Financial Structure Indicators in Russia
***Source**: Research Findings*

India: India's financial structure exhibits a gradual shift toward greater market orientation. The FSS index shows a clear upward trend, reflecting the expansion and deepening of capital markets supported by financial reforms and stronger institutional participation. In contrast, the FSA index remained relatively stable over time. The divergence between the two indicators suggests that while India has significantly expanded the size of its capital market, the banking sector continues to play a dominant role in financial intermediation and credit allocation (World Bank, 2025).

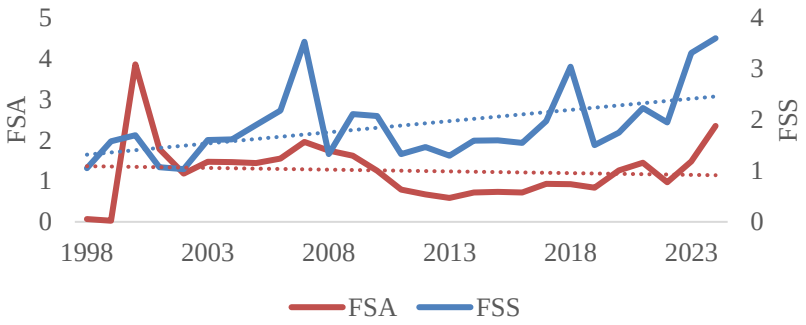

Figure 4. Evolution of Financial Structure Indicators in India
Source: *Research Findings*

China: Over the past quarter-century, China's financial structure has undergone a deliberate, policy-driven transformation. Financial structure size (FSS) and activity (FSA) show steady upward trends, with notable surges in 2008 (stimulus response) and 2014 (margin trading reforms). Deeper structural shifts—including the STAR Market launch, Stock Connect, and QFII—have progressively elevated capital markets. In 2025, a historic turning point occurred: direct financing increment surpassed indirect financing for the first time, signaling a shift from a bank-dominated toward a more balanced hybrid system. This evolution supports innovation and industrial upgrading, yet remains embedded within a tightly controlled regulatory framework (People's Bank of China, 2025).

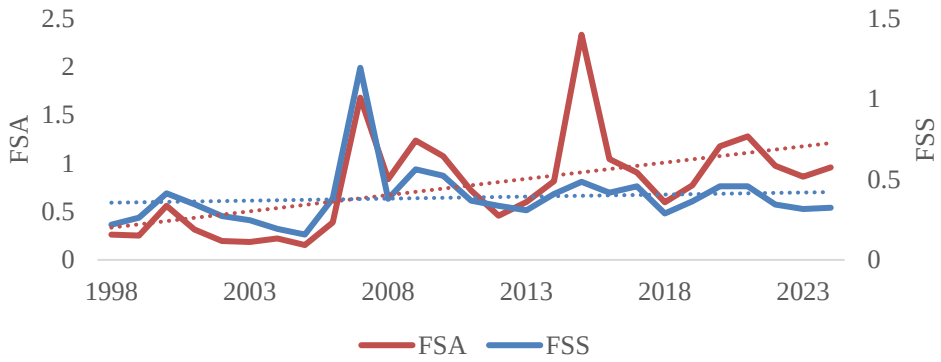

Figure 5. Evolution of Financial Structure Indicators in China
Source: *Research Findings*

South Africa: South Africa's financial structure shows a general upward trend in both the FSS and FSA indices, with FSS rising more strongly and peaking around 2018 before declining slightly. The expansion was supported by financial liberalization, regulatory reforms, and the development of the Johannesburg Stock Exchange as one of Africa's leading capital markets. The post-2018 decline reflects weaker economic growth, fiscal pressures, and governance challenges. Overall, South Africa exhibits the most market-oriented financial structure among the countries studied, although its progress remains sensitive to macroeconomic and institutional conditions (IMF-South Africa, 2024).

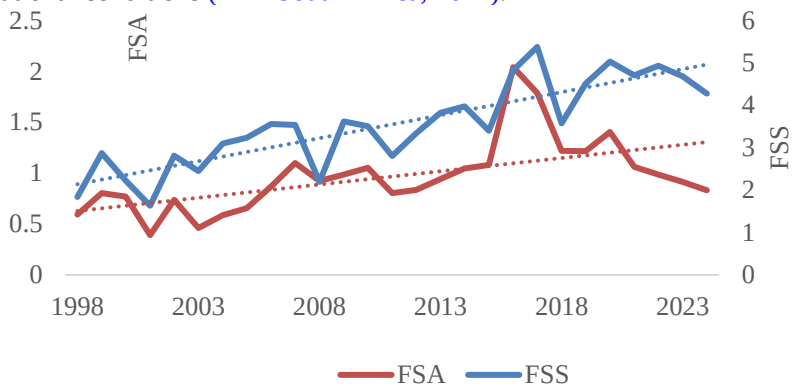

Figure 6. Evolution of Financial Structure Indicators in South Africa
Source: *Research Findings*

3. The Methodology

3.1 Data and Model Specification

The objective of this research is to test one of the main hypotheses of the NSFE theory in regard to the association between economic development and the economy's financial structure. The NSFE approach argues that the structure of the financial system evolves alongside the development of the real economy. As countries move toward more sophisticated production structures, firms require increasingly diverse financing instruments, leading to adjustments in the relative roles of financial intermediaries and capital markets. Accordingly, the level of economic development is expected to influence the composition of the financial system. Consistent with the existing literature (Arestis et al.,2001; Lee,2012; Demir and Hall, 2017), this relationship can be expressed as:

$$FSR = f\ (ED) \tag{1}$$

Where ED is measured by real GDP per capita and FSR captures the balance between market-based and bank-based finance. In empirical terms, the indicator reflects the relative weight of capital market activities compared to banking sector activities, thereby providing a measure of the degree to which a financial system is

market-oriented or bank-oriented (Beck et al. 2001a; Levine 2002). It can be assessed through several complementary dimensions. In this study, two principal dimensions of financial structure—structure size and structure activity—are employed. Although financial structure is sometimes characterized by three dimensions (size, activity, and efficiency), cross-country data for the efficiency dimension are not consistently available for all selected economies over the sample period. Therefore, the composite financial structure index is constructed using the size and activity dimensions. The structure–size indicator reflects the relative importance of financial markets compared to the banking sector in terms of scale. It is commonly measured by the ratio of stock market capitalization to bank credit to the private sector, or alternatively, by the ratio of stock market capitalization to GDP divided by bank credit to GDP. The structure–activity indicator captures the comparative level of financial intermediation or activity between markets and banks. It is usually proxied by the ratio of stock market total value traded to bank credit to the private sector (Xu et al, 2024). Since both dimensions are correlated and represent complementary aspects of the financial structure, this study employs Principal Component Analysis (PCA) to aggregate these two indicators into a single composite index, which serves as the dependent variable representing the overall financial structure of the economy. The PCA was performed on the pooled panel dataset to construct a common financial structure index that is directly comparable across all selected economies. The first principal component (PC1) has an eigenvalue of 1.42 and explains 71% of the total variation in the two indicators (Table 1). Both variables exhibit identical positive factor loadings (0.707), indicating that PC1 effectively captures the common variation shared by the financial structure size and activity measures (Table 2). Therefore, the first principal component provides an appropriate composite indicator of financial structure for the subsequent panel econometric analysis.

Table 1. Principal Components Analysis

Component	Eigenvalue	Proportion	Cumulative
PC1	1.420	0.710	0.710
PC2	.579	0.289	1.000

Source: *Research Findings*

Table 2. Principal Component Analysis (Eigenvectors)

Variable	PC1	PC2
FSA	0.707	0.707
FSS	0.707	-0.707

Source: *Research Findings*

Beyond Economic Development (ED), which serves as the primary independent variable, this study includes several control variables to capture macroeconomic and structural factors that may influence the composition of financial development:

Square of Economic Development (ED^2) is included to capture the potential non-linear evolution of financial structure as predicted by NSFE's three-stage framework. This allows for the possibility that the marginal effect of economic development on financial structure may vary across different stages of development. According to NSFE, the relationship is expected to be positive but potentially non-linear: at early stages, the effect may be weak as bank-based systems dominate; at intermediate stages, the effect may strengthen as markets emerge; and at advanced stages, the effect may diminish as financial systems reach maturity. Although NSFE does not explicitly predict a quadratic functional form, the inclusion of ED^2 provides a parsimonious empirical test for departures from linearity and helps assess whether the relationship changes across different stages of development.

Trade Openness (Open) is considered as a proxy for external integration, which can stimulate stock market activity by facilitating access to foreign capital and intensifying competition, though it may also reinforce the role of banks through the expansion of trade-finance services; therefore, its net effect on the financial structure ratio remains theoretically ambiguous (Levine & Zervos, 1998; Beck & Levine, 2002; Aizenman & Noy, 2004).

Inflation Rate (Inf) is expected to negatively affect market-based finance by increasing valuation uncertainty and reducing the real value of financial assets, while its adverse effects on banking credit tend to be relatively milder, implying a potential decline in the stock market–to–banking development ratio with higher inflation (Boyd et al. 2001) .

Regulatory Quality (RQ) is incorporated to reflect the government's capacity to design and enforce effective policies and regulations that foster private sector development. Higher regulatory quality is expected to strengthen investor confidence, improve financial market efficiency, and facilitate the expansion of market-based financing relative to bank-based finance.

Rule of Law (RL) is incorporated to measure the extent to which economic agents have confidence in and abide by the legal system, particularly with respect to contract enforcement, property rights, and judicial effectiveness. Stronger legal institutions are expected to reduce transaction costs and information asymmetries, thereby promoting the development of capital markets alongside the banking sector.

Finally, a continuous COVID-19 severity index (CovIndex) is included to control for the heterogeneous effects of the pandemic across countries and over time. Compared with a binary dummy variable, this index provides a more comprehensive measure of the intensity of the COVID-19 shock and its influence on financial systems, including both capital-market activity and bank-based financing.

Financial structure variables were drawn from the World Bank's Global Financial Development Database (GFDD) and the World Development Indicators (WDI). Data on economic development, trade openness, and inflation came from the World Development Indicators (WDI). Regulatory Quality (RQ) and Rule of Law (RL) were sourced from the Worldwide Governance Indicators (WGI) database, while

the COVID-19 severity index (CovIndex) was obtained from the Oxford COVID-19 Government Response Tracker (OxCGRT).

3.2 Preliminary Tests

The validity of panel-data estimators often depends on the degree of independence across cross-sectional units. When countries or firms are interconnected through common shocks, spillover effects, or shared economic conditions, the assumption of cross-sectional independence may be violated. Sarafidis and Wansbeek (2012) argue that overlooking such dependence can result in biased parameter estimates and misleading hypothesis tests. For this reason, the presence of cross-sectional dependence must be assessed prior to conducting panel econometric analysis. This point was also highlighted by Bai and Kao (2006). One of the strengths of the Pesaran CD test is its applicability to both balanced and unbalanced panels. Moreover, the test remains effective in the presence of structural changes across individual units, making it suitable for heterogeneous panel datasets. The null hypothesis assumes the absence of cross-sectional dependence among panel members. Therefore, when the calculated test statistic is sufficiently large to be statistically significant, the null hypothesis is rejected, indicating that shocks or disturbances are transmitted across cross-sectional units and that cross-sectional dependence exists in the dataset.

In addition to cross-sectional dependence, the assumption of homogeneous slope coefficients should also be evaluated. Panel members may respond differently to changes in explanatory variables because of differences in institutional quality, economic structure, financial development, or policy environments. If slope heterogeneity is ignored, pooled estimators may produce biased and inconsistent estimates of the average long-run relationship. Therefore, following Pesaran and Yamagata (2008), slope homogeneity is tested prior to the empirical analysis. The test assesses the null hypothesis that slope coefficients are homogeneous against the alternative that they are heterogeneous across panel members through the Delta ($\tilde{\Delta}$) and adjusted Delta ($\tilde{\Delta}$_adj) statistics.

The results of the preliminary panel diagnostics reject the null hypothesis of cross-sectional independence, indicating that the countries in the sample are interconnected through common shocks and unobserved factors (Table 3). Furthermore, the null hypothesis of slope homogeneity is also rejected, implying that the long-run relationships differ across countries (Table 4). These findings suggest that the sample is characterized by both cross-sectional dependence and slope heterogeneity.

One of the essential steps in all empirical studies is to examine the stationarity status of the variables used in the analysis. Although several methods are available for conducting unit root tests, the presence of CD and heterogeneity implies that the results obtained from conventional tests—such as those proposed by Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003)—may be spurious. Therefore, stationarity is examined using Pesaran's (2007) CIPS test, which is specifically

designed to account for cross-sectional correlations arising from common factors. The methodology combines the results of cross-sectionally augmented Dickey–Fuller regressions estimated for each unit and aggregates them into a single panel test statistic. Under the null hypothesis, the variables contain a unit root. Rejection of the null hypothesis indicates stationarity. The results of this test (Table 5) indicate that all variables except inflation become stationary after first differencing, confirming that they are integrated of order one, I(1).

Table 3. Cross-Sectional Dependence Test Result

Variable	CD-test	P-Value
PC1	3.17	0.00
ED	14.74	0.00
ED^2	-2.54	0.01
CovIndex	16.30	0.00
RL	-1.65	0.09
RQ	0.55	0.58
Open	0.59	0.55
Inf	-0.54	0.59

***Source**: Research Findings*

Table 4. Homogeneity Test Result

Variable	Statistic	P-Value
$\tilde{\Delta}$	4.871	0.00
$\tilde{\Delta}_{adj}$	5.807	0.00

***Source:** Research Findings*

Table 5. Panel Unit Root Test Result

	CIPS (Level)		CIPS (First Diff)		Result
Variable	Cons	Cons+Trend	Cons	Cons+Trend	
PC1	-2.09	-2.91	-5.77**	-5.89**	I(1)
ED	-2.05	-1.61	-3.03**	-3.46**	I(1)
ED^2	-2.05	-1.60	-3.02**	-3.45**	I(1)
RL	-1.59	-1.80	-4.58**	-4.74**	I(1)
RQ	-1.62	-2.42	-5.18**	-5.06**	I(1)
Inf	-3.01**	-2.91*	-5.73**	-5.85**	I(0)
Open	-1.28		-2.01	-4.22** -4.30**	I(1)

***Note:** ** and * indicate significance levels at 5% and 10% respectively. (Source: Authors' calculations)*
***Source:** Research Findings*

With the unit root test results in hand, we can now test whether the variables share a long-term stable relationship. Although several panel cointegration tests—such as those proposed by Kao (1999) and Pedroni (2003)—are commonly used, they are not reliable in the presence of cross-sectional dependence and slope heterogeneity. Therefore, this study employs the Bootstrap LM Panel Cointegration Test proposed by Westerlund and Edgerton (2007). This residual-based panel cointegration test extends the LM framework by employing a bootstrap procedure to obtain empirical critical values, thereby providing reliable statistical inference in the presence of cross-sectional dependence and relatively small cross-sectional

dimensions. Unlike conventional panel cointegration tests, the null hypothesis of the Bootstrap LM test states that all cross-sectional units are cointegrated, whereas the alternative hypothesis is that at least some panel members are not cointegrated. Therefore, failure to reject the null hypothesis provides evidence supporting the existence of a stable long-run equilibrium relationship among the variables.
Table 6 reports the results for two deterministic specifications: (i) a model including only a constant and (ii) a model including both a constant and a deterministic time trend. In both specifications, the bootstrap p-values are well above the conventional significance levels, indicating that the null hypothesis of panel cointegration fails to be rejected, offering strong evidence of a stable long-run relationship among the variables.

Table 6. LM Bootstrap Cointegration Test Result

	Cons		Cons+Trend	
Test	Statistic	Bootstrap P-value	Statistic	Bootstrap P-value
LM bootstrap cointegration	6.765	0.86	13.266	0.51

Note: *The bootstrap p-values are reported instead of the asymptotic p-values because in panels characterized by cross-sectional dependence and a relatively small number of cross-sectional units, the bootstrap version of the test yields more reliable inferences. (Source: Authors' calculations)*
Source: *Research Findings*

3.3 Estimation Result and Robustness Check

Following the verification of cross-sectional dependence, slope heterogeneity, stationarity, and a long-run cointegrating relationship among the variables, the long-run coefficients were estimated using the Group-Mean Fully Modified Ordinary Least Squares (GM-FMOLS) estimator developed by Pedroni, 2001. This estimator is particularly suitable for heterogeneous panel data because it first estimates country-specific long-run coefficients and then computes their unweighted average, thereby allowing for cross-country heterogeneity while correcting for endogeneity and serial correlation within the cointegrating relationship. Although reverse causality between financial structure and economic development cannot be completely ruled out, the objective of this study is to estimate the long-run equilibrium relationship predicted by the New Structural Economics Framework (NSFE) rather than to establish strict causal effects. Accordingly, the estimated coefficients should be interpreted as long-run associations rather than as definitive evidence of causality. Although the CIPS unit-root test indicates that Inflation is stationary at level, it is retained in the model as a stationary exogenous control variable rather than as a component of the stochastic cointegrating relationship.

Table 7 reports the long-run estimates obtained from the GM-FMOLS estimator under four alternative model specifications. Model (1) presents the benchmark specification including economic development, inflation, trade openness, and the COVID-19 severity index. Models (2) and (3) alternatively introduce institutional quality indicators—Regulatory Quality (RQ) and Rule of

Law (RL)—to examine whether institutional factors alter the estimated long-run relationship. Finally, Model (4) incorporates the squared term of economic development (ED^2) as an additional

Table 7. Group-Mean FMOLS (GM-FMOLS) and Augmented Mean Group (AMG) Estimation Results

Model	GM-FMOLS				AMG			
Variable	1	2	3	4	5	6	7	8
ED	0.88*	0.721**	9.387**	9.742**	1.612**	1.36	4.91**	3.972**
	(0.08)	(0.04)	(0.00)	(0.00)	(0.01)	(0.19)	(0.00)	(0.00)
ED^2	-	-	-7.459**	-9.50**	-	-	0.247	-3.289
			(0.00)	(0.00)			(0.94)	(0.13)
Inf	-0.046**	-0.022	-0.072**	-0.031	-0.023	-0.013	-0.042	-0.029
	(0.00)	(0.18)	(0.00)	(0.12)	(0.64)	(0.73)	(0.24)	(0.38)
Open	2.727**	1.688	2.368**	1.78	1.211	1.12	1.696	1.20
	(0.00)	(0.81)	(0.00)	(0.14)	(0.34)	(0.38)	(0.15)	(0.38)
CovIndex	0.005**	0.001**	0.01**	0.004**	-0.000	-0.001	0.000	0.000
	(0.00)	(0.02)	(0.00)	(0.00)	(0.87)	(0.77)	(0.90)	(0.91)
RQ	-	0.153**	-	0.119**	-	0.077	-	0.070
		(0.00)		(0.00)		(0.09)		(0.11)
RL	0.057	-	0.056	-	-0.021	-	-0.028	-
	(0.13)		(0.33)		(0.39)		(0.40)	

Note: *** and * indicate significance levels at 5% and 10% respectively. FMOLS uses all available observations (N = 130). Source: Authors' calculations*
Source: *Research Findings*

robustness exercise to investigate the possibility of a non-linear relationship.

Across the four GM-FMOLS specifications, the coefficient of economic development (ED) remains positive and statistically significant. The estimated coefficient ranges from 0.72 in Model (2) to 9.74 in Model (4), while the benchmark specification reports a coefficient of 0.880 ($p < 0.10$). Although the magnitude varies across specifications, the consistently positive sign indicates that higher levels of economic development are associated with a greater relative importance of capital markets relative to the banking sector. This result provides robust empirical support for the central proposition of the New Structural Economics Framework, which argues that financial structures evolve in line with changes in the productive structure of the economy.

The estimated coefficients of the control variables are also broadly stable across specifications. The estimated coefficient of inflation is consistently negative across all model specifications, indicating that higher inflation tends to reduce the role and weight of capital markets versus banks and other lenders. However, its statistical significance is not robust across alternative specifications. Once institutional variables and nonlinear terms are introduced, the coefficient becomes statistically insignificant, suggesting that inflation primarily acts as a macroeconomic control variable rather than a stable long-run determinant of financial structure. Consequently, no strong economic interpretation is attached to this variable. Trade openness maintains a positive effect throughout the GM-FMOLS estimations, although its statistical significance weakens after institutional variables are introduced. The COVID-19 severity index remains positive and

statistically significant in the first three specifications, while inflation exhibits a relatively small effect whose significance declines once additional explanatory variables are included. Introducing Regulatory Quality or Rule of Law does not alter the positive effect of economic development, suggesting that the principal finding is not driven by the choice of institutional control variable.

To further investigate whether the relationship between economic development and financial structure is non-linear, Models (3) and (4) incorporate the squared term of economic development (ED^2). Under the GM-FMOLS estimator, the coefficient of ED remains positive and highly significant (9.38 and 9.74, respectively; $p < 0.01$), while the coefficient of ED^2 is negative and statistically significant (−7.45 and −9.50, respectively; $p < 0.01$). The positive effect of economic development on financial structure may taper off at higher levels of development, according to these results. However, the quadratic specifications are treated as supplementary robustness exercises rather than the preferred empirical models because the New Structural Economics Framework emphasizes the gradual evolution of financial structure with economic development without explicitly predicting a quadratic functional form. Consequently, the linear specifications remain the benchmark models for interpreting the main hypothesis of the study.

As a further robustness exercise, Table 7 also reports the estimates obtained from the Augmented Mean Group (AMG) estimator proposed by Eberhardt and Teal (2010), which explicitly controls for unobserved common dynamic processes shared across countries. The AMG results broadly support the conclusions obtained from the GM-FMOLS estimator. In Models (5), (7), and (8), the coefficient of economic development remains positive and statistically significant, with estimated values of 1.612, 4.910, and 3.972, respectively. Only Model (6), which includes Rule of Law, produces a positive but statistically insignificant coefficient (1.36). To further assess the robustness of the potential non-linear relationship, Models (7) and (8) estimate the AMG specification including both ED and ED^2. Although the coefficient of economic development remains positive and statistically significant (4.910 and 3.972, respectively), the coefficient of ED^2 is statistically insignificant in both specifications (−2.921 and −3.510, respectively). Therefore, unlike the GM-FMOLS estimates, the AMG results do not provide robust evidence supporting a non-linear relationship between economic development and financial structure. This suggests that the existence of a quadratic relationship depends on the estimation method and should therefore be interpreted with caution.

Overall, the robustness analysis indicates that the positive relationship between economic development and financial structure remains stable across alternative model specifications and estimation techniques. In contrast, the evidence for a non-linear relationship is sensitive to the estimation method and therefore cannot be regarded as sufficiently robust. Accordingly, the principal empirical support for the New Structural Economics Framework is derived from the consistently positive long-run effect of economic development rather than from the quadratic specification.

4. Conclusion

This study investigated the link between economic development and financial structure across a panel of BRICS economies from 1998 to 2024, drawing on the New Structural Economics Framework (NSFE). Unlike conventional approaches that treat financial structure as an independent determinant of economic growth, the NSFE posits that the ideal financial structure is not fixed but evolves endogenously in response to shifts in the economy's productive structure. Accordingly, this study investigated whether higher levels of economic development are associated with a gradual shift from bank-based toward market-based financial systems.

Before estimating the long-run relationship, the analysis accounted for several important characteristics of the data. Cross-sectional dependence, slope heterogeneity, panel unit roots, and panel cointegration were systematically examined. The bootstrap LM panel cointegration test verified a stable long-run equilibrium relationship among the variables, establishing a suitable foundation for estimating long-run coefficients via the Group-Mean FMOLS estimator.

The empirical evidence lends strong support to the central proposition of NSFE. Across all baseline specifications, economic development exhibits a positive and statistically significant effect on financial structure, indicating that higher levels of real income are associated with a greater relative role of capital markets compared with the banking sector. This relationship remains robust after controlling for trade openness, inflation, the COVID-19 shock, and alternative institutional quality indicators. The robustness analysis further demonstrates that the principal finding is generally preserved under the AMG estimator, although the estimated coefficient becomes smaller in magnitude and less statistically significant in some specifications after controlling for unobserved common dynamic factors.

The study also explored the possibility of a non-linear relationship by incorporating the squared term of economic development. While the quadratic specification produced significant results under the GM-FMOLS estimator, the corresponding coefficients were not statistically significant under the AMG estimator. Therefore, the evidence for non-linearity cannot be regarded as sufficiently robust across alternative estimation techniques. Consequently, the principal conclusion of this study rests on the consistently positive long-run relationship between economic development and financial structure rather than on the existence of a quadratic pattern.

In policy terms, the findings imply that financial-sector reforms should be aligned with the phase of economic development. Attempts to promote capital markets without corresponding structural transformation in the real economy may not produce sustainable results. Instead, financial systems should evolve in accordance with the financing requirements generated by industrial upgrading, technological progress, and changes in production structure, consistent with the core principles of the New Structural Economics Framework.

Several limitations should also be acknowledged. First, the analysis focuses exclusively on BRICS economies, which limits the generalizability of the findings to other groups of countries. Second, financial structure is measured using a

composite index based on the relative development of stock markets and the banking sector, and other dimensions of financial development are not explicitly incorporated. Finally, although alternative model specifications and estimation methods were considered, future research may explore threshold, nonlinear, or sector-specific approaches to examine more precisely the way in which financial structure adapts and evolves across the various stages of economic development.

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