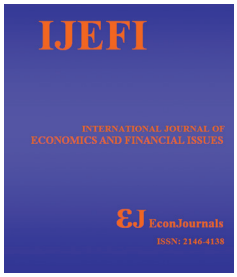

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The Impact of Financial Development on Economic Growth in BRICS Countries

Tshepo Motau, Abigail Stiglingh-Van Wyk*

North-West University, Potchefstroom, South Africa. *Email: Abigail.Stiglingh@nwu.ac.za

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ABSTRACT

This study examines the impact of financial development on economic growth in the BRICS countries Brazil, Russia, India, China, and South Africa over the period 2000-2024. It aims to determine how financial development contributes to growth in these emerging economies, which play an increasingly influential role in the global financial system. Drawing on literature emphasizing capital accumulation, innovation, and financial intermediation, the study focuses on gross fixed capital formation, employment-to-population ratio, research and development expenditure, and domestic credit to the private sector. Using a quantitative panel data approach with fixed and random effects regression models, the Hausman test identifies the fixed-effects specification as most suitable, accounting for country-specific institutional and structural characteristics. Results show that gross fixed capital formation and research and development expenditure significantly boost GDP growth, highlighting the importance of investment and innovation, whereas financial development exhibits an insignificant or negative effect, reflecting inefficiencies in credit allocation and weak transmission to productive investment. The study concludes that financial development alone is insufficient for growth; sustainable expansion requires effective regulation, good governance, inclusive financial systems, and deeper capital markets across BRICS economies.

Keywords: BRICS, Economic Growth, Financial Development, Panel Data
JEL Classifications: A12, B1, C33, G1, O4

1. INTRODUCTION AND BACKGROUND TO THE STUDY

BRICS is a grouping of intergovernmental states of Brazil, Russia, India, China, and South Africa, formed to enhance economic and political cooperation among the big emerging markets. "BRIC" was coined in 2001 by Goldman Sachs economist Jim O'Neill to highlight the future economic growth potential of Brazil, Russia, India, and China, projected to dominate the world's economy by 2050 (O'Neill, 2001:3). South Africa joined in 2010, entering the club as BRICS, giving African membership to the club (IPEA, 2010:1). The group was formalized in 2009 and convened its first summit in Yekaterinburg, Russia, seeking to restructure international financial institutions and deepen economic cooperation considering the 2008 global recession (BRICS, 2009:2). In 2024, BRICS welcomed Egypt, Ethiopia, Iran, the United Arab Emirates, and Indonesia, leaving Saudi Arabia's status as a member pending, increasing its global economic and demographic power to around 37.3% of global GDP and 46% of global population (Banque de France, 2024:3).

BRICS is significant in the field of financial economics because it challenges the Western-centred international financial order, particularly institutions like the International Monetary Fund (IMF) and the World Bank (World Bank, 2024). This group advocates for the idea of a multipolar world and creates new financial institutions, as seen with the New Development Bank (NDB) and the Contingent Reserve Arrangement (CRA) (Iqbal, 2022:5). These efforts are intended to lessen dependence on the U.S. dollar and deepen South-South cooperation, solving problems such as infrastructure development and financial stability in developing economies (Chatham House, 2023:4). It is important

to study BRICS because it reflects a global economic power shift, and its members have a combined share of 33% in the world GDP and 17% in world trade, thereby emerging as an important force in reforming international trade, investment, and financial policies (Unacademy, 2021:2). Yet inner diversity of political regimes and economic structures, such as the dominance of China (52% of BRICS GDP) and geopolitical rivalries (e.g., India-China border disputes), contradicts its cohesion, and thus it is a fascinating case for observing economic integration and global governance (Banque de France, 2024:5).

A crucial framework for comprehending the dynamics of national economies is provided by the study of macroeconomics, especially when considering emerging markets like the BRICS countries (Brazil, Russia, India, China, and South Africa). Using metrics like GDP, unemployment, gross capital formation, and R&D expenditure, macroeconomics analyses the composition and functioning of economies (ECON211, 2025:3). To achieve macroeconomic goals that are frequently related but involve trade-offs, such as economic growth, low unemployment, stable output and inflation, BoP equilibrium, equitable income distribution, and poverty reduction, these aggregates are essential (ECON211, 2025:5). These goals are crucial for BRICS economies because of their fast expansion, structural difficulties, and growing interconnectedness (Bhanumurthy and Kumawat, 2020:12).

To support these macroeconomic objectives, financial economics—which focuses on resource allocation over time under uncertainty—is essential (Mishkin, 2019:23). Strong financial systems are crucial for directing savings into profitable investments in BRICS countries, where financial markets are still in their infancy. Economic growth is characterized by consistent rises in real GDP or per capita GDP (ECON211, 2025:7). However, as demonstrated by South Africa's 2015 Palma ratio of 7.9 and Gini coefficient of 0.65, rapid growth can worsen inflation or increase income inequality (ECON211, 2025:10). In BRICS economies that depend on foreign investment, financial systems also affect capital flows and the efficacy of monetary policy, both of which are essential for preserving the balance of payments (Prasad and Rajan, 2008:45). To stabilize the BoP, for example, controlling interest and exchange rates may clash with domestic goals like reducing unemployment (Obstfeld, 2012:67).

With an emphasis on the interaction of financial markets, monetary policy, and fiscal strategies, this article examines how financial development influences economic growth in BRICS economies. The study evaluates their effects on growth, stability, and development by fusing macroeconomic theory from the ECON211 slides with BRICS-specific issues like income inequality and erratic capital flows (Bhanumurthy and Kumawat, 2020:15). Additionally, it looks at trade-offs, like how to balance inflation and growth, and how financial economics can help ease these conflicts (Mishkin, 2019:30). The goal of this study is to demonstrate how financial systems can support inclusive and sustainable growth in the BRICS, considering both domestic developmental priorities and the importance of the global economy.

Despite contributing more than one-third of global GDP, the BRICS economies—Brazil, Russia, India, China, and South Africa exhibit uneven patterns of economic growth and financial development. While financial systems are central to mobilizing savings, allocating capital efficiently, and fostering innovation, empirical evidence on the finance–growth relationship in emerging markets remains inconclusive. In some BRICS economies, deeper financial intermediation has coincided with rapid growth (e.g., China and India), whereas in others, such as Brazil and South Africa, credit expansion has not translated into sustained economic performance.

This inconsistency raises an important question: to what extent does financial development contribute to economic growth across BRICS economies, given their structural and institutional differences? Existing studies have often focused on advanced economies or short time frames, leaving a gap in understanding how financial systems influence long-term growth dynamics within BRICS countries. Therefore, addressing this gap requires an empirical investigation that integrates financial development into an augmented Solow growth framework, alongside key production-side determinants such as capital formation, labour market performance, and technological progress. By analysing panel data from 2000 to 2024, this study seeks to determine whether financial development measured by domestic credit to the private sector significantly drives economic growth in BRICS economies, thereby providing evidence-based insights for promoting inclusive and sustainable development.

2. LITERATURE REVIEW

2.1. Introduction

Financial development and its relationship to economic growth plays an important role in BRICS economies, because it acts as a catalyst in their growing global economic influence. Financial development stimulates growth by improving capital allocation, encouraging savings, and facilitating investment, thereby boosting productivity (Levine, 2005; Sahay et al., 2015). However, this relationship is neither straightforward nor universally positive. Moreover, discussions continue regarding the cause-and-effect relationship: In certain situations, financial deepening seems to propel economic growth, whereas in other instances, growth itself fosters the development of the financial sector (Demirgüç-Kunt and Levine, 2008; Pradhan et al., 2017). Variations in financial systems are significant, as bank-based systems (e.g., China, India) yield different results compared to market-based systems (e.g., South Africa) (Allen et al., 2012; Čihák et al., 2013).

The finance–growth nexus is importance for South Africa. Financial deepening leads to macroeconomic stability and guides resources toward essential priorities including infrastructure development and industrialization and renewable energy adoption (Adegboye et al., 2020). The expansion of financial inclusion through mobile banking and fintech innovations has improved credit and savings opportunities for low-income families and small and medium enterprises which supports both investment growth and social equality (Nanziri and Gbahabo, 2025; Magwedere and Marozva, 2025). The outcomes depend heavily on institutional quality. Financial development leads to sustainable inclusive

growth when strong governance and prudential regulation systems are in place to reduce vulnerability to shocks (Asante et al., 2023; Chhabra et al., 2023). The finance–growth nexus requires more than economic efficiency because it depends on institutional capacity together with social inclusiveness and long-term resilience. The purpose of this literature review combines global and emerging market evidence from BRICS countries with special attention to South Africa to understand the theoretical bases and empirical research and contextual elements that influence the finance–growth relationship.

2.2. Theoretical Framework

Financial development describes the improvement of a nation's financial system through technological efficiency, financial stability, ease of accessibility and inclusiveness which boosts its ability to encourage savings, distribute resources, manage risks and drive economic expansion. In BRICS countries, finance promotes growth by directly supporting agriculture, education, human capital development and firm growth (Mugova, 2017). Financial development consists of four dimensions which include banking sector development, capital market deepening, financial inclusion and institutional quality. These concepts together establish the foundation for researching financial development across both emerging and developed economies as seen in Table 1.

2.2.1. Defining economic growth

Economic growth describes the continuous expansion of a nation's productive capabilities which economists measure through rising real Gross Domestic Product (GDP) and GDP per capita values across multiple years. The growth of an economy indicates its capacity to generate additional products and services which typically leads to better living conditions (Todaro and Smith, 2015:14). Below Table 2 shows the relationship between GDP and other macroeconomic variables.

2.2.1.1. Theoretical foundations

The two main theoretical frameworks for analysing long-term economic growth are the Solow-Swan growth model and endogenous growth theories. The Solow-Swan growth model demonstrates that capital accumulation together with labour force growth and exogenous technological progress function as the main drivers of output growth. The model demonstrates that higher savings rates and investment levels increase output during short to intermediate periods, yet technological progress acts as a driving force of sustainable long-term growth because capital returns decrease with time.

Paul Romer (1986; 1990) and Lucas (1988) introduced endogenous growth theories which show that technological change and human capital accumulation result from economic activities and policy decisions rather than external factors. The Romer model shows how knowledge creation and R&D activities generate non-decreasing returns from investments and Lucas explains productivity growth through human capital development, practical learning and educational investments. The Solow–Swan model and endogenous growth theories differ fundamentally in how they explain long-run economic growth. The Solow–Swan model, emphasizes capital accumulation, labour force growth, and exogenous technological progress as the main drivers of growth. It argues that while higher savings and investment can temporarily raise output, diminishing returns to capital ensure that economies eventually converge to a steady state where long-term per capita growth depends only on technological change, which is treated as an external factor outside the model (Solow, 1956).

By contrast, endogenous growth models place technology and human capital at the centre of the growth process. These models contend that knowledge creation, innovation, R&D, and skills development generate constant or even increasing returns to capital, as knowledge spillovers and learning-by-doing counteract diminishing returns. The two models differ in their predictions about how countries will converge with each other. The Solow–Swan model predicts that countries with similar savings rates, population growth, and access to technology will experience income convergence over time, narrowing global inequality. Endogenous growth theories, however, suggest that convergence is not automatic, as differences in human capital accumulation, innovation capacity, and institutional strength may cause persistent divergence in growth paths (Aghion and Howitt, 1998).

2.2.1.2. Role of capital accumulation, productivity, and innovation

The roles of capital accumulation, productivity, and innovation are central to explaining both the short and long-run dynamics of economic growth. Capital accumulation—through investment in physical capital such as machinery, infrastructure, and technology, as well as in human capital via education and skills development—expands a nation's productive capacity. In the short to medium term, increases in savings and investment allow economies to produce more output by deepening capital per worker. The Solow–Swan model highlights this mechanism, but it also shows that capital accumulation alone cannot sustain growth indefinitely, because returns to physical capital diminish over time (Solow, 1956).

Productivity growth refers to the efficiency with which inputs of labour and capital are used to produce output. It is typically measured through total factor productivity (TFP), which captures improvements in resource allocation, management practices, and the adoption of better technologies. Higher productivity allows an economy to achieve more with the same level of inputs, raising competitiveness and living standards. Innovation is the long-run driver of sustained economic growth (Barro, 1991). By creating new products, processes, and markets, innovation fuels technological progress and expands the frontier of production possibilities. Endogenous growth theorists such as Romer (1990) and Aghion and Howitt (1998) argue that innovation generates non-diminishing returns through knowledge spillovers, R&D, and human capital accumulation.

2.2.2. Theories linking financial development and economic growth

The relationship between financial development and economic growth has been explained through several theoretical perspectives. The supply-leading hypothesis, advanced by Schumpeter (1911) and later formalised by McKinnon (1973) and Shaw (1973), argues that financial development plays a proactive role in driving growth. By mobilising savings, efficiently allocating capital, and

fostering entrepreneurial activity, a well-developed financial system stimulates investment and innovation, thereby spurring long-term economic expansion.

In contrast, the demand-following hypothesis, associated with Robinson (1952), suggests that financial development is largely a response to economic growth. As economies expand, demand for financial services increases, leading to the deepening and sophistication of financial systems. Some scholars emphasise a bi-directional causality, where finance and growth reinforce one another in a feedback loop. A feedback loop is a system where the outputs or results of a system are fed back to the system as inputs, and this affects future behaviour or outcomes. Therefore, financial deepening supports investment and productivity, while higher incomes and output levels generate demand for more advanced financial services. Finally, the independent hypothesis, associated with Lucas (1988) and Stern (1989), contends that finance and growth may not be causally linked in a meaningful way. Instead, both are influenced by deeper structural and institutional factors, implying that financial development alone does not guarantee sustained economic growth.

2.3. Global Empirical Evidence

2.3.1. Cross-country evidence

Cross-country evidence consistently demonstrates that financial development is linked to long-term growth, though the strength and nature of this relationship vary across economies. Classic studies (Levine et al., 2000) emphasised the positive role of financial deepening, while more recent work shows diminishing returns when financial systems expand beyond sustainable thresholds (Rousseau and Wachtel, 2011; Chhabra et al., 2023). Recent studies reaffirm that financial development enhances productivity and capital allocation but highlight that institutional quality and macroeconomic stability mediate these effects (Asante et al., 2023).

2.3.2. Evidence from emerging markets

Research conducted on BRICS nations and Sub-Saharan African (SSA) economies demonstrates that institutional quality together with financial liberalization and macroeconomic stability play essential roles in determining the finance–growth dynamic. The presence of robust governance structures together with sound regulatory frameworks enhances positive outcomes (Asante et al., 2023) by directing resources to productive sectors and minimizing macroeconomic risks and ensuring deep financial systems produce actual economic benefits (Abaidoo and Agyapong, 2022). The economic performance of BRICS economies improves when institutional quality interacts with financial openness. The successful implementation of liberalisation measures through capital account opening and trade restriction easing depends on credible institutions as demonstrated in India and China (Uzoechina and Imoagwu, 2022). The implementation of liberalization policies without robust institutions in SSA results in no economic growth benefits.

2.4. South African Context

2.4.1. Historical development of the financial sector

The financial sector of South Africa experienced significant changes after 1994 when the nation transitioned from apartheid's discriminatory racial segregation and strict control to an open and inclusive framework. The apartheid system excluded black South Africans from formal financial markets while credit access remained limited by race and capital markets operated under strict control (Balkaran, n.d.).

The post-1994 reforms abolished discriminatory laws to establish South Africa's integration with the global economy. The banking sector experienced fast growth and consolidation during this period as the "big four" banks expanded their operations while implementing Black Economic Empowerment (BEE) requirements (Prozesky, 2020). The Johannesburg Stock Exchange (JSE) underwent modernization through electronic trading and global listings and regulatory reforms which made it one of the largest emerging market exchanges (Hawkins, 2014).

A guide to the National Credit Act by Andrews (2005) established a landmark consumer protection measure which worked to stop abusive lending practices while ensuring credit access for disadvantaged communities (Andrews, 2005). Financial inclusion programs including Mzansi accounts and Postbank services and mobile banking services made savings and credit and payment services available to millions of people who were previously excluded (Bhorat et al., 2014).

The South African Reserve Bank (SARB) adopted an inflation targeting framework in 2000 which improved transparency and stabilized expectations (Aron and Muellbauer, 2006). The SARB maintained stability through its constitutional independence and prudential oversight during global financial turbulence while its policy mix achieved price stability and growth objectives (Aron, 2011).

2.4.2. Structure and depth of financial markets

South African financial markets demonstrate advanced sophistication but show significant banking sector dominance. The five major banks which include Standard Bank and FirstRand and Absa and Nedbank and Capitec control most assets and lead both retail and corporate banking sectors with worldwide leading concentration levels (Nyangu et al., 2022). The high degree of stability in this system restricts competition and service innovation between banks. South Africa demonstrates better financial inclusion compared to other Sub-Saharan African nations, yet it maintains significant differences between regions and income levels. According to Bhorat et al. (2014) the FinScope 2023 survey together with Demirgüç-Kunt et al. (2022) indicated the World Bank Global Findex 2021 show that more than 80% of adults have bank accounts but formal credit insurance and investment product usage remains low among rural and low-income populations (Nanziri and Gbahabo, 2025; Bodlani, 2021).

2.4.3. Empirical studies in South Africa

In South Africa, empirical work on the finance–growth nexus has produced mixed evidence, reflecting both methodological differences and sector-specific dynamics. Odhiambo (2008;

2009) applied time-series techniques to test the supply-leading (finance drives growth) and demand-following (growth drives finance) hypotheses. Using causality tests, he found that the direction of causality in South Africa shifts depending on the proxy used for financial development—when using bank-based indicators, the evidence tended to support a demand-following pattern, while stock market-based measures suggested a more supply-leading role.

2.5. Determinants Influencing the Relationship in South Africa

2.5.1. Institutional and regulatory environment

The banking and financial markets of South Africa operate under a solid prudential regulation system which the South African Reserve Bank (SARB) monitors. The South African Reserve Bank (SARB) as both central bank and prudential authority maintains financial system resilience by enforcing capital standards and liquidity requirements and risk management standards that surpass international minimums (Hollander and Van Lill, 2019). South Africa adopted Basel III in 2013 and then established capital adequacy ratios and liquidity coverage ratios and leverage requirements that surpass the minimum requirements of the Basel Committee. The SIB designation and enhanced supervisory framework for systemically important banks serves to reduce potential systemic risks (Lichaba, 2023). The implementation of Basel III standards has built market trust but created trade-offs that limited credit expansion during specific periods according to Sadien (2017) and Merrino and Harris (2025).

The Financial Sector Regulation (FSR) Act established the financial stability mandate of the SARB which focuses on crisis prevention because a well-functioning financial system remains vital for economic expansion (Van Niekerk, 2018). Research demonstrates that effective prudential oversight decreases credit and liquidity cycle volatility which leads to better long-term investment and GDP expansion (Tshikovhele, 2018; Gilbert et al., 2009).

2.5.2. Financial inclusion and inequality

The dual economy of South Africa maintains a modern formal financial system alongside a substantial informal sector which results in ongoing financial access disparities. The informal financial service usage in rural areas and former homelands reaches twice the level of formal services because of past discrimination and insufficient infrastructure (Singer, 2014). The SMEs and microenterprises operating in township and rural economies depend on informal savings groups and family networks and rotating credit schemes because they face barriers such as collateral requirements and high transaction costs and limited banking presence (Simatele and Kabange, 2022; Bodlani, 2021). SMEs operating in the formal sector seek microfinance institutions and fintech-based solutions to obtain working capital and growth funding because they face financing restrictions (Dhawnarain, 2024). Digital financial inclusion through mobile payments and e-wallets and online lending has shown promise to reduce these divides, yet its adoption remains inconsistent because of cost barriers and connectivity issues and digital literacy challenges (Magwedere and Marozva, 2025; Kelikume, 2021).

The restricted access to credit and savings products and insurance and payment systems perpetuates income inequality in rural areas. The gaps between financial services and rural communities are being addressed through targeted initiatives which include agency banking and rural microfinance schemes and SME-focused fintech solutions (Rasheed and Siddiqui, 2019; Gavhumende, 2024).

2.5.3. Macroeconomic factors

South Africa's macroeconomic environment is shaped by the interaction of inflation, interest rates, exchange rate volatility, and fiscal policy—all of which influence investment dynamics and growth prospects. SARB uses its inflation-targeting framework to control inflation and interest rates. The inflation control measures of higher interest rates reduce borrowing and consumption which leads to decreased investment activity (Buthelezi, 2024). The historical data shows that global commodity price fluctuations have caused inflation shocks which negatively affect exchange rates and increase fiscal deficits (Munzhelele, 2024).

Exchange rate volatility acts as a deterrent for both foreign and domestic investment especially in manufacturing and export-oriented sectors (Aidoo, 2017; Dube, 2017). The large movements in the rand under inflation targeting have also affected export competitiveness and capital flows (Ndou, 2022). The investment climate depends heavily on fiscal stability. The implementation of expansionary fiscal policy through government borrowing creates demand stimulation but it may increase long-term bond yields and reduce private investment when debt sustainability becomes doubtful (Meyer and Hassan, 2020). Research indicates that government spending increases tend to cause real exchange rates to rise and create inflationary pressures which could damage national competitiveness (Buthelezi, 2024). The investment environment requires macroeconomic stability which depends on proper fiscal management and credible inflation control and exchange rate volatility reduction strategies (Hlongwane and Daw, 2022).

2.6. Summary

The research combines theoretical and empirical findings to understand the finance–growth relationship specifically for BRICS nations and South Africa. The study bases its framework on the Solow–Swan growth model and endogenous growth. The supply-leading and demand-following and bi-directional and independent hypotheses explain how financial development affects economic growth by showing how financial intermediation and investment efficiency and macroeconomic conditions interact. The empirical evidence from cross-country studies demonstrates that finance acts as a primary driver for long-term GDP growth but its impact depends on institutional quality and regulatory frameworks and financial inclusion and macroeconomic stability.

The results for South Africa show conflicting evidence about the direction of causality because stock market indicators support supply-leading effects while banking indicators indicate demand-following effects. The financial liberalization and inclusion programs and regulatory improvements since 1994 have expanded markets yet banking sector concentration and inequality persist. The synthesis for this study recommends using multiple financial

development proxies that include both bank-based and market-based indicators and controlling for institutional factors and inclusion and macroeconomic variables to prevent biased causality inferences. The mixed empirical results in South Africa justify testing bi-directional and context-dependent hypotheses rather than assuming a single causal pathway.

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Study Design

This study adopts a quantitative research design, employing a panel data approach to examine the relationship between financial development and economic growth within BRICS countries (Brazil, Russia, India, China, and South Africa). Panel data analysis is particularly suitable for this study as it allows the researcher to account for both temporal dynamics and cross-country variations over a specified period (Baltagi, 2021). A longitudinal perspective enhances the robustness of findings by controlling for unobserved heterogeneity, providing more precise estimates than purely cross-sectional or time-series analyses (Hsiao, 2014). The focus on BRICS countries is motivated by their emerging economic significance, diverse financial systems, and varying stages of development, which offer a rich context for investigating the financial-growth nexus.

3.2. Study Context

BRICS countries represent a heterogeneous group of emerging economies with distinct financial structures, regulatory frameworks, and growth trajectories. Financial development in these economies is characterized by varying levels of banking sector efficiency, capital market depth, and access to financial services (Beck et al., 2000). Understanding the relationship between financial development and economic growth in this context is critical, as financial systems play a pivotal role in mobilizing savings, allocating capital efficiently, and promoting investment in productive sectors (Levine, 2005). Moreover, the heterogeneity of BRICS countries provides an opportunity to explore how differences in institutional quality, regulatory frameworks, and macroeconomic stability influence the financial-growth relationship.

3.3. Data Sources and Variables

The study will utilize secondary data collected from a reputable source which is the World Bank's World Development Indicators (WDI) for the period 2000-2024.The reason we use this period is because it gives us more recent developments about the economies of BRICS countries. The dependent variable is economic growth, which will be measured by annual growth in real GDP. The independent variables are employment-to population ratio, gross fixed capital formation, research and development and credit to private sector. Credit to private sector will represent financial development in this study. Inflation is not included because it focuses on macroeconomic stability.

3.4. Model Specification

$\ln(\text{RealGDPit}) = \beta_0 + \beta_1 \ln(\text{Employment-to-population ratioit}) + \beta_2 \ln(\text{Gross fixed capital formationit}) + \beta_3 \ln(\text{R\&Dit}) + \beta_4 \ln(\text{Credit to Private Sectorit}) + \epsilon_{it}$

The dependent variable, Real GDP, is measured as the natural logarithm of real GDP in constant USD to normalize its distribution and interpret coefficients as elasticities. For labour input, the study uses the employment to population ratio (total percentage), where higher values are expected to positively impact GDP by increasing productive labour participation. Capital accumulation is proxied by gross capital formation, measured as the natural logarithm of gross fixed capital formation (% of GDP), with higher values anticipated to positively correlate with GDP growth. Technological progress is represented by R&D expenditure, operationalized as the natural logarithm of research and development spending (% of GDP), where increased investment is theorized to enhance productivity and output. Finally, financial development is captured through credit to the private sector, measured as the natural logarithm of domestic credit provided to the private sector (% of GDP), with greater credit availability expected to facilitate investment and economic expansion.

3.5. Analytical Approach

The study will employ panel regression techniques to estimate the relationship between financial development and economic growth. Fixed-effects and random-effects models will be considered, with the Hausman test used to determine the most appropriate specification (Gujarati and Porter, 2009). The number of years form part of the time series while the five BRICS countries form part of the cross-section in the study. The number of observations is calculated using the formula: $5 \times 24 = 120$ observations because the study focuses on the economies of five BRICS countries over the span of 24 years.

3.6. Validity, Reliability, and Ethical Considerations

Validity is ensured using widely recognized indicators for financial development and economic growth, while reliability is enhanced by employing consistent, standardized data sources across countries and years. Ethical considerations involve the responsible use of publicly available data, ensuring proper citation of sources, and avoiding any misrepresentation of results. This methodology provides a rigorous framework for investigating the financial development-economic growth nexus in BRICS countries, offering insights into policy measures that could strengthen financial systems and promote sustainable economic growth.

4. RESULTS AND DISCUSSION

This study analyses the macroeconomic dynamics of BRICS economies of Brazil, Russia, India, China, and South Africa by looking at the interrelationships among gross domestic product (GDP) growth, gross capital formation (GCF), employment, research and development (R&D), and domestic credit to the private sector. The BRICS nations are a distinct combination of developed and developing markets that have had a major impact on the world output, trade, and investment trends in the last two decades (World Bank, 2023). It is vital to understand the driving forces of economic growth in this group because they represent over 40% of the global population and close to one-fourth of the global GDP combined (UNCTAD, 2022).

Empirical studies indicates that capital formation, ability to innovate and the development of the financial sector in emerging economies supports sustainable economic growth (Solow, 1956; Romer, 1990; Aghion and Howitt, 2009). Nevertheless, structural heterogeneity among BRICS, due to institutional quality and innovation intensity, and labour market efficiency, implies that the measures will not affect member states uniformly (Herrera and Kouame, 2021). This study aims at using panel data econometric analysis to establish the short-run and long-run dynamics of these macroeconomic factors, thus aiding in the comprehension of growth convergence and divergence in the BRICS bloc.

4.1. Real Gross Domestic Product (GDP)

Kaur et al. (2023:4) observed that China and India maintained superior GDP performance due to robust innovation frameworks and trade openness. Kushwaha (2024:12) identified that macroeconomic stability and post-COVID fiscal policy responses allowed China to recover faster than other BRICS members. Similarly, Mohanty et al. (2024:8) confirmed that outward FDI and integration into global value chains significantly boosted GDP expansion in BRICS economies. Collectively, these findings align with the trend in Figure 4.1, where China and India exhibit sustained upward growth trajectories compared to the more volatile performances of Brazil, Russia, and South Africa.

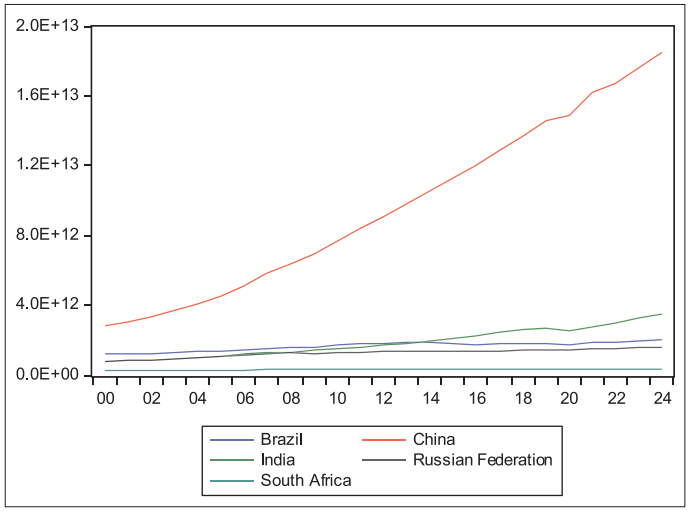
In Figure 1, a few notable trends emerge, with China and India outperforming their BRICS counterparts, exhibiting higher growth rates than Brazil, Russia, and South Africa. In 2020, the economic growth of all countries declined due to the COVID-19 crisis; however, China demonstrated a rapid recovery, with its GDP continuing to rise thereafter. Specifically, Figure 1 suggests that China recorded a growth rate of 1.49% in 2020 and 1.62% in 2021, while India's growth rate increased from 2.53% in 2020 to 2.78% in 2021. In comparison, Brazil's growth rose modestly from 1.76% to 1.84%, Russia's from 1.42% to 1.51%, and South Africa's from 3.37% to 3.54% over the same period.

4.2. Gross Fixed Capital Formation (GFCF)

In Figure 2, gross capital formation is employed to measure the total value of a country's investments in fixed assets, changes in inventories, and the net acquisition of valuables over a given period. This variable, serving as an independent indicator, reflects the economy's commitment to expanding its productive capacity and supporting future economic growth. It comprises three main components: fixed capital formation (such as investments in machinery, equipment, and buildings), changes in inventories (including raw materials, work-in-progress, and finished goods held by firms), and the acquisition of valuables (such as precious metals and gemstones). Arzova and Şahin (2024:509) demonstrated that investment in fixed assets enhances green and sustainable growth within BRICS-T countries. Rehman and Islam (2023:15) further revealed that higher levels of GCF, supported by foreign investment and institutional quality, increase productivity across the bloc. In parallel, Meyer and Meyer (2017:10) found a strong positive correlation between capital formation and GDP, highlighting that rising GCF leads to improved employment and industrial expansion.

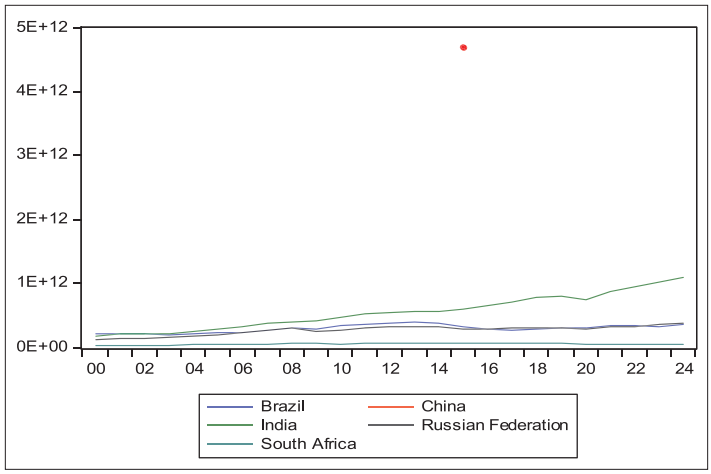
China and Brazil outperform the other BRICS countries, exhibiting higher levels of gross capital formation (GCF) compared to Russia, India, and South Africa. China recorded the highest GCF in 2015, although this is the only year for which data are available for the

Figure 1: GDP growth for BRICS



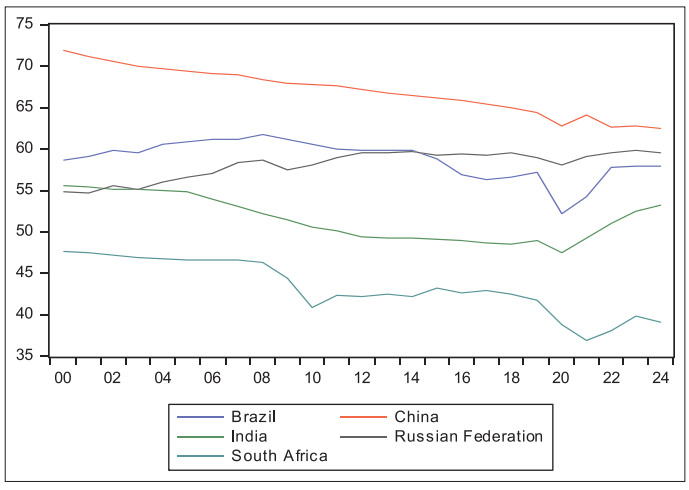
Source: World Bank Development Indicators

Figure 2: Gross fixed capital formation for BRICS



Source: World Bank Development Indicators

Figure 3: Employment to population ratio for BRICS



Source: World Bank Development Indicators

country. All BRICS economies experienced a notable decline in gross fixed capital formation (GFCF) in 2009 because of the global financial crisis. Similarly, in 2020, GFCF declined across all BRICS economies due to the COVID-19 pandemic, with South Africa experiencing the sharpest contraction and showing only gradual signs of recovery. In response to the pandemic, South Africa implemented strict lockdown measures in March 2020, which severely disrupted most sectors of the economy, including manufacturing, construction, and services.

4.3. Employment to Population Ratio

Rastogi and Gaikwad (2017:305) concluded that human capital development significantly improves labour market outcomes, particularly when supported by education and technology transfer. Meyer and Meyer (2017:15) reported that employment elasticity of GDP was higher in India and Brazil, showing that economic growth translated more directly into jobs in those countries. Additionally, Rehman and Islam (2023:21) found that FDI inflows and institutional efficiency enhanced labour absorption, particularly in manufacturing and services sectors. According to Figure 3, South Africa has maintained the lowest employment-to-population ratio (EPR) since 2000, with significant declines observed in 2010 and 2020, corresponding to the global financial crisis and the COVID-19 pandemic, respectively. China has consistently recorded the highest EPR among the BRICS countries since 2000, although it has exhibited a gradual downward trend over time. Brazil experienced the steepest decline in 2020, indicating that its labour market was the most severely affected by the pandemic within the BRICS bloc. India's EPR has remained relatively low—though higher than South Africa's—and has shown a steady recovery following the 2020 downturn. In contrast, Russia displays an upward trajectory, maintaining the second-highest EPR after China.

4.4. Research and Development

Gyedu et al. (2021:5) identified that R&D intensity and patent activity positively affect GDP per capita, particularly in China and India. Uyar et al. (2022:12) demonstrated that R&D spending is strongly correlated with research productivity, although the magnitude of its impact varies across economies. Jalil et al. (2024:7) found that China's financial development amplifies R&D's contribution to innovation and output growth, positioning it as the technological leader among BRICS. In Figure 4, the data indicates an upward trend for China, which has consistently recorded the highest level of investment in research and development (R&D) among the BRICS countries. China's investment in research and development (R&D) peaked at 2.8% in 2024, with its lowest level recorded at 0.89% in 2000. Brazil ranks second among the BRICS countries in terms of R&D investment, reaching a peak of 1.37% in 2015. However, its investment has steadily declined from 2019 to 2024, reaching a low of 0.88%. Russia led the BRICS group in R&D investment between 2000 and 2003 but experienced a modest decline from 2004 to 2008. Investment increased again in 2009 as part of efforts to diversify the economy and reduce dependence on energy resources. Nevertheless, following 2009, Russia's R&D investment has gradually decreased, reaching its lowest level of 0.85% in 2024. (Falkenheim and Alexander, 2023:42).

India and South Africa have consistently recorded the lowest levels of R&D investment within the BRICS group. South Africa's

Table 1: Conceptual definitions of financial development

Concept	Definition
Banking sector development	Refers to improvements in the size, efficiency, stability, and reach of the banking system, including its ability to mobilise savings, allocate credit efficiently, manage risks, and support economic growth.
Capital market deepening	The expansion and increased efficiency of financial markets, particularly equity and bond markets, in terms of market size, liquidity, diversity of instruments, and ability to channel capital to productive investments.
Financial inclusion	The process of ensuring access to useful and affordable financial products and services—transactions, payments, savings, credit, and insurance—delivered responsibly and sustainably to all individuals and businesses, especially disadvantaged groups.
Institutional quality	The effectiveness of legal, regulatory, and governance frameworks in supporting financial transactions, enforcing contracts, protecting property rights, and maintaining market confidence.

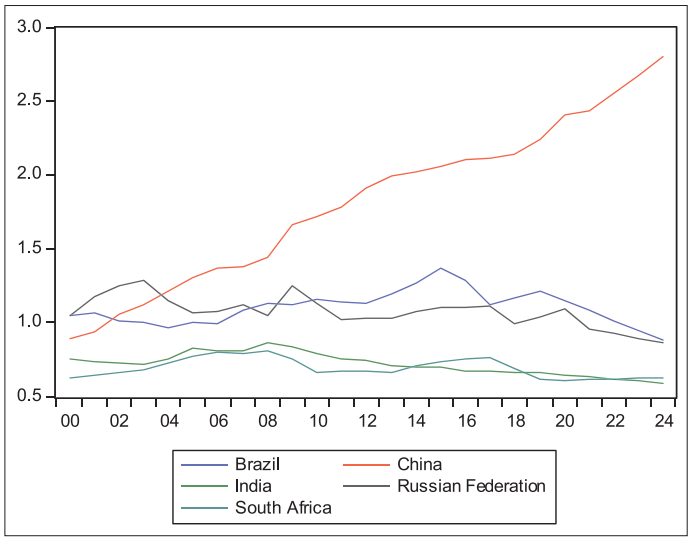
Source: Author's compilation

Table 2: The relationship between GDP growth and other macroeconomic indicators

Indicator	Description
Real GDP growth	Measures the percentage change in the value of all goods and services produced, adjusted for inflation.
GDP per capita	GDP divided by the population; indicates average income and living standards.
Labour productivity	Output per worker or per hour worked; a driver of long-term growth.
Investment rate	Share of GDP devoted to capital formation, affecting future productive capacity.
Total factor productivity (TFP)	Measures efficiency in combining capital and labour; often linked to technological progress.
Employment growth	Changes in total employment; indicates capacity to create jobs alongside GDP growth.

Source: Author's compilation

Figure 4: Research and development



Source: World Bank Development Indicators

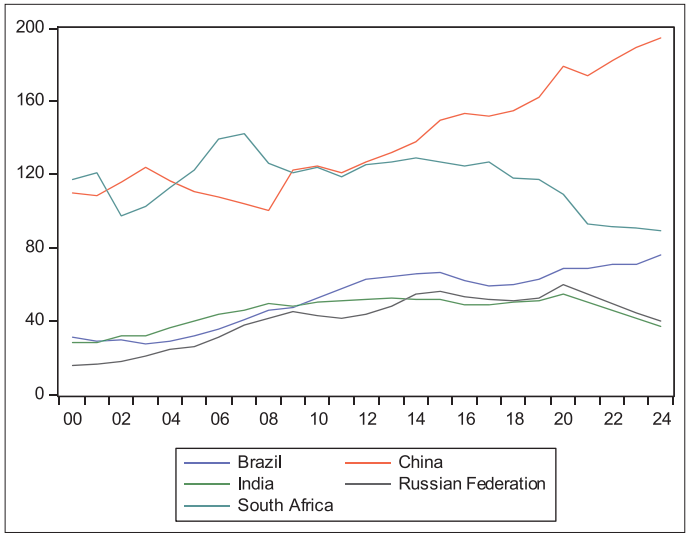
highest investment was 0.81% in 2008, with a low of 0.6% in 2020. Similarly, India's investment peaked at 0.86% in 2008 but declined thereafter, recording the lowest R&D investment in the BRICS bloc at 0.59% in 2024.

4.5. Domestic Credit to Private Sector (DCPS) as a % of GDP Growth

Arzova and Şahin (2024:512) found that while credit expansion promotes investment, excessive private borrowing can weaken long-term stability if not matched by productive use. Kaur et al. (2023:6) observed that domestic credit strongly supports growth in India and Brazil but has weaker effects in Russia and South Africa due to inefficiencies in credit allocation. Meanwhile, Rehman and Islam (2023:17) established that financial infrastructure improvements enhance total factor productivity, suggesting that well-regulated credit access can drive sustainable growth.

In Figure 5, China recorded the highest domestic credit to the private sector (DCPS) among the BRICS countries, while India consistently exhibits the lowest. China's DCPS reached its lowest level in 2008 at 100.4% but has shown a steady upward trend, thereafter, peaking at 194.17% in 2024. South Africa had the highest DCPS in the BRICS group in 2007 at 142.42%; however, it declined sharply following the 2008 global financial crisis and has continued to decrease, reaching its lowest level of 89.38% in 2024. Russia recorded the lowest DCPS in 2000 at 15.7% but has shown a consistent upward trajectory since then, peaking in 2020 at 59.58%. Figure: 5: DCPS.

Figure 5: Domestic credit to private sector (DCPS) as a % of GDP growth



Source: World Bank Development Indicators

4.6. Descriptive Stats

The descriptive statistics for the BRICS economies reveal notable differences across key macroeconomic indicators (Table 3). Real GDP (Ln (GDP)) has the highest mean value of 27.67, followed by gross fixed capital formation (Ln (GFCF)) at 26.07. Domestic credit to the private sector (Ln (DCPS)) and the employment-to-population ratio (Ln (EPR)) show mean values of 4.03 and 3.96, respectively, while research and development (Ln(R&D)) records the lowest mean at −0.13, indicating comparatively limited investment in this area. The range of values further reflects this variation. Real GDP reaches a maximum of 30.05, while R&D has the lowest observed value of −0.527. Gross fixed capital formation exhibits the greatest variability with a standard deviation of 0.97, followed by GDP at 0.78. DCPS shows moderate variation (0.53), while R&D (0.25) and EPR (0.14) demonstrate relatively low variability.

Distributional characteristics indicate that most variables are slightly negatively skewed, with skewness values of −0.407 for GDP, −0.208 for GFCF, and −0.776 for EPR. In contrast, R&D and DCPS exhibit mild positive skewness, at 0.296 and 0.022 respectively. Kurtosis values are close to the normal benchmark of 3, with GDP at 2.78, GFCF at 3.00, EPR at 2.58, R&D at 2.56, and DCPS at 2.50. The Jarque-Bera test confirms that most variables approximate a normal distribution, with probabilities exceeding 0.05 for GDP (0.224), GFCF (0.694), R&D (0.316), and DCPS (0.587), while EPR (0.004) slightly deviates from normality. Overall, these statistics highlight the dominance of GDP and capital formation in terms of magnitude and variability within the BRICS economies, while R&D and employment-to-population ratios remain comparatively low and stable.

4.7. Correlation Analysis

Correlation analysis was conducted to examine the relationships between the BRICS variables (Table 4). Overall, most variables exhibit positive correlations, indicating that increases in GDP, gross fixed capital formation, employment-to-population ratio, and R&D tend to move together. Notably, domestic credit to the private sector (DCPS) shows negative correlations with all other

Table 3: Descriptive statistics for BRICS

Description	Ln (GDP)	Ln (GFCF)	Ln (EPR)	Ln (R&D)	Ln (DCPS)
Mean	27.66739	26.07045	3.961618	−0.130556	4.032186
Median	27.91319	26.36676	4.007842	−0.152266	3.949097
Maximum	30.05412	29.17746	4.190836	0.721253	5.008158
Minimum	26.12455	24.08111	3.605443	−0.527260	2.753861
Std. Dev	0.782923	0.971229	0.136169	0.253570	0.527205
Skewness	−0.407233	−0.208175	−0.776377	0.296046	0.021556
Kurtosis	2.781707	3.004886	2.575037	2.556323	2.498543
Jarque-Bera	2.992158	0.729606	10.90648	2.303734	1.066045
Probability	0.224007	0.694333	0.004282	0.316046	0.586829

Source: Compiled by the author

Table 4: Correlation results for BRICS

Variables	Ln (GDP)	Ln (GFCF)	Ln (EPR)	Ln (R&D)	Ln (DCPS)
Ln (GDP)	1	0.980491	0.690526	0.460895	−0.506487
Ln (GFCF)	0.980491	1	0.615379	0.353124	−0.469019
Ln (EPR)	0.690526	0.615379	1	0.784318	−0.625373
Ln (R&D)	0.460895	0.353124	0.784318	1	−0.358439
Ln (DCPS)	−0.506487	−0.469019	−0.625373	−0.358439	1

Source: Compiled by the author

variables, suggesting that higher GDP, investment, employment, and R&D are associated with lower levels of private sector credit.

Among the strongest associations, GDP and GFCF are highly correlated (0.98), while employment-to-population ratio and R&D also display a strong positive correlation (0.78). In contrast, the negative correlation between EPR and DCPS (−0.63) is the most pronounced among the negative relationships. These results indicate that while economic output, investment, and human capital indicators are closely linked, financial development, as measured by DCPS, does not move in tandem with them, reflecting a possible disconnect between credit allocation and other development indicators in the BRICS economies (Rehman and Islam, 2023: 486).

4.8. Panel Unit Root Tests

Prior to estimation, panel unit root tests (ADF and PP) will be applied and the results shown in Table 5 to determine the order of integration of each variable. If the dependent variable, ln(GDP per capita), and the explanatory variables (ln(Gross Capital Formation), ln(R&D Expenditure), and ln(Credit to Private Sector)) are found to be integrated of order one, I(1), panel cointegration tests will be conducted to examine the existence of a long-run equilibrium relationship among them. The Pedroni (1999; 2004) and Kao (1999) panel cointegration tests will be employed, given their suitability for heterogeneous cross-sections such as BRICS countries.

H_0: There is presence of unit root

H_1: There is no presence of unit root

For all the variables, the P-values of the Augmented Dickey-Fuller (ADF) test are >0.05 for more than one unit root test, therefore we do not reject the null hypothesis that the variables contain a unit root. Real GDP, GFCF, EPR, R&D and DCPS are therefore non-stationary at level. We should then proceed to difference them.

At first difference, the P-values of the PP test are <0.05 for all unit root tests, therefore we reject the null hypothesis that all the variables contain a unit root. Real GDP, GFCF, EPR, R&D and DCPS are therefore stationary at first difference. The next step was to conduct panel cointegration tests, which consisted of the Pedroni and Kao tests. We found that that the P-values are >0.05 for most test specifications, therefore we do not reject the null hypothesis, and we conclude that there is no cointegration among variables. There is no long-run equilibrium relationship among financial development, investment, R&D, labour use, and economic growth (real GDP) for BRICS as a group. In other words, while these variables may move together in the short term, they do not sustain a stable long-term growth path collectively. This suggests that BRICS economies differ structurally their financial systems, innovation policies, and investment efficiencies are not yet harmonized or stable enough to sustain long-run cointegration.

Table 5: Panel unit root test for BRICS - P values of ADF tests at level

Variable	Individual intercept	Individual intercept and trend	None
Ln (GDP)	0.0161	0.9292	1.0000
Ln (GFCF)	0.2695	0.9356	0.9998
Ln (EPR)	0.6948	0.4531	0.0008
Ln (R&D)	0.4844	0.2493	0.5400
Ln (DCPS)	0.4416	0.9936	0.9754

Source: Compiled by author

Table 6: Pooled regression for BRICS

Variable	Coefficient	Std. error	t-statistic	Prob.
Ln (GFCF)	0.736251	0.016371	44.97155	0.0000
Ln (EPR)	0.200651	0.201454	0.996013	0.3217
Ln (R&D)	0.321780	0.082037	3.922392	0.0002
Ln (DCPS)	−0.028123	0.030535	−0.921006	0.3594

Source: Compiled by the author

4.9. Panel Regression Analysis

4.9.1. Pooled regression

First a pooled regression, fixed effect model (FEM) and random effect model (REM) were estimated and redundant fixed effects tests and correlated random effects Hausman Test were used to identify the model supported by the data. The results of the selected are then presented and discussed. Results of pooled regression and FEM were different, suggesting that the redundant fixed Effects tests, which test for Test cross-section fixed effects, had to be conducted to identify the relevant model between these models.

Table 6. presents the pooled OLS regression results for the BRICS countries. Gross fixed capital formation (Ln(GFCF) = 0.736) and research and development (Ln(R&D) = 0.322) are positively and significantly associated with real GDP, with P-values below 0.05, indicating that increases in investment and innovation contribute meaningfully to economic growth. Employment-to-population ratio (Ln(EPR) = 0.201) and domestic credit to the private sector (Ln(DCPS) = −0.028) are not statistically significant, suggesting that, on average, they have limited impact on GDP within the sample period. The negative coefficient for DCPS implies an inverse relationship with GDP, although this effect is not statistically significant. The high R-squared value of 0.977 indicates that approximately 98% of the variation in real GDP is explained by the included variables, with the remaining 2% captured by the error term. These results highlight that, across the BRICS countries, investment and R&D are the primary drivers of economic growth, while employment and financial development show weaker or no immediate association. Comparison with fixed-effects (FE) model results is necessary to account for unobserved heterogeneity across countries.

Table 7 presents the fixed-effects (FE) regression results for the BRICS countries. Gross fixed capital formation (Ln (GFCF) = 0.679) and domestic credit to the private sector (Ln (DCPS) = 0.010) are positively associated with real GDP, while employment-to-population ratio (Ln (EPR) = −0.639) and research and development (Ln(R&D) = −0.304) are negatively associated. All coefficients are statistically significant at the 5% level except for DCPS (P = 0.741), indicating that increases in GFCF strongly contribute to GDP growth, while higher EPR and R&D appear to reduce GDP per capita within the sample.

The model has a high explanatory power, with an R-squared of 0.995, suggesting that 99% of the variation in GDP is explained by the included variables. Compared to the pooled OLS model, the FE specification accounts for unobserved country-specific effects, providing a more reliable estimation of the factors influencing economic growth across BRICS countries. Therefore, the regression analysis for BRICS highlights gross fixed capital formation as the primary driver of economic growth, with positive and significant coefficients in both pooled OLS (0.736) and FE (0.679) models. Research and development and employment-to-population ratio show contrasting effects: they are positive in the pooled model but negative in the FE model, suggesting that their impact on GDP is sensitive to country-specific factors. Domestic credit to the private sector is consistently insignificant in both models.

The FE model, with an R^2 of 0.995, provides a better fit than the pooled regression, capturing nearly all variation in GDP and indicating that investment in physical capital dominates growth dynamics in the BRICS economies, while the effects of employment, R&D, and financial development are weaker.

4.9.2. Redundant fixed effect

The likelihood ratio hence is between 0 and 1. Low values of the likelihood ratio mean that the observed result was less likely to occur under the null hypothesis that the fixed effects are equal to zero as compared to the alternative that effects are different from zero. High values of the statistic mean that the observed outcome was nearly as likely to occur under the null hypothesis as the alternative, and the null hypothesis cannot be rejected.

Table 8 presents the redundant fixed effects test for BRICS. Both the cross-section F (85.10, P = 0.000) and Chi-square (156.30, P = 0.000) statistics are highly significant, indicating that the null hypothesis of no fixed effects can be rejected. This confirms that country-specific effects are important in explaining variations in economic growth across the BRICS countries. The high R-squared value (0.977) further suggests that the model explains most of the variation in GDP. Given these results, the next step is to estimate the random effects model (REM) and use the Hausman test to determine whether FEM or REM provides the more appropriate specification.

Table 7: Fixed effect (cross-sectional specific estimates) for BRICS

Variable	Coefficient	Std. error	t-statistic	Prob.
Ln (GFCF)	0.678782	0.025963	26.14467	0.0000
Ln (EPR)	−0.639440	0.121910	−5.245196	0.0000
Ln (R&D)	−0.303774	0.065361	−4.647607	0.0000
Ln (DCPS)	0.009572	0.028912	0.331078	0.7413

Source: Compiled by the author

Table 8: Redundant fixed effect for BRICS

Effects test	Statistic	d.f	Prob.
Cross-section F	85.099413	(4,92)	0.0000
Cross-section Chi-square	156.303265	4	0.0000

Source: Compiled by the author

4.9.3. Testing for random effect

The random effects model, which is also known as the error components model, which assumes that the random effects are uncorrelated with the explanatory variables otherwise there would be an endogeneity problem, which in turn would make the estimators inconsistent. The Hausman Test for Correlated Random Effects tests this hypothesis. (Hausman, 1978:126; Baltagi, 2018:2; Bell and Jones, 2015:134) The random effects model (REM) assumes that the unobserved country-specific effects are uncorrelated with the explanatory variables. Table 9 presents the REM estimates for BRICS, with gross fixed capital formation (Ln(GFCF) = 0.736) and research and development (Ln(R&D) = 0.322) showing strong positive and statistically significant effects on GDP (P < 0.05). Employment-to-population ratio (Ln(EPR) = 0.201) is also positive and significant, while domestic credit to the private sector (Ln(DCPS) = −0.028) is negative and marginally insignificant (P = 0.054).

The variation in coefficients reflects differences in the structural characteristics of the BRICS economies, highlighting that the impact of investment, employment, and innovation on economic growth differs across countries. These results provide a baseline for the Hausman test, which determines whether fixed or random effects yield the more consistent and efficient estimates.

Table 10 presents the Hausman test for correlated random effects in the BRICS panel. The test statistic (Chi-square = 340.40, P = 0.000) is highly significant, leading to the rejection of the null hypothesis that the random effects are consistent. This indicates that country-specific factors, such as policies, institutions, and structural characteristics, are correlated with

Table 9: Random effects model BRICS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Ln (GFCF)	0.736251	0.007714	95.44296	0.0000
Ln (EPR)	0.200651	0.094923	2.113835	0.0371
Ln (R&D)	0.321780	0.038655	8.324478	0.0000
Ln (DCPS)	−0.028123	0.014388	−1.954647	0.0535

Source: Compiled by the author

Table 10: Hausman test for BRICS

Correlated random effects-Hausman test			
Test cross-section random effects			
Test summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	340.397651	4	0.0000

H_0: Random effects are consistent. H_1: Random effects are not consistent.
Source: Compiled by author

the explanatory variables. Consequently, the fixed effects model is more appropriate for analysing the BRICS data, as it accounts for these unobserved heterogeneities and provides unbiased and consistent estimates.

4.9.4. Cross-section random effects test (comparisons)

Table 11 presents a comparison of fixed and random effects coefficients for the BRICS countries. The differences in coefficients between the FEM and REM are statistically significant for gross fixed capital formation (Ln(GFCF), P = 0.020), employment-to-population ratio (Ln(EPR), P = 0.000), and research and development (Ln(R&D), P = 0.000), indicating that these variables are sensitive to the choice of model. Domestic credit to the private sector (Ln(DCPS)) shows no significant difference (P = 0.133).

Combined with the Hausman test results, this confirms that the fixed effects model is more appropriate for the BRICS data. The FEM captures country-specific heterogeneity, explaining 99% of the variation in real GDP, and provides a more reliable fit than the pooled or random effects models.

The regression analysis for the BRICS countries highlights the determinants of economic growth and the appropriate model specification. In the pooled OLS model, gross fixed capital formation (Ln(GFCF) = 0.736) and research and development (Ln(R&D) = 0.322) are positive and statistically significant, indicating that investment and innovation drive GDP, while employment-to-population ratio (Ln(EPR)) and domestic credit to the private sector (Ln(DCPS)) are not significant. The fixed effects model (FEM), which accounts for country-specific heterogeneity, presents a different pattern: GFCF (0.679) and DCPS (0.010) are positive, while EPR (−0.639) and R&D (−0.304) are negatively associated with GDP, with all coefficients significant except DCPS. The high R-squared value of 0.995 confirms the FEM captures almost all variation in GDP across the BRICS countries.

Redundant fixed effects tests and the Hausman test further support the choice of FEM over random effects, indicating that country-specific factors—such as policies, institutions, and structural conditions—are correlated with the explanatory variables. Comparison of FEM and REM coefficients shows significant differences for GFCF, EPR, and R&D, reinforcing that fixed effects provide more reliable and unbiased estimates. Overall, the analysis underscores the dominant role of investment in physical capital in driving economic growth, while the impact of employment, R&D, and financial development varies across countries and is sensitive to unobserved heterogeneity.

Table 11: Cross-section random effects test (comparisons)

Cross-section random effects test comparisons:				
Variable	**Fixed**	**Random**	**Var (Diff).**	**Prob.**
Ln(GFCF)	0.678782	0.736251	0.000615	0.0204
Ln(EPR)	−0.639440	0.200651	0.005852	0.0000
Ln(R&D)	−0.303774	0.321780	0.002778	0.0000
Ln(DCPS)	0.009572	−0.028123	0.000629	0.1328

Source: Compiled by the author

4.9.5. Summary

The results of this study reveal that economic growth in the BRICS economies is primarily driven by gross capital formation (GCF), employment-to-population ratio (EPR), and research and development (R&D), while domestic credit to the private sector (DCPS) shows a weak or even negative relationship with growth. The strong positive correlation between GCF and GDP (r = 0.98) confirms that investment remains a fundamental driver of growth in emerging markets, consistent with the neoclassical growth model proposed by Solow (1956), which emphasises capital accumulation as a key determinant of output. Similarly, Pradhan et al. (2017:45) found that increased investment and innovation contribute significantly to long-term economic growth across BRICS economies. The positive association between EPR and GDP indicates that labour market performance and human capital utilisation are crucial for sustaining growth. This finding aligns with the endogenous growth theory of Romer (1990), which identifies human capital and innovation as central to productivity improvements. The moderate correlation between R&D and GDP further highlights the emerging role of technological advancement in driving growth, particularly in China and Brazil, where R&D expenditure is highest. Studies by Freimane and Bāliņa (2016:57) also confirm that R&D investments enhance total factor productivity and economic performance within innovation-driven economies.

In contrast, the negative relationship between DCPS and GDP suggests that financial deepening has not yet translated into efficient resource allocation in BRICS countries. This finding supports the argument of Adu et al. (2013:95) that in developing economies, rapid credit expansion often fails to promote growth due to weak institutional frameworks and inefficient financial intermediation. The results are also in line with Stiglingh (2015:82), who reported that financial development positively influences growth in both BRICS and G7 countries, but the impact is weaker and less consistent in emerging economies, where financial systems are less mature. Overall, these results demonstrate that BRICS countries rely heavily on capital accumulation, employment, and innovation, while financial development measured through credit expansion plays a limited or indirect role in promoting growth. This suggests that for financial development to become a more effective driver of economic progress, it must be accompanied by institutional strengthening, improved credit quality, and enhanced financial governance, as highlighted by Levine (2005) and King and Levine (1993).

5. CONCLUSION AND RECOMMENDATIONS

This study has examined the nexus between financial development and economic growth among BRICS countries, focusing on the extent to which financial systems contribute to sustainable and inclusive economic expansion. The literature review revealed that while financial development enhances capital allocation, investment efficiency, and innovation (Levine, 2005; Sahay et al., 2015), its effects are highly contingent on institutional quality, regulatory soundness, and macroeconomic stability (Asante et al., 2023).

The empirical and theoretical foundations suggest that the finance–growth relationship within BRICS is complex and context-dependent. In China and India, financial deepening has facilitated robust economic expansion, whereas in Brazil and South Africa, excessive credit growth and financial concentration have constrained inclusive growth (Odhiambo, 2009; Rousseau and Wachtel, 2011). Institutional diversity and policy asymmetry across BRICS underline the importance of governance, transparency, and regulatory capacity in mediating financial sector outcomes (Uzoechina and Imoagwu, 2022). Overall, the analysis underscores that financial development remains a necessary but insufficient condition for sustained economic growth. When complemented by effective regulation, technological innovation, and inclusive financial systems, it can serve as a cornerstone for long-term prosperity within BRICS economies.

It is thus recommended that BRICS governments should enhance prudential oversight to ensure that financial development translates into productive investment. Sound institutions and robust legal systems are essential for mitigating risks associated with capital volatility and ensuring credit allocation supports the real economy (Lichaba, 2023; Hollander and Van Lill, 2019).

To achieve inclusive growth, BRICS nations must broaden access to affordable financial services through digital innovation and fintech integration. This will empower small and medium enterprises (SMEs) and marginalized populations, reducing structural inequalities (Nanziri and Gbahabo, 2025; Magwedere and Marozva, 2025). Policymakers should promote capital market deepening by encouraging bond and equity market expansion. These markets diversify funding sources, support entrepreneurship, and lessen overreliance on banking systems (Allen et al., 2012; Beck et al., 2000). Financial systems must support research and development (R&D) initiatives, aligning with endogenous growth theories that highlight innovation and human capital as key drivers of sustained growth (Romer, 1990; Aghion and Howitt, 1998). Given structural differences among BRICS economies, country-specific strategies are necessary. For example, South Africa could focus on reducing banking concentration and enhancing SME credit access, while China and India could strengthen financial liberalization mechanisms within robust institutional frameworks (Prozesky, 2020; Uzoechina and Imoagwu, 2022).

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