

Determinants of Provincial Economic Growth Disparities in South Africa Post-Democracy

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Abstract

South Africa continues to experience significant economic growth disparities across its nine provinces, which hinder equitable development and challenge national economic cohesion. This study examines the key factors that influence provincial economic growth in South Africa during the post-democracy period (1995–2023). Following a quantitative econometric approach, the study employs fixed effects, random effects, and dynamic panel data models (System GMM) to analyse provincial growth dynamics while addressing potential endogeneity and dynamic relationships. The findings reveal that fixed capital formation, income expenditure, and export growth rate significantly drive provincial economic growth. Conversely, in the dynamic model, employment share shows a negative association, pointing to labour market inefficiencies. Meanwhile, population size positively influences growth, reflecting its contribution to labour supply and market expansion. The results suggest the need for targeted investments in infrastructure, labour productivity, and export-oriented sectors to address provincial disparities and promote equitable development.

Keywords: *Provincial Economic Growth, Export-Led Growth, Fixed effects, Random effects, Systems Generalised Method of Moments, Export growth*

JEL: O40, R11, C23, F4

1. Introduction

Provincial economic growth plays a pivotal role in driving overall national economic development. When regions or provinces within a country grow equitably, the effect enhances national economic performance and reduces disparities that could undermine social and economic cohesion (Salas-Guerra, 2021). For instance, countries like Germany and China have achieved substantial national growth by making targeted investments in regional development. Germany's focus on infrastructure and innovation in less-developed regions after reunification fostered balanced regional growth, while China's policies promoting export-oriented industrialisation in coastal provinces catalysed national economic transformation (Li et al, 2020).

Provincial growth is crucial for national economic development, fostering greater inclusion, greater inclusion, resource utilisation, and resilience. When provincial economies succeed, they contribute to job creation, reduce poverty, and support the national economy by enabling balanced development (Cardoso et al, 2023). However, regional economic growth is shaped by several determinants, including infrastructure development, education and skills, natural resource endowments, institutional quality, and access to finance. In developed countries, these determinants have been studied extensively, with findings indicating that investments in education, infrastructure, and technology are crucial drivers of regional growth (Jeleskovic & Loeber, 2020).

In contrast, regional economic growth dynamics in Africa differ significantly due to historical, institutional, and resource-related challenges. Many African countries face persistent disparities between urban and rural areas or resource-rich and resource-scarce regions. For example, Nigeria's oil-rich states dominate its economy, leaving other regions impoverished and underdeveloped (Ibitoye et al., 2022). Similarly, in Ethiopia, growth has been concentrated in urban centres while rural areas lag due to limited infrastructure and access to education (Argaw, 2017).

South Africa provides a particularly striking example of regional economic disparities. Despite being the most industrialised nation on the continent, its nine provinces exhibit vast differences in economic performance. Provinces such as Gauteng and the Western Cape have thriving economies driven by advanced infrastructure, higher investment levels, and greater access to financial resources, while provinces like Limpopo and the Eastern Cape remain underdeveloped, facing challenges like high unemployment and poor service delivery (Bhorat et al., 2009). These disparities, a legacy of apartheid-era spatial planning and unequal resource allocation, continue to hinder inclusive economic growth and development.

Existing studies on South Africa's economic growth disparities have focused on individual determinants such as infrastructure, education, and labour market dynamics but often neglect the interactions between these factors or their impact at the provincial level. Furthermore, there is limited research exploring the dynamic and structural relationships that drive provincial disparities over time, particularly in the post-democracy era. This study investigates the determinants of regional economic growth disparities in South Africa, addressing these gaps. This study's findings are expected to provide actionable insights for policymakers at provincial and municipal levels, offering strategies to foster inclusive growth, reduce disparities, and enhance provincial competitiveness.

2. Literature Review

This section reviews key theoretical perspectives and empirical studies that explain the determinants of provincial economic growth. Three main theories Endogenous Growth Theory, Structural Transformation Theory, and Institutional Theory offer insights into how human capital, industrial shifts, and governance structures shape regional economies. Additionally, empirical studies are discussed highlighting critical drivers of provincial economic performance, such as infrastructure, innovation, and investment patterns. This review identifies gaps in the literature and positions this study within the broader discourse on regional economic growth.

2.1 Theoretical underpinnings

The theoretical framework provides the basis for understanding the mechanisms that contribute to regional economic disparities. Various

theories and models are used to explain this phenomenon. In this paper, we discuss three (3) theories, namely (i) Endogenous Growth Theory, (ii) Structural Transformation Theory, and (iii) Institutional theory.

2.1.1 Endogenous Growth Theory

The endogenous growth theory posits that economic growth is determined by factors that are internal to the system. The theory suggests regional economic disparities may stem from differences in human capital accumulation and technology advancements (Romer, 1990). According to this theory, investment in human capital, technology innovations and knowledge creation is likely to create and sustain long-term economic growth by generating spillover effects and increasing productivity. The endogenous growth theory challenges the neoclassical view which assumes that technological progress is determined by a scientific process that is separate from and independent of economic factors (Romer, 1990). It challenges this view by proposing how economic factors influence technological progress and long-run growth. The theory argues that innovations are a result of investment in research and development (R&D), and therefore, economic policies on trade, competition, education and intellectual property can influence the rate of innovation.

2.1.2 Structural Transformation Theory

Structural transformation is defined as the shift of an economic structure from low-productivity, labour-intensive activities to higher productive, capital (Herrendorf et al., 2014). Structural transformation theory explains how economies transition from agriculture to industry and services. Within the South African context, an example of this theory is the transition post-1994, which saw sectors such as mining, manufacturing and services becoming more dominant in Gauteng and Western Cape, while other provinces such as Limpopo and Eastern Cape are still lagging because of their heavy reliance in agriculture (McMillan & Rodrik, 2014).

2.1.3 Institutional Theory

The institutional theory focuses on the influence of formal and informal rules, norms and practices on organisational behaviour and outcome

(Lammers & Garcia, 2017). According to North (1990), the quality of institutions such as governance, property rights and the rule of law, play an important role in regional economies' outcomes. In the South African context, the uneven distribution of effective governance and institutional support across provinces influences economic performance. Provinces that are better run are likely to attract investors and foster economic growth.

2.2 Empirical Literature

The reviewed empirical literature illuminates factors influencing provincial economic growth disparities. For instance, a study conducted by Bhorat et al. (2009) on the impact of South Africa's post-apartheid economic policies in addressing inequality showed an uneven distribution across provinces. Kumo (2012) emphasized that provinces with better access to infrastructure, including roads, energy, and communication networks, tend to achieve higher growth rates. Similarly, Friderichs and Correa (2022) identified investment in human capital, particularly through education and skills development, as a critical determinant of provincial economic performance in South Africa.

Studies from other countries also provide insights into regional economic disparities and their determinants. For instance, Jeleskovic and Loeber, (2020) analyzed economic growth disparities across European regions. Their findings indicated that innovation, infrastructure, and regional governance are pivotal in determining economic performance. Specifically, regions with higher research and development (R&D) investment and quality governance experienced stronger growth.

In China, Li et al. (2020) investigated provincial disparities and found that export orientation and foreign direct investment (FDI) were key drivers of growth, particularly in coastal regions, which consistently outperformed inland areas. Their study emphasized the role of trade liberalisation and access to global markets in exacerbating regional disparities.

Similarly, Cardoso et al. (2023) explored the relationship between infrastructure and economic growth in India, finding that targeted investments in transport, energy, and communication infrastructure significantly enhanced regional economic performance. They also highlighted that labour market rigidities and unequal access to education perpetuated disparities between urban and rural areas.

While existing studies provide valuable insights into the determinants of economic growth disparities, several gaps remain unaddressed. In South Africa, there is limited focus on the dynamic relationship between fixed capital formation, income distribution, and trade policies in shaping regional growth trajectories (Fedderke & Garlick, 2008). Comparative studies from other countries emphasise innovation, governance quality, and export orientation; however, these factors are often underexplored in the South African context. This study aims to fill these gaps by providing a comprehensive analysis of the determinants of provincial economic growth disparities in South Africa.

3. Research Methodology

This study employs a quantitative approach to analyse regional economic growth disparities across South Africa's nine provinces. By utilising a panel dataset from 1995 to 2023, the research examines key economic indicators influencing provincial growth. The econometric framework incorporates Fixed Effects (FE) and Random Effects (RE) models, with the System Generalized Method of Moments (System GMM) estimator addressing endogeneity and dynamic relationships. Data is sourced from the QuantecEasyData database, ensuring consistency and reliability. This section outlines the methodological approach, econometric models, and data sources used to assess the determinants of regional economic performance.

3.1 Regional Economic Growth

The analysis of regional economic growth disparities is central to understanding the uneven development across South Africa's nine provinces. In this study, provincial economic growth is quantified using annual Gross Domestic Product (GDP) data at the regional level, expressed in constant prices to account for inflationary effects. This approach enables a clear depiction of economic performance trends from 1995 to 2023.

The study employs a panel dataset of economic indicators including fixed capital formation, population, unemployment rates, consumption expenditure, and export growth. These variables are selected based on their theoretical and empirical relevance to regional economic growth, as established in the literature.

3.2 Econometric Model

The study utilises panel data models, progressing from foundational techniques to advanced dynamic modelling. The chosen models address key econometric challenges, including unobserved heterogeneity, the dynamic nature of economic growth, and potential endogeneity in explanatory variables.

To establish a baseline understanding of the data and relationships, the study begins with Fixed Effects (FE) and Random Effects (RE) models. The Fixed Effects model is specified as:

$$\begin{aligned}
 Y_{it} &= \alpha \\
 &+ \sum_{k=1}^K \gamma_k X_{kit} + \mu_i \\
 &+ \varepsilon_{it} \dots \dots \dots [1]
 \end{aligned}$$

Where:

Y_{it} represent the provincial economic growth rate i at time t ; X_{kit} is a vector of explanatory variables including fixed capital formation, population, unemployment, consumption expenditure and export growth; μ_i represents unobserved province-specific effects, and ε_i is the error term. The FE model accounts for unobserved heterogeneity by allowing for province-specific intercepts (μ_i), which are assumed to be correlated with the explanatory variables (Baltagi, 2008). While effective in controlling for time-invariant heterogeneity, this model cannot address endogeneity issues or include time-invariant explanatory variables.

The Random Effects (RE) model, in contrast, assumes that unobserved heterogeneity (μ_i) is uncorrelated with the explanatory variables in the model. This means that the individual-specific effects, such as time-invariant characteristics of each cross-sectional unit, do not systematically influence the independent variables. The RE model is specified as:

$$\begin{aligned}
 Y_{it} &= \alpha \\
 &+ \sum_{k=1}^K \gamma_k X_{kit} + \mu_i \\
 &+ \varepsilon_i \dots \dots \dots [2]
 \end{aligned}$$

This assumption allows for more efficient estimates under certain conditions, as it treats (μ_i) as part of the error term. However, violating this assumption risks bias; specifically, if (μ_i) is correlated with one or more explanatory variables, the estimates of the RE model will be inconsistent (Wooldridge, 2010). To determine the appropriate model, we employed the Hausman test. The test evaluates whether the key assumption of the RE model holds. A significant result from the Hausman test indicates that the FE model is preferred because it accounts for the correlation between (μ_i) and the explanatory variables, ensuring consistent estimates (Hausman, 1978).

While FE and RE models provide insights into baseline relationships, they do not fully address the dynamic nature of regional economic growth or endogeneity concerns. Economic growth is inherently dynamic, with past growth influencing current outcomes. This necessitates the inclusion of a lagged dependent variable (Y_{it-1}) . The mathematical notation of the dynamic model is expressed as:

$$\begin{aligned}
 Y_{it} &= \alpha + \beta Y_{it-1} \\
 &+ \sum_{k=1}^K \gamma_k X_{kit} \\
 &+ \varepsilon_{it} \dots \dots \dots [3]
 \end{aligned}$$

Where:

βY_{it-1} represent the persistence of economic growth over time, and the inclusion of lagged Y_{it} introduces endogeneity, as Y_{it-1} is likely correlated with the error term (ε_{it}) .

To address these challenges, the study employs the System Generalised Method of Moments (System GMM) estimator, as developed by Arellano and Bover (1995). The System GMM approach combines equations in levels and first differences to improve estimation efficiency. The System GMM estimator addresses issues of omitted variable bias, reverse causality and measurement error. Diagnostic tests, including the Arellano-Bond test for serial correlation (Arellano & Bond, 1991) and Hansen's J test for instrument validity (Hansen, 1982), ensure the robustness of the results.

3.3 Data Sources

The data for this study spans from 1995 to 2023 and is sourced from the QuantecEasyData database, a comprehensive and reliable database resource for South African macroeconomic and provincial-level data. The dataset includes annual measures of provincial GDP at constant prices, fixed capital formation, population, unemployment share, consumption expenditure and export growth rates for South Africa's nine provinces.

4. Empirical Findings

The results presented in Table 1 project the key variables analyzed in this study. The analysis focuses on the central tendencies, dispersion, and ranges of these variables, highlighting notable observations. The average gross value added across all provinces and years is approximately R692,931 million, with a standard deviation of R780,435.7 million, indicating substantial variation in economic output among provinces. The minimum gross value added is R25,774.13 million, while the maximum reaches R4,596,183 million, suggesting significant disparities in provincial economic performance. This aligns with prior studies highlighting regional inequalities in South Africa's economic development (Mdingi & Ho, 2023)

Fixed capital formation has a mean of R56,653.98 million, reflecting moderate levels of investment in physical capital, with considerable variation as indicated by a standard deviation of R59,867.05 million. The maximum value of R328,447.8 million suggests that some provinces have achieved relatively high levels of capital investment, potentially driving economic growth in those regions (Aysan & Veysel, 2022)

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Gross Value Added	692,931	780,435.7	25,774.13	4,596,183
Fixed Capital Formation	56,653.98	59,867.05	3,097.901	328,447.8
Population	5,769,964	3,411,734	967,272.9	15,300,000
Employment Share	11.11111	6.730101	2.129574	26.11553
Income Expenditure	257,120.5	268,992	13,151.53	1,545,018
Export growth	98,147.69	168,836.1	626.9225	1,143,658

Source: STATA results, 2024

Population size varies widely, with an average of 5,769,964 and a maximum of 15,300,000, reflecting the demographic disparities across provinces. Employment share averages around 11.1%, ranging from 2.1% to 26.1%, indicating diverse labour market dynamics (World Bank, 2021). Income expenditure also shows significant variation, with an average of R257,120.5 million and a maximum of R1,545,018 million, highlighting disparities in consumer spending capacity. Exports average R98,147.69 million but vary widely, with a standard deviation of R168,836.1 million. This suggests that while some provinces are heavily export-driven, others rely more on domestic economic activities. The maximum export value of R1,143,658 million reflects the significant contributions of export-oriented provinces to the South African economy.

4.1 Correlation Analysis

Table 2 provides the correlation coefficients between the key variables in the dataset. This analysis highlights the strength and direction of the relationships between variables, focusing on statistically significant correlations. Gross value-added exhibits a very strong positive correlation with fixed capital formation ($r = 0.9845$), indicating that higher investments in physical capital are strongly associated with higher economic output. This is consistent with economic theories emphasising the role of capital investment in driving productivity and growth (Solow, 1956). Similarly, income expenditure shows a strong positive correlation with gross value added ($r = 0.9846$), highlighting the importance of consumer spending in economic performance, a finding supported by Keynesian economic principles (Keynes, 1936).

The population also demonstrates a strong positive correlation with gross value added ($r = 0.7886$), reflecting the role of larger populations in enhancing economic output, likely through increased labour supply and market size (Romer, 1990). Exports are highly correlated with gross value added ($r = 0.9384$), supporting export-led growth theories, which argue that regions with higher exports tend to achieve greater economic performance due to expanded market opportunities (Krugman, 1980). Interestingly, employment share shows a weaker positive correlation with gross value added ($r = 0.6853$), suggesting that increases in employment do not always translate directly into proportional economic gains. This aligns with findings from labour economics, which highlight potential

inefficiencies or mismatches in labour market dynamics (Morchio& Moser, 2024).

Table 2: Correlation Matrix

	Gross Value Added	Fixed Capital Formation	Population	Employment Share	Income Expenditure	Exports
Gross Value Added	1.0000					
Fixed Capital Formation	0.9845	1.0000				
Population	0.7886	0.7699	1.0000			
Employment Share	0.6853	0.6703	0.9615	1.0000		
Income Expenditure	0.9846	0.9625	0.8031	0.6704	1.0000	
Exports	0.9384	0.9218	0.6931	0.6259	0.9043	1.0000

Source: Stata results, 2024

4.2 Results of the Fixed Effect, Random Effect and GMM model

Table 3 presents the results of the regression analysis using Fixed Effects (FE), Random Effects (RE), and Generalised Method of Moments (GMM) models. The R-squared values for the FE and RE models are 0.72 and 0.78, respectively. This indicates that approximately 72% of the variation in gross value added is explained by the independent variables in the FE model, while 78% is explained in the RE model. The Adjusted R-squared values, which account for the number of predictors, are slightly lower at 0.71 for the FE model and 0.76 for the RE model. These high values suggest both models fit the data well, but the RE model has marginally better explanatory power based on these metrics.

The Fixed Effects (FE) and Random Effects (RE) models were estimated to determine the relationship between key variables. The Hausman test was conducted to choose between the FE and RE models. The test yielded a p-value less than 0.05, indicating that the Fixed Effects model is preferred (Hausman, 1978). However, due to the potential presence of endogeneity in the dataset and dynamic relationships, the Generalized Method of Moments (GMM) model was used as a robust estimation technique (Arellano & Bond, 1991).

The FE model indicates that fixed capital formation has a positive and statistically significant relationship with the gross value added, as evidenced by the coefficient (1.3467, $p < 0.001$). Population also has a

positive and significant effect (0.1723, $p < 0.001$), while employment share is negatively associated, though it is not statistically significant. Income expenditure and exports are both positively and significantly associated with gross value added, with coefficients of 1.3506 and 0.5563, respectively (both $p < 0.001$).

The RE model similarly shows significant positive effects of fixed capital formation (2.6921, $p < 0.001$), population (0.0487, $p < 0.01$), income expenditure (1.5614, $p < 0.001$), and exports (0.7220, $p < 0.001$). The employment share coefficient remains negative (-7007.95) but is statistically insignificant. Overall, the RE model coefficients are larger compared to the FE model, suggesting potential overestimation due to unobserved heterogeneity (Wooldridge, 2010).

The GMM model addresses potential endogeneity issues by incorporating lagged variables and instruments. Fixed capital formation remains positively significant (0.8921, $p < 0.001$), while population and income expenditure also maintain positive and significant effects. Employment share becomes significant but retains a negative coefficient (-12951.70, $p < 0.05$), suggesting that an increase in employment share may reduce gross value added. The lagged dependent variable (Lag 1. gross value added) is positive and significant (0.3809, $p < 0.001$), indicating the persistence in gross value added over time (Baltagi, 2008).

Table 3: Results of the FE, RE and GMM model

Variable	Fixed Effects Model	Random Effects Model	GMM Model
Fixed Capital Formation	1.3467***	2.6921***	0.8921***
Population	0.1723***	0.0487**	0.1195***
Employment Share	-5662.76	-7007.95	-12951.70*
Income and expenditure	1.3506***	1.5614***	0.7844***
Exports	0.5563***	0.7220***	0.4212***
L1_Gross Value Added			0.3809***
Constant	-716723.2***	-134995.99***	-391606.37***
Number of Observations	261	261	243
Chi-squared		41972.843	327388.97
R-squared	0.72	0.78	
Adjusted R-squared	0.71	0.76	

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$
Source: Stata results, 2024

4.3 Robust Diagnostic Tests

According to the results in Table 2, the Wooldridge Test for Autocorrelation in the Fixed Effects and Random Effects models indicates the presence of serial correlation, as evidenced by a significant p-value ($p = 0.012$). This suggests that the error terms are not independent over time, which can affect standard error estimates. Similarly, the Modified Wald Test for Heteroskedasticity detects significant heteroskedasticity in the Fixed Effects model ($p = 0.002$). Additionally, the Pesaran Test for Cross-Sectional Dependence shows evidence of cross-sectional dependence ($p = 0.048$), indicating that residuals across entities are correlated.

For the GMM model, the Arellano-Bond Test confirms no second-order autocorrelation, as AR (2) is not significant ($p = 0.344$). This validates the use of GMM for dynamic panel estimation. Moreover, the Sargan Test for Instrument Validity does not reject the null hypothesis ($p = 0.245$), suggesting that the instruments used in the GMM model are valid and uncorrelated with the error term. Overall, while the Fixed

Effects and Random Effects models exhibit issues such as serial correlation and heteroskedasticity, the GMM model appears robust and suitable for addressing the dynamic relationships and potential endogeneity in the data.

Table 4: Results of Robust Diagnostic Tests

Test	Statistic (p-value)	Conclusion
Wooldridge Test for Autocorrelation (FE/RE)	F (1, 8) = 10.56 (p = 0.012)	Evidence of serial correlation
Arellano-Bond Test for Autocorrelation (GMM)	AR (1): z = -2.89 (p = 0.004) AR (2): z = 0.95 (p = 0.344)	No second-order autocorrelation
Modified Wald Test for Heteroskedasticity (FE)	Chi-sq (9) = 24.67 (p = 0.002)	Heteroskedasticity detected
Pesaran Test for Cross-Sectional Dependence (FE)	z = 1.98 (p = 0.048)	Evidence of cross-sectional dependence
Sargan Test for Instrument Validity (GMM)	Chi-sq (15) = 18.34 (p = 0.245)	Instruments are valid

Source: Stata results, 2024

5. Discussion and Conclusion

This study aimed to analyse the determinants of provincial economic growth in South Africa using panel data analysis. The results provide important insights into the factors influencing gross value added, including fixed capital formation, population, employment share, income expenditure, and exports. The Fixed Effects (FE) and Random Effects (RE) models were employed alongside the Generalised Method of Moments (GMM) model to address potential endogeneity and dynamic relationships.

The findings highlight the positive and significant role of fixed capital formation in driving provincial economic growth. This aligns with theoretical literature stressing physical capital investment as a critical driver of productivity and economic expansion. Previous studies in developing countries, including South Africa, have similarly identified capital investment as a key determinant of regional economic performance. Population growth also exhibits a positive impact, consistent with the Solow growth model, which posits that labour availability enhances production capacity. However, the negative

coefficient for employment share, particularly in the GMM model, suggests structural challenges in employment creation that do not translate effectively into higher economic output. This finding aligns with studies highlighting labour market mismatches in low-productivity regions.

Income expenditure and exports both show significant positive relationships with gross value added across all models, highlighting their role in driving regional economic growth. These results are consistent with export-led growth theories, which argue that increased trade and consumption can stimulate regional development through enhanced market access and resource allocation. The GMM model's identification of lagged gross value added as a significant factor underscores the importance of historical economic conditions in shaping current growth trajectories, a finding consistent with path dependency theories in regional economics. This suggests that sustained economic growth requires leveraging historical strengths while addressing structural bottlenecks.

In conclusion, these results suggest that fixed capital formation, population growth, and income expenditure are pivotal drivers of provincial economic growth in South Africa. The negative association between employment share and gross value-added underscores the need for structural reforms to enhance labour market efficiency and productivity. The findings suggest the South African government prioritise investments in infrastructure, technology, and export-oriented sectors for sustainable growth. Provinces should focus on leveraging their unique resources to enhance trade and consumption while addressing structural barriers to employment and productivity. In light of these findings, the study recommends that the South African government and provincial authorities implement targeted policies to boost fixed capital formation, enhance labour productivity, and promote export-oriented growth strategies to achieve inclusive and sustainable economic development.

Conflict of Interest Statement

The author declares no conflict of interest related to this manuscript

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