MDPI

Article

Determinants of Income Inequality in South Africa: A Vector Error Correction Model Approach

Molepa Seabela, Kanayo Ogujiuba *[iD] and Maria Eggink [iD]

School of Development Studies, University of Mpumalanga, Mbombela 1200, South Africa
* Correspondence: kanayo.ogujiuba@ump.ac.za

Abstract: The issue of income disparity has long plagued South Africa because of the political environment that existed before the country's 1994 democratic transition. Based on the widely used Gini index, which gauges global inequality, the nation routinely has some of the highest rates of income disparity in the world. Income inequality in South Africa keeps rising even after a number of frameworks and policies have been put in place, which has a big influence on society. Thus, it is essential to comprehend the causes of income disparity and put suitable policies in place to remedy it. The purpose of this study is to look into the relationship between South Africa's income disparity and its determinants. Using the Vector Error Correction Model (VECM) approach, this study empirically examines the effects of government spending on social grants, gross savings, population growth, and economic growth on income inequality from 1975 to 2017. Data on the Gini index are sourced from the Standardized World Income Inequality Database (SWIID). Findings reveal a statistically significant negative correlation between government spending on social grants and income inequality. Moreover, income inequality demonstrates a negative relationship with both gross savings and economic growth. However, population growth exhibits a positive correlation with income inequality. This study highlights the significance of implementing a comprehensive strategy to address income inequality in South Africa. This strategy should involve augmenting government expenditure on social grants, cultivating a savings culture within households, and enacting policies that incentivize job creation, particularly in areas with rapid population growth. In addition to making a substantial contribution to the body of evidence already available on income disparity, this study offers insightful information to policymakers working to improve the socioeconomic climate in South Africa.

Keywords: income inequality; government spending on social grants; Gini coefficient; VECM; South Africa

JEL Classification: C51; D63; H53

1. Introduction

In recent years, there has been a growing global focus on income inequality, particularly its significant impact on developing countries such as South Africa. This study delves into the complex dynamics of income inequality within South Africa irrespective of a myriad of political and socioeconomic challenges confronting it. It examines the intricate relationship between government spending on social grants and income inequality. Using the Vector Error Correction Model (VECM), this study provides a detailed analysis of these dynamics.

Ever since the country's democratic transition in 1994, South Africa has faced growing anxiety over the problem of increasing wealth disparity. The persistent upward trend in income inequality highlights the complexity of addressing its underlying causes through policy and intervention methods, even in the face of widespread implementation of social spending measures. The political environment that South Africa finds itself in right now presents challenges to these endeavors. However, the available empirical academic research indicates conflicting relationships between the amount of money the government spends

on social grants and income disparity. Additionally, there are still unanswered questions about the relationships between gross savings, population increase, economic expansion, and income inequality.

To comprehend income inequality both between and within groups, various inequality measures come into play such as the Gini coefficient, a widely utilized measure ranging from zero (indicating perfect equality) to one (indicating perfect inequality). Drawing from the Standardized World Income Inequality Database (SWIID), this study examines Gini indices for income inequality, considering both gross and net incomes from 1975 to 2017. The South African government through the National Development Plan (NDP) aims to reduce income inequality from 0.70 to 0.60 by the year 2030. Despite the various drafted and implemented policies, South Africa remains the most unequal country globally (IMF 2020). Severe income inequality has persisted over the last century, indicating the necessity of comprehensive economic reforms either through policy or legal prescripts. As Leibbrandt and Shipp (2019) opined, reducing inequality requires targeted policies that address disparities in earnings and employment prospects and ongoing support to diminish gender and racial income inequalities.

Irrespective of the political climate and orientation held by those in authority, this study contends that existing policies and frameworks fall short in the face of growing income inequality, urging a re-evaluation of the contributing factors to income inequality. This study focuses on South Africa, a country known for its struggle with income inequality. It provides valuable insights that can inform national policy and global discourse on income inequality. This study's inclusion of data spanning from 1975 to 2017 allows for a comprehensive analysis of long-term trends and dynamics, providing a strong foundation for policy recommendations and future research directions. Considering the aforementioned background, this study investigated how government socioeconomic spending, particularly on social grants, affects income inequality. Additionally, the roles of gross savings, population growth, and economic growth in shaping income inequality were analyzed. The paper follows the following layout: Section 2 critically analyzes the literature, encompassing both the theoretical framework and empirical studies on the relationship between government spending on social grants and income inequality. This section delves into existing research to provide a comprehensive understanding of the topic. Section 3 outlines the data and methodology utilized in the study. Section 4 presents the findings and engages in a detailed discussion. Finally, Section 5 concludes the study, offering policy recommendations based on the results of the study.

2. Related Literature

Income inequality, a pressing issue in both developed and developing economies, is influenced by a variety of factors. This literature review consolidates insights from seminal works, global- and emerging-market studies, and specific studies focused on Africa, particularly South Africa, to comprehensively understand how each factor affects income inequality. These factors are not only crucial in the context of income inequality but are also connected to important works in economics that offer both theoretical foundations and empirical evidence for understanding the complex relationships between them and income inequality.

2.1. Seminal Works

Although exactly what causes income inequality cannot be determined due to the variety of factors that play a role, in this study some of the crucial factors are identified. Financial development, economic growth, external trade, and government initiatives can help mitigate income inequality, whereas inflation worsens it (Kapingura 2017).

A fundamental component of Keynesian economics, government expenditure on social welfare programs plays a crucial role in managing economic fluctuations and lessening income inequality (Vo et al. 2019). Such policies can stabilize aggregate demand, achieve full employment, and mitigate income inequality (Vo et al. 2019). In his influential work

during the Great Depression, John Maynard Keynes established the framework for Keynesian economics, highlighting the significance of aggregate demand in propelling economic activity (Jahan et al. 2014). Keynes proposed government intervention through expansionary fiscal policies to address economic fluctuations, attain full employment, stabilize prices, and diminish income inequality (Jahan et al. 2014; Alamanda 2020).

Fishburn and Willig (1984) extended Dalton's principle of transfer for income redistribution, demonstrating that socially desirable transfers, coupled with inverse transfers at higher income levels, yield positive social benefits. They linked these transfer principles to measures of income inequality and social welfare. Lerman and Yitzhaki (1995) developed a method to decompose changes in the Gini coefficient into components that narrow the income gap and reorganize income rankings. When this approach was used to analyze U.S. taxes and transfers for 1991, it was demonstrated that fiscal policies have the potential to lessen inequality by reducing income gaps and reordering income rankings.

Apart from government intervention in the form of redistribution of income, savings can also play a role in income inequality. The relationship between savings and income inequality is complex. While savings can contribute to wealth inequality, they can also serve as a safety net and reduce poverty (Vo et al. 2019). Shen and Zhao (2022) found that the impact of savings on income inequality varies across different subgroups and economies. Serven and Schmidt-Hebbel (1999) found no evidence that income inequality affects aggregate saving across countries, whereas a study by Schmidt-Hebbel and Serven (2000) highlighted the theoretical ambiguity in the relationship between income inequality and aggregate savings, with empirical results showing no systematic effect. The relative income hypothesis (RIH) according to Duesenberry (1949) and the permanent income hypothesis (PIH) proposed by Friedman (1957) are two important theories for understanding consumption patterns, indicating that consumption patterns are influenced by relative income and expected lifetime income, respectively. In modern societies, social status and relative income have a major impact on consumption patterns. A study by Bisset and Tenaw (2020) showed that low-income individuals adjusted their consumption to keep pace with others, showing strong "proof effects" and "ratchet effects". A study by Palley (2010) found that wealthy households save more permanent income than poor households, suggesting that relative income influences consumption patterns. Stable, long-term income policies can reduce income inequality by stabilizing consumption patterns (Yun et al. 2023).

Another component that is identified by the literature as playing a role in income inequality is population growth. High population growth is generally associated with a less equal income distribution (Ram 1984; Oyekale et al. 2004; Kaasa 2005). Reducing population growth tends to increase the income share of the poorest segments of the population (Rodgers 1983; Oyekale et al. 2004). Lower population growth and limited migration may contribute to increased national and global economic inequality (Peterson 2017).

Although economic growth may seem important for the reduction of income inequality, the relationship between income inequality and economic growth is more complex. Simon Kuznets (1955) proposed the Kuznets curve, which shows an inverted U-shaped relationship between economic development and income inequality. This suggests that inequality is a temporary phase in the development process. Arthur Lewis's (1954) dual-sector model explains economic development through labor transfer from a traditional to a modern sector, initially increasing inequality but eventually decreasing it as more workers transition to higher-paying industrial jobs (Sumner 2018). Lewis stressed the importance of government intervention to facilitate this transition and ensure fair income distribution (Sumner 2018). Piketty (2014) argues that returns on capital exceed the rate of economic growth and capital returns are higher than wages. He suggests that income inequality increases because wages grow more slowly than returns on capital. Piketty's work emphasizes the need for progressive taxation and policies to promote equal access to education and opportunities in order to address income inequality (Sawyer 2015). Mo (2000) developed a theoretical framework revealing that income inequality negatively influences GDP growth, particularly through the transfer channel. Empirical studies in-

dicate that while economic growth can reduce poverty, income inequality can intensify poverty and exacerbate the impact of growth on poverty (Amponsah et al. 2023). Economic growth exhibits poverty-reduction properties, but income inequality intensifies poverty and aggravates the impact of growth on poverty (Adeleye et al. 2020). The impact of GDP growth on poverty reduction diminishes with higher initial inequality, with a smaller poverty-reduction response in sub-Saharan Africa (Fosu 2009).

Evidence from empirical studies to determine how these theories apply and how these factors of income inequality play a role will be discussed further.

2.2. Africa/South African Studies

Leibbrandt et al. (2012) discovered that social transfers, particularly child support grants and old-age pensions, played a crucial role in decreasing poverty and income inequality in South Africa. Woolard et al. (2015) demonstrated that progressive taxes and pro-poor social spending significantly reduce income inequality in South Africa. The findings indicate a negative relationship between progressive taxes and pro-poor social spending. Additionally, Schiel et al. (2014) found that while social grants have helped alleviate poverty, they have not significantly reduced income inequality in South Africa. Household composition decomposition techniques revealed that changes have significantly reduced the direct impact on inequality through changes in household composition. Consequently, the relationship between government expenditures and income inequality is deemed insignificant. Despite the vital role played by social grants in reducing South Africa's persistently high levels of inequality, greater efforts are needed to further reduce income inequality as it remains relatively high.

The impact of savings on economic growth in South Africa is negative in the long run but positive in the short run (Van Wyk and Kapingura 2021). The development of the financial sector, especially when inclusive, can reduce income inequality, making financial inclusion crucial for benefiting disadvantaged groups (Kapingura 2017). According to Yun et al. (2023), the government may consider introducing a policy that allows tax deductions for retirement savings. Additionally, the government can design welfare and social security programs to provide individuals with a steady income over the long term rather than short-term cash payments. High population growth in low-income countries, including many in Africa, may slow economic development and exacerbate income inequality (Peterson 2017). Limited migration and lower population growth could increase economic inequality both nationally and globally. Studies by Nwosa (2019) and Ullah et al. (2021) support the positive relationship between population size and income inequality.

The relationship between economic growth and income inequality in African countries, including South Africa, has been the subject of various studies on the Kuznets curve. The Kuznets hypothesis, which suggests an inverted U-shape relationship between economic growth and income inequality, has been challenged in several empirical studies. These studies rejected the hypothesis because the data used were cross-sectional, meaning that the countries analyzed were at different stages of development. For example, Wahiba and Weriemmi (2014), Niyimbanira (2017), Nwosa (2019), Mdingi and Ho (2021), and Chude and Chude (2022) re-evaluated the relationship between income inequality and economic growth and found that variations in income distribution are more related to country-specific characteristics than data comparability issues. In South Africa, high income inequality has been shown to have a negative impact on long-term economic growth (Mdingi and Ho 2021). Niyimbanira (2017) found that in the Mpumalanga province of South Africa, economic growth was associated with poverty reduction but did not significantly affect income inequality, contrary to theoretical expectations. Chude and Chude (2022) and Nwosa (2019) found no significant effect of income inequality on economic growth in Nigeria. Wahiba and Weriemmi (2014) found that economic growth had a positive impact on income inequality in Tunisia. Zungu et al. (2021) discovered that lower growth is associated with lower income inequality in the SADC region. Despite efforts to address income inequality through economic growth and redistributive policies, South Africa

remains one of the most unequal countries globally (Francis and Webster 2019). According to studies by Bhorat et al. (2014), long-term economic growth in South Africa led to a decline in aggregate poverty but also increased inequality between 1995 and 2005. Nambie et al. (2023) found that financial inclusion and investment have a positive impact on economic growth, while income inequality and unemployment have a negative effect. Niyimbanira (2017) suggested that although economic growth can reduce poverty, it does not necessarily lead to a more equal distribution of income.

3. Data and Methodology

This study pursued exploring how different independent variables affect income inequality, using a meticulous methodology that included econometric analyses to gauge and analyze the impacts of crucial variables like government spending on social grants, gross savings, population growth, and economic growth. Importantly, the Gini coefficient index was used as a stand-in for income inequality, given its ability to offer a comprehensive gauge of income or wealth distribution within a population.

3.1. Data Source

This study used annual time series data between 1975 and 2017. The Gini coefficient is the metric used to measure income inequality, while government spending on social grants, gross savings, population growth, and economic growth serve as independent variables. The Gini index, which is the control variable, was obtained from the SWIID dataset by Solt (2020), while the independent variable data were sourced from the World Bank's World Development Indicators (WDI). The SWIID dataset was chosen due to its consistent time-series data and uniform data collection methods. This ensures comparability across countries throughout the specified study period.

3.2. Model Specification and Definition of the Variables

Model Specification:

The decision to use VECM in this context as the preferred model is supported by some previous studies. These include a study by Asari et al. (2011), who used VECM to examine the relationship between economic variables in emerging economies and demonstrated its effectiveness in capturing both short-term dynamics and long-term equilibrium relationships. Similarly, Arshad and Ali (2016) employed VECM in their study to investigate the relationship between the unemployment rate, interest rate, and inflation rate in Pakistan and analyze the models' short-term dynamics.

The variables are defined as follows:

$$Gini_t = \varnothing_0 + \varnothing_1 SG_t + \varnothing_2 GS_t + \varnothing_3 POPG_t + \varnothing_4 RGDPR_t + \varnothing_5 Dummy + \varepsilon_t \tag{1}$$

where:

❖ $Gini_t$ South Africa's Gini index, disposable income. The value assigned to this index is between 0 and 1, representing the dependent variable. A Gini index of zero indicates that there is no income inequality, while an index closer to one implies higher income inequality. Countries with a Gini index close to one are the most unequal in terms of income. This study focuses on the Gini index due to its widespread use, comparability, and availability over time, making it a suitable measure for analyzing and comparing income inequality trends. While the income quintile share ratio is informative, it is less familiar and less available in historical data compared to the Gini index.

❖ SG_t: Social grants include government spending on grants for the elderly, children, and disabled individuals, expressed as a percentage of the national budget. The coefficient is expected to be negative as government grants tend to reduce income inequality. While expressing SG as a percentage of GDP provides a broader economic view, the national budget perspective is particularly relevant in South Africa due to the country's history of social inequality and the crucial role of social grants in reducing

poverty and redistributing income. In addition, while disaggregating social transfers could provide valuable insights into their varying impacts on income inequality in South Africa, data limitations for the study period (1975–2017) prevent such analysis in the current study.

❖ GS_t: Gross savings represent the difference between disposable income and consumption and replace gross domestic savings, a concept used by the World Bank and included in World Development Indicators editions before 2006. Gross savings are calculated as gross national income minus total consumption plus net transfers. The anticipated coefficient for this variable is expected to be negative.

❖ $POPG_t$: Population growth (annual %) represents the total percentage change in population, assuming a constant growth rate between two points in time. The anticipated coefficient for this variable is expected to be negative.

❖ $RGDPR_t$: The annual growth of GDP at market prices, based on constant local currency and expressed in U.S. dollars, is calculated using aggregates based on constant 2015 prices. GDP encompasses the sum of gross value added by all resident producers, accounting for product taxes and subtracting subsidies not included in product values. This is a proxy for economic growth. The anticipated coefficient for this variable is expected to be negative.

❖ D_{ummy} = 1 from 2008 to the end of the sample and zero otherwise. This assumes it captures the period of the global financial crisis.

❖ ε_t: Represents the error term, encompassing other variables that may influence the relationship between the dependent variable and independent variables but were not explicitly included in the analysis.

3.3. Analytical Technique

The Vector Error Correction Model (VECM) was the chosen estimation technique in this study. As per the insights from Andrei and Andrei (2015), when a set of variables exhibits one or more cointegrating vectors, VECM becomes a suitable approach. The VECM is chosen for its ability to capture both short-term dynamics and long-term equilibrium relationships. This choice aligns with the objective of our study to explore the relationship between income inequality and its determinants in South Africa, which likely involves variables with cointegrating properties, as well as being particularly useful when dealing with cointegrated non-stationary time series data.

In this study, the Vector Error Correction Model (VECM) was deliberately chosen to conduct a comprehensive analysis of the relationship between income inequality and its determinants in South Africa. The primary objective was to account for both short-term fluctuations and long-term equilibrium adjustments, thus increasing the robustness and reliability of their findings. This study aims to contribute towards a deeper understanding of the dynamics of income distribution and provide a basis for evidence-based policy interventions to address the issue of income inequality in South Africa.

3.3.1. Unit Root Testing

This study employed the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests to evaluate the stationarity of the variables. Conducting tests is essential to ensure the stationarity of time series variables before carrying out any econometric analysis to minimize the likelihood of obtaining spurious results. In addition, it aimed to ascertain if the variables fulfill the prerequisites of the VECM model, necessitating that variables are integrated into order one. Ensuring that variables are integrated as order one is crucial for the cointegration property, a fundamental aspect of the VECM. The unit root test equations for these tests are as follows:

$$
\begin{aligned}
Intercept\ and\ trend:\ &\Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + \mu_t \\
Intercept:\ &\Delta Y_t = \alpha + \delta Y_{t-1} + \mu_t \\
None:\ &\Delta Y_t = \delta Y_{t-1} + \mu_t
\end{aligned}
\tag{2}
$$

3.3.2. Testing for Cointegration

This study employed the Johansen cointegration approach (Johansen 1991) to examine the long-term relationship among the variables. Cointegration suggests that while individual variables may not be stationary, certain linear combinations of these variables may exhibit stationarity, indicating a lasting relationship. After confirming that at least one variable was integrated at order one I(1), the cointegration test was conducted using Johansen's (1991) maximum likelihood approach. This implies that variables X_t and Y_t are integrated at order one I(1) and exhibit a linear combination following regression.

To demonstrate cointegration, it is necessary to formulate the following equation:

$$\beth(r, r+1) = TIn(1 - \beth_{r+1}) \tag{3}$$

where:

$\beth(r, r+1)$ = likelihood ratio test statistic;
r = cointegration vectors;
T = sample size;
λ_r = estimated value for the i_{th} ordered eigenvalue from the π matrix.

4. Findings and Discussion

The findings include the descriptive statistics, the long- and short-run estimation and diagnostic tests which is then followed by a discussion of the findings.

4.1. Descriptive Statistics

The descriptive statistics for the variables under consideration are presented in Table 1, offering an organized and summarized perspective of the data for enhanced interpretability (Wooldridge 2019). The mean of the Gini is 2.341628 and the median is 2.010000. The data shows a large spread from the mean, indicated by a standard deviation of 0.827532. The results show that the Gini coefficient has a high positive skewness, and measures of centrality such as the mean and median show a skewness coefficient of 0.593320. In addition to that, the data show an increase in kurtosis to 1.968487, indicating that there is a gap in the distribution of Gini index values. In terms of the gross savings ratio, the data have a high kurtosis of 1.055535, indicating that there are outliers in the data and a reduced skewness due to population increase. The central tendency measures are significantly positively skewed, with a skewness of 4.521406.

Table 1. Summary of descriptive statistics (1975 to 2017).

South Africa	GINI	GS	POPG	RGDP	SG
Mean	2.341628	18.40556	1.894849	44,558.76	1.770333
Median	2.010000	17.00704	1.646040	43,910.25	1.888067
Maximum	3.910000	30.13734	3.497676	60,000.75	2.369546
Minimum	1.350000	13.49738	0.387278	28,061.25	1.111265
Std. Dev.	0.827532	4.521406	0.884247	9802.099	0.370982
Skewness	0.593320	1.055535	0.275616	−0.082303	−0.637557
Kurtosis	1.968487	2.948416	1.697031	1.625771	1.993379
Jarque–Bera	4.429237	7.989539	3.586171	3.432119	4.728569
Probability	0.109195	0.018412	0.166446	0.179773	0.094017
Sum	100.6900	791.4391	81.47851	1,916,027	76.12430
Sum Sq. Dev.	28.76199	858.6107	32.83947	4.04×10^9	5.780374
Observations	43	43	43	43	43

Our study employed the Gini coefficient from the SWIID database to assess inequality in pre-tax, pre-transfer (market) income. The Gini coefficient typically ranges from 0 to 1. However, our analysis converted it into an unbounded measure using the following formula: Gini/(100 − Gini). Following the approach outlined in Ahmad (2017), we then converted the unbounded measure to natural log values. Consequently, these log-transformed values of median, mean, and mode exceed 1.

4.2. Unit Root Tests: ADF Unit Root Test and Lag–Length Selection Criteria

The ADF unit root tests in Table 2 indicate that the variables are not stationary at level I(0), as evidenced by negligible *p*-values (*p*-value > 0.1, 0.05, and 0.01). However, at I(1), significant *p*-values (*p*-value < 0.01 for LSG and *p*-value < 0.1 for all other variables) suggest that all variables are stationary at first difference without trend. The Johansen cointegration test is employed to explore the long-term relationship between variables given their stationary nature at I(1).

Table 2. Unit root of all variables.

Variable	Levels (ADF Test) (*p*-Value in Brackets)	First Difference (ADF Test) (*p*-Value in Brackets)	Result
LGINI	−2.942736 (0.1610)	−4.958705 *** (0.0013)	I(1)
LSG	−1.786786 (0.6933)	−3.336181 * (0.0775)	I(1)
LGS	−1.821231 (0.6765)	−6.554354 *** (0.0000)	I(1)
LPOPG	−1.369638 (0.1557)	−2.261930 ** (0.0247)	I(1)
LRGDP	−1.951057 (0.6098)	−4.674045 *** (0.0000)	I(1)

Note: (*): The rejection of the null hypothesis of unit root at the 10% significance level. (**): The rejection of the null hypothesis of unit root at the 5% significance level. (***): The rejection of the null hypothesis of unit root at the 1% significance level.

The above test (Table 2) aims to identify at least one cointegrating equation, with optimal lags selected for the subsequent Johansen cointegration test. This suggests that, through first differencing, all variables exhibit stationarity, as indicated by ADF values surpassing their critical values at a 5% significance level. This outcome provides a pathway for conducting a cointegration analysis.

4.3. Johansen Cointegration Test

To assess if the variables in this study have a long-term relationship, there was a need to conduct a Johansen cointegration test since these variables are stable at I(1) level. A failure of the test to identify cointegration would suggest the absence of a long-term association among the variables.

Table 3 presents the Johansen cointegration findings. The *p*-values of the Trace and Max-Eigen test statistics are significant at the 5% significance level, and both test statistics are greater than their respective critical values. As a result, it can be concluded that there is only one cointegrating equation. The conclusion follows that there is a long-term link between the variables and income inequality in South Africa. Therefore, the null hypothesis is rejected.

In Table 4, we used the Phillips–Perron (PP) test to determine if the five different variables, LGINI, LGS, LSG, LPOPG, and LRGDP, were stationary or not. The test results showed that all five variables were non-stationary in their original form but became stationary after the first differencing. This is denoted as I(1), indicating that each variable is integrated as order one.

Table 3. Johansen cointegration results.

Hypothesized No. of ce(s)	Trace Test			Maximum Eigen Test		
	Trace Statistic	t-Critical Values	*p*-Value	Max-Eigen Statistic	t-Critical Values	*p*-Value
None *	133.4235	69.81889	0.0000 *	58.99659	33.87687	0.0000
At most 1 *	74.42690	47.85613	0.0000 *	47.97227	27.58434	0.0000
At most 2	26.45463	29.79707	0.1157	18.51302	21.13162	0.1118

Note: * denotes the rejection of the null hypothesis at the 0.05 level.

Table 4. Phillips–Perron (PP) test results.

Variable	Levels (PP Test) (*p*-Value in Brackets)	First Difference (PP Test) (*p*-Value in Brackets)	Result
LGINI	−1.712052 (0.7282)	−5.085249 *** (0.0009)	I(1)
LGS	−1.831453 (0.6715)	−6.583596 *** (0.0000)	I(1)
LSG	−1.785250 (0.6941)	−8.358888 *** (0.0000)	I(1)
LPOPG	−1.269205 (0.8819)	−6.034506 *** (0.0001)	I(1)
LRGDP	−1.567222 (0.7890)	−4.479040 *** (0.0048)	I(1)

(***): Shows significance at the 1% significance level.

4.4. Long-Run and Short-Run Estimation Results of the VECM Model (1975 to 2017)

The subsequent step involved employing the Vector Error Correction Model (VECM) to analyze both short-term and long-term relationships given the established existence of long-term relationships between the variables. VECM accommodates short-term adjustments while constraining the long-term behavior of endogenous variables to converge to their cointegrating relationships. As a suitable model for measuring corrections from past disequilibrium, VECM is deemed necessary. The presence of a stable long-term association is indicated by a negative and significant coefficient in the VECM, suggesting that any short-term fluctuations between variables result in a steady long-term relationship.

Table 5 illustrates the long-term relationship between the study variables. The cointegrating Equation (1) demonstrates the long-term relationships between income inequality (LGINI) and the explanatory variables (LSG, LGS, LPOPG, and LRGDP). Negative coefficients signify a positive long-term association between the dependent variable and its explanatory factors, while positive coefficients indicate a negative long-term relationship. The cointegration Equation (1) reveals a negative long-term link between the Gini coefficient and government spending on social grants, gross savings, population growth, and annual GDP growth.

The significant error correction term, which ranges from zero to negative values, signifies a stable long-term equilibrium. In this study, the error correction term of −0.005705 suggests a stable cointegration relationship, indicating a 0.57% adjustment rate. This adjustment rate reflects the speed at which shocks to independent variables return the Gini coefficient to its equilibrium, reducing the income inequality gap by 0.57% in the short term. The R-squared of 0.542628 measures the explanatory power of the model; that is, 54% of the variation in the dependent variable is explained by independent variables. From the long-run equation of the VECM, the dummy(−1) variable captures the global financial crisis negatively and significantly leads to income inequality in South Africa.

Table 5. VECM results.

Cointegrating Equation	Cointegration Equation (1)					
LGINI(−1)	1.000000					
LGS(−1)	−2.725854					
	(0.60893)					
	[−4.47649]					
LPOPG(−1)	−2.938554					
	(0.31013)					
	[−9.47518]					
LRGDP(−1)	−6.987395					
	(1.40785)					
	[−4.96318]					
LSG(−1)	0.218470					
	(0.37415)					
	[0.58391]					
DUMMY(−1)	1.051549					
	(0.10666)					
	[9.85877]					
C	82.98360					
Error Correction:	**D(LGINI)**	**D(LGS)**	**D(LPOPG)**	**D(LRGDP)**	**D(LSG)**	**D(DUMMY)**
Cointegration Equation (1)	−0.005705	0.095592	0.368434	0.012212	−0.030995	0.072930
	(0.01862)	(0.05053)	(0.05560)	(0.00884)	(0.06916)	(0.13498)
	[−0.30642]	[1.89174]	[6.62693]	[1.38085]	[−0.44817]	[0.54029]

4.5. Discussion of the Results

The results indicate a significant negative impact of government spending on social grants on income inequality, with statistical significance at the 1% level. This suggests that an increase in such spending is expected to reduce income inequality in the long term, reflecting a negative relationship between the two variables. These findings align with existing studies and theoretical frameworks, such as the Keynesian theory, which underscores the state's role in mitigating income inequality through government expenditures and taxes. Similarly, the permanent income hypothesis and the relative income hypothesis propose that social security programs' government expenditure can help alleviate income inequality. However, the Kuznets hypothesis contradicts the Keynesian theory by suggesting that inequality initially rises in economic development's early phases but falls in later stages, a trend not supported by this study's results. South Africa is considered an upper-middle-income country that has a diverse economy and a significant population of over 62 million, according to the Census 2022 (Stats SA 2023). Although the country has advanced from its early developmental stages, it does not follow the Kuznets theory. According to the theory, income inequality usually rises during the early stages of economic development and then declines. However, this is not the case in South Africa, where income inequality continues to increase despite the country's economic growth. The outcomes of this study are consistent with prior empirical studies by Sanchez and Perez-Corral (2018), Anderson et al. (2017), Woolard et al. (2015), and Leibbrandt et al. (2012). Thus, the statistical analysis in this study rejects the null hypothesis of no relationship between government spending on social grants and income inequality. This study provides solid evidence for the efficacy of such policies, which could shape budgetary priorities and social welfare strategies.

Gross savings has a significant positive relationship with income inequality, with a 1% significance level. This means that when households save more, it leads to an increase in income inequality. Darku (2014) found that increased income inequality results in increased consumption by individuals in all income groups, leading to declining personal savings rates. According to Palley (2010), wealthy households save a higher percentage of their permanent income than poor households, leading to disproportionate wealth accumulation and investment returns and exacerbating income inequality. Similarly, empirical studies by Maaboudi et al. (2023) and Tran et al. (2020) found a positive relationship between gross savings and income inequality. However, studies by Van Wyk and Kapingura (2021), Yildirim (2020), and Deniz and Ozturkler (2010) found a negative relationship, while Halim et al. (2016) found no significant association between gross savings and income inequality. The theoretical studies that support these findings are Yun et al. (2023), Friedman (1957), and Duesenberry (1949). When applying the Relative Income Hypothesis (Duesenberry 1949) to this study, it is found that individuals with lower incomes might save less to keep up with the consumption patterns of wealthier individuals, leading to lower wealth accumulation and higher income inequality over time. On the other hand, the Permanent Income Hypothesis (Friedman 1957) suggests that wealthier households save more, leading to faster wealth accumulation than that of poorer households, resulting in increasing income inequality. Yun et al. (2023) suggest that policy intervention aimed at stabilizing income can reduce income inequality by stabilizing consumption patterns.

The findings indicated that the population growth coefficient at 1% was statistically significant. As a result, population growth had a negative impact on income inequality over time. This suggests that as the population increases, income inequality is likely to also increase. The potential positive impact of population growth could be attributed to the fact that if state resources do not increase in line with the population, the allocation for social programs, healthcare, and education may result in fewer resources per person. This could strain society and ultimately lead to a rise in income inequality. Therefore, these results are consistent with other studies by Ullah et al. (2021), Nwosa (2019), Peterson (2017), and Anyanwu (2016), which found that population growth in the long-term leads to increases in income inequality. In an ideal scenario, an increasing population can lead to more entrepreneurial activity, job creation, and overall economic growth. However, in South Africa, several factors complicate these relationships. Issues such as structural inequality, limited access to education and resources, regulatory barriers, and economic instability can hinder entrepreneurial efforts and business growth. Historical differences in South Africa, including the impact of apartheid, have resulted in persistent economic inequality that disproportionately affects marginalized communities. High unemployment rates, skill shortages, and inadequate infrastructure further impede the development of entrepreneurs and economic expansion. Addressing these fundamental problems is crucial to creating a conducive environment for entrepreneurship and business growth while harnessing the potential benefits of a larger population. While social subsidies are essential in addressing immediate challenges of poverty and income inequality, long-term sustainable solutions must focus on encouraging inclusive economic growth and empowering individuals and communities to participate meaningfully in the economy. To achieve this, a comprehensive approach is needed to address both the supply-side constraints facing businesses and the broader socio-economic factors that contribute to inequality and exclusion. Prioritizing policies that support entrepreneurs and economic empowerment can help South Africa create a more equitable and prosperous society for all citizens. Policymakers may need to re-evaluate population-related policies like immigration, family planning, and resource allocation strategies. Addressing the potential negative impact of population growth on income distribution necessitates a holistic approach that accounts for demographic trends and social policy frameworks.

This study's findings show that annual GDP growth rates have a positive impact on income inequality in the long term. The commonly held view that economic growth automatically leads to improved income distribution is not always true in most developing

countries, including South Africa. This indicates that the relationship between economic growth and income inequality is more complex and can vary depending on various factors, such as policy interventions and labor market dynamics. This is consistent with a study by Wahiba and Weriemmi (2014) that also found a positive relationship. Empirical studies by Mdingi and Ho (2021), Nambie et al. (2023), Jianu et al. (2021), Vo et al. (2019), Royuela et al. (2019), and Caraballo et al. (2017) found a negative relationship between economic growth and income inequality. Chude and Chude (2022), Nwosa (2019), and Niyimbanira (2017) found no significant effect of income inequality on economic growth contrary to theoretical expectations.

The dummy variable representing economic crises shows a negative relationship with income inequality. This means that in the long-run equation of the VECM, the dummy variable has a negative and significant impact on income inequality in South Africa, particularly capturing the global financial crisis. This study's significant error correction term of -0.063277, which falls between zero and negative, indicates a stable long-run equilibrium. The negative error correction term also suggests a stable and statistically significant cointegration relationship. Policymakers may need to reconsider the connection between economic growth and income distribution, focusing on inclusive growth strategies that prioritize equitable wealth distribution. This finding underscores the importance of targeted interventions to ensure that economic prosperity benefits all members of society.

4.6. Robustness Check

Performing diagnostic tests is an essential part of this study since it indicates whether or not there is an issue with the model's estimation. If an issue is found, it indicates that the model is inefficient, which may also imply that the findings are skewed (Wooldridge 2001). Tests for normality, heteroscedasticity, and serial correlation were among the diagnostic procedures carried out to determine whether the model utilized in this investigation reasonably fits the data. The results of the diagnostic tests conducted for this study indicate that the model is quite well described. Table 6 shows that the residuals have a combined probability for the Jarque–Bera of 0.1107 and are normally distributed. The likelihood of 0.5015 for LM-Stat indicates that the residuals are not serially correlated. Furthermore, no heteroskedasticity has been discovered, as shown by a joint Chi-square probability of 0.5603.

Table 6. Diagnostic tests.

Test	Null Hypothesis	t-Statistics	Probability
Jarque–Bera (JB)	There is a normal distribution	4.401542	0.1107
Langrage Multiplier (LM)	No serial correlation	45.54572	0.5015
White (CH-sq)	No conditional heteroskedasticity	33.09478	0.5603

5. Conclusion and Recommendations

This study concludes by summarizing findings, providing recommendations, and outlining limitations in Sections 5.1–5.3.

5.1. Conclusions

South Africa has been struggling with the issue of income inequality for a long time, even before the onset of democracy. According to the widely accepted measure of global inequality, the Gini index, South Africa has the highest income inequality in the world. Despite implementing policies and frameworks, South Africa has seen a rise in income inequality, which has a profound impact on society. The purpose of this study was to analyze the relationship between specific economic indicators in South Africa using the Vector Error Correction Model (VECM) on income inequality. This is fundamental because

assessing the factors contributing to income inequality assists in finding appropriate measures to mitigate it. By evaluating government spending on social grants, gross savings, population growth, economic growth, and the dummy variable to capture economic crises, this study sheds light on their impact on income inequality from 1975 to 2017 in the South African context.

This study revealed that government spending on social grants has a negative impact on income inequality. This means that as government spending on social grants increases, income inequality is expected to decrease in the long term. Additionally, this study found that gross savings have a positive impact on income inequality, with a significance of 1%. This suggests that wealthier households tend to save a higher percentage of their permanent income compared to poorer households, leading to disproportionate wealth accumulation and exacerbating income inequality. Furthermore, this study's results indicated that economic growth has a positive impact on income inequality in the long run. However, it is worth noting that economic growth does not always lead to improved income distribution in developing countries like South Africa, as the relationship is influenced by factors such as policy interventions and labor market dynamics. Moreover, population growth is statistically significant at 1% and positively impacts income inequality in the long term. This implies that an increase in population over time can lead to a surge in income inequality. However, it is important to recognize that population growth can also stimulate entrepreneurship, create job opportunities, and contribute to overall economic development. In the long run, the dummy variable representing economic crises demonstrates a negative and significant relationship with income inequality in South Africa. This suggests that it has a notable impact on income inequality, particularly in the context of capturing the global financial crisis.

The results of this study add to the existing literature on the relationship between government spending, gross savings, population growth, economic growth, and income inequality. The findings highlight the importance of government spending on social grants and the negative impact of gross savings on income inequality. These findings can inform policy decisions to reduce income inequality in South Africa. To tackle the pressing problem of income inequality, policymakers are advised to adopt a versatile approach that includes policies aimed at economic growth and equitable income distribution. Such measures may include boosting government spending on social welfare programs and revamping social security policies, both of which have shown to be effective in addressing income inequality. In a South African context, a prime example was the successful implementation of the social relief of distress grant during the COVID-19 pandemic. Although increasing spending on social welfare programs can help to reduce poverty and income inequality in the short term, there are some potential disadvantages to consider. For instance, relying too heavily on social grants without implementing measures to promote economic growth and employment could lead to dependency instead of encouraging self-reliance. In addition, inefficient administration and corruption can undermine the effectiveness of social welfare programs, resulting in misallocated resources and worsening income inequalities.

This study's findings emphasize the significance of savings and economic growth in addressing income inequality. Encouraging people to save and invest can lead to economic growth and create opportunities for accumulating wealth. Policies that incentivize saving behavior, such as tax breaks and tax-free investment incentives, can effectively promote these endeavors without adversely affecting government income. Furthermore, implementing policies to strengthen economic growth, such as infrastructure development, innovation incentives, and trade facilitation, can stimulate job creation and income generation. Supporting small and medium-sized enterprises (SMEs) and entrepreneurship can also foster inclusive economic growth.

In addition, investing in population programs, including family planning initiatives and reproductive health services, can effectively manage population growth, therefore leading to less government spending on social grants. By empowering individuals to make informed choices about family planning, these programs can positively impact income

inequality by encouraging smaller family sizes. This, in turn, reduces pressure on resources and promotes economic development.

5.2. Recommendations

This study's findings highlight the importance of balancing individual saving behaviors with broader socio-economic goals, which can potentially influence financial regulation and social welfare policies.

The following recommendations are made based on the results of this study:

1. This study proposes implementing strategies to curb income inequality, including increasing government spending on social welfare programs and reforming social security policies. These measures have been demonstrated to be effective in mitigating income disparities, as exemplified by the success of the social relief of distress grant implemented during the COVID-19 pandemic in South Africa.
2. Policymakers are encouraged to address the fundamental causes of income inequality, acknowledging the essential role of labor supply and job creation in alleviating income inequality; policies should focus on employment expansion. Initiatives such as skill development programs can enhance the workforce's employability.
3. To balance population growth with inclusive economic development, policymakers are encouraged to develop policies that stimulate job creation and economic opportunities in regions experiencing rapid population growth. This should also foster an environment conducive to entrepreneurship and small business development to absorb the growing workforce and minimize the exacerbation of income inequality over the long term.
4. This study highlights the importance of policies geared towards improving gross savings. Encouraging a culture of saving and implementing incentives for individuals and businesses by the government can contribute to economic stability and resilience in the long term.

5.3. Limitations of This Study and Recommendation for Future Studies

This study had some limitations due to a shortage of relevant data and materials. This study is restricted to a specific time frame because of the availability of data. The study period is from 1975 to 2017, which means that there is a five-year time lag in terms of the data since this study concluded in 2023. The unemployment data were not included in the model due to the methodological constraints of the Vector Error Correction Model (VECM) and data limitations. The unemployment rate data are considered to be integrated as order zero (I(0)), indicating that it is already stationary. On the other hand, for the Vector Error Correction Model (VECM) to establish cointegrating relationships, all variables need to be integrated as order one (I(1)). If an I(0) variable is included in a VECM, it can result in model misspecification and unreliable results. The near singular matrix error occurred when the lagged Gini coefficient was introduced, indicating perfect collinearity. This means that the lagged Gini coefficient was highly correlated with the current Gini coefficient, making it redundant in the model. Including perfectly collinear variables violates the assumptions of the VECM and can lead to unstable estimates. Furthermore, despite several efforts that were made to collect relevant data from different sources, this study is constrained due to the limited amount of data on income inequality in South Africa. It is recommended that:

- Future research studies should investigate whether the results of this study would vary if the income inequality data were available over a more extended period.
- Also, future research could incorporate different categories of social transfers as separate variables, enabling a more nuanced examination of their effects on income inequality.

Author Contributions: Conceptualization, M.S. and K.O.; methodology, M.S.; validation, M.E., K.O. and M.S.; formal analysis, M.S.; investigation, M.S. and M.E.; data curation, M.E.; writing—original draft preparation, M.S. and K.O.; writing—review and editing, M.S., K.O. and M.E.; visualization, M.E.; supervision, K.O. All authors have read and agreed to the published version of the manuscript.

Informed Consent Statement: Not applicable.

Data Availability Statement: Available on request.

Conflicts of Interest: The authors declare no conflict of interest.

References

Adeleye, Bosede Ngozi, Obindah Gershon, Adeyemi Ogundipe, Oluwarotimi Owolabi, Ifeoluwa Ogunrinola, and Oluwasogo Adediran. 2020. Comparative investigation of the growth-poverty-inequality trilemma in Sub-Saharan Africa and Latin American and Caribbean Countries. *Heliyon* 6: e05631. [CrossRef]

Ahmad, Mahyudin. 2017. Economic freedom and income inequality: Does political regime matter? *Economies* 5: 18. [CrossRef]

Alamanda, Alamanda. 2020. The effect of government expenditure on income inequality and poverty in Indonesia. *Journal Info Artha* 4: 1–11. [CrossRef]

Amponsah, Mary, Frank W. Agbola, and Amir Mahmood. 2023. The relationship between poverty, income inequality and inclusive growth in Sub-Saharan Africa. *Economic Modelling* 126: 106415. [CrossRef]

Anderson, Edward, Maria Ana Jalles D'Orey, Maren Duvendack, and Lucio Esposito. 2017. Does government spending affect income inequality? A meta-regression analysis. *Journal of Economic Surveys* 31: 961–87. [CrossRef]

Andrei, Dalina Maria, and Liviu C. Andrei. 2015. Vector error correction model in explaining the association of some macroeconomic variables in Romania. *Procedia Economics and Finance* 22: 568–76. [CrossRef]

Anyanwu, John C. 2016. Empirical Analysis of the Main Drivers of Income Inequality in Southern Africa. *Annals of Economics & Finance* 17: 337–64.

Arshad, Sumera, and Amajd Ali. 2016. Trade-off between Inflation, Interest and Unemployment Rate of Pakistan: Revisited. *Bulletin of Business and Economics (BBE)* 5: 193–209.

Asari, F. F. A. H., Nurul Syuhada Baharuddin, Nurmadihah Jusoh, Zuraida Mohamad, Norazidah Shamsudin, and Kamaruzaman Jusoff. 2011. A vector error correction model (VECM) approach in explaining the relationship between interest rate and inflation towards exchange rate volatility in Malaysia. *World Applied Sciences Journal* 12: 49–56.

Bhorat, Haroon, David Tseng, and Benjamin Stanwix. 2014. Pro-poor growth and social protection in South Africa: Exploring the interactions. *Development Southern Africa* 31: 219–40. [CrossRef]

Bisset, Tazeb, and Dagmawe Tenaw. 2020. Keeping up with the Joneses: The relevance of Duesenberry's relative income hypothesis in Ethiopia. *Research Square*. [CrossRef]

Caraballo, Mª Ángeles, Carlos Dabús, and Fernando Delbianco. 2017. Income inequality and economic growth revisited. A note. *Journal of International Development* 29: 1025–29. [CrossRef]

Chude, Nkiru Patricia, and Daniel Izuchukwu Chude. 2022. Effect of Income Inequality on the Economic Growth of Nigeria. *International Journal of Scientific and Management Research* 1: 22–35. [CrossRef]

Darku, Alexander. 2014. Income inequality, status seeking, and savings rates in Canada. *Canadian Studies in Population* 41: 88–104. [CrossRef]

Deniz, Pinar, and Harun Ozturkler. 2010. Effect of Income Inequality on Aggregate Saving: A Panel Analysis. Paper presented at Turgut Özal International Conference on Economics and Politics–I: Global Crises and Economic Governance, Malatya, Turkey, May 15–16; Available online: https://studys.ssrn.com/sol3/studys.cfm?abstract_id=3299364 (accessed on 10 February 2022).

Duesenberry, James Stemble. 1949. *Income, Savings, and the Theory of Consumer Behavior*. Cambridge: Harvard University Press.

Fishburn, Peter C., and Robert D. Willig. 1984. Transfer principles in income redistribution. *Journal of Public Economics* 25: 323–28. [CrossRef]

Fosu, Augustin Kwasi. 2009. Inequality and the impact of growth on poverty: Comparative evidence for Sub-Saharan Africa. *Social Science Research Network*. [CrossRef]

Francis, David, and Edward Webster. 2019. Inequality in South Africa. *Development Southern Africa* 36: 733–34. [CrossRef]

Friedman, Milton. 1957. The permanent income hypothesis. In *A Theory of the Consumption Function*. Princeton: Princeton University Press.

Halim, Mohammed Abdul, Sadia Sultana, Asma Akter, and Ataur Rahaman. 2016. Savings and Income Inequality in Bangladesh (Working Study Series: WP No 1617). Available online: https://www.bb.org.bd/pub/research/workingstudy/wp1617.pdf (accessed on 15 March 2020).

International Monetary Fund. 2020. Six Charts Explain South Africa's Inequality. Available online: https://www.imf.org/en/News/Articles/2020/01/29/na012820six-charts-on-south-africas-persistent-and-multi-faceted-inequality (accessed on 27 March 2024).

Jahan, Sarwat, Ahmed Saber Mahmud, and Chris Papageorgiou. 2014. Back to Basics: What Is Keynesian Economics?—The central tenet of this school of thought is that government intervention can stabilize the economy. *Finance & Development* 51: 53–54.

Jianu, Ionuț, Marin Dinu, Dragoș Huru, and Alexandru Bodislav. 2021. Examining the Relationship between Income Inequality and Growth from the Perspective of EU Member States' Stage of Development. *Sustainability* 13: 5204. [CrossRef]

Johansen, Søren. 1991. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica* 59: 1551–80. [CrossRef]

Kaasa, Anneli. 2005. Factors of Income Inequality and their Influence Mechanisms: A Theoretical Overview. *Social Science Research Network*. [CrossRef]

Kapingura, Forget Mingiri. 2017. Financial sector development and income inequality in South Africa. *African Journal of Economic and Management Studies* 8: 420–32. [CrossRef]

Kuznets, Simon. 1955. Economic growth and income inequality. *The American Economic Review* 45: 1–28.

Leibbrandt, Murray, Arden Finn, and Ingrid Woolard. 2012. Describing and decomposing post-apartheid income inequality in South Africa. *Development Southern Africa* 29: 19–34. [CrossRef]

Leibbrandt, Murray, and Timothy Shipp. 2019. Reducing Inequalities in South Africa: Progress on Equality Thwarted by Slow Growth and Success of Top Earners. (UN-WIDER Policy Brief 2019/2). Available online: https://www.wider.unu.edu/publication/reducing-inequalities-south-africa (accessed on 7 July 2022).

Lerman, Robert I., and Shlomo Yitzhaki. 1995. Changing Ranks and The Inequality Impacts of Taxes and Transfers. *National Tax Journal* 48: 45–59. [CrossRef]

Lewis, W. Arthur. 1954. Economic Development with Unlimited Supply of Labor. *The Manchester School of Economic and Social Studies* 22: 139–91. [CrossRef]

Maaboudi, Reza, Mohammad Hassan Fotros, and Zeynab Dare Nazari. 2023. The Effect of Income Inequality on the National Savings in Iran. *Stable Economy Journal* 4: 69–91.

Mdingi, Kholeka, and Sin-Yu Ho. 2021. Literature review on income inequality and economic growth. *MethodsX* 8: 1–12. [CrossRef] [PubMed]

Mo, Pak Hung. 2000. Income inequality and economic growth. *Kyklos* 53: 293–315. [CrossRef]

Nambie, Nicholas Bamegne, Philomena Dadzie, and Dorcas Oye Haywood-Dadzie. 2023. Measuring the Effect of Income Inequality, Financial Inclusion, Investment, and Unemployment, on Economic Growth in Africa: A Moderating Role of Digital Financial Technology. *International Journal of Economics and Financial Issues* 13: 111–24. [CrossRef]

Niyimbanira, Ferdinand. 2017. Analysis of the impact of economic growth on income inequality and poverty in South Africa: The case of Mpumalanga Province. *International Journal of Economics and Financial Issues* 7: 254–61.

Nwosa, Philip Ifeakachukwu. 2019. Income inequality and economic growth in Nigeria: Implication for Economic Development. *Acta Universitatis Danubius Oconomica* 15: 108–16.

Oyekale, A. S., A. I. Adeoti, and T. O. Ogunnupe. 2004. Sources of income inequality and poverty in rural and urban Nigeria. Paper presented at 3rd Annual Workshop of Poverty and Economic Policy (PEP) Network, Dakar, Senegal, June 11–20.

Palley, Thomas I. 2010. The Relative Permanent Income Theory of Consumption: A Synthetic Keynes–Duesenberry–Friedman Model. *Review of Political Economy* 22: 41–56. [CrossRef]

Peterson, E. Wesley F. 2017. The role of population in economic growth. *SAGE Open* 7: 215824401773609. [CrossRef]

Piketty, Thomas. 2014. *Capital in the Twenty-First Century*. Cambridge: Harvard University Press.

Ram, Rati. 1984. Population increase, economic growth, educational inequality, and income distribution. *Journal of Development Economics* 14: 419–28. [CrossRef]

Rodgers, Gerry. 1983. Population growth, inequality and poverty. *International Labour Review* 122: 443–60.

Royuela, Vicente, Paolo Veneri, and Raul Ramos. 2019. The short-run relationship between inequality and growth: Evidence from OECD regions during the Great Recession. *Regional Studies* 53: 574–86. [CrossRef]

Sanchez, A. Angeles, and Antonio L. Perez-Corral. 2018. Government social expenditure and income inequalities in the European Union. *Hacienda Pública Española* 227: 133–56. [CrossRef]

Sawyer, Malcolm. 2015. Confronting inequality: Review article on Thomas Piketty on Capital in the 2st Century. *International Review of Applied Economics* 29: 878–889. [CrossRef]

Schiel, Reinhard, Murray Leibbrandt, and David Lam. 2014. Assessing the Impact of Social Grants on Inequality: A South African Case Study. (UN-WIDER Working Study 2014/160). Available online: https://www.wider.unu.edu/publication/assessing-impact-social-grants-inequality (accessed on 24 June 2019).

Schmidt-Hebbel, Klaus, and Luis Serven. 2000. Does income inequality raise aggregate saving? *Journal of Development Economics* 61: 417–46. [CrossRef]

Serven, Luis, and Klaus Schmidt-Hebbel. 1999. *Income Inequality and Aggregate Saving: The Cross-Country Evidence*. World Bank Policy Research Working Paper. Washington, DC: World Bank. [CrossRef]

Shen, Chengfang, and Xindong Zhao. 2022. How does income inequality affects economic growth at different income levels? *Ekonomska Istraživanja/Ekonomska IstražIvanja* 36: 864–84. [CrossRef]

Solt, Frederick. 2020. Measuring income inequality across countries and over time: The Standardized World Income Inequality Database. *Social Science Quarterly* 101: 1183–99. [CrossRef]

Stats SA (Statistics South Africa). 2023. Census 2022 (Statistical Release P0301.4). Available online: https://census.statssa.gov.za/assets/documents/2022/P03014_Census_2022_Statistical_Release.pdf (accessed on 28 March 2024).

Sumner, Andy. 2018. Trickle along Not Trickle Down? Inequality and the Lewis Model of Economic Development. (ESRC GPID Research Network Briefing Paper 13). Available online: https://gpid.univie.ac.at/wp-content/uploads/2018/04/Brief_13.pdf (accessed on 22 May 2024).

Tran, Nhan Dang, Chuong Nguyen Ong, and Quy Dinh Le Nguyen. 2020. The relationship between income inequality and savings: Evidence from household-level panel data in Vietnam. *Journal of Applied Economics* 23: 709–28. [CrossRef]

Ullah, Atta, Zhao Kui, Saif Ullah, Chen Pinglu, and Saba Khan. 2021. Sustainable utilization of financial and institutional resources in reducing income inequality and poverty. *Sustainability* 13: 1038. [CrossRef]

Van Wyk, Bianca Flavia, and Forget Mingiri Kapingura. 2021. Understanding the nexus between savings and economic growth: A South African context. *Development Southern Africa* 38: 828–44. [CrossRef]

Vo, Duc Hong, Thang Cong Nguyen, Ngoc Phu Tran, and Anh The Vo. 2019. What Factors Affect Income Inequality and Economic Growth in Middle-Income Countries? *Journal of Risk and Financial Management* 12: 40. [CrossRef]

Wahiba, Nasfi Fkili, and Malek El Weriemmi. 2014. The Relationship between Economic Growth and Income Inequality. *International Journal of Economics and Financial Issues* 4: 135–43.

Woolard, Ingrid, Rebecca Metz, Gabriela Inchauste, Nora Lustig, Mashekwa Maboshe, and Catriona Purfield. 2015. How Much Is Inequality Reduced by Progressive Taxation and Government Spending. Available online: http://www.econ3x3.org/study/how-much-inequality-reduced-progressive-taxation-andgovernment-spending (accessed on 27 March 2024).

Wooldridge, Jeffrey M. 2019. Correlated random effects models with unbalanced panels. *Journal of Econometrics* 211: 137–50. [CrossRef]

Wooldridge, Jeffrey M. 2001. Diagnostic testing. In *A Companion to Theoretical Econometrics*. Edited by Badi H. Baltagi. Hoboken: Blackwell Publishing Ltd., pp. 180–200.

Yildirim, Ahmet Eren. 2020. The Relationships between Income Inequality & Savings: A Study on Households in Turkey. *BİLTÜRK Journal of Economics and Related Studies* 2: 370–80.

Yun, Wong Sing, Siti Hajar Samsu, Jain Yassin, Shairil Izwan Taasim, and Faerozh Madli. 2023. Household Consumption Function Based on Permanent Income Hypothesis: A Systematic Review. *International Journal of Academic Research Economics and Management Sciences* 12: 441–52.

Zungu, Lindokuhle Talent, Lorraine Greyling, and Nkanyiso Mbatha. 2021. Economic growth and income inequality: A non-linear econometrics analysis of the SADC region, 1990–2015. *African Journal of Economic and Management Studies* 12: 285–301.