DETERMINANTS OF INCOME INEQUALITY: A CASE OF GOVERNMENT SOCIOECONOMIC SPENDING IN SOUTH AFRICA

by

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DECLARATION

I, **Molepa Isaac Seabela (student number: 220663017**), hereby declare that this dissertation titled "**Determinants of Income Inequality: A Case of Government Socioeconomic Spending in South Africa**" submitted for the degree of Master of Commerce (MCom) in Economics is entirely my original work. I have correctly cited and acknowledged all sources used in this dissertation, and it has not been previously submitted for any other academic qualification at any other institution of higher learning.

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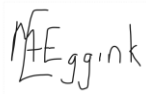
Co-Supervisor:  **Date**: 25 April 2025

Dr Maria Eggink

ABSTRACT

Income inequality in South Africa has remained a significant challenge, despite numerous government interventions, especially since the democratic transition in 1994. Rather than diminishing, it has persisted over time. This study explores the key determinants of income inequality in South Africa, with a particular emphasis on the effects of government socioeconomic spending, notably through social grants. Furthermore, the study analyses the influence of gross savings, population growth rate, and economic growth on the dynamics of income inequality.

Using a Vector Error Correction Model (VECM), the analysis draws on time-series data from 1975 to 2017 to evaluate the effects of government spending on social grants, gross savings, economic growth, and population growth rate on income inequality. The findings reveal that government spending on social grants and gross savings negatively impacts income inequality, while population growth has a positive impact. The findings imply that government spending on social grants and gross savings contributes to reducing income inequality, while the population growth rate exacerbates it. Furthermore, the results reveal a negative long-term relationship between economic growth and income inequality.

The findings offer valuable guidance for policymakers in crafting targeted interventions to mitigate income inequality in South Africa. The study also enriches the existing literature by empirically assessing the impact of government socioeconomic spending and exploring how redistributive policies influence income inequality. The study recommends a comprehensive approach to address income inequality in South Africa, including increased social spending, social security reforms, and promoting a savings culture.

KEYWORDS:
Inequality, income inequality, social grants, government spending, Gini coefficient, VECM, South Africa.

DEDICATION

- In loving memory of my late father, Seema Seabela, whose unwavering support, and wisdom continue to inspire me, even in his absence. To my dear sister, Matapa Seabela, whose memory remains a guiding light, illuminating the path of my academic journey. Your influence, love, and enduring presence shape the pages of this dissertation.

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LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation/Acronym	Full Meaning
ADF	Augmented Dickey-Fuller
ARCH	Auto-Regressive Conditional Heteroskedastic
ARDL	Autoregressive Distributed Lag
BGP-LM	Breusch-Pagan-Godfrey Lagrange Multiplier
EPWP	Expanded Public Works Programme
EU	European Union
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
IMF	International Monetary Fund
KC	Kuznets Curve
LM	Lagrange Multiplier
NDP	National Development Plan
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PP	Phillips-Perron
SADC	Southern African Development Community
SG	Social Grants
SWIID	Standardized World Income Inequality Database
VAR	Vector Autoregressive Model
VECM	Vector Error Correction Model

CHAPTER 1
INTRODUCTION TO THE STUDY

1.1 Introduction and Background

The persistent rise of income inequality in South Africa, even after the transition to democracy in 1994, has become a pressing socioeconomic concern. The Gini coefficient, a widely used measure of income distribution, reveals that South Africa has one of the highest levels of inequality globally, with the gap between the rich and the poor continuing to widen (World Bank, 20). The detrimental effects of income inequality on economic growth, social cohesion, and overall well-being have been well-documented in the literature. The South African government has implemented various policies and tools to address the root causes of income inequality, including social spending programs and initiatives to promote economic growth and employment (Folarin, 2021). However, the effectiveness of these interventions remains a subject of ongoing debate, with conflicting findings in the existing literature regarding the impact of socioeconomic factors on income inequality.

This study aims to contribute to the understanding of income inequality in South Africa by investigating the impact of government socioeconomic spending, particularly on social grants, on income inequality. The study also examines the influence of other key socioeconomic factors, such as gross savings, population growth rate, and economic growth, on income inequality. By employing a quantitative approach and utilizing time-series data from 1975 to 2017, the study aims to provide empirical evidence on the determinants of income inequality and offer policy recommendations to address this pressing issue. Based on the Standardized World Income Inequality Database (SWIID) data, when comparing South Africa's Gini index for 2017 to other African countries within the Southern African Development Community (SADC), it is clear that South Africa holds the second-highest rank, trailing behind Namibia, which recorded a higher Gini index of 63.3 in that year (Solt, 2020). The study draws upon Keynesian economics as its theoretical framework, emphasizing the role of government intervention in mitigating income inequality through fiscal policies and social spending. The study employs the Vector Error Correction Model (VECM) to analyse the long-run and short-run relationships between the variables.

The empirical evidence on the impact of government spending and economic growth on income inequality in South Africa is mixed and inconclusive. Studies on the effect of government spending on social grants have yielded contradictory results, with some finding no significant relationship (Schiel et al., 2014), others showing a negative relationship (Woolard et al., 2015), and some even indicating a positive relationship. Similarly, the relationship between economic growth and income inequality in South Africa remains a subject of debate, with studies reporting positive, negative, or no significant association. These inconsistencies in the existing literature highlight the need for further research to re-evaluate these relationships and provide clearer policy recommendations.

The findings of this study reveal that government spending on social grants and gross savings negatively impacts income inequality, suggesting their potential to promote a more equitable distribution of income. However, population growth rate is found to have a positive impact on income inequality, highlighting the potential strain on resources and social programs due to rapid population increase. Additionally, the study uncovers a negative relationship between economic growth and income inequality, indicating that economic development can play a crucial role in mitigating income inequality.

1.2 Problem Statement

The persistent and deeply rooted issue of income inequality in South Africa, prevalent even before the advent of democracy, continues to be a pressing socioeconomic challenge. The country's Gini coefficient, a widely recognized measure of income distribution, consistently places South Africa among the most unequal nations globally (IMF, 2020). Despite various government interventions aimed at addressing this issue, including increased social spending and affirmative action initiatives, income inequality has stubbornly persisted and even worsened in recent years. The ineffectiveness of current policies and frameworks in curbing income inequality underscores the urgent need to reassess the factors contributing to this problem and identify appropriate measures to address it.

The existing literature on the determinants of income inequality in South Africa presents a complex and often contradictory picture, creating ambiguity in understanding the root causes and hindering the development of effective policies. For instance, Schiel, Leibbrandt, and Lam (2014) found that while social grants have alleviated poverty, they have not significantly reduced income inequality. This contradicts the findings of Woolard et al. (2015), who demonstrated that progressive taxes and pro-poor social spending play a significant role in reducing income inequality. Similarly, the impact of economic growth on income inequality is also debated, with studies like Niyimbanira (2017) finding no definite link and others like Mdingi and Ho (2023) and Bhorat and Van der Westhuizen (2008) reporting a negative and positive relationship, respectively. The lack of consensus on these crucial relationships highlights a significant research gap that this study aims to address.

The study will re-evaluate the impact of key socioeconomic factors, including government spending on social grants, gross savings, population growth rate, and economic growth, on income inequality in South Africa. By employing a quantitative approach and utilizing time-series data from 1975 to 2017, the study will provide a comprehensive understanding of both the short-term and long-term relationships between these variables. The Vector Error Correction Model (VECM) will be employed to analyse these relationships, offering insights into the dynamic interplay between socioeconomic factors and income inequality. The study's findings are expected to contribute to the ongoing discourse on income inequality in South Africa and inform policy decisions aimed at creating a more just and equitable society.

1.3 Research Questions

The primary focus of the study is to address the following questions: What are the underlying causes of income inequality in South Africa? Additionally, the study aims to assess the impact of government socioeconomic spending on income inequality.

The secondary research questions that will be addressed by the study are as follows:

i. How do theories address the issue of income inequality?

ii. What do empirical studies say about the impact of socioeconomic determinants on income inequality?
iii. How does government spending on social grants, gross savings, population growth rate, and economic growth, affect income inequality?

1.4 Study Objectives

The primary focus of the study is to identify the determinants of income inequality in South Africa and to determine how government spending on social grants affects income inequality.

The following are the specific objectives of the study:

i. To review the theoretical explanations of addressing income inequality.
ii. To investigate the empirical findings regarding the social-economic determinants of income inequality.
iii. To analyse the impact of government spending on social grants, gross savings, population growth rate, economic growth, on income inequality.

1.5 Hypotheses of the Study

To accomplish the study objectives, the following empirically testable hypotheses are formulated:

H_0: There is no statistically significant relationship observed between government spending on social grants, gross savings, population growth rate, and economic growth, on income inequality in South Africa.

H_1 : A statistically significant relationship is observed between government spending on social grants, gross savings, population growth rate, and economic growth on income inequality in South Africa.

1.6 Significance of the Study

The study provides significant contributions to the current literature on income inequality in South Africa. Firstly, the impact of government socio-economic spending is empirically examined, enhancing our comprehension of the factors influencing income inequality in the country. Secondly, the relationship between income inequality and policies designed to mitigate it through income redistribution is delved into. Thirdly, the study extends the timespan of previous research as compared to previous studies by Yang (2023), Verberi and Yaşar (2021), Alamanda (2020), Juodsnukis (2020), Sánchez and Pérez-Corral (2018) and Ulu (2018), using annual data 1975 to 2017, from a larger sample size of 43. The larger sample size has been demonstrated to enhance statistical power in hypothesis testing, concurrently elevating the reliability and validity of the study's findings (Kim and Park, 2019).

1.7 Study Layout and Structure

The study is divided into five chapters. The first chapter provides an overview and background of the study. In the second chapter, a critical review of the literature is presented, focusing on theoretical perspectives of income inequality determinants and empirical literature contrasting income inequality with government spending variables. In the third chapter, the study delves into the methodology employed, specifically focusing on the Vector Error Correction Model (VECM) used to analyse the impact of government spending on income inequality. In the fourth chapter, a detailed analysis of the results and their interpretation is presented. Lastly, the fifth chapter concludes the study by summarizing the key findings and offering policy recommendations.

1.8 Chapter Summary

Chapter 1 outlines the study's basic assumptions and approach. The chapter outlines the organization of the study. The study aims to address the problem of income inequality in South Africa, which remains a significant concern despite government intervention. The study seeks to identify the determinants of income inequality in the

South African context, covering the period from 1975 to 2017. The sample size ends in 2017 because the source data used for the study concludes in that year.

The study is deemed essential as it seeks to contribute to the resolution of a critical challenge facing South Africa. By identifying the determinants of income inequality, effective interventions that can bring about positive change can be identified. It is anticipated that the study will provide valuable insights that can inform policy decisions and interventions to address income inequality. The next chapter will explore the relevant literature related to the study through a comprehensive review.

CHAPTER 2
LITERATURE REVIEW: THEORETICAL AND EMPIRICAL

2.1 Introduction

The concept of inequality can be viewed from a variety of perspectives, all of which are linked. The income inequality indicator is one of the most commonly used measures of inequality, measuring the extent to which income is distributed unequally among individuals or households (Trapeznikova, 2019). The objective of this chapter is to examine the theoretical viewpoints on the factors that contribute to income inequality. Additionally, it aims to present the results of empirical research on the relationship between the government's socioeconomic spending on social grants, gross savings, population growth rate, and economic growth, on income inequality.

2.2 Theoretical Framework

Most studies analysing the determinants of income inequality draw their theoretical background from Keynesian theory, Kuznets hypothesis theory, the Lewis model, and Piketty's Hypothesis on the Drivers of Income Inequality. The above-mentioned theories explain income inequality and how it relates to expenditure by the government on socio-economic development in the form of social grants, as discussed in detail below. The section also discusses theories explaining gross savings, population growth rate, and economic growth on income inequality.

2.2.1 Keynesian Theory

The economic thought and policy landscape for over a century has been significantly shaped by the Keynesian theory, initially developed by John Maynard Keynes in the early twentieth century. Even though the theory originated during the Great Depression in the 1930s, it continues to provide a framework for understanding and managing economic fluctuations to this day. In Keynes' view, aggregate demand is the primary driving force behind an economy, which is measured by the sum of purchases made by individuals, businesses, and governments (Jahan, Mahmud, and Papageorgioun, 2014). Keynesianism posits that the free market does not inherently

self-adjust to full employment. As a result, government intervention is deemed justified through policies aimed at attaining full employment and price stability.

According to the International Monetary Fund (2014), Keynesian economics suggests that government should increase aggregate demand to stimulate economic growth. A Keynesian view of economics holds that consumer demand is the primary driver of economic growth. As a result, the theory supports an expansionary fiscal policy. To achieve this goal, government expenditure on infrastructure, unemployment benefits (including social grants), and education are the most important tools. It should be noted that increasing inflation may result from the overuse of Keynesian policies. The Keynesian theory is applicable in this study with a specific focus on how government spending is used to redistribute income. Consequently, Keynesian Theory, according to Alamanda (2020), can help the government achieve its goal of balancing savings, consumption, and investment. Thus, government policies should strive towards a healthy relationship between savings, consumption, and investment. Therefore, the theory suggests that governments can reduce income inequality by participating in the economy.

A key aspect of Keynesian economic theory is that it is primarily concerned with ensuring short-term economic stability rather than fostering growth in the long run. According to Jahan *et al*. (2014), Keynes believed that inadequate demand could lead to prolonged high unemployment. The economy's output is reliant on four key components, namely consumption, investment, government purchases, and net exports. It follows that any rise in demand must originate from one of these four components. In contrast, in a recession, income and output are often altered in the short run due to strong forces dampening demand when spending is reduced (Jahan *et al*., 2014). Consequently, this erodes consumer confidence, which results in a decrease in spending, especially on luxury items. A reduction in business investment spending is reflected when firms respond to weakened market demand by reducing expenditure. The government thus assumes responsibility for increasing the output of the economy. Keynesian economics contends that the state must intervene to reduce booms and busts in business activity (Jahan *et al*., 2014).

The Keynesian theory is widely used to explain the relationship between income inequality, poverty, and government expenditure. It emphasizes the role of the government in economic activities and suggests that income inequality arises from market distortions as well as underdevelopment across various dimensions. To reduce income inequality, Keynesians advocate for economic development through growth and support government intervention at the macroeconomic level through fiscal and monetary policies. Stack (1978) highlights that Keynesian theory provides insights into changes in employment and economic growth rates, which influence income inequality. According to this theory, lower income inequality is linked with higher employment and growth rates. It suggests that government interventions can help achieve an equilibrium between saving, consumption, and investment and that employment levels, shaped by the supply of goods and services, become the determining factor for income inequality (Stack, 1978).

Stack (1978) stated that demand is determined by the relative tendency to consume and the relative propensity to save. This may imply that if more money is being saved by income recipients than those who oversee investments, there could potentially be a lack of demand that would make it difficult to maintain full employment, thus leading to higher income inequality. Thus, excessive saving is detrimental to the economy in that it inhibits job growth and creates an unemployment crisis, which increases income inequality (Alamanda, 2020).

Government policies encompassing spending on social security programs, subsidies, and welfare can potentially impact low-income households. Moreover, the government's ability to generate employment, such as through initiatives like the Expanded Public Works Programme (EPWP) and state-owned industries, may contribute to reducing the unemployment rate and, consequently, income inequality (Stack, 1978). Keynes (1973) proposed a reduction in taxation as a means of stimulating expenditure, thereby encouraging induced consumption by households.

Historically, Karl Marx has indicated the existence of cycles in business activity that we now refer to as the business cycle (Vianna, 2022). As a result, the economy experiences periods of economic growth followed by periods of stagnation. In contrast to classical economists who believed the economy would move to

equilibrium on its own, John Maynard Keynes argued that government intervention may be necessary in order to maintain employment levels during a recession or depression. As the economic crisis of the last couple of years has shown, government involvement can still play a significant role in preventing an economy from falling into a recession. During the period of the crisis, monetary and fiscal policies have once again been shown to be of vital importance (Hausman and Johnston, 2014). One notable instance of a country facing economic instability due to overspending for a long duration is Greece's situation after the worldwide financial crisis. The country had to deal with issues like high trade deficits, high inflation, low growth, and exchange rate problems. As a result, hardship has been suffered by many Greek citizens due to austerity packages that were negotiated with the European Union (EU) (Stuckler, Reeves, Loopstra, Karanikolos and McKee, 2017).

The study employs Keynesian theory to investigate how income inequality can be reduced through government spending. The hypothesis that social grants provided by the government are positively correlated with income inequality in South Africa is tested.

2.2.2 Kuznets Curve Hypothesis

Contrary to Keynesian theory, the Kuznets (1955) curve hypothesis argues that inequality generally increases in the early stages of economic growth and decreases in its later stages (Thereson and Heller, 2015). Kuznets (1955) predicted an inverted U-shaped relationship between per capita income and GDP. But today there is mixed evidence supporting this idea. According to Deininger and Squire (1998), income and inequality are decreasing; Galbraith and Garcilazo (2004), however, found no evidence to support Kuznets' hypothesis.

According to the Kuznets (1955) curve hypothesis, there is an inverted U-shaped relationship between income and income inequality. Kuznets (1955) elaborated on this idea and explained that income inequality will increase in the early stages of economic development (Hossain, 2013). This argument is supported by Ahluwalia (1976), who finds clear evidence of a non-monotonic relationship between inequality and level of development. Hossain (2013) also found that as GNP per capita

increases, the total income of the group that constitutes only 20% of the population initially decreases and then increases. The income of the top 20% shows a different structure. When a certain income level is reached, income inequality begins to decrease with economic development, trade, democracy, and economic growth. The essence of this theory is that there is an inverted U-shaped relationship between income and income inequality, that is, the Kuznets Curve (KC). Kuznets (1955) also argued that increased public spending on education would reduce racial inequality and increase income inequality, thus increasing income inequality.

However, it is worth noting that this theory is not valid for every country. Since the relationship between inequality and economic growth is based on cross-sectional data, which means that the countries used for this study are at various stages of development, some studies have rejected the Kuznets hypothesis. The study conducted by Jha (1996), Mdingi and Ho (2021), and Topuz (2022) reexamined the relationship between economic growth and income inequality and discovered that most of the changes in income distribution are due to the characteristics of the country rather than economic growth and not due to data comparison issues.

Kuznets (1955) conducted a study to explore the connection between income inequality and economic growth, specifically in terms of the level of economic development. The study found that there exists a difference between income inequality and economic growth. It showed that there is a positive impact during the early stages of economic development, and a negative impact during the later stages of development. As the people who work on farms shift to other sectors of the economy, per capita income for the labour force increases, while the income of those living on farms decreases, leading to an increase in inequality. However, as the economy grows, and people leave agriculture, the lack of employment opportunities will increase the incomes of those who stay in agriculture and ultimately reduce income inequality.

The Kuznets curve can be used to assess the effectiveness of economic policies aimed at reducing income inequality in agriculture. Policymakers can compare income inequality before and after implementing the policy to determine whether it's achieving its goals (Bourguignon, 2015). Additionally, the curve can predict future

income inequality in a country. Policymakers can estimate a country's position on the curve by examining the current level of economic development and growth and predict how income inequality will increase. However, some researchers criticize the Kuznets curve theory, stating that the pattern described by the curve is not universal. Factors like government policy, social status, and culture can influence the relationship between rising economic and income inequality. Therefore, the study includes variables such as government spending on social grants, population growth rate, gross savings, and economic growth.

Kuznets describes how urban areas experienced rapid economic and demographic growth during the early stages of urbanization. Rural migrants and immigrants arriving to seek employment opportunities in the manufacturing sector drove significant economic differences in terms of economic activities in emerging urban centres. It is Kuznets' view that even though there will always be a small number of wealthy, well-established urban dwellers, a growing number of low-skill and low-wage workers will result in increasing income inequality in early industrialization and urbanization. As a result of population growth, both high-skilled and low-skilled workers are attracted to larger and more diverse economies, leading to an increase in occupational differentiation and income inequality. A large body of evidence supports the Kuznets theory, based largely on urban economic and demographic growth, whereas little is known about the decline of the rural population and the impact it has on income inequality.

2.2.3 Lewis Model

The Lewis model of 1954 provides a good explanation of the relationship between growth and inequality (Topuz, 2022). According to the theory, inequality will continue to increase until a "transition" occurs, eventually leading to a reduction in inequality. The Lewis model explains income inequality by using the distribution of income from capital and labour, and not by household or individual inequality. This is significant to his model of economic development. In other words, an increase in the capital share encourages growth but does not necessarily reflect a change in the labour share, thus inequality may not necessarily increase. The second perspective on inequality is between and within modern and traditional sectors (Mdingi and Ho, 2021).

Lewis, as cited by Sumner (2018), believed that economic development and distribution are closely linked. He saw the growth of the modern sector as having both positive and negative effects on the traditional sector and emphasized that factors such as property distribution, economic structure (including firm size, capital intensity of production, and dependence on foreign resources), and the speed of growth can influence the distribution of income. Lewis also pointed out that these factors are often subject to public control. In essence, Lewis argued that the state had a crucial role to play in ensuring that economic growth is distributed fairly (Sumner, 2018). Lewis (1954) proposed a policy of tackling inequality through public policy. He stressed that the development of the modern sector relies heavily on whether the government coerces or supports the traditional sector, thus advocating for government intervention in reducing income inequality (Sumner, 2018).

It should be noted that the theoretical foundation of the Lewis model was challenged by Harris and Todaro (1970) who argued that if there were substantial anticipated living standard disparities between rural and urban areas, rural migrants might be moved to cities at a rate that exceeds what is warranted. Lewis focused on the process of transferring labour, with an emphasis on the levels of employment and output growth in the modern sector (Todaro and Smith, 2009). One of the key implications of Lewis' work was related to income distribution, which aligns with the focus of Kuznets' contributions (1955). Kuznets used a structural analysis based on a dualistic model, suggesting that an economy undergoes a transition from agriculture to manufacturing and subsequently to services.

2.2.4 Marxist Theory

The Marxist Theory offers a critical perspective on income inequality, emphasizing the role of class struggle and the exploitation of labour within the capitalist system (Gimenez et al., 2019; Mengesha, 2020). In the South African context, the historical legacy of apartheid has contributed to the persistence of deep-rooted inequality (Van der Berg, 2011). The transition to democracy has not eradicated these inequalities; instead, income inequality has increased, with the top decile capturing a larger share of income (Leibbrandt et al., 2012; Leibbrandt et al., 2018). The labour market

remains a primary driver of inequality, influenced by factors such as rising unemployment and earnings disparities (Leibbrandt et al., 2012). While social grants have become more important for lower-income groups, they have not been sufficient to offset the overall trend of increasing inequality (Leibbrandt et al., 2018). The basis of inequality has shifted from being solely race-based to a more complex interplay of race and class, with both between-race and within-race inequality contributing to the overall picture (Leibbrandt et al., 2012). The Marxist perspective underscores the structural factors that perpetuate income inequality, highlighting the need for systemic change to achieve a more equitable distribution of resources and opportunities. Marxist Theory is key in analysing how these structural factors, particularly the legacy of apartheid and the concentration of wealth and power, interact with other socioeconomic determinants to shape income distribution and perpetuate inequality in South Africa.

2.2.5 Piketty's Hypothesis on the Drivers of Income Inequality

According to Piketty's (2014) theoretical explanations, an increase in the gap between the returns on capital and the growth rate of output leads to a rise in the capital share of national income, assuming all other factors remain constant. Since capital income is usually distributed more unequally than labour income, an increase in the capital share could potentially result in an overall rise in income (and consequently, wealth) inequality. Both these connections are considered plausible.

Piketty (2014) argued that the increase in income inequality is mainly due to the role of capital income, and less so to the relationship between education and technology, and the rise of manager salaries. He also claims that inequality has been rising generally over the last three to four decades. Sawyer (2015) challenged the idea that the higher share of the top ten per cent is simply due to their productivity. Instead, he focused on the increase in wealth relative to income and wealth inequality, particularly the income inequality coming from capital, which is a major contributing factor to higher income inequality.

2.2.6 The Relative Income Hypothesis and Permanent Income Hypothesis

This theory was first introduced by Dusenberry (1949) in his seminal work Income, Savings, and the Theory of Consumer Behaviour. A person's attitudes toward consumption and saving are influenced more by their income than any other factor, according to Dusenberry (1949). Rather than concern themselves with their absolute well-being, individuals are more concerned with their relative well-being. Current consumption is also influenced by the level of consumption obtained at a previous time, as well as the current level of absolute and relative income. In the event that a family reaches a certain level of consumption, lowering it can be difficult. Based on Dusenberry's analysis, poor people spend more of their income to narrow the consumption gap, and the consumption within a family is impacted by its income as compared to other families in the community. As a result, the aggregate savings ratio should be independent of the level of income. This is because everyone will have a unique savings-to-income ratio for any given income distribution. Despite difficult economic conditions, Ishtiaq, Tauheed, and Ishtiaq (2022) found that households do not reduce their consumption when incomes are reduced.

The permanent income hypothesis was proposed by Friedman (1957) to explain saving behaviour. The long-term average income of individuals affects their spending behaviour rather than their current income, according to this theory. Instead of adjusting their spending habits to temporary income fluctuations, the theory proposes that individuals should modify their spending patterns based on their expected lifetime income. As suggested by Yun *et al*. (2023), the government may introduce a policy that allows tax deductions for retirement savings. Furthermore, the government can also design welfare and social security programs in a way that provides individuals with a steady income over the long term rather than providing short-term cash payments. This aligns with the theory asserting that individual’s consumption decisions are influenced by their long-term average income. Rather than promoting short-term consumer spending, Yun *et al.* (2023) argue that government policies should encourage long-term economic growth and savings. Based on the arguments from the permanent income hypothesis and Relative Income Hypothesis, an increase in government expenditure by the government on social security programs will reduce income inequality.

2.3 Review of empirical studies on the determinants of income inequality

The relationship between income inequality and government spending on social grants for socioeconomic purposes is investigated in this section through the analysis of empirical evidence from previous studies. The discussion encompasses the findings of previous studies regarding how income inequality is linked to control variables like gross savings, population growth and economic growth. As mentioned in section 2.1 under the theoretical framework, there is no consensus on the effect of government social spending on income inequality, which is supported by empirical evidence. This section aims to review the studies conducted globally, in Sub-Saharan Africa, and South Africa, that investigate the effects of government spending on social grants on income inequality. The section also examines the influence of gross savings, population growth rate, and economic growth on income inequality.

2.3.1 Government spending on social grants and income inequality

Several studies have been carried out to investigate the impact of government social spending on income inequality. Andersen *et al*. (2017) conducted a meta-regression study which found that certain types of government spending can have a negative effect on income inequality. The authors also suggest that there is a moderately positive relationship between income inequality and total government spending. However, when certain types of government spending are separated, a moderately negative relationship is seen between government social spending and income inequality (Anderson *et al*., 2017). Additionally, the study reveals that factors other than the measure of inequality, control variables and estimation method have an impact on the size and direction of the estimated income inequality and government spending relationship (Anderson *et al*., 2017).

Verberi and Yasar (2021) conducted a cross-sectional regression analysis to examine the relationship between social spending and income inequality in 30 OECD countries. The study revealed that social spending leads to a reduction in income inequality. Juodsnukis (2020) used panel regression models and variable selection methods to investigate the relationship between income inequality and socioeconomic indicators in OECD countries between 2007 and 2016. The study

found that the effect of government social spending is positively associated with income inequality. Ulu (2018) confirms the positive relationship between government social spending and income inequality in a study analysing panel data to determine the impact of government social spending on income inequality for 21 OECD countries. The results showed that government social spending positively affects income inequality. The study also found that government social spending was more effective than government education expenditures in reducing income inequality.

Alamanda (2020) used panel data from 33 provinces in Indonesia from 2005 to 2017 to examine the relationship between government social spending and income inequality. The study aimed to determine whether social aid, subsidies, and grants have a significant impact on reducing income inequality in Indonesia. According to the study results, social assistance expenditure positively affects income inequality in rural areas in Indonesia at a significance level of 5%, which means that the greater the government's social spending, the worse the income inequality in rural areas (Alamanda, 2020). Yang (2023) explored the role of government social spending, income inequality, and charitable giving using United States county-level panel data between 2011 and 2017. The study found no significant relationship between income inequality and government social spending.

Several studies, including Sánchez and Pérez-Corral's (2018) study, have found a negative relationship between government social spending and income inequality, as asserted by Anderson *et al*. (2017). Sánchez and Pérez-Corral's (2018) study examined the relationships between public social spending and income inequality distribution from 2005-2014 in 28 European Union Member States and demonstrated a negative correlation between public social spending and income inequality. In a study examining 17 developing and 30 developed countries between 1990 and 2014, Balseven and Tugcu (2017) investigated the effects of fiscal policy on income inequality. The study concluded that social benefits decreased income inequality in developed countries, suggesting a negative relationship between government social spending and inequality.

The empirical literature on the relationship between government social spending (social grants) and income inequality has yielded mixed results. Verberi and Yaşar

(2021), Alamanda (2020), Juodsnukis (2020), and Ulu (2018) concluded that there is a positive relationship between the two variables, whereas others, such as Sanchez *et al*. (2018) and Anderson *et al*. (2017), assert that there is a negative relationship. Schiel *et al*. (2014) found that social grants are beneficial in alleviating poverty, but they have not resulted in a significant reduction in income inequality, suggesting that there is no relationship between government spending on social grants and income inequality. The previous studies' inconsistent outcomes highlight the need to reconsider the relationship between government spending on special grants and income inequality.

2.3.2 Gross savings and income inequality

In a study by Tran, Ong, and Nguyen (2020), they examined whether provincial income inequality is related to household savings in twelve provinces of Vietnam between 1970 and 1990. Using the generalised method of moments approach, the study revealed that household savings are positively influenced by income inequality. Additionally, it was found that the impact of inequality on savings is more significant in households headed by married couples, as well as those headed by individuals who are either poorer, richer, or younger.

Yildirim (2020) used the ARDL bound testing methodology to examine how savings and income inequality are related to the Turkish economy. The study found that there is a long-term negative relationship between income inequality and savings, which is statistically significant. Meanwhile, Deniz and Ozturkler (2010) conducted a panel analysis of developed, developing, and miracle countries and found that the relationship between income inequality and savings varies depending on the country's characteristics. Their study suggests that citizens in miracle economies tend to save more than their counterparts in other economies, indicating a positive relationship between income inequality and savings rates. In contrast, developed countries have a negative relationship between the two variables because high-income inequality has a detrimental effect on saving. No significant relationship exists in developing countries.

Maaboudi, Fotros, and Nazari (2023) used the mixed data sampling approach to study income inequality's effect on national savings in Iran from 1989 to 2020 and found that income inequality shapes national savings in a hump-shaped manner. Income inequality and savings were found to be positively correlated in the study. Due to this, more increases in income inequality resulted in a decline in national savings. Halim, Sultana, Akter and Rahaman (2016) conducted a study which revealed that the relationship between savings and income inequality is not a straightforward one and can be affected by fluctuations in economic policies. There was no significant relationship between the two variables in their study.

The relationship between gross savings and income inequality has yielded conflicting results in various studies. Some authors have reported positive relationships, such as Maaboudi *et al*. (2023), Tran *et al*. (2020), and Deniz and Ozturkler (2010) in miracle countries that experienced rapid economic growth. On the other hand, a negative relationship between the two variables has been found by Yildirim (2020) and Deniz and Ozturkler (2010) for developed countries. Developing countries have not exhibited a significant relationship between gross savings and income inequality, as demonstrated by Halim *et al*. (2016), and Deniz and Ozturkler (2010).

2.3.3 Population growth rate and income inequality

The effect of population declines and growth on rural income inequality was examined using fixed-effect regression models from 1980 to 2016 by Butler (2020). The decrease in population has a considerable impact on income inequality in rural areas. On the other hand, population growth rate has a minimal effect on income inequality, indicating a negative relationship between population growth and income inequality. The study also found that income inequality and population change are not uniformly correlated in rural America, since the relationship varies by county region, level of inequality, and size of the baseline population.

The study on targeted income inequality for a given population size was conducted by Sitthiyot and Holasut (2016). Data from sixty-nine countries in 2012, along with Gini coefficients, were used in this study. It was found that Gini coefficients and natural logarithms of population sizes have a nonlinear relationship, which can be explained

by a polynomial function with a second degree. Consequently, the two variables have a negative relationship.

Nwosa (2019) conducted a study on income inequality and economic growth in Nigeria and its implications for economic development. According to the study, population growth has a positive and significant impact on income inequality. The study period covered 1981 to 2017, and autoregressive distributed lag estimation was used. The study conducted by Ullah, Kui, Ullah, Pinglu, and Khan (2021) on 64 countries connected by One Belt One Road between 2003 and 2018, using the generalized method of moments (GMM), concluded that there exists a positive correlation between population size and income inequality. The outcomes of the study are consistent with Nwosa's (2019) findings.

Various studies have explored the relationship between income inequality and population growth, but the results have been mixed. It is worth noting that studies such as the one by Butler (2020) and Sitthiyot and Holasut (2016) have indicated a negative relationship between population growth and income inequality. On the other hand, studies by Nwosa (2019) and Ullah *et al*. (2021) argue that there is a positive and significant impact of income inequality on population growth, with the two variables being positively correlated.

2.3.4 Economic growth and income inequality

Rubin and Segal (2015) found a positive relationship between economic growth and income inequality during the post-war period between 1953 and 2008. Meanwhile, Vo, Nguyen, Tran, and Vo (2019) discovered that this relationship is the opposite in middle-income countries. They utilized the Granger causality test, and a system generalized method of moments (GMM) on two different samples spanning from 1960 to 2014 and concluded that income inequality and economic growth have a negative correlation.

Jianu, Dinu, Huru and Bodislav (2021) conducted an analysis of the relationship between income inequality and economic growth from the viewpoint of the level of development of each country within the European Union. Based on the country's level

of development, income inequality has different effects on economic growth, consistent with the Kuznets (1955) curve hypothesis. The study results supported this conclusion, and it was concluded that income inequality is positively related to economic growth in the developed EU Member States.

Royuela, Veneri, and Ramos (2019) conducted a study on the relationship between income inequality and economic growth in OECD countries. They found that income inequality had a negative relationship with economic growth from 2003 to 2013. On the other hand, Caraballo, Dabbles, and Delbianco (2017) investigated the relationship between income inequality and economic growth in 112 emerging countries between 1980 and 2014. Their study suggested that income inequality had a positive impact on economic growth in richer countries and a negative impact in poorer countries, consistent with the political economy view.

Zungu, Greyling and Mbatha (2021) conducted a study investigating the economic growth and inequality relationship, using panel data from 13 Southern African Development Community (SADC) countries over the period 1990 to 2015. They found that lower growth tends to be associated with lower income inequality, whereas if growth increases above US$8,969, inequality tends to increase in the SADC region. Chude and Chude (2022) also conducted a study investigating the effect of income inequality on economic growth in Nigeria from 1981 to 2021, using the ordinary least squared (OLS) method of data analysis, and found no significant effect of income inequality on economic growth in Nigeria. This conclusion is consistent with Nwosa (2019), who examined the relationship between income inequality and economic growth in Nigeria between 1981 to 2017, employing an autoregressive distributed lag estimation technique. The results of the study showed that economic growth had a positive but insignificant impact on income inequality in Nigeria.

Empirical studies in sub-Saharan countries have produced mixed results on the relationship between economic growth and income inequality. For example, Wahiba and Weriemmi (2014) conducted a study on the nature of the relationship between income inequality and economic growth in Tunisia, covering the period 1984 to 2011. Their results showed that economic growth had a positive effect on income inequality.

There is no consensus in the literature regarding the effect of economic growth on income inequality. Some studies, such as Rubin and Segal (2015), Zungu, Greyling, and Mbatha (2021), and Wahiba and Weriemmi (2014), have found a positive relationship between the two variables. In contrast, Royuela, Veneri, and Ramos (2019), as well as Vo, Nguyen, Tran, and Vo (2019), found a negative association between the two variables. Jianu, Dinu, Huru and Bodislav (2021) have shown that economic growth has a different impact on income inequality depending on the country's level of development, as indicated by the Kuznets curve hypothesis. According to the study, income inequality is positively related to economic growth in developed EU Member States and negatively related to economic growth in developing EU Member States. Similarly, income inequality was found to have a positive impact on economic growth in richer countries and a negative impact in poorer countries by Caraballo, Dabbles, and Delbianco (2017). On the other hand, Chude and Chude (2022) and Nwosa (2019) concluded that income inequality does not significantly affect economic growth, and the latter study showed that economic growth had some positive but not significant effects on income inequality.

2.3.5 Studies on the South African landscape: An evaluation of empirical evidence

The following section discusses the empirical evidence related to the income inequality trends in South Africa, based on country-specific evidence. The sub-sections 2.2.5.1 to 2.2.5.4 present the empirical evidence on the relationship between government spending on social grants, gross savings, population growth rate, and economic growth, on income inequality in South Africa.

2.3.5.1 The impact of government’s spending on social grants on income inequality in South Africa

Schiel, Leibbrandt, and Lam (2014) assessed the effect of social grants on inequality in South Africa and found that while social grants have helped to alleviate poverty, they have not significantly reduced income inequality in the country. Changes in household composition have resulted in a significant decrease in the direct impact of social grants on inequality, as revealed by decomposition techniques. As a result, the

association between government spending and income inequality is not substantial. Despite social grants playing a critical role in reducing South Africa's persistently high levels of inequality, greater efforts are needed to reduce income inequality as it remains high.

Several studies have investigated the connection between government spending and income inequality in South Africa, with varying outcomes. Leibbrandt, Finn, and Woolard (2012) analyzed changes in inequality in South Africa from 1993 to 2008, using income data from 1993 and 2008. Their findings demonstrate that income inequality has risen throughout the post-apartheid period due to an increase in the share of income going to the top decile. Furthermore, their study revealed that social grants have become a more significant source of income for the lower deciles of society. The study also revealed that the labour market remains the primary driver of aggregate inequality. Overall, the study concluded that the high level of aggregate income inequality in South Africa increased between 1993 and 2008. Additionally, inequality exists within each of South Africa's four major racial groups. The study identified the increasing income share for individuals in the top decile as a key driver of inequality.

Woolard *et al*. (2015) investigated the impact of progressive taxation and government spending on inequality in South Africa and found that progressive taxes and pro-poor social spending significantly reduced income inequality. The extent of this reduction is greater compared to twelve comparable middle-income countries. Moreover, the study found that income inequality remains higher in South Africa than in comparable countries even after considering significant taxes, government transfers, and spending. Finally, the study concluded that while the fiscal system has a significant role in reducing inequality, interventions are necessary to improve the distribution of wages, salaries, and capital income.

2.3.5.2 Impact of gross savings on income inequality in South Africa

Zwane, Greying and Maleka (2016) conducted a study to examine the factors that influence household savings in South Africa between 2008 and 2012. The study used a panel data estimation model, and it was found that income, age structure, education

achievement, and employment status significantly determined household savings in South Africa during the period under review. The study's results indicate a positive relationship between income inequality and gross savings in South Africa.

2.3.5.3 Impact of population growth rate on income inequality in South Africa

A study carried out by Anyanwu (2016) into the primary factors causing income inequality in Southern Africa, comprising South Africa, reveals that there is a there is a significant relationship between population growth and income inequality in Southern Africa. The study's findings also suggest that higher population growth in Southern Africa is associated with higher income inequality.

2.3.5.4 Impact of economic growth on income inequality in South Africa

A study conducted by Niyimbanira (2017) in the province of Mpumalanga in South Africa, evaluated the impact of economic growth on income inequality and poverty. The study concluded that there is no relationship between income inequality and economic growth. Despite the theoretical indication that the Gini coefficient negatively affects economic growth, Niyimbanira (2017) asserts that empirical evidence suggests otherwise. The study found that economic growth was associated with poverty reduction, but not with a reduction in income inequality. Another study by Mdingi and Ho (2023) used the autoregressive distributed lag (ARDL) bounds testing technique to investigate the relationship between income inequality and economic development in South Africa between 1989 and 2018. The study found a long-term correlation between income gap and economic growth. The findings showed that while the income gap has no effect in the near term, it has a negative long-term effect on economic growth. Bhorat and Van der Westhuizen (2008) conducted a study on economic growth, poverty, and inequality in South Africa between 1995 and 2005 and discovered a positive correlation between income gap and growth.

2.3.5.5 Summary of empirical findings studies from South Africa

Studies conducted on the relationship between government spending and income inequality in South Africa have produced mixed results. According to Leibbrandt *et al*.

(2012), government social spending on social grants has a positive association with income inequality. However, Woolard *et al.* (2015) found a negative relationship between income inequality and government social spending on social assistance. Zwane *et al*. (2016) have found a positive relationship between South African gross savings and income inequality. A study by Anyanwu (2016) has revealed that population growth, including in South Africa, is significantly associated with income inequality in Southern Africa.

Various conclusions and results have been drawn from the literature on the relationship between income inequality and economic growth in South Africa. Niyimbanira's (2017) study concluded that there is no correlation between income inequality and economic growth. The results do not support the theory that the Gini coefficient negatively affects economic growth, despite theoretical indications. Mdingi and Ho (2023) have concluded that income inequality has a negative impact on economic growth in the long run, but no impact in the short run. Therefore, the relationship may also vary between the long run and short run, depending on the assumptions made. Income inequality and economic growth have a positive relationship, according to a study by Bhorat and van der Westhuizen (2008). Thus, conducting the study to re-evaluate the relationship between government spending on social grants, gross savings, population growth, economic growth, on income inequality in South Africa is crucial to achieving the study's third objective.

2.4 Conceptual Framework

The following conceptual framework in Table 1 illustrates the anticipated relationships between the dependent variable (Income Inequality) and the independent variables, as hypothesized in the study:

Table 1: Conceptual Framework

Variable	Type of Variable	Definition	Expected Sign
Income Inequality	Dependent Variable	Gini Coefficient	Not applicable
Social Grants	Independent Variable	(% of the national budget) includes government	(-)

		spending on social grants for the elderly, children, and disabled individuals.	
Gross Savings	Independent Variable	Represent the difference between disposable income and consumption.	(-)
Population Growth Rate	Independent Variable	Represents the total percentage change in population, assuming a constant growth rate between two points in time.	(Indeterminate)
Growth Rate	Independent Variable	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.	(Indeterminate)

The signs in parentheses represent the expected nature of the relationship:

- (-) indicates a negative relationship (an increase in the independent variable is expected to lead to a decrease in income inequality).
- (+) indicates a positive relationship (an increase in the independent variable is expected to lead to an increase in income inequality).

The conceptual framework provides a visual representation of the study's theoretical underpinnings and the anticipated relationships between the variables. It serves as a guide for the empirical analysis and helps interpret the findings concerning the hypothesized effects.

2.5 Chapter Summary

The theoretical and empirical determinants of income inequality, both internationally and in South Africa, have been investigated and analyzed in various studies, as covered by the literature review provided in sections 2.2 and 2.3. Theoretical background has explained the determinants of income inequality, with various theories such as Keynesian theory, Kuznets hypothesis theory, Lewis model, Piketty's Hypothesis, Relative Income Hypothesis, and Permanent Income Hypothesis. Income inequality is significantly affected by government spending according to the Keynesian theory. The theory suggests that both market distortions and underdevelopment contribute to income inequality. The Kuznets hypothesis, on the other hand, argues that inequality rises in the early phases of economic development and falls in the later stages, which contradicts the Keynesian theory. The permanent income hypothesis and the relative income hypothesis suggest that income inequality can be reduced through an increase in government expenditure on social security programs.

Despite the debate surrounding socioeconomic variables and their impact on income inequality, there is no consensus, due to different schools of thought that draw different conclusions. The need for this particular study is reinforced by the contradictory results of empirical studies, caused by different estimation techniques, study periods, focus areas, and the number of years and frequency under consideration by the different authors. The relationship between the variables (government spending on social grants, gross savings, population growth rate, and growth rate) on income inequality in South Africa was investigated in the study. The following chapter details the methodology and estimation techniques employed in the study.

CHAPTER 3
METHODOLOGY EMPLOYED IN THE STUDY

3.1 Introduction

The study primarily aims to evaluate how the government's spending on social grants, gross savings, population growth rate, and economic growth affect income inequality. This chapter will focus on discussing the research design, empirical model specification, and estimation technique used to analyse the socioeconomic factors that influence income inequality in South Africa.

3.2 Research Design

The research design used in the study is non-experimental and quantitative in nature. The purpose of this approach is to explore the factors that contribute to income inequality in South Africa and to analyse the impact of government spending on social grants on income inequality.

3.3 Analytical Technique

The Vector Error Correction Model (VECM) is the methodology used in this study. According to Andrei and Andrei's (2015) findings, if a collection of variables has one or more cointegrating vectors, then VECM can be an appropriate estimation approach as it accounts for short-term fluctuations and deviations from equilibrium among variables.

The study aims to investigate how government spending on social grants, gross savings, population growth rate and economic growth impact income inequality. The focus will be on examining the direct relationship between these variables and income inequality. To perform the analysis, the data must first be transformed using the log natural method, to normalize it. Secondly, the data must be checked for normality and multicollinearity. Thirdly, testing whether government spending directly impacts income inequality on social grants. It is necessary to perform hypothesis testing using the widely recognized threshold of a p-value of less than 0.05 as the

final step. This implies that if the p-value is more than 0.05, the null hypothesis should be rejected. All other independent variables will impact the Gini index, which is the dependent variable that measures income inequality.

3.3.1 Model Specification

$$Gini_t = \emptyset_0 + \emptyset_1 SG_t + \emptyset_2 GS_t + \emptyset_3 POPG_t + \emptyset_4 RGDPR_t + \varepsilon_t \qquad [Eqn\ 1$$

Where:

- $Gini_t$= The South Africa's Gini index, disposable income. The value assigned to this index is between 0 and 1, and it represents 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.

- 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.

- GS_t= Gross saving is calculated as the difference between disposable income and consumption. The anticipated coefficient for this variable is expected to be negative.

- $POPG_t$= Population growth (annual %) rate 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 calculation does not deduct for the depreciation of fabricated assets or the depletion and degradation of natural resources. The anticipated coefficient for this variable is expected to be negative.

- 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.

3.3.2 Unit Root Tests

Conducting unit root tests is crucial for this study. These tests are essential tools for examining the properties of time series data, identifying suitable models, and creating dependable forecasts and policy decisions.

3.3.2.1 Stationarity Test

Conducting tests to ensure the stationarity of time series variables is crucial before carrying out any econometric analysis. In this study, the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests will be employed to evaluate the stationarity of the variables. The unit root test equations for these tests are as follows.

$$Intercept\ and\ trend: \Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + \mu_t \qquad [Eqn\ 2]$$

$$Intercept: \Delta Y_t = \alpha + \delta Y_{t-1} + \mu_t \qquad [Eqn\ 3]$$

$$None: \Delta Y_t = \delta Y_{t-1} + \mu_t \qquad [Eqn\ 4]$$

The presence of a unit root in a time series can be evaluated using the ADF test. Under the null hypothesis, the presence of a unit root (non-stationarity) is assumed, while the alternative hypothesis posits stationarity. Similarly, the PP test is used to test the presence of a unit root. The null hypothesis in this case also assumes the presence of a unit root, while the alternative hypothesis suggests stationarity. The ADF test has a limitation that assumes residual errors are statistically independent and have a constant variance. This led to the development of the PP test, which

allows error disturbances to be weakly dependent and heterogeneously distributed. Before specifying the VAR, the data must be differenced to establish stationarity. To proceed, the data must have an order of integration as one I(1). The first differencing typically makes macroeconomic data stationary, but it should not always be assumed that it will become stationary after just one differencing (McCauley, Bassler and Gunaratne, 2008).

The following is the estimated regression equation for the PP test:

$$\Delta Y_t = \emptyset_0 - \delta Y_{t-1} + \epsilon_t \qquad [Eqn\ 5]$$

3.3.2.2 Linearity Check

The study employed scatterplots to visually assess the linearity assumption, which is fundamental to multiple linear regression and crucial for the accuracy of the Vector Error Correction Model (VECM) (Thrane, 2019). The aim was to examine the presence of a linear relationship between the dependent variable (Gini coefficient) and the independent variables (government spending on social grants, gross savings, population growth rate, and economic growth). The expectation was to observe a clear linear pattern in these plots, signifying a straight-line relationship. The detection of any curvilinear or non-linear patterns would have necessitated data transformations or the exploration of alternative models to ensure the validity of the VECM analysis.

3.3.2.3 Testing for Cointegration

The study used the Johansen cointegration approach (Johansen, 1991) to establish a long-term relationship among the variables. The concept of cointegration suggests that, despite the non-stationarity of individual variables, there could be linear combinations of these variables that exhibit stationarity, indicating a lasting relationship. Once it was confirmed that at least one variable was integrated at order one I(1), the cointegration test was conducted following Johansen's (1991) maximum likelihood approach. This implies that variables X_t and Y_t are integrated at order one I(1) and show a linear combination after regression.

Granger (1981) introduced the concept of cointegration, while Engle and Granger (1987) proposed a two-step procedure for testing and estimating cointegrating relationships, which is particularly significant in the context of cointegration. Instead of using the Engle-Granger method (Engle and Granger, 1987), the present study opted for the Johansen cointegration approach. The Johansen cointegration approach provides a more flexible framework by allowing the consideration of multiple cointegrating vectors. This is especially useful when dealing with an econometric model comprising more than two variables. To establish a long-term relationship between variable X_t and Y_t, it is important to begin by differencing the variables to guarantee stationarity. Following that, the next step is to use the subsequent equation for regression:

$$Y_t = \beta_0 + \beta_1 X_t + \mu_t \qquad [Eqn\ 6]$$

The Johansen test is a statistical method that is used to determine the number of cointegrating vectors r, in a vector autoregressive model (VAR), (Johansen, 1991). The test is conducted by testing the null hypothesis $r = 0$ against $r \geq 1$, which helps to determine whether there is at least one cointegrating relationship between the variables. If the null hypothesis is accepted, it indicates that there is not enough evidence to conclude the presence of cointegration. The Johansen cointegration method primarily depends on the correlation between the rank of a matrix and its characteristic roots. The aim of this method is to break down π , which provides estimates of α and β, by using a regression procedure that has a lower rank as illustrated by:

$$\Pi = \alpha\beta \qquad [Eqn\ 7]$$

Johansen (1991) states that the π holds information pertaining to the long-term relationships between the variables in the vector, whereby α shows the speed of

adjustment coefficients and β the long-run coefficients. The number of cointegrating vector $\kappa \times \kappa$ with rank r can be determined through the test and trace statistics. The test statistics depend on the maximum eigenvalues. The largest eigenvalues are ordered in descending order and checked if they differ significantly from zero. If the rank π is equal to one, then there is cointegration. To indicate cointegration, the following equation needs to be specified:

$$\lambda(r, r+1) = TIn(1 - \lambda_{r+1}) \qquad [Eqn\ 8]$$

Where:

- $\lambda(r, r+1)$ = Likelihood ratio test statistic
- r = Cointegration vectors
- T = Sample size
- λ_r = Estimated value for the i_{th} ordered eigenvalue from the π matrix.

The trace statistic is obtained by examining the trace of the matrix and is derived from the likelihood ratio test. The values for the trace statistic can be determined using the following equation:

$$\lambda_{trace}(r) = -\Gamma \sum_{i=r+1}^{n} ln\,(1 - \lambda_{r+1}) \qquad [Eqn\ 9]$$

The trace statistics' null hypothesis states that the number of cointegrating vectors is at most less than or equal to r. Once α and β are estimated, the Johansen method enables testing of specific hypotheses related to economic theories and predictions by permitting the inclusion of possible linear restrictions. Finally, the Johansen method tests for linear restrictions in the cointegrating vector as suggested by Hjalmarsson and Osterholm (2010), which enhances the reliability of the test.

3.3.2.4 Vector Error Correction Model (VECM) estimation technique

The estimation technique used in the study is the Vector Error Correction Model (VECM). VECM is a suitable method for modelling cointegrated variables, providing

insights into short-term dynamics and long-term equilibrium relationships. Once cointegration is detected in the VAR model, the VECM can be estimated to show both long-run equilibrium and short-run dynamics. The VECM is an extension of the cointegrated VAR system that captures the adjustments toward equilibrium in response to short-term shocks. The equation below can be used to estimate the dynamics:

$$\Delta Y_t = \beta_1 \Delta X_t + \beta_2 (Y_{t-1} - \gamma_{xt-1}) + \varepsilon_t \qquad [Eqn\ 10]$$

Where:

- β_1 = Short-run relationship between the variables
- $xt-1$ = Coefficient for long-run relationship between variables X and Y
- $Y_{t-1} - \gamma_{xt-1}$ = Error correction term
- γ = Long run relationship between X and Y

The error correction model suggests that variable Y will change between $t-1$ and t due to variations in the independent variable X during the same period. Any changes in variable Y will partially correct any existing disequilibrium at time t. To assess error correction, it is necessary to scrutinize the coefficients that relate to the error correction terms, specifically those that correspond to the initial variable in the cointegrating equation (Kanioura and Turner, 2003). This involves analysing the relationship between the variables and their long-run equilibrium values, and how they adjust back to equilibrium after a shock or disturbance.

In conclusion, the VAR model is useful for capturing short-term relationships between variables, while the VECM is better suited for testing long-term relationships. For example, when a shock occurs, VAR is the appropriate tool. The testing process for unit root, co-integration, VAR, and VECM is sequential. In this study, the unit root analysis indicated that all variables exhibit an I(1) characteristic of integration. Therefore, the study proceeded to test for co-integration. Once co-integration was confirmed, indicating a long-term relationship between the variables, the analysis

moved to VECM. However, if co-integration was not confirmed, VAR would be used as an alternative approach.

3.3.2.5 Diagnostic Testing

The purpose of the diagnostic tests assessments is to create test statistics that can diagnose and evaluate the accuracy of model specification, as described by Broemeling (1993). The study used several diagnostic tests to validate the model's accuracy. Specifically, the Jarque-Bera test statistic was employed to evaluate whether residuals conform to a normal distribution using the normality tests for residuals. The Breusch-Godfrey Serial Correlation LM Test was utilised to check for serial correlation within the residuals. Additionally, the Heteroscedasticity Test: ARCH was used to identify heteroscedasticity within the residuals.

In addition to its predictive purpose, model stability is crucial for econometric inference, according to Hansen (1992). Therefore, the stability of a parametric econometric model's parameters is critical to its stability. If a relevant variable is left out, the model may become unstable. As a result, the study included a stability test to ensure that the chosen functional form remains linear. The Ramsey reset test, also known as the regression specification error test, was utilised in the study to fulfil this objective. These diagnostic tests collectively contribute to the econometric model's robustness and reliability.

3.4 Data Sources, description, justification of variables

A correlational design was utilized in the study to investigate the relationship between the Gini coefficient and the control variables. Instead of primary data, secondary data will be used to examine the determinants of income inequality from 1975 to 2017. The Gini index, government spending on social grants, gross savings, population growth rate, and economic growth are the selected variables for analysis. The purpose of including these variables is to explore their relationship with income inequality.

The data for the Gini index was sourced from the Standardized World Income Inequality Database (SWIID). The World Bank's World Development Indicators (WDI)

were used to obtain data on government spending on social grants, gross savings, population growth rate, and economic growth. The rationale behind selecting these variables is rooted in the desire to analyze the determinants of income inequality comprehensively. By including social grants, gross savings, population growth rate, and economic growth, the study aims to capture various factors influencing income distribution within South African society. The interplay of these variables can provide insights into the complex dynamics shaping income inequality patterns over the study period of 1975 and 2017.

In determining the duration of the study, the quality and availability of data was considered. The SWIID Database was chosen given that it provided consistent time-series data as compared to other data sources covering the period between 1975 and 2017. Additionally, the SWIID database is known for supplying consistent data on income inequality across countries, using uniform data collection methods and reporting formats to enhance comparability over time and across regions.

Table 2:Definitions, measures, sources, expected signs of coefficients, period

Variable	**Definition**	**Expected Sign**	**Source**	**Period**
Income Inequality	Gini Coefficient	Not applicable	Standardized World Income Inequality Database (SWIID)	1975 to 2017
Social Grants	(% of the national budget) includes government spending on social grants for the elderly, children, and disabled individuals.	Negative	World Bank World Development Indicators (WDI)	1975 to 2017
Gross Savings	Represent the difference between disposable income and consumption.	Negative	World Bank World Development Indicators	1975 to 2017

			(WDI)	
Population Growth Rate	Represents the total percentage change in population, assuming a constant growth rate between two points in time.	Indeterminate	World Bank World Development Indicators (WDI)	1975 to 2017
Growth Rate	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.	Indeterminate	World Bank World Development Indicators (WDI)	1975 to 2017

3.5 Chapter Summary

The primary aim of the study is to identify the factors contributing to income inequality in South Africa, explicitly examining how government spending on social grants influences income inequality. Chapter 3 provided a comprehensive overview of the econometric techniques and models, complete with mathematical equations, employed in the study to achieve its objectives. Alongside the Vector Error Correction Model (VECM), the study utilised augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests to assess stationarity. The Johansen cointegration methodology was applied to examine the long-term relationships between the relevant variables. In Chapter Four, a more in-depth data analysis will be conducted using the analytical techniques discussed in this chapter to explore the socio-economic determinants of income inequality in South Africa.

CHAPTER 4

EMPIRICAL EVIDENCE: RESULTS AND INTERPRETATION

4.1 Introduction

Chapter Four presents econometric analyses and empirical findings based on the specifications and estimation techniques presented in Chapter Three. The chapter aims to empirically analyse the impact of government spending on social grants, gross savings, population growth rate, and economic growth on income inequality in South Africa, which is the study objective number three (3). To achieve this objective, VECM bounds testing is used. Section 4.2 provides detailed descriptive statistics about the variables used in the study. Section 4.3 presents the results of the econometric analyses and empirical findings concerning the last objective of the study. Section 4.3 is divided into four subsections. These include the results of the unit root test of all variables utilized, the results of the VECM cointegration, and empirical evidence from VECM-based models. The chapter concludes with a post-estimation diagnostic test in subsection 4.4. As a conclusion to this chapter, section 4.5 is presented.

4.2 Descriptive Statistics for the Study

Table 3 exhibits the descriptive statistics for the time series data employed in the study. The data present background characteristics of the dependent and independent variables, which include the Gini coefficient, government spending on social grants, gross savings, population growth rate and economic growth rate.

Table 3: Descriptive Statistics for the Study (1975 to 2017)

South Africa	GINI	GS	POPG	RGDP	SG
Mean	2.341628	18.40556	1.894849	44558.76	1.770333
Median	2.010000	17.00704	1.646040	43910.25	1.888067
Maximum	3.910000	30.13734	3.497676	60000.75	2.369546
Minimum	1.350000	13.49738	0.387278	28061.25	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	1916027.	76.12430
Sum Sq. Dev.	28.76199	858.6107	32.83947	4.04E+09	5.780374
Observations	43	43	43	43	43

The descriptive statistics for the variables under consideration are presented in Table 3, offering an organized and summarized perspective of the data for enhanced interpretability (Wooldridge, 2019). The calculated mean Gini coefficient stands at 2.341628, with a corresponding median of 2.010000. This suggests that, across 43 observations, the average Gini coefficient is approximately 2.341628. Notwithstanding, the data exhibits substantial dispersion from the mean, as indicated by the standard deviation of 0.827532. The broad dispersion is likely attributable to noteworthy fluctuations in the Gini coefficient, as demonstrated by the recorded maximum of 3.910000 and the minimum of 1.350000.

The findings reveal a notable positive skewness in the Gini coefficient, with measures of central tendency such as the mean and median values demonstrating a substantial skewness coefficient of 0.593320. Moreover, the data exhibits elevated kurtosis at 1.968487, implying the presence of outliers in the distribution of Gini coefficient values. Given the size of the sample, which is vast by nature and prone to produce unexpected values, these outliers may be the result of natural variation. In this scenario, the analysis ignores the outliers because they are typically part of the data distribution (Frost, 2019).

In terms of the gross savings ratio, the data has 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. The data appears to be "light-tailed" or lacking in outliers, as indicated by the negatively skewed growth rate and social grants indicators of central tendency.

The Jarque-Bera test's null hypothesis states that the residuals are normally distributed, if the p-value is below 0.05, we reject the null hypothesis, suggesting that

the residuals deviate significantly from a normal distribution, implying that the assumption of normality is violated.

4.3 Econometric Analyses and Empirical Results

To avoid spurious correlations during estimation, it is necessary to integrate variables of order one (1) as part of the VECM estimation technique. Accordingly, the first step in this section is to use unit root tests to determine the order of integration. Once the model satisfies the stationarity requirements, the following subsection tests for cointegration. In the following section, an empirical analysis of the results of VECM-based studies is presented from 1975 to 2017. Post-estimation diagnostic tests are presented at the end of the chapter.

4.3.1 Unit Roots Tests

4.4.3.1 ADF Unit Root Test and Lag–Length Selection Criteria

Table 4 displays the ADF Unit root test findings, from which it is clear that the variables are not stationary (have unit root) at level I (0) since the p-values remained negligible (P-value>0.1, 0.05, and 0.01). Nevertheless, at I(1), it can be inferred that the p-values are significant (P-value<0.01 for LSG and P-value<0.1 for all other variables), suggesting that all variables are stationary (no unit root) at first difference without trend. A 5% significance level was used for interpreting the results. The Johansen co-integration test should be used to examine the long-term relationship between the defined variables because all variables are stationary at I(1). If there is at least one co-integrating equation, optimal lags must be found, as the lags are utilized to estimate a Johansen co-integration test. With the same chosen lags, a Vector Error Correction (VEC) model will be estimated. The ideal number of delays to be utilized in the model is two (2), according to the results of the lag-length selection criteria.

Table 4: Dickey-Fuller (ADF) 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 1% significance level.

4.4.3.2 Phillips-Perron (PP) Unit Root Test

Table 5: Phillips-Perron (PP) Unit Root 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)

Table 5 presents the results of the Phillips-Perron (PP) unit root tests for the variables used in the study. The PP test, like the Augmented Dickey-Fuller (ADF) test, is used to assess whether a time series is stationary or not.

The results show that all five variables (LGINI, LGS, LSG, LPOPG, and LRGDP) are non-stationary in their levels (original form) as indicated by the high p-values (greater than 0.05). However, after taking the first difference of each variable, they all become stationary as the p-values are now very small (less than 0.05). These findings align with the results of the ADF test presented in Table 4, confirming the non-stationarity of the variables in their levels and their stationarity after first differencing. This consistency strengthens the conclusion that these variables are indeed I(1) and justifies the subsequent use of the Johansen cointegration test and the Vector Error Correction Model (VECM) in the analysis.

To ensure the model assumption of linearity between the dependent and independent variables is upheld, scatterplots were generated to visually assess the relationship. Visual inspection of these scatterplots indicated a predominantly linear relationship

between the variables, supporting the appropriateness of the Vector Error Correction Model (VECM) for the data. The detailed results of this linearity check are presented in Appendix A.

4.3.2 Johansen Co-integration Test

The next step is to estimate a Johansen co-integration test to see if there is a long-run link between the designated variables because the study's variables are stationary at I(1). A constrained VAR (VECM model) should be calculated if there is proof of a long-term relationship between the chosen variables (Brooks, 2014). Nonetheless, an unlimited VAR will be computed in the absence of any indication of a long-term association between the targeted variables (Brooks, 2014).

Table 6 shows the Johansen co-integration findings. The p-values of the Trace and Max-Eigen test statistics are significant at the 5 percent 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 co-integrating equation. It follows that there is a long-term link between the variables since this suggests that there is only one co-integrating equation. Consequently, the null hypothesis is rejected.

Table 6: Johansen Co-integration 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.

4.3.3 Empirical Analysis of Vector Error Correction Model (VECM) Results (1975 to 2017)

The next stage is to use the Vector Error Correction Model to determine the dynamics of the short- and long-term relationships since the long-term relationship between the variables has been proven to exist. While allowing for short-run adjustment processes, VECM limits the endogenous variables' long-term behaviour to converge to their cointegrating relationships. Since VECM is a suitable model for measuring the correction from past periods' disequilibrium, it is required. Any short-term oscillations between the variables will result in a stable long-term association between them, according to a negative and significant coefficient of the VECM.

Table 7 shows the long-term link between the study's variables. The long-term relationship between income inequality (LGINI) and the explanatory variables (LSG, LGS, LPOPG, and LRGDP) is shown by the cointegrating equation (1). A positive long-run link between the dependent variable and its explanatory factors is indicated by coefficients with negative values, whereas coefficients with positive numbers indicate a negative long-run relationship. A negative long-term link between the Gini coefficient and government spending on social grants, gross savings, population growth rate, and annual GDP growth is shown by the cointegration equation (1).

A stable long-term equilibrium is indicated by the considerable error correction term between zero and negative. Given that the study's error correction term is -0.063277, the cointegration relationship appears to be steady. There is a 6.33 percent rate of adjustment. This is the rate at which shocks to independent variables bring the Gini coefficient back to equilibrium. It demonstrates that in the short run, 6.33 percent of the difference between income inequality and its equilibrium value is erased. The deterministic trend assumption of the test was to allow for the linear deterministic trend in the data at trend 4, Intercept, and trend in CE-no intercept in VAR. VECM was performed at one lag length order with two cointegrating vectors. Table 6 presents the findings.

Table 7: VECM Results

Cointegrating Equations	Cointegration Equation (1)
LGINI(-1)	1.00000
LPOPG(-1)	1.79379 (0.2980) [6.0175]
LSG (-1)	4.227135 (0.70046) [6.03477]
LRGDP(-1)	8.164157 (1.38689) [5.88667]
LSG(-1)	0.484162 (0.53179) [0.91044]
C	-101.4435

Error Correction Model	D(LGINI)	D(LPOPG)	D(LSG)	D(LGS)	D(LRGDP)
Cointegration Equation 1	-0.063277 (0.01976) [-3.20208]	0.222221 (0.11462) [1.93870]	-0.083515 (0.06697) [-1.24715]	-0.121575 (0.05430) [-2.23882]	-0.024613 (0.01096) [-2.24549]

Below is a detailed discussion of the study's findings regarding objective three, which involves the empirical analysis of social grants, gross savings, population growth rate, and economic growth on income inequality.

4.3.3.1 Social Grants and Income Inequality

According to the results presented in Table 7, income inequality is negatively impacted by government spending on social grants, which is statistically significant at 1%. It is expected that an increase in government spending on social grants will lead to a decrease in income inequality in the long run due to the negative relationship

between the two. These findings are consistent with existing studies and theoretical frameworks such as the Keynesian theory, which emphasizes the role of the state in reducing income inequality through government expenditure and taxes. The permanent income hypothesis and the relative income hypothesis also suggest that government expenditure on social security programs can help to reduce income inequality. The results are in line with previous empirical studies such as Anderson *et al*. (2017), Sánchez and Pérez-Corral (2018), Anderson *et al*. (2017), and Woolard *et al*. (2015). This study rejects the null hypothesis of no relationship between government spending on social grants and income inequality.

4.3.3.2 Gross Savings and Income Inequality

The study indicates that gross savings have a significant negative impact on income inequality with a 1% level of significance. The study's results were as expected and are consistent with other existing studies that have also shown that gross savings have a negative effect on income inequality both theoretically and empirically. The theoretical studies that support the findings are Yun *et al*. (2023), Dusenberry (1949), and Friedman (1957). Similarly, empirical studies such as Yildirim (2020) and Deniz and Ozturkler (2010) have also found a negative relationship between gross savings and income inequality.

4.3.3.3 Population Growth Rate and Income Inequality

The results showed that the population growth rate coefficient at 1% was statistically significant and, over time, had a favourable effect on income inequality. It was suggested that as the population grew, income inequality would eventually rise as well. The reason population growth has a positive effect could be that, if state resources do not increase along with the population, spending on social programs, health care, and education would leave the population with fewer resources. This would put a strain on society and ultimately lead to a rise in income inequality. These results were in line with earlier research by Ullah *et al.* (2021), Nwosa (2019), and Anyanwu (2016), which discovered that long-term increases in population lead to increases in income inequality.

In Africa, the relationship between population growth and income inequality is complex and characterized by a variety of theoretical perspectives and empirical findings (Anyanwu et al., 2016; Akadiri & Akadiri, 2018). The results of studies conducted in Nigeria (Nwosa, 2019; Ullah et al., 2021) and Southern Africa (Anyanwu, 2016) have indicated a positive association between population growth and income inequality. Based on Fayissa and Nsiah's (2013) study of Sub-Saharan Africa, the study demonstrates that population growth has a significant positive impact on income inequality, especially in countries with low human capital and weak institutions. In contrast, Anyanwu and Erhijakpor's (2010) panel study of African countries suggests a negative relationship, indicating that high population growth may result in a reduction in wages because of increased labour supply. The study contributes to the existing literature by highlighting the diverse nature of the relationship between population growth and income inequality in Africa, emphasizing the importance of considering contextual factors such as institutional quality and human capital levels in understanding this complex dynamic.

4.3.3.4 Economic Growth and Income Inequality

In the long run, income inequality would be negatively affected by the annual growth of GDP coefficients at 1%, according to the study results. As expected, the results were consistent with what was expected. Several studies have supported these findings, both theoretically (Kuznets, 1955) and empirically (Mdingi and Ho, 2023, Jianu *et al.*, 2021, Vo *et al.*, 2019; Royuela *et al.*, 2019; and Caraballo *et al.*, 2017).

4.4 Diagnostic Test Results

Tests for normality, heteroscedasticity, and serial correlation were among the diagnostic procedures carried out to determine whether the model utilized in this investigation reasonably fit the data. Performing diagnostic tests is an essential part of the 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). The results of the diagnostic tests conducted for this study indicate that the model is quite well described. Table 8 shows that the residuals have a combined probability of the

Jarque-Bera of 0.2691 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-sq probability of 0.3445.

Table 8: Diagnostic Tests

Test	Null Hypothesis	t-statistics	Probability	Conclusion
Jarque-Bera (JB)	There is a normal distribution	2.625684	0.2691	Fail to reject the null hypothesis.
Langrage Multiplier (LM)	No serial correlation	24.48312	0.5015	Fail to reject the null hypothesis
White (CH-sq)	No conditional heteroskedasticity	339.7096	0.3445	Fail to reject the null hypothesis

4.5 Chapter Summary

With the use of the VECM testing procedure, the study empirically examines determinants of income inequality in South Africa, as well as the effects of government expenditure on social income inequality. The purpose of this chapter was to review empirical findings on macroeconomic factors that affect income inequality by the objectives of this study. As part of the model, the study included control variables, such as government spending on social grants, gross savings, population growth rate and annual growth of GDP. Furthermore, their impact on income inequality was tested using the Gini coefficient.

The descriptive statistics of the variables used in this study are provided in section 4.2 of this chapter. To determine whether the variables were stationary, the unit root test was performed in section 4.3. We found that the variables were integrated into order one, I(1). A long-run relationship was estimated according to sub-section 4.3.3 following the stationarity test. Based on the results, cointegration was observed between the variables. It was then necessary to use the Vector Error Correction

Model to establish the short-run and long-run dynamics of the relationship since the long-run relationship had already been established between the variables. Since the VECM is a suitable model for measuring the correction from past disequilibrium, it was necessary to employ it. When the VECM coefficient is negative and significant, it indicates that there will be a stable long-run relationship between the variables regardless of any short-term fluctuations.

In this study, the results indicate that the Gini coefficient has a negative long-run relationship with government spending on social grants, gross savings, and annual growth of GDP. The relationship between population growth rate and income inequality is positive. The significant error correction term of -0.063277, which is between zero and negative suggests that long-run equilibrium is stable. Statistical significance is indicated by the negative error correction term in this study, which indicates a stable and statistically significant cointegration relationship. Tests of diagnostics and stability conducted after estimation were successful.

CHAPTER 5
CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

The study on determinants of income inequality in South Africa is concluded in this chapter, with a focus on government socioeconomic spending. A synopsis of the study is provided in Section 5.2, followed by a summary of the empirical findings in Section 5.3. Policy recommendations are presented in section 5.4, and section 5.5 concludes with the limitations of the study and suggested areas for future research.

5.2 Summary of the study

The determinants of income inequality with a specific focus on government socioeconomic spending in South Africa have been examined in this study. Three specific objectives were pursued to achieve this. Firstly, theoretical explanations of addressing income inequality were reviewed. Secondly, empirical findings regarding the social economic determinants of income inequality were investigated. Lastly, the impact of social grants, gross savings, population growth rate, and economic growth on income inequality from 1975 to 2017 in South Africa were compared and analysed.

The study's contributions to the existing literature on income inequality in South Africa are unambiguous. The findings provide a valuable and much-needed perspective on this socioeconomic issue, shedding light on the complexities of the problem and offering insights that can inform future policy decisions. Firstly, the effects of government socio-economic spending on income inequality are empirically investigated, thus adding to our understanding of the factors driving income inequality in the country. Secondly, the relationship between income inequality and policies aimed at reducing it through income redistribution is explored. Thirdly, the time span of the study is extended as compared to previous research, using annual data from 1975 to 2017, from a larger sample size of 43, which has been shown to improve statistical power in hypothesis testing and increase the reliability and validity of the study's finding, as demonstrated by Kim and Park (2019).

Chapter two addressed the first and second objectives of the study. The first study objective was achieved by providing a critical assessment of the theoretical framework regarding the determinants of income inequality in Chapter 2, section 2.1. The Keynesian theory best explains the relationship between government spending and income inequality, according to the study. The continuing applicability of this theory in the study can be attributed to its emphasis on the role of the government in economic activity. Market distortions and underdevelopment in all its forms cause income inequality, according to this view. The study considers the views of Keynesian theory, which emphasizes the role of the state in the distribution of the enclave. On the other hand, the Kuznets hypothesis maintains that inequality often rises in the early stages of economic development and falls in the later stages. The study expected GDP and per capita income to have an inverted U relationship that refutes Keynes' claims. Lastly, the permanent income hypothesis and relative income hypothesis argue that an increase in government spending on social security programs will reduce income inequality. There are theoretical discrepancies among various schools of thought regarding the relationship between income inequality and the variables used in our econometric model, such as social grants, gross savings, population growth rate, and economic growth. Consequently, different schools draw different conclusions.

The second study objective was addressed in detail in Chapter 2, section 2.2. It was found that there is no consensus among the different scholars based on the empirical literature. Empirical evidence provided by the study revealed mixed results of a positive, negative, and no relationship between income inequality and social grants, gross savings, population growth rate, and economic growth. The differences observed can be attributed to various reasons, such as the appropriateness of the estimation methods, the length of time under the study, the data frequency, and the variables under the study.

The methodology used in the study is explained in Chapter Three. The Vector Error Correction Model (VECM) was chosen as it adjusts for short-run changes of variables and deviations from equilibrium between variables. The variables used in the study were the Gini index, social grants, gross savings, population growth rate and economic growth. The data covered the period 1975 to 2017, and the Gini Index was

collected from the Standardized World Income Inequality Database. Social grants, gross savings, population growth rate and annual GDP growth rate were sourced from the World Bank's World Development Indicators (WDI).

In Chapter Four, the third objective of the study is addressed, which is to analyse the impact of social grants, gross savings, population growth rate, and economic growth income inequality. The chapter presents the econometric analyses and empirical findings derived from the data used in the study. Descriptive statistics of the variables used are presented. To avoid spurious correlations during estimation it was necessary to integrate variables of order one (1) and satisfy the stationarity requirements, ADF unit root tests were conducted. The long and short-term relationships between the dependent variable and the explanatory variables are tested using the VECM estimation technique. Diagnostic tests were performed to assess if the model used in this study reasonably fits the data, which included testing for normality, heteroscedasticity, and serial correlation. The diagnostic tests showed that the model used in the study is reasonably well-specified.

5.3 Summary of the empirical findings and contribution

The main empirical findings were revealed by the study:

5.3.1 Income inequality is negatively associated with government spending on social grants. As such It is expected that an increase in government spending on social grants will lead to a decrease in income inequality in the long run due to the negative relationship between the two variables.

5.3.2 The study found that gross savings have a significant negative impact on income inequality with a 1% level of significance. The study's results were as expected and are consistent with other existing studies that have also shown that gross savings have a negative effect on income inequality both theoretically and empirically.

5.3.3 The presented results show that the population growth rate coefficient at 1% was statistically significant and had a positive impact on income inequality in

the long run. This implies that an increase in population would result in an increase in income inequality in the long run.

5.3.4 The empirical results of the study showed that in the long run annual growth of GDP has a negative impact on economic growth and the coefficients are statistically significant.

The study makes a significant scientific contribution by combining theoretical insights, empirical evidence, a longer time span, a larger sample size, and methodological rigour to provide a better understanding of the South African income inequality challenge. Considering the present results, the scientific contribution of the study can be described as follows:

- **Government spending on social grants**: The study contributes to the literature by demonstrating that government spending on social grants has a statistically significant negative impact on income inequality. The finding is consistent with existing studies (Sánchez and Pérez-Corral, 2018, Anderson *et al*., 2017, and Woolard *et al.*, 2015) and theoretical frameworks, particularly Keynesian theory, which stresses the role of the state in reducing income inequality through its expenditures and taxes. With the rejection of the null hypothesis, it is now empirically demonstrated that increased government spending on social grants is associated with a decrease in income inequality.

- **Gross savings**: The study confirms the findings of theoretical studies such as Yun *et al*. in 2023, Dusenberry (1949) and Friedman (1957) which have shown a substantial negative effect on income inequality due to gross savings. Based on the empirical evidence provided by this study, higher gross savings are associated with lower income inequality, and this is consistent with studies by Yildirim (2020) and Deniz and Ozturkler (2010). As such, these findings contribute to a more robust understanding of the relationship between gross savings and income distribution.

- **Population growth rate**: The study findings indicating that population growth has a statistically significant positive impact on income inequality, suggest that income inequality tends to increase in the long run as the population grows. The study highlights the potential strain on state resources and social programs as factors contributing to this relationship, thereby providing greater depth to our understanding of the population growth-incoming inequality nexus. The consistency of these findings with previous studies by Ullah *et al*. (2021), Nwosa (2019), and Anyanwu (2016) further strengthens the scientific contribution of the study.

- **Annual GDP growth**: The study concludes that annual GDP growth has a statistically significant negative impact on income inequality over the long term. The results of this study are in line with the theoretical expectations by Kuznets and are supported by several empirical studies such as (Mdingi and Ho, 2023, Jianu *et al.*, 2021, Vo *et al.*, 2019; Royuela *et al*., 2019; and Caraballo *et al*., 2017). The consistency of these findings contributes to the overall understanding that higher economic growth is associated with reduced income inequality. The study provides additional evidence to support the idea that economic development can have positive implications for income distribution.

5.4 Recommendations for Policy

The study's findings have significant implications for South African policymakers, emphasizing the urgent need to address income inequality through targeted interventions. The evidence suggests that the government plays a crucial role in mitigating income inequality and promoting economic development. The study's findings support the following policy recommendations for South Africa:

5.4.1 The government should increase its expenditure on social grants and consider introducing new grants targeted at vulnerable groups. The effectiveness of existing social security policies should also be evaluated and reformed to better address the needs of disadvantaged populations and contribute to reducing income inequality.

5.4.2 Policymakers should focus on creating an environment that stimulates employment growth. This can be achieved through investments in skills development programs, vocational training initiatives, and support for entrepreneurship.

5.4.3 The government should encourage both individuals and businesses to save by implementing policies that provide incentives for saving. This can contribute to greater economic stability and resilience, which can help to mitigate income inequality in the long term.

5.4.4 The government should consider implementing policies aimed at managing population growth rate, such as promoting family planning and reproductive health programs. These initiatives can help to alleviate the pressure on resources and social services, contributing to a more equitable distribution of income

5.4.5 The government should put in place a system to regularly assess the impact of the implemented policies. This will allow for necessary adjustments and ensure that policies remain effective in addressing the dynamic nature of income inequality in South Africa.

5.5 Limitations of the study and suggested areas for future research

Some limitations are posed on the study due to the lack of relevant data and materials on income inequality. The availability of the data restricts this study to a particular period. The study covers the period 1975 to 2017, which results in a five-year time lag in terms of the data since the study concludes in 2023. Despite various efforts to obtain relevant data from different sources, the limited amount of data on income inequality in South Africa constrained the study. It is suggested that future research may examine whether the results of the study will change if the data is available over a longer period, as the data becomes available.

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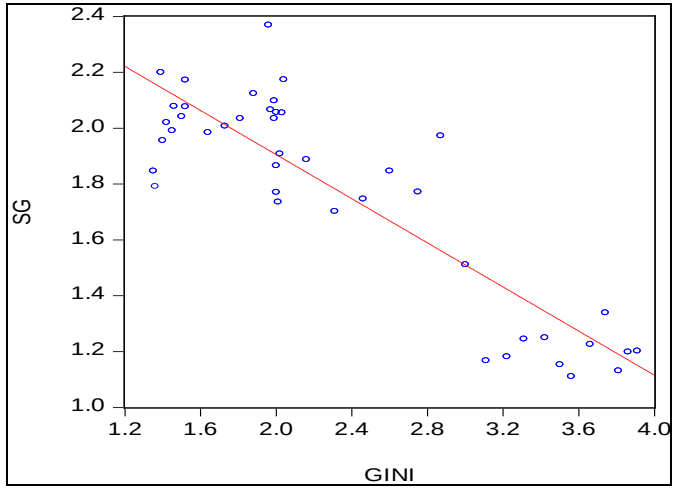
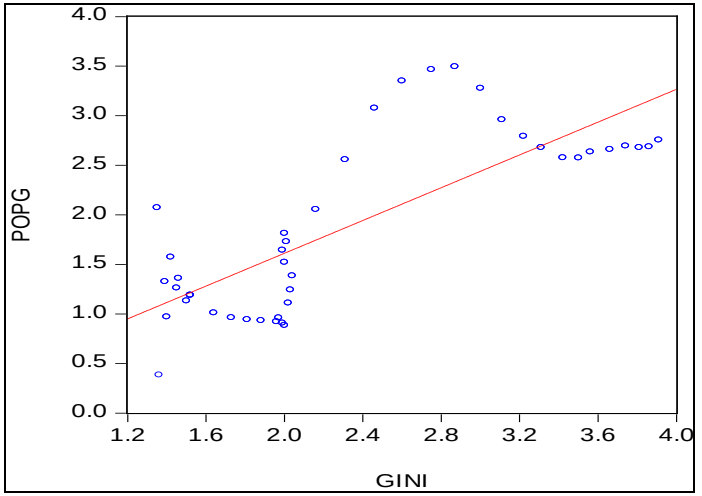
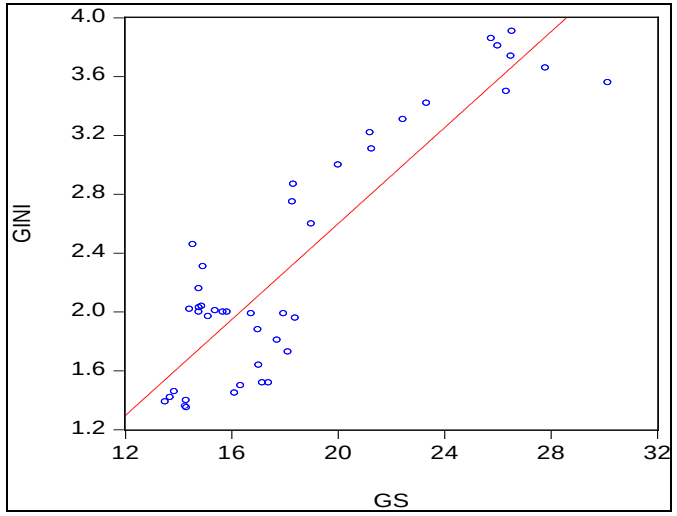
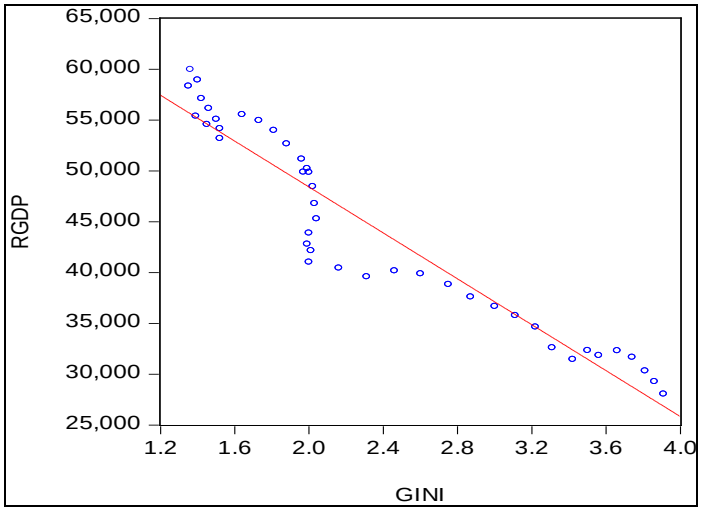
APPENDIX A: LINEARITY TEST RESULTS









APPENDIX B: EMPIRICAL LITERATURE REVIEW SUMMARY

Table 9: Studies that illustrate the relationship between government spending on social grants and income inequality

Author(s)	Region/Country and Period	Index of Income Inequality/Independent Variable	Methodology	Empirical Results
Alamanda (2020)	❖ Indonesia panel data from 33 provinces ❖ 2005 – 2017	❖ Gini coefficient	❖ Seemingly Unrelated Regression (SUR)	❖ Positive relationship between government social spending and income inequality
Anderson *et al.* (2017)	❖ 19 low- and/or ❖ middle-income countries, as defined by the World Bank.	❖ Gini coefficient	❖ Meta-regression analysis	❖ Negative relationship between government social spending and income inequality
Balseven and Tugcu (2017)	❖ . 17 developing and 30 developed countries between 1990 and 2014	❖ Gini coefficient	❖ Panel data regression models	❖ Negative relationship between government social spending and income inequality
Juodsnukis (2020)	❖ OECD countries ❖ 2007- 2016	❖ Gini coefficient	❖ Panel regression models	❖ Positive relationship between government social spending and income inequality
Sánchez and Pérez-Corral (2018)	❖ 28 European Union Member States ❖ 2005-2014	❖ Gini coefficient	❖ Panel regression models	❖ Negative relationship between government social spending and income inequality
Ulu (2018)	❖ 21 OECD ❖ 2004 – 2011	❖ Gini coefficient	❖ Panel regression models	❖ Positive relationship between government social spending and income inequality
Verberi and	❖ 30 OECD	❖ Gini coefficient	❖ OLS method	❖ Positive relationship between

Yaşar (2021)	countries ❖ 2009 – 2015			government social spending and income inequality
Yang (2023)	❖ US county-level panel data ❖ 2011 – 2017	❖ Gini coefficient	❖ Panel data analysis	❖ No significant relationship between government social spending and income inequality

Source: Author's own compilation

Table 10: Studies that illustrate the relationship between gross savings and income inequality.
Source: Author's own compilation

Author(s)	Region/Country and Period	Index of Income Inequality/Independent Variable	Methodology	Empirical Results
Tran *et al*., (2020)	❖ Twelve Vietnam Provinces ❖ 2181 rural households ❖ 1970 – 1990	❖ Gini coefficient ❖ Theil index ❖ Palma ratio	❖ Generalized method of moments (GMM)	❖ Positive relationship between income inequality and savings
Yildirim, (2020)	❖ Turkey ❖ 1987 – 2018	❖ Gini coefficient	❖ Autoregressive Distributed Lag (ARDL)	❖ Negative relationship between income inequality and savings
Deniz and Ozturkler, (2010)	❖ Developing countries (1995 – 2006) ❖ Miracle countries (1990 – 2005) ❖ Developed countries (1995 – 2007)	❖ Gini coefficient	❖ Fully modified ordinary least squares (FMOLS)	❖ Positive relationship between income inequality and savings in miracle countries ❖ Negative relationship between income inequality and savings in developed countries ❖ No relationship between income inequality and savings in developing countries
Maaboudi, Fotros, and Nazari (2023)	❖ Iran ❖ 1989 – 2020	❖ Gini coefficient	❖ Mixed data sampling approach	❖ Positive relationship between Income inequality and savings
Halim *et al*. (2016)	❖ Bangladesh ❖ 1971 – 2015	❖ Gini coefficient	❖ Quantitative	❖ No relationship between income inequality and savings

Table 11: Studies that illustrate the relationship between population growth rate and income inequality

Author(s)	Region/Country and Period	Index of Income Inequality/Independent Variable	Methodology	Empirical Results
Butler *et al*. (2020)	❖ Rural America ❖ 1980 – 2016	❖ Gini coefficient	❖ Fixed-effect Regression	❖ Negative relationship between population growth rate and income inequality
Sitthiyot and Holasut (2016)	❖ 69 countries ❖ 2012	❖ Gini coefficient	❖ Regression Analysis	❖ Negative relationship between population growth rate and income inequality
Nwosa (2019)	❖ Nigeria ❖ 1981 to 2017.	❖ Gini coefficient	❖ ARDL	❖ Positive relationship between population growth rate and income inequality
Ullah *et al*. (2021)	❖ 64 Belt and Road Initiative countries ❖ 2003 – 2018	❖ Gini coefficient	❖ Generalized Method of Moments (GMM)	❖ Positive relationship rate between population growth and income inequality

Source: Author's own compilation

Table 12: Studies that illustrate the relationship between economic growth and income inequality.

Author(s)	Region/Country and Period	Index of Income Inequality/Independent Variable	Methodology	Empirical Results
Rubin and Segal (2015)	❖ USA ❖ 1953 – 2008	❖ Income share	❖ Univariate analysis	❖ Positive relationship between economic growth and income inequality
Vo *et al.* (2019)	❖ 158 countries ❖ 47 high-income ❖ 45 upper-middle income ❖ 41 lower-middle	❖ Gini coefficient	❖ Granger causality test ❖ System generalized method	❖ Negative relationship between economic growth and income inequality

	income ❖ 25 low income ❖ 1960 – 2014		moments (GMM)	
Jianu *et al.* (2021)	❖ 14 developed EU Member States ❖ 14 developed EU Member States ❖ 2010 – 2018	❖ Gini coefficient	❖ Estimated Generalized Least Squares ❖ Fixed effects method	❖ Positive relationship between economic growth and income inequality in developed EU Member States ❖ Negative relationship between economic growth and income inequality in developing EU Member States
Royuela *et al.* (2019)	❖ 15 OECD countries ❖ 2003 – 2013	❖ Gini coefficient	❖ Pooled OLS ❖ Random effect ❖ IV	❖ Negative relationship between economic growth and income inequality
Caraballo *et al.* (2017)	❖ 112 emerging countries ❖ 1980 – 2014	❖ Gini coefficient	❖ Dynamic panel estimation	❖ Positive relationship between economic growth and income inequality in richer countries ❖ Negative relationship between economic growth and income inequality in poorer countries
Wahiba and Weriemmi (2014)	❖ Tunisia ❖ 1984 – 2011	❖ Gini coefficient	❖ Two-way causality	❖ Positive relationship between economic growth and income inequality
Zungu *et al.* (2021)	❖ 13 SADC countries ❖ 1990 – 2015	❖ Gini coefficient	❖ Panel smooth transition regression (PSTR) model	❖ Positive relationship between economic growth and income inequality
Chude and Chude (2022)	❖ Nigeria ❖ 1981 – 2021	❖ Gini Coefficient	❖ Ordinary least squared (OLS)	❖ There is no relationship between economic growth and income inequality
Nwosa, (2019)	❖ Nigeria	❖ Gini Coefficient	❖ ARDL	❖ Positive insignificant relationship

	❖ 1981 – 2017			between economic growth and income inequality.

Source: Author's own compilation

Table 13: Summary of the empirical evidence resulting from studies on the South African landscape.

Author(s)	Region/Country and Period	Index of Income Inequality/Independent Variable	Methodology	Empirical Results
Schiel *et al.* (2014)	❖ South Africa ❖ 1993 – 2008	❖ Gini coefficient	❖ Income decomposition technique	❖ No relationship between government social expenditure on social grants and income inequality
Leibbrandt *et al.* (2012)	❖ South Africa ❖ 1993 – 2014	❖ Gini coefficient	❖ Income Share	❖ Positive relationship between government social expenditure on social grants and income inequality
Woolard *et al.* (2015)	❖ South Africa ❖ 1994 – 2011	❖ Gini coefficient	❖ Income decomposition technique	❖ Negative relationship between government social expenditure on social grants and income inequality
Zwane *et al*. (2016)	❖ South Africa ❖ 2008 – 2012	❖ Gini coefficient	❖ Fixed effects ❖ Random effects ❖ 2SLS models	❖ Positive relationship between gross savings and income inequality
Anyanwu (2016)	❖ Southern Africa ❖	❖ Gini coefficient	❖ Generalised Method of Moments (GMM)	❖ Positive relationship between population growth rate and income inequality
Niyimbanira (2017)	❖ 18 Mpumalanga municipalities, South Africa ❖ 1996 – 2014	❖ Gini coefficient	❖ Fixed effect and pool regression models	❖ No relationship between economic growth and income inequality

Mdingi and Ho (2023)	❖ South Africa ❖ 1989 – 2018	❖ Gini coefficient	❖ ARDL	❖ No relationship between economic growth and income inequality in the short run ❖ Negative relationship between economic growth and income inequality in the long run
Bhorat and Van der Westhuizen, (2008).	❖ South Africa ❖ 1995 – 2005	❖ Gini coefficient	❖ Distribution neutral measure	❖ Positive relationship between economic growth and income inequality

Source: Author's own compilation