UNIVERSITY OF MPUMALANGA

Examining the Determinants of Human Development Index in South Africa: An Econometric Model

By

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Dissertation submitted in fulfilment of the requirements for the degree **Master of Commerce (MCOM) in Economics** to be awarded at the University of Mpumalanga

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DECLARATION

I, Maponya Lethabo, hereby declare that this is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means of referencing and that this work has not been submitted before for any other degree at any other institution.

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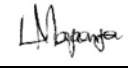
Signature: 

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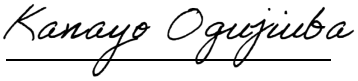
Supervisor: 

Prof Kanayo Ogujiuba

Date: 22 April 2025

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DEDICATION

This study is dedicated to my lovely daughter Oreneile Tebogo Maponya, my beloved parents Tebogo Tubake Maponya and Tsabatsaba Abram Maponya, my sister Letladi Mogale Maponya and lastly my grandmother Georgina Mamogale Maponya. I appreciate the love, courage, advice, and support that you gave me throughout the writing of this dissertation.

ABSTRACT

South Africa's Human Development Index (HDI) has shown a slight decline since 2020, reflecting challenges in sustaining improvements in health, education, and income outcomes. This research the determinants of HDI in South Africa using annual data from 1991 to 2021. The analysis is structured into three types of explanatory variables: economic metrics (GDP, FDI, CPI), demographic metrics (GINI, birth rate, population increase), and policy-related factors (trade openness and ICT accessibility). The Auto-Regressive Distributed Lag (ARDL) model is used to evaluate relationships in the short-run as well as in the long-run. The findings from the ARDL bounds test on cointegration show that there is a long-term relationship between the variables.

Over time, population growth is positively and significantly linked to HDI, whereas trade openness and ICT access show significant negative correlations. Other factors such as GDP, FDI, CPI, GINI, and the fertility rate were determined to have statistically insignificant long-term impacts on HDI. In the short term, economic indicators have a negative and significant relationship with HDI. Demographic and policy-related indicators revealed no statistically significant short-term relations. The findings indicate a varied range of factors influencing human development, with policy elements showing more significant long-term effects compared to short-term influences.

The findings suggest the need for more targeted social investments and institutional reforms, particularly in areas where development inputs do not translate into HDI gains. The study highlights the importance of evaluating both structural and policy dimensions when assessing long-term human development trends in South Africa.
The results suggest a need for more focused social investments and institutional changes, especially in regions where development efforts do not lead to HDI improvements. The research emphasizes the need of considering both structural and policy aspects when analysing long-term human development patterns in South Africa.

KEYWORDS: Human Development Index**,** Economic indicators, Demographic indicators, Policy frameworks, South Africa

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List of Abbreviations

1. HDI:	Human Development Index
2. UNDP:	United Nations Development Programme
3. NDP:	National Development Programme
4. GDP:	Gross Domestic Products
5. GNI:	Gross National Income
6. FDI:	Foreign Direct Investment
7. CPI:	Consumer Price Index
8. SARB:	South African Reserve Bank
9. OECD:	Organization for Economic Cooperation and Development
10. IDI:	ICT development index
11. GRDP:	Gross Regional Domestic Product
12. OLS:	Ordinary Least Squares
13. CO2:	Carbon Dioxide
14. MEM:	Measurement Error Model
15. ARDL:	Autoregressive Distributed Lag
16. VECM:	Vector Error Correction Model
17. PMG-ARDL:	Pooled Mean Group-Autoregressive Distributed Lag
18. R&D:	Research and Development
19. ADF:	Augmented Dickey-Fuller
20. PP:	Phillips-Perron
21. KPSS:	Kwiatkowski-Phillips-Schmidt-Shin
22. WLS:	Weighted Least Squares
23. JB:	Jarque-Bera
24. VIF:	Variance Inflation Factors
25. RESET:	Regression Specification Error Test
26. EU:	European Union
27. SPSS:	Statistical Package for the Social Sciences
28. ACFTA:	African Continental Free Trade Area
29. ICASA:	Independent Communications Authority of South Africa
30. AGOA:	African Growth and Opportunity Act
31. ASGISA:	Accelerated and Shared Growth Initiative for South Africa
32. NEPAD:	New Partnership for Africa's Development

CHAPTER 1: INTRODUCTION

1.1. Background of the study

Human development is defined as "a procedure for enlarging people's choices" with the aim of improving people's lives as well as their well-being. It has several dimensions, such as physical, cognitive, emotional, as well as social aspects (Haan & Rogan, 2014). Human development is an important factor in determining a country's development success. It is critical in the long-term effort to reduce poverty and, as a result, income inequality. As a result, growth-oriented economic development must be accompanied by human development.

One of the crucial tools used for measuring and comparing levels of human development across different countries is the Human Development Index (HDI). Sagar & Najam (1998) cited that since 1990, the United Nations Development Programme has published an annual human development index to assess these factors. Human Development Index (HDI) is a measure that is frequently employed of human development that considers criteria such as life expectancy, education, and income.

According to UNDP (2021) reports, globally the top 3 countries with a very high human development were Switzerland which scored 0.962 in HDI, life expectancy of 84.0 years and expected schooling of 16.5 years; Iceland scoring 0.959 in HDI, life expectancy of 82.7 years and expected schooling of 19.3 years and Hong Kong scoring 0.952 in HDI, life expectancy of 85.5 years and expected schooling of 17.3 years. In terms of African countries, the top 3 countries with a very high human development were Mauritius scoring 0.806 in HDI, life expectancy of 75.9 years and expected schooling of 13.3 years; Seychelles scoring 0.785 in HDI, life expectancy of 70.2 years and expected schooling of 13.9 years; and Egypt which scored 0.731, life expectancy of 75.9 years and expected schooling of 13.8 years. Meanwhile countries like Niger and Chad were amongst the lowest with Human Development, Chad scored 0.400 in HDI, life expectancy of 61.6 years and expected schooling of 7.0 years; Chad scoring 0.394, life expectancy of 52.2 years and expected schooling of 8.0 years.

Moreover, the report stated that BRICS countries specifically Brazil, Russia, and China made significant progress in Human Development; Russia scoring 0.822 in HDI, life expectancy of 69.4 years and expected schooling of 15.8 years; Brazil scoring 0.806, life expectancy of 72.8

years and expected schooling of 15.6 years; and China scoring 0.751 in HDI, life expectancy of 78.2 years and expected schooling of 14.2 years. Meanwhile South Africa and India made a slight progress but are still lagging; South Africa scoring 0.713 in HDI, life expectancy of 62.3 years and expected schooling of 13.6 years and India scoring 0.633 in HDI, life expectancy of 67.2 years. The Human Development Index (HDI) is a composite measure that evaluates a population's overall well-being and development. Since the UNDP introduced HDI 1990, it has gained wide recognition as a measure of human development. (UNDP 1990)

The HDI comprises three core dimensions: life expectancy (health), educational attainment (literacy), and standard of living (measured by GNI per capita) (Dasic et al., 2020). Each of these dimensions captures distinct components of human capability. Health is typically represented by life expectancy, which indicates the combined effects of healthcare availability, nutrition, and disease prevalence on the well-being of the population. Improvements in healthcare systems and preventive measures lead to increased life expectancy, which is a key element of the HDI. Likewise, education is evaluated by average years of schooling and anticipated years of schooling, both of which reflect human capital development. Higher levels of education improve job opportunities, income potential, and socio-economic mobility across generations, thereby directly affecting HDI ratings (Dasic et al., 2020; Bayati et al., 2013).

In the context of South Africa, the education system still encounters considerable difficulties. According to the National Development Plan (NDP, 2013), persistent issues include inadequate financing, infrastructural deficits, and insufficient teacher support and training. Nonetheless, policy measures like the 2012 introduction of the National Development Plan seek to enhance both access to and the quality of education at every level. Govender (2017) categorizes the system into primary education, advanced education and training, and tertiary education. Although fundamental education is mainly financed and overseen by the government, various public and private entities play a role in delivering post-secondary education. Significantly, funding for education in South Africa rose from 5.8% of GDP in 2000 to 6.9% in 2018 (World Bank, 2018), emphasizing the government’s acknowledgment of education as a catalyst for human capital development and inclusive growth. This rise in investment is intended to improve learning outcomes, reduce inequality, and enhance labour market readiness (Brown & Lauder, 1996).

Life expectancy, another key dimension of the HDI, is influenced by various related factors like availability of healthcare services, disease prevention efforts, and the public health system. Bayati, Akbarian, and Kavosi (2013) argue that population health outcomes are central to long-term human development. Nonetheless, South Africa faces a dual challenge of communicable and non-communicable diseases including HIV/AIDS, tuberculosis, and diabetes. Bates, Marais, and Zumla (2015) stress that disparities in access to quality healthcare particularly in rural and underserved areas continue to be a major barrier to enhancing life expectancy. In response, the government has implemented reforms such as the National Health Insurance (NHI) initiative, designed to attain universal healthcare access.

Finally, the third HDI dimension, standard of living, is measured using Gross National Income (GNI) per capita, adjusted logarithmically to account for diminishing marginal returns to income. According to the UNDP Human Development Report (2020), South Africa was ranked 109th out of 189 countries, with a Human Development Index value of 0.709, reflecting persistent structural challenges in health, education, and income distribution. The overall quality of life people has in a country is referred to as the standard of living. According to Stjepanović, Tomić, & Škare (2017) a prominent measure for evaluating a country's economic health is its gross national income (GNI). The concept standards of living are measured by gross national income per-capita. The HDI employs the logarithm of income to demonstrate how income becomes less significant as GNI rises. GNI covers both net foreign income and the total value of goods as well as services produced within the country.

1.2. Problem Statement

South Africa has undergone enormous social and economic transformation after the end of apartheid, despite that the country suffers from extreme poverty, inequality, and unemployment (Nattrass, 2019). In 2019 human development index in South Africa scored 0.736 HDI with an increase of +0.011 and GNI being $13.366 which indicated a high level of Human development. However, in 2020 the country started experiencing an ongoing decrease with HDI scoring 0.727 with a decrease of -0.009 and GNI being $ 12.450, furthermore in 2021 the country’s HDI scored 0.713 with a decrease of -0.014 and GNI being $12.948 (UNDP 2021). Therefore, a decrease in Human development has an inverse impact on sectors such as educational, health, manufacturing, and mining. Educational sector the expenditure on education as a proportion of GDP fell from 14.9% in 2018 to 14.4% in 2019 (OECD,

2020). This decrease in funding created concerns about fulfilling educational standards and striving towards a high-quality education for all. Education funding disparities between rural and urban schools worsen existing inequities, prolonging the downward trajectory of low HDI in poor communities. Moreover, the Centre for Risk Analysis the Department of Basic Education's School Monitoring Survey shows public schools face challenges like inadequate infrastructure, teacher absenteeism, and water and sanitation facilities, causing frustration and resentment and leading to premature student departures.

In terms of the health sector, HIV prevalence among individuals aged 15-49 was high in 2019, at 18.4% (UNAIDS, 2021), regardless of improving antiretroviral medication coverage. High HIV prevalence burdens healthcare systems and reduces life expectancy. This has a direct impact on HDI and creates difficulties for economic growth. Furthermore, the shortage of healthcare practitioners in South Africa is deteriorating due to population growth, the government's plans to implement a monopolistic National Health Insurance system and poor rates of healthcare hinders the development and shorten the citizen’s lifespan. This could jeopardise South Africa's progress in life expectancy, CRA (2023). With the manufacturing sector, in the third quarter of 2019 the sector shed 28,000 jobs indicating a downward trajectory (Stats SA, 2019). Job losses directly result in reduced wages as well as household income for those affected. This can push families into poverty, making it difficult for them to purchase essentials such as food, housing, and healthcare. Lastly the mining sector, according to the Department of Minerals Resources the amount of annual Medical Reports (AMRs) filed to the Department rose by 2.46%, from 975 in 2017 to 999 in 2019 (DMR, 2020). High incidents as well as occupational hazards resulted in fatalities and injuries, negatively harming people's health and HDI.

Looking into the Influence of Economic Indicators, Demographic Factors, and Policy Framework on the inverse impacts of Human Development. In studies undertaken by Nnadi and Soobaroyen (2015) and Andinuur (2013), inflation was found to be an indicator of macroeconomic unpredictability. Rising inflation rates could discourage both potential and existing foreign investors. According to Macro trends (2023) in 2019 CPI was 4.1%, which declined in 2020 CPI being 3.2% then 2021 and 2022 CPI was 4.6% and 7.1% respectively. When CPI rises, purchasing power of households’ decreases, meaning low purchasing power leads to reduce the standard of living for many people because the same amount buys fewer goods and services. This can also lead to a decrease in access to necessities such as

healthcare, food and housing which has a negative impact on Human Development. SARB (2023) in 2018 unemployment rate was 27.1%, then 2020 and 2021 unemployment was 28.7% and 29.2% respectively. An increase in Unemployment leads to income losses for households, which can result in reduce in access to basic needs like education, healthcare food and housing.

Furthermore, long-term unemployment can result in financial instability and poverty, which can have an impact on human development. In 2017 GDP was 0.0%, then 2020 and 2021 GDP was -1.2% and -7.2% respectively, SARB (2023). A decrease in GDP leads to reduced economic activity, which leads to job losses, which will reduce household wages or income. Resulting in higher poverty rates, limited access to necessities, and decreased purchasing power, all that can negatively impact human development. Lower GDP may reduce government spending on education, resulting in fewer resources, reduced teacher salaries, and limited access to quality education, this hinders individuals' long-term opportunities. Lower GDP impacts healthcare by reducing government funding, causing higher mortality rates and poorer health outcomes, and impacting human development and overall health.

Lastly, the Government has been allocating financial resources for citizen well-being programs, initiatives, and services but Human Development is still decreasing. According to Naidoo, Kasiram & Mahomed (2020), overspending of financial resources does not necessarily mean that the funds spent are being used efficiently. If the resources are not being allocated effectively, then the impact may be limited. While previous studies have broadly examined the determinants of human development across countries, few have focused specifically on South Africa using disaggregated dimensions of economic, demographic, and policy indicators. Moreover, limited work has employed time-series econometric techniques such as the ARDL model to capture both short-run and long-run dynamics. This study fills this gap by applying a rigorous empirical strategy to national data covering 1991 to 2021, offering policy-relevant insights specific to South Africa’s developmental context.

1.3. Research Questions

This study will be guided by the following research questions:

i. What is the impact of the determinants of HDI on Human Development?

ii. What is the trajectory and movement between the determinants of HDI [Economic Indicators/Demographic Issues/Policy Framework] and Human Development?

1.4. Research Objectives

The study also seeks to achieve the following specific objectives:

i. To investigate the long-run and short-run impacts of economic indicators (GDP, CPI, FDI), demographic factors (Gini index, fertility rate, population growth), and policy framework variables (trade openness and ICT development) on the Human Development Index (HDI) in South Africa using an ARDL model.
ii. To assess the trajectory and structural shifts in the relationship between HDI and its determinants across different presidential eras (from De Klerk to Ramaphosa), capturing policy transitions and socio-economic dynamics over the period 1991–2021.

1.5. Research Hypothesis

This study presents both research questions and hypotheses to ensure conceptual clarity and empirical testability. The research questions guide the inquiry into the determinants of human development, while the hypotheses translate these questions into statistically testable statements aligned with the ARDL estimation strategy. To pursue the study the following null hypotheses have been formulated:

i. H0 2: determinants of HDI [Economic Indicators/Demographic Issues/Policy Framework] and does not have a significant impact on HDI in South Africa
ii. H0 1: There is significant trajectory between determinants of HDI and Human Development in South Africa.

1.6. Significance of the study

- Several studies have been done in relation to the Determinants of Human Development Index, but not a lot has concentrated on both long-run and short-run relationships amongst the variables. In the South African context not a lot has been done on the determinants of human development, so the study intends to assist with that.

- By examining both the long-run and short-run relationships among the variables, this study aims to provide a comprehensive understanding of the determinants of the Human Development Index. This will contribute to filling the existing research gap and enhance our knowledge of the factors influencing human development.
- Analysing the HDI determinants assists in identifying areas where South Africa has made significant progress as well as areas that require improvement. This information is essential to creating policies that promote growth in both society and the economy. The HDI covers indices for health, education, and income.
- Examining the root causes enables us to measure disparities across the country, which promotes efforts to address and eliminate inequality across various regions and populations.
- Policymakers can use the study's findings to develop targeted initiatives. Understanding the components that influence HDI allows governments to create policies that have an even more tangible and positive impact on overall human development.
- Moreover, studying the elements not only helps to understand the specific challenges that South Africa encounters but also allows for appropriate comparisons with international equivalents, which adds to the development of international communication and collaboration.
- Understanding the factors that influence HDI can help with long-term planning. This helps both governmental and non-governmental organisations define achievable and feasible development goals, promoting long-term improvement.

1.7. Organization/ Outline of the study

Chapter 1 – Introduction
Chapter 2 – Brief Review of Related Literature
Chapter 3 – Theoretical Framework
Chapter 4 – Data and Methodology
Chapter 5 – Findings and Discussion
Chapter 6 – Summary and Conclusion

CHAPTER 2: STYLIZED FACTS

2.1 Introduction

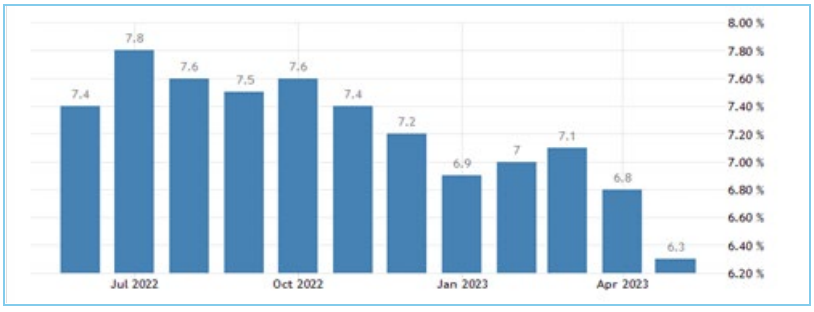
This chapter presents official figures sourced directly from national and international statistical agencies, including StatsSA, the World Bank, SARB, and Statista. These figures have been used in their original form without modification and are cited in accordance with academic and copyright standards. While some figures include data beyond the study's estimation period (1991–2021), they are retained for contextual and policy relevance. All econometric estimations are based solely on the 1991–2021 dataset.

2.2 Economic Indicators

2.2.1 Inflation

In May 2023, South Africa's annual Inflation rate fell to 6.3% from market expectations of 6.5%, a 13-month low. Food and non-alcoholic beverages, transportation, household goods, alcoholic beverages, tobacco, and recreation & culture all experienced a downturn in price. After reaching a six-year high of 5.3% in April, core inflation softened to 5.2% in May. May saw a 0.2% increase in consumer prices, the smallest increase in four months and less than market expectations of a 0.4% increase. The decrease in inflation was driven by lower costs for essential goods and services, such as food and transportation. This decline in consumer prices suggests that the economy may be experiencing a period of reduced demand and economic slowdown.

Figure 1: Annual inflation rate in South Africa, May 2023

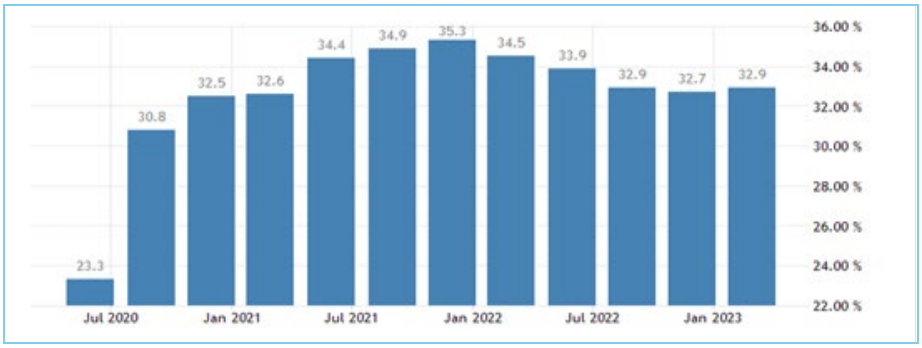


Source: StatsSA (2023)

2.2.2 Unemployment

The Unemployment rate in South Africa rose for the first time in more than a year in Q1, rising to 32.9%. As compared to the rise in employment from 258 thousand to 16.192 million, the number of unemployed people increased from 179 thousand to 7.933 million. The number of workers increased from 437 thousand to 24.125 million. The finance as well as community and social services sectors saw the most job growth. In Q1, the expanded definition of unemployment decreased from Q4's 42.6% to 42.4% in Q1. Despite the increase in unemployment rate, there was a notable growth in the number of employed persons, particularly in the finance and community and social services sectors. However, it is concerning that the expanded definition of unemployment remained high, indicating ongoing challenges in the job market.

Figure 2: Unemployment rate in South Africa, Quarter 1 of 2023

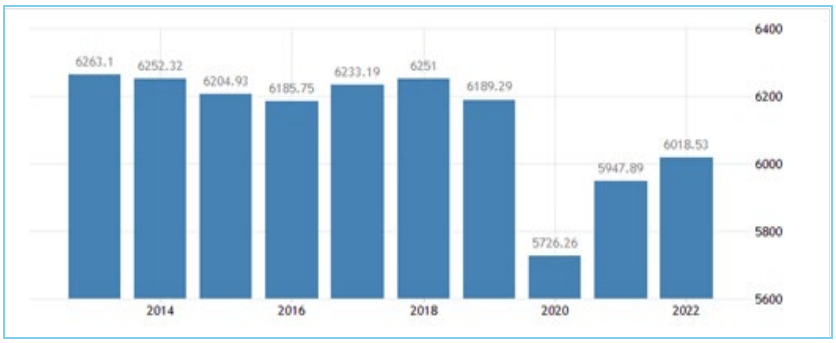


Source: StatsSA (2023)

2.2.3 Gross Domestic Product

The most recent report of South Africa's Gross Domestic Products per capita was 6018.53 US dollars in 2022. South Africa's GDP per capita is equivalent to 48% of the global average. This indicates that South Africa's GDP per capita is relatively low compared to the global average. However, it's important to consider other factors such as income inequality and cost of living when assessing the overall economic well-being of a country.

Figure 3: Gross domestic product (GDP) per capita in South Africa, 2022

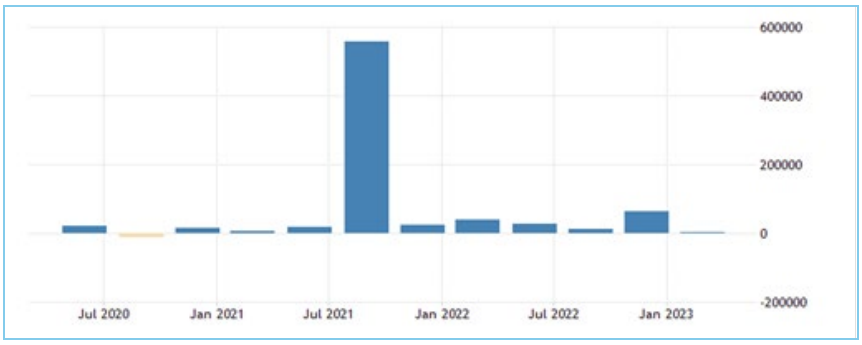


Source: world Bank (2023)

2.2.4 Foreign Direct Investment

According to central bank data, South Africa recorded a small Foreign Direct Investment inflow of ZAR 0.5 billion in the Q1 of 2023, down from a revised inflow of ZAR 64.0 billion in the previous quarter. It was the lowest reading since the third quarter of 2020, owing in part to a share sale by an overseas corporation following the listing of its domestic subsidiary on the Johannesburg Stock Exchange. The decline in foreign direct investment inflow in South Africa during the first quarter of 2023 can also be attributed to the uncertainty surrounding the global economic recovery and ongoing concerns about the country's business environment. This decrease highlights the need for policies that promote a more attractive investment climate to attract greater foreign capital inflows in the future.

Figure 4: Foreign direct investment inflows in South Africa, Quarter 1 of 2023



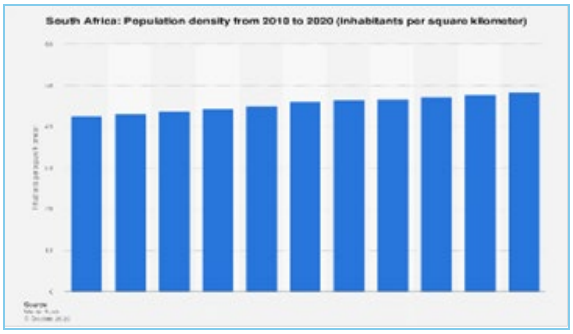
Source: SARB (2023)

2.3 Demographic Indicators

2.3.1 Population

In 2020, South Africa's Population density remained unchanged at 48.47 people per square kilometre. However, in 2020, the population density peaked for the observed period. Population density is the average number of people per square kilometre who reside in each nation or region. It is determined by dividing the total population at midyear by the total area of the land. Population density is an important indicator of the level of urbanisation and development in a country. In the case of South Africa, despite the relatively stable population density, it is crucial to consider regional variations in population distribution, as certain areas may have significantly higher or lower densities than the national average. Additionally, population density can have implications for resource allocation, infrastructure planning, and environmental sustainability.

Figure 5: Population density in South Africa, 2020

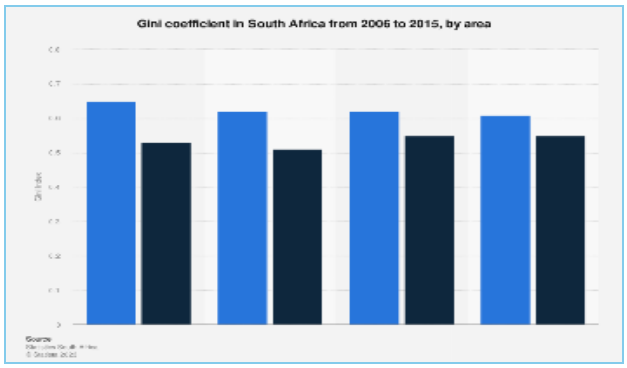


Source: Statista (2023)

2.3.2 Gini Index and Fertility Rate

The Gini coefficient for South Africa in 2015 was 0.65, which indicates a high level of income inequality in the nation, according to the most recent government data from 2019. Rural areas, however, experienced relatively less income inequality. The Gini index, which ranges from zero (perfect income equality) to one (the highest level of inequality), provides data on how income is distributed across a country. The first eight countries with the highest income inequality were all in Sub-Saharan Africa, with Gini indices exceeding 50 points. South Africa has the highest income inequality in the entire world.

Figure 6: Gini coefficient for South Africa, based on most recent data (2015–2019)

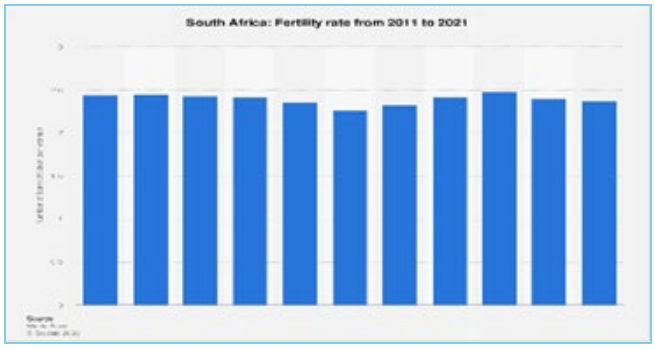


Source: Statista (2023)

2.3.3 Fertility Rate

The total fertility rate in South Africa remained around 2.37 children per woman in 2021, with no significant changes from the previous year 2020. Nonetheless, the fertility rate fell for the second time in a row in 2021. The total fertility rate is the average number of children that a woman of childbearing age (15 to 44 years) is expected to have during her reproductive years. Fertility rates, unlike birth rates, are estimates (like life expectancy) that apply to a hypothetical woman, assuming that recent trends in age-specific fertility will remain constant all through her reproductive years.

Figure 7: Total fertility rate in South Africa, 2020–2021



Source: Statista (2023)

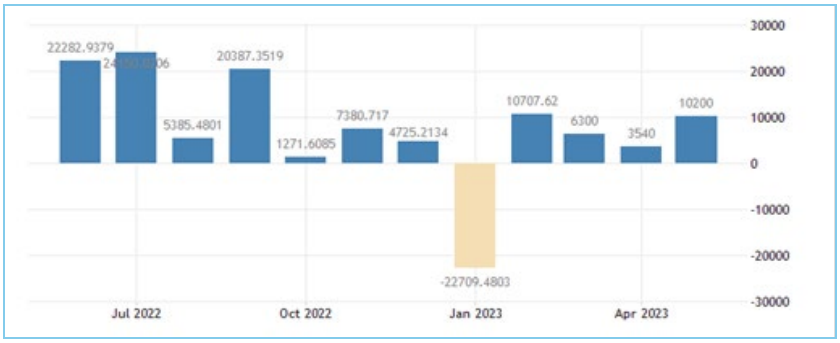
2.4 Policy Framework

2.4.1 Trade

In May 2023, South Africa recorded a trade surplus of ZAR 10.2 billion, far exceeding market expectations of ZAR 6 billion and an upwardly revised ZAR 4 billion in the previous month. Exports increased by 12.3% month on month to ZAR 184.2 billion, boosted primarily by shipments of vegetable products (+28%), machinery & electronics (+24%), vehicle & transport equipment (+17%), precious metals & stones (+13%), and base metals (+9%). Meanwhile, imports increased 8.7% to ZAR 174 billion, led by purchases of wood pulp and paper (+38%), machinery and electronics (+7%), and mineral products (+7%). The increase in exports was driven by strong demand for vegetable products, machinery & electronics, vehicle & transport equipment, precious metals & stones, and base metals. On the other hand, imports saw a slower growth rate, with wood pulp & paper, machinery & electronics, and mineral products being the main contributors to the increase.

Trade openness can influence HDI through its impact on income, employment, and government revenue resources which, if equitably distributed, can enhance access to health and education services.

Figure 8: Monthly trade surplus in South Africa, May 2023. Source: Statista (2023).



Source: Statista (2023)

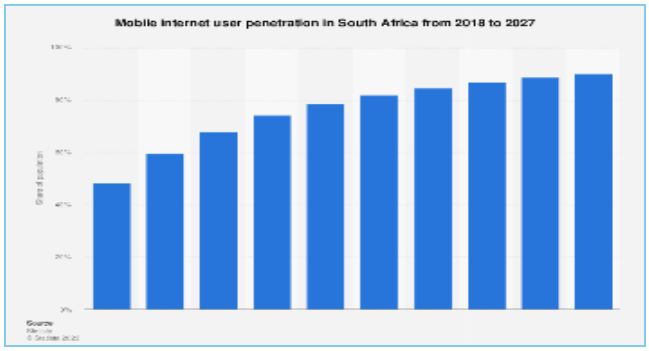
2.4.2 Information and Communication Technology

The IT market spending in South Africa from 2015 to 2020 has increased. Total spending in South Africa is forecast to reach around 303.5 billion South African rand in 2019. The largest

IT market segment in South Africa is communications services, where spending is expected to reach 133 billion South African rand in 2019. This indicates a significant growth in the IT market in South Africa over the past few years. The increasing investment in communications services reflects the country's growing reliance on technology for communication and connectivity. Based on the diagram in 2022, approximately 78.6% of South Africa's population will be using mobile devices to access the internet. This percentage is expected to surpass 90% by the conclusion of 2026. As of 2021, the count of mobile internet users in South Africa is estimated to be nearly 47.8 million.

Information and communication technology (ICT) advances facilitate human development by expanding access to digital education, remote healthcare services, employment platforms, and public service delivery, thereby enhancing multiple dimensions of the HDI.

Figure 9: IT market spending and mobile internet usage in South Africa, 2015–2022



Source: Statista (2023)

2.5 Conclusion

This chapter has presented key stylized facts on macroeconomic, demographic, and policy variables relevant to the human development context in South Africa, with a primary focus on the period 1991 to 2021. While selected figures from 2022 and 2023 have been included to provide contemporary policy relevance, the econometric analysis in subsequent chapters strictly adheres to the 1991–2021 dataset. The descriptive trends reveal structural volatility in inflation and FDI, persistent labour market challenges, high income inequality, and uneven demographic dynamics. These insights substantiate the inclusion of the selected variables in

the model specification. The next chapter builds on this foundation by engaging with the theoretical and empirical literature on the determinants of human development.

CHAPTER 3: THEORETICAL FRAMEWORK

3.1 Overview

This chapter describes the theoretical framework of the research, concentrating on human development in South Africa. The chapter relies on two primary theoretical viewpoints: Post-Development Theory and the Capability Approach. These frameworks provide various yet complementary perspectives on development that extend beyond conventional economic growth metrics. The goal is to comprehend how wider social, political, and institutional influences—particularly those impacting marginalized populations like women with disabilities and informal labourers affect human development results. The discussion starts with a summary of every theory and subsequently details how these viewpoints shape the design and emphasis of the research.

3.2 Post-development theory

Post-Development Theory arose as a reaction to increasing dissatisfaction with conventional development models that equate advancement with Western-style economic expansion. Researchers such as Escobar (1995), Sachs (1992), and Rahnema (1992) contend that traditional development methods frequently overlook local conditions and apply outside solutions that may cause more damage than benefit. From this perspective, development is not a neutral or universally beneficial process, it is shaped by power dynamics, particularly those rooted in colonial histories and global economic inequalities.

In numerous instances, conventional development initiatives have neglected the perspectives of the individuals they intend to assist. In the context of South Africa, this criticism is relevant considering the nation's history of social exclusion and inequality. Post-Development Theory prompts us to consider if development factors like GDP genuinely represent advancements in individuals' welfare. Rather, it emphasizes the importance of local insight, cultural background, and individuals' personal interpretations of what constitutes a good life.

The theory additionally highlights the importance of sustainability and enduring well-being. Development involves more than just economic results it must also take into account if people's lives are genuinely improving, whether communities have a voice in decision-

making, and if future generations will have the necessary resources. This viewpoint advocates that human development should extend past economic measures to incorporate social justice, equity, and environmental sustainability.

3.3 Capability Approach

The Capability Approach, developed by Amartya Sen (1999) and further expanded by Martha Nussbaum, offers a practical framework for thinking about well-being and development. It shifts the focus from income or material resources to what people are actually able to do and be their "capabilities." For example, the ability to live a healthy life, participate in education, and be free from discrimination are all seen as essential aspects of development.

This method supports composite indicators such as the Human Development Index (HDI), which encompasses health, education, and income as its primary components. In contrast to GDP, which measures the economy's size, HDI is more in tune with human welfare. The Capability Approach is helpful in analyzing inequality—having the same income does not guarantee equal opportunities for everyone. For example, an individual with a disability might require extra assistance to attain an equivalent level of well-being as a person without a disability.

In policy context, this method has been utilized to support public funding in education, healthcare, and social safety nets. It also aids in evaluating if institutions and policies are eliminating obstacles to opportunity. In South Africa, where significant portions of the population are still impacted by poverty, inequality, and restricted access to essential services, the Capability Approach provides a framework that underscores these issues while proposing specific areas for intervention.

Table 1: Human Development Theories

S/N	Key Constructs	Measurable Indicators	Theoretical Proposition	Key Constructs
1	Post-Development Theory	Development discourse critique; Subjective well-	Genuine Progress Indicator (GPI); Qualitative methods; Ethnographic studies	Challenges the validity of universal development metrics, arguing that they often reflect Western

		being; Social justice and equity		epistemologies and obscure locally relevant, context-specific forms of well-being. Emphasizes the importance of cultural agency and alternative conceptions of progress.
2	Capability Approach	Capabilities; Functionings; Multidimensionality; Equity in opportunity distribution	Human Development Index (HDI); Multidimensional Poverty Index (MPI); Alkire-Foster Capability Index (ACI)	Advocates for evaluating development through individuals' real freedoms and capabilities, highlighting the need for equitable access to health, education, and economic participation to achieve substantive well-being.

Source: Authors Computation

3.4 Integrating the Theories into the Study

Both theories contribute to how this study understands human development. Post-Development Theory offers a critical perspective, enabling analysis of prevailing development narratives and factors that might not entirely reflect local realities particularly for disadvantaged communities. This is especially relevant when analysing how structural problems such as poverty, inequality, and exclusion influence human development results in South Africa.

Simultaneously, the Capability Approach provides a systematic method to assess advancements by concentrating on what individuals can truly accomplish with the resources and chances accessible to them. It supports the utilization of HDI as the result variable in the analysis and emphasizes the importance of public policy, education, health, and financial inclusion in enhancing well-being.

The study applies both perspectives in selecting and interpreting the variables:

- GDP growth represents economic performance but is critically assessed using Post-Development Theory.
- Employment (EMP), basic education (LF), and digital financial inclusion (DP, CC, FBA) capture aspects of human capital and access to opportunity.

- Inflation (CPI) and disability grant expenditure (DG) reflect constraints or support mechanisms that affect real capabilities.

Together, these frameworks help build a more complete understanding of the conditions that support or hinder human development in South Africa.

3.5 Conclusion

This chapter has introduced two theoretical viewpoints that inform the study's method regarding human development. Post-Development Theory challenges traditional beliefs regarding the definition of development, whereas the Capability Approach offers a practical and human-centered method for assessing it. The integration of both elements enhances the study's capacity to investigate development results in a manner that is both critical and constructive, particularly for demographics that are frequently marginalized in conventional analysis. These theories likewise influence how the empirical findings presented in subsequent chapters are understood.

CHAPTER 4: REVIEW OF RELATED LITERATURE

4.1. Overview

Several studies have examined the determinants of Human Development Index. However there hasn't been much research on these relationships in South Africa, particularly when it comes to the short- and long-term relationships. As a result, for this chapter of the paper, the research emphasizes theoretical and empirical literature. In addition, the study examined the research's similarities, differences, and gaps in the context of the relevant literature.

Objective 1: To determine the impact of the determinants of HDI [Economic Indicators/Demographic Issues/Policy Framework] on Human Development

4.2. Theoretical Literature

4.2.1 Economic Indicators

HDI is an abbreviation for Human Development Index. It was created and introduced in 1990 by Pakistani economist Mahbub-ul-Haq, who was followed by Indian economist Amartya Sen. Human Development Index, or HDI, is a comprehensive measure developed by the United Nations for measuring and ranking the levels of social and economic development in various countries. It compares life expectancy, education, literacy, and standard of living (Shah, 2016). The HDI provides a comprehensive analysis of a nation's development, concentrating on elements like health and education and emphasising the people's well-being. It enables comparisons between nations and helps identify problem areas that can be addressed to raise the general quality of life.

According to Lai (2000) employed the main fundamental component to quantify the temporal changes in the human development of several chosen countries and applied the weighted principal component method on the human development indicators to evaluate and analyse the progress of human development globally. The weighted principal component method, according to Lai's research, offered a thorough and accurate measure of human development, enabling useful comparisons between nations over time. This solution works well for comprehending the dynamics and patterns of global human development. The weighted

principal component technique offers a detailed understanding of progress by considering the significance of indicators in assessing human development. Analysing temporal changes throughout numerous nations enables the identification of trends and patterns, assisting in the direction of policy choices and interventions for the advancement of human development worldwide.

Cherchye, Ooghe, & Van Puyenbroeck, (2008) concentrated on robust human development rankings and demonstrated that all proposed ranking procedures are implementable using linear programming. Finally, they demonstrated how their methodology could be used to improve the statistical robustness of human development country ranking/classification. The authors emphasized the importance of considering multiple dimensions of human development, such as education, health, and income, in their ranking procedures. They argued that their approach allows for a more comprehensive assessment of a country's overall development, which can aid policymakers in making informed decisions to improve human well-being. The authors believe that their methodology offers a more accurate representation of a country's progress and challenges because it considers multiple aspects of human development. Additionally, they made the case that policymakers could use their rankings to pinpoint areas that need special attention and allocate resources, accordingly, resulting in targeted interventions and ultimately better outcomes for the public.

To compare the performance of the nations in terms of human development Lee, Lin, & Fang (2006), created a fuzzy multiple objective data envelopment analysis model using the best weights for the HDI's component indices. Their model aimed to overcome the limitations of traditional data envelopment analysis models by incorporating fuzzy logic, which allowed for the consideration of uncertainty and imprecision in the data. The optimal weights for the component indices of the HDI were determined based on expert opinions and subjective judgments, providing a more comprehensive and accurate assessment of human development across countries. This technique not only increased the analysis's accuracy but also tried to ensure that the weights given to each component index were more accurate representations of their relative significance in assessing human development. Fuzzy logic was included in the framework in order to capture the finer details as well as complexities of the data, producing a more thorough and accurate evaluation of human development.

Yang and Hu (2008) emphasize the regional differences in HDI trends among Chinese provinces, stressing that structural inequalities may continue to exist despite overall improvements in HDI. This perspective is particularly relevant to South Africa, where provinces like Gauteng and Limpopo exhibit differing development paths. Like Grimm et al. (2010), who highlight inequalities in HDI within nations, these results suggest that HDI at the national level should be understood through subnational factors something that is presently not well examined in the South African situation.

Pinar et al. (2013) employed a DEA-based HDI to assess the efficiency of human development across countries and found that GDP per capita had a statistically significant positive impact on composite HDI scores, suggesting that economic growth directly influences income and indirectly supports access to education and health services. Similarly, Lai (2000) found that sustained GDP growth enables public investment in social sectors, which improves long-term human development outcomes. By considering alternative indices constructed from individual components, they were able to identify potential areas for improvement and provide a more comprehensive assessment of development. Using this method, they were able to identify advancement dimensions that the official HDI had failed to adequately capture. The alternative indices also allowed governments to prioritise targeted interventions for improvement by giving them a more detailed understanding of the positives and negatives associated with various facets of human development.

To investigate the relationships between various institutional types and human development, Terzi, Trezzini, and Moroni (2013) created a partial least squares path model. Their study aimed to provide a comprehensive understanding of how institutions, such as political, economic, and social, influence human development outcomes. By utilizing the partial least squares path model, they were able to analyse the direct and indirect relationships between these institutions and various dimensions of human development, such as education, health, and income levels. Their research showed that while economic institutions had a direct impact on income levels, political institutions had a direct significant impact on education and income levels. Furthermore, it was discovered that social institutions' effects on income levels have an indirect impact on health and educational outcomes. In general, their study drawn attention to the intricate interactions between various institutional factors and outcomes for human development.

Tofallis (2013) proposed a two-step automatic-democratic approach to weight setting for the new HDI, which has properties of non-subjectivity, fairness, and convenience. The first step aims to find the most advantageous set of weights for each nation in turn, and the second step evaluates the associated optimal scores on the corresponding indicators to obtain a single weight set. According to the analysis results, the highest weight was placed on the life expectancy dimension. This indicates that Tofallis (2013) considered life expectancy to be the most important factor in determining a nation's HDI. The weight placed on life expectancy suggests that he believed it to have the greatest impact on overall human development. Tofallis highlighted the importance of a population's health and longevity by giving life expectancy the highest weight. This implies that he thought attaining a longer, healthier life was essential to achieving human development. Additionally, he prioritised life expectancy, which suggests that he understood how important it was to improve living conditions and the healthcare system to raise a country's HDI.

Finally, a rise in per capita income can help increase the HDI. Hasan (2013) and Eren et al. (2014) demonstrate that GDP per capita influences the level of development. This improvement will raise people's spending power and, as a result, the quality of education and health care. However, the region's high growth sector does not always translate into equitable affluence for all residents. Furthermore, rapid economic expansion will not result in increased or improved profit distribution for the entire population. Increasing the performance of human development indicators may accelerate the country's transition from developing to developed status. In addition, it is crucial to deal with the problem of income inequality and make sure that the advantages of economic growth are distributed more fairly among all societal members. This can be accomplished by putting in place policies that support inclusive growth and give disadvantaged groups a chance to participate in the economy. By doing this, the nation will be able to improve its citizens' general well-being and truly achieve sustainable development.

4.2.2 Demographic Indicators

Antony & Visweswara Rao (2007), calculated the HDI and Human Poverty Index for each state in India and created a composite index using several multivariate statistical techniques that can account for variations in poverty, health, nutritional status, and standard of living. Their findings revealed significant disparities among the Indian states, with some states

experiencing higher levels of poverty and lower standards of living compared to others. This composite index provides a comprehensive understanding of the factors contributing to these disparities, enabling policymakers to identify and target areas in need of intervention for poverty alleviation and improvement in overall well-being. Policymakers can target initiatives and prioritise resources by analysing the composite index to address the unique needs of states with higher rates of poverty and lower living standards. This strategy makes sure that efforts are concentrated where they will have the biggest impact, which ultimately results in more effective strategies for reducing poverty and better overall wellbeing for all citizens.

Grimm, et al., (2010) conducted an empirical assessment of 32 countries using a simple approach to compute the three components and the overall HDI for quintiles of the income distribution, and they discovered a strong overall negative correlation between the level of human development as well as inequality in human development. This finding suggests that countries with higher levels of human development tend to have lower levels of inequality in human development. It highlights the importance of addressing inequality to improve overall human development outcomes. Cross-national social indices are simply a linear combination of multivariate country level data onto a univariate score, as described by Abayomi & Pizarro (2013). They also suggested a Bayesian approach that produces probabilistic intervals for the point estimates of country scores. This methodology allows for a more comprehensive understanding of progress by considering multiple dimensions simultaneously. The Bayesian approach provides a measure of uncertainty in the country scores, which is crucial for accurate interpretation and decision-making based on the results. Additionally, by including probabilistic intervals, the results are made more transparent and reliable, empowering stakeholders to make decisions knowing exactly how much uncertainty surrounds each country's score.

Wu, Fan, and Pan (2013) used a super efficiency model to assess the consistency of the HDI rankings of 19 OECD countries that were evaluated in 2009. Empirical findings revealed that approximately 75% of the evaluated countries had rather different results in the efficiency rankings and the HDI rankings. This indicates that the HDI rankings may not accurately reflect the countries' overall efficiency levels. These findings suggest the need for a more comprehensive and nuanced approach to measuring and evaluating a country's development and progress. The study also discovered that some nations with high HDI rankings also had

lower efficiency rankings, suggesting that the factors considered for each ranking may not have been the same. As a result, relying solely on HDI rankings may not present an accurate picture of a nation's progress and development. To accurately assess a country's overall performance, a more comprehensive approach that considers a variety of indicators and factors would be helpful.

4.2.3 Policy Framework

Over the last decade, African countries have increased their investments in infrastructure for information and communication technology, or ICT, in order to aid social and economic growth. The availability of ICTs like the web, cell phones, as well as fixed-line telephones strives to provide digital opportunities to all inhabitants in Africa. The United Nations, through UNDP and the World Bank, affirms that such infrastructure will boost the degree of development in poor nations. The UN's HDI (Human Development Index) is a measure of a country's development. The study examined the effects of ICT infrastructure utilisation on human development in southern African countries. According to the empirical investigation, the adoption of these ICTs has a major impact on the well-being of people in southern African countries. (Bankole, Brown, & Osei-Bryson, 2011).

Lastly Nowakowski, (2005) researched the three equally weighted variables, material output life expectancy and literacy comprise the widely used comprehensive measure of development known as the Human Development Index (HDI). Although the level of development for a society is constrained by its resource endowment traditional HDI calculations ignore this. Economic theory suggests that international trade leads to a more efficient use of resources and can contribute to economic development. This paper addresses the question of whether trade contributes only to material development, or whether it impacts life expectancy and literacy rates as well, taking into account differences in endowments and attitudes towards outcomes. The HDI values, with outcome flexibility are calculated for a number of countries using data envelopment analysis, controlling for resource use. Then the impact of trade on different variables is considered. Economies in Central Europe or former Soviet republics, or both, are compared to the rest of the world to identify differences in performance and the influence, if any of trade on performance. Relative to resource endowments, the subset of nations performs well relative to the rest of the world. Trade is seen to have varying influences in the two regions for certain performance variables.

4.3. Empirical Literature

4.3.1 Economic Indicators

Economic indicators like gross domestic product (GDP) per capita, inflation, and foreign direct investment (FDI) are widely regarded as key determinants of human development. These variables affects income levels, government fiscal capacity, and individual access to essential services such as health and education. The empirical literature provides mixed evidence on their impact, suggesting that the effects of economic growth and macroeconomic conditions on HDI may be context-dependent and mediated by structural factors.

According to Arisman (2018), employing panel data from ASEAN nations (2000–2015) and a fixed effects regression model, found that per capita income and population growth positively influence HDI, while inflation and unemployment rates were statistically insignificant. The findings from analysing with a fixed effect model reveal that the rate of population and per capita income growth influences the human development index in ASEAN member nations, however the variable rate of inflation as well as the unemployment rate have no effect.
In similarly, Fadillah & Setiartiti (2021) analyzed HDI determinants in the Special Region of Yogyakarta (Indonesia) using panel data for 2013–2018. This study found that the Gross Regional Domestic Product (GRDP) and government spending in the health sector positively and significantly affect the Human Development Index.

Sangaji (2016) examining Buddhist-majority countries employing random effects panel regression and reported that GDP per capita and life expectancy significantly enhance HDI, while inflation and fertility exerted negative effects. The result of the study showed that the four explanatory variables were proven to significantly affect the human development index in countries whose majority are Buddhists.

In the Malaysian context, Roshaniza & Selvaratnam (2015) employed Johnsen Cointegration Test method for the long term and Vector Error Correction Estimate. The result in this study shows HDI and poverty rate have a relationship with GDP. The HDI and poverty rate have relationship with GDP in the long term. HDI and GDP have a negative relationship in the

long term while poverty rate and GDP has a positive relationship with the GDP. Conversely, Dewi (2017 employed the multiple linear regression models, with cross-section data collected using SPSS. According to these studies, poverty has a major impact on the Human Development Index. In terms of economic growth, no relationship was discovered between economic growth and HDI for Riau Province.

Zainuddin (2015) analysed data from Aceh Province and stated that inflation, GRDP, and minimum regional wages all significantly affected by HDI, using a multiple linear regression model. Meanwhile, inflation negatively influenced HDI, both GRDP and wages had positive impacts, indicating that wage policy and regional economic output play a direct role in enhancing living standards and access to services.

Ogbebor, Oguntodu & Oyinloye (2020) the Auto-regressive Distributed Lag (ARDL) model was used for the analysis. The findings revealed a long-run relationship between inflation and living standards. Their findings imply that inflationary pressures can erode real income and access to social services, particularly for low-income households, thereby undermining long-term human development outcomes.

Regarding foreign capital inflows, Sharma & Gani (2004 used a fixed effects model which indicated a positive effect of foreign direct investment on human development for both the groups of countries. Similarly, Reiter and Steensma (2010) found that FDI positively influences HDI, though the effect is contingent upon host-country governance and corruption levels.

Muliza, Zulham, & Seftarita (2017) a panel data was employed, which is a combination of time series and cross-section data. While common effects, fixed effects, and random effects models are employed. According to the findings of this study, government spending on education and health does not have a substantial impact on HDI in Aceh Province's District / City. Instead, poverty and GRDP were the key determinants, suggesting that sectoral spending must be efficiently allocated and aligned with broader economic reforms to be impactful.

Larasati (2018), examined the role of zakat, GRDP per capita, and poverty on HDI in Indonesia and found that both GRDP and zakat had positive effects, while poverty remained

a constraining factor. According to this research, ZIS and GRDP have a positive and significant effect on the human development index, whereas poverty has a negative effect on the human development index.

Taken together, the empirical literature underscores that economic indicators exert both direct and indirect effects on HDI through income generation, social spending, and price stability. However, the strength and direction of these relationships vary across regions depending on institutional quality, income inequality, and policy effectiveness. Moreover, while GDP growth is frequently cited as a key driver of development, its impact on HDI is maximized only when accompanied by inclusive redistributive policies and inflation control.

4.3.2 Demographic Issues

Demographic factors such as population growth, fertility rates, income inequality (proxied by the Gini index), and female labor force participation represent critical structural determinants of human development. These indicators influence the distribution of public resources, household dynamics, and the accumulation of human capital over time. The empirical literature presents consistent evidence that demographic conditions significantly shape outcomes in health, education, and standard of living, core dimensions of the Human Development Index (HDI).

Miraç, Ali, & Arif, (2014) using binary logit, probit, and Tobit models on a cross-country dataset, found that life expectancy at birth, expected years of schooling, the female-to-male labour force participation ratio, and GDP per capita had statistically significant positive effects on HDI. The results of the all-regression models indicate that determinants including life expectancy at birth, expected years of schooling, labour force participation rate (female-male ratio), and GDP per capita have statistically significant effects on the level of development.

On one hand Tudorache, (2020), examined the drivers of human development in the European Union from 2010 to 2017, demonstrating that reductions in corruption significantly increased HDI. In addition, the share of early school leavers and employment in low-productivity agricultural sectors were negatively related with HDI. This study emphasised the

multidimensional nature of demographic constraints where early education dropout rates and structural labour market imbalances diminish long-term development prospects.

In a regional study of Indonesia, Basuki & Saptutyningsih (2016) analyzed panel data from districts in Yogyakarta Province (2008–2014) using a random effects model. The findings of this study reveal that the per capita income variable has no effect on HDI. Then, government spending on health has a major impact on HDI. Following that, government spending on public infrastructure has a favourable connection with HDI. Finally, the Gini coefficient has a significant negative association with HDI, as does the proportion of the poor.

Astuti (2018) used panel data with the fixed effect model's approach or 2010–2016 in the same region. According to the findings of this study, the variables of economic growth and education had a substantial effect on HDI. The Gini variable, on the other hand, had a significant as well as negative impact on the Human Development Index, whereas poverty had no significant effect on the Human Development Index.

Hafner & Mayer-Foulkes (2013) employed dynamic OLS estimation approaches to estimate the long-run relationship among cointegrated variables. Fertility has a negative relationship to human development but is favourable to income as well as trade. Furthermore, neither developed countries nor developing economies indicate a major impact of human development on income.

Asmita & Ruslan (2017) found that the GDRP has a favourable and significant impact on the Human Development Index in North Sumatra Province. In North Sumatra Province, the impoverished have a negative and significant impact on the Human Development Index. While government education spending, Population, health, and income disparities have no effect on the Human Development Index in North Sumatra Province.

Wijayanto, Khusaini, & Syafitri (2015) used Panel data with a quantitative approach and the Fixed Effect Model method were employed. This analysis indicates that government expenditure factors for health, education, and per capita GRDP have a significant impact on the Human Development Index in East Java districts/cities.

Shah (2016) used secondary data in the investigation, and the approach was multiple linear regression. According to the study's findings, GDP per capita, literacy rate, life expectancy at birth, Gini index, fertility rate, and CO2 emissions all have a significant effect on HDI. In a region-by-region examination, we can see that Europe and Central Asia, as well as Latin America and the Caribbean, have higher human development indexes. South Asia and Sub-Saharan Africa, on the other hand, have lower human development indexes.

Winarti (2014) and Heka, Lapian, and Lajuck (2017) further reinforce these patterns in the Indonesian context, with both studies affirming the role of government education and health expenditure as significant drivers of HDI. Conversely, high levels of poverty and inequality continue to act as structural barriers to inclusive development.

Al-Nasser & Al-Hallaq (2019) used Measurement Error Model (MEM) thier study. The study's findings reveal that human poverty has a negative impact on the human development index, implying that Jordan's policymakers must strengthen policies and tactics to boost people's life expectancy, educational attainment, and income.

Overall, the empirical evidence suggests that demographic factors especially income inequality, fertility, and labour market structure play a key role in shaping human development trajectories. These findings validate the inclusion of demographic indicators in econometric models of HDI and point to the importance of redistributive policies, educational retention, and gender inclusion as pathways for sustained improvement in human well-being.

4.3.3 Policy Framework

Policy-related variables like trade openness, investment in information and communication technologies (ICT), and the broader institutional environment play an increasingly important role in influencing human development outcomes. These factors affect the efficiency of public service delivery, access to information, labour market flexibility, and overall economic competitiveness all of which have implications for the core dimensions of the Human Development Index (HDI): health, education, and standard of living.

Khan, Ju & Hassan (2019) autoregressive distributed lag (ARDL) and vector error correction model (VECM) approaches are used to analyse the data. The empirical results reveal that ICT

promote human development index. Along with, economic growth has a positive and significant impact on human development, meanwhile Urbanization, trade, and FDI discouraged human development.

Anam, er al. (2021) used the panel vector autoregressive (PVAR) model was used to examine 30 developing nations from 1990 to 2017. The empirical data indicate that there is a significant relationship between information and communication technologies, renewable energy, and economic growth and the human development index.

Bankole, Osei-Bryson, & Brown (2013) used a novel approach known as regression splines in the study. The findings suggest, among other things, that: (1) the effect of investments in various ICT components differs with context; (2) impacts are often conditional as well as complex; and (3) the trajectory of the effects of ICT investment on Standard of Living may differ from the related directions of impacts on Health.

Moreover. Ježić, Zaninović and Škulić (2022) used static panel data regression analysis, while a fixed-effects estimator (FE) is used for estimation. The results support our hypothesis and show that ICT use and tertiary education positively affect human development, although the results vary by estimator. While in the case of the FE estimator, the effects are significant and positive across all observed countries, the results with the GMM estimators show a significant impact of ICT only in the case of upper-middle-income countries.

According to Davies & Quinlivan (2006) a panel data framework, the study employed the generalised method of moments (GMM) strategy. The results revealed a positive long-term association between trade liberalization and HDI, conditional upon governance quality. In countries with robust institutions, trade openness enabled higher public revenue mobilization and broader access to education and health services. However, in weaker institutional environments, trade gains may not translate into equitable human development improvements.

Furthermore, Sana, Dilawar, Alam, & Magda (2020) investigate using pooled mean group-autoregressive distributed lag (PMG-ARDL) model to examine the short- and long-term effects of trade aid on human development. The PMG-ARDL technique discovered that trade

aid had a favourable and considerable impact on human development, both in the short and long run.

Overall, the empirical literature supports the inclusion of policy framework variables like ICT, trade, and governance quality in models assessing the determinants of HDI. The evidence suggests that the developmental impact of these variables is highly contingent on absorptive capacity, institutional strength, and redistributive mechanisms. Investments in ICT and trade integration must be accompanied by policies that ensure access, equity, and accountability to yield sustainable improvements in human development outcomes.

4.4. Summary of Revised Literature

4.4.1 Similarities

Several scholars such as Miraç, Ali, & Arif, (2014) and Anam, Muhammad, Muhammad, Jiahai, & Sultan, (2021) concurred on the impact of Economic Indicators/Demographic Issues/Policy Framework on Human Development. Studies found that variables like life expectancy at birth, expected years of schooling, Labour participation rate (female-male ratio), GDP per capita, information and communication technologies, renewable energy and economic growth have a favourable and significant influence on human development. Miraç, Ali, & Arif, (2014), study may provide a strategy for high-income countries to reach very high levels of development. Human Development Indexes from 84 countries were used in the analysis with respect to nine independent factors. According to the findings of all regression models, factors such as life expectancy at birth, predicted years of schooling, labour force participation rate (female-male ratio), and GDP per capita have statistically significant effects on the degree of development. These findings indicate that investing in healthcare, education, inequality, and economic growth can significantly contribute to a country's overall development. Furthermore, authorities in high-income countries can use these findings to efficiently prioritise and distribute resources to reach higher levels of development.

Furthermore Anam, Muhammad, Muhammad, Jiahai, & Sultan, (2021) analysed the relationship between information and communication technology, renewable energy, economic growth, and the human development index in 30 developing countries from 1990 to 2017. The empirical findings indicate a substantial positive relationship between information and communication technologies, renewable energy, and economic growth and the human

development index. According to the causality outcomes, there is bidirectional causality among renewable energy as well as the human development index. Furthermore, unidirectional causality exists from human development to information and communication technologies. These implies that the advancement of renewable energy and human development can both contribute to the development of information and communication technologies. Furthermore, the bidirectional causation between renewable energy as well as the human development index emphasises the possibility of these two factors having a mutually reinforcing relationship.

4.4.2 Differences

Furthermore, several scholars such as Khan, Ju & Hassan (2019) and Sangaji (2016) vary on the impact of Economic Indicators/Demographic Issues/Policy Framework on Human Development. Studies found that variables like ICT, life expectancy at birth, gross domestic per capita and economic growth have a favourable and significant influence on human development. Meanwhile urbanization, inflation, fertility rate, foreign direct investment (FDI), and trade have an unfavourable and insignificant on human development. Khan, Ju & Hassan (2019) that the country has had a major gap between ICT economic progress and human development. In this context, this study modelled the relationship between ICT, economic growth, and the human development index (HDI) from 1990 to 2014, considering urbanisation, foreign direct investment (FDI), and trade. The empirical findings indicate that ICT improves human development. Economic growth also has a positive and important impact on human development. Furthermore, urbanisation, trade, and FDI all work against human development in Pakistan.

Sangaji (2016) the study intends to investigate four factors of the human development index in the eight Buddhist-majority countries, including GDP per capita, inflation, life expectancy at birth, and fertility rate. The study's findings revealed that the four explanatory variables had a significant impact on the human development index in Buddhist-majority countries. Factors such as life expectancy at birth and GDP per capita showed positive indicators, while inflation and the fertility rate showed negative signs. According to the study, it is critical to consider all explanatory variables while enhancing the human development index in these countries. In order to increase the human development index, the study also emphasised the significance of tackling inflation and fertility rates. Implementing efforts to manage inflation

and promote family planning could have a favourable impact on the overall growth of Buddhist-majority countries, according to the report.

4.4.3 Gaps

From the review literature few studies has been done from South Africa on the determinants of the Human Development Index. A few scholars also investigated the influence of Economic Indicators, Demographic Issues, and Policy Frameworks on Human Development. Lastly, a few studies have been done on specifically both the long-run and short-run relationships amongst the variables. From the reviewed literature, a few studies used the ARDL method; the methods used from the literature review that is likely used are Fixed Effect Model, OLS, and VECM. The current objectives are relevant in the sense that it examines the impact of the determinants of Economic Indicators/Demographic Issues/Policy Framework on Human Development. This objective is not only important but also needed for obtaining a thorough understanding of human development, finding areas for improvement, and ultimately reaching a future that is fair and sustainable for all.

4.5. Conclusion

This chapter explored several types of theoretical literature, it also relied on the empirical literature from previous research on the same variables conducted by other researchers. Moreover, the studied literature has similarities, differences, and gaps, which were discussed in the chapter.

CHAPTER 5: DATA AND METHODOLOGY

5.1. Overview

This chapter presents the methodology employed in the study to establish the determinants of Human Development Index in South Africa. In this regard, the sections start off by outlining the overview of this chapter followed by presenting research approach and strategy then the model specifications, defining the variables, discussing the expected signs and justification of variables, followed by Data description explaining the data used, the period covered, its source before it goes on to explaining the Estimation techniques. Furthermore, the section closes off by explaining the Diagnostic tests of the variables which are as follows; Serial correlation, Heteroskedasticity, Normality, Multicollinearity, Stability tests.

5.2. Research Approach and Strategy

A research design is the overall approach for conducting research that provides a concise and logical method to address a specific research issue through data collection, interpretation, analysis, and discussion (Creswell, 2009). Moreover, it serves as a guide for the entire research process, laying out the methods, procedures, and techniques that will be employed to answer the research question. A well-designed study assures that the results are trustworthy, valid, and generalizable. Leedy & Ormrod, (2007) cited that a research design's main purpose is to create a concise plan for conducting the research, making sure all phases are completed methodically and logically. A well-designed study adheres to strict scientific standards, increasing the credibility and trustworthiness of the findings. It outlines the proper methods and strategies for data collection, guaranteeing that the data is relevant and dependable. It directs the choice of proper data analysis procedures, ensuring that the results are correctly interpreted and presented. Furthermore, a well-designed study evaluates the findings' ability to generalise, allowing inferences to be drawn from the sample to the larger population. The study is therefore explanatory in the sense that it applies an econometrics model to analyse the relationship and related factors among the determinants of Human Development Index. This research method enabled the collection of quantitative data for all variables addressed in the study to address the research questions and fulfil the research objectives.

5.3. Model Specification

The model is specified based on the empirical literature reviewed with regard determinants of Human development in various jurisdictions. In this instance the model is specified in a similar manner to the studies that examines the long run and short run relationship between trade aid on human development Sana, Dilawar, Alam, & Magda (2020) while making adjustment to suit the South African environment. This is to confirm that the model specified is well aligned to other similar studies conducted in different jurisdiction. The research utilizes the ARDL bounds testing method for cointegration as outlined by Pesaran, Shin, and Smith (2001). This model is especially appropriate for small-sample time series data where the variables are integrated of order I (0) or I (1), but not I (2). The ARDL framework is effective in estimating short-term dynamics and long-term equilibrium relationships, while accommodating lag structures for every explanatory variable. Additionally, the ARDL model provides adaptability in model setup and tackles endogeneity via dynamic lag structure. Fundamental assumptions supporting its validity encompass: (i) absence of I (2) variables, (ii) the presence of a singular cointegrating vector, and (iii) the stability of the estimated coefficients. These assumptions are evaluated through preliminary unit root tests, ARDL bounds tests for cointegration, and subsequent stability diagnostics such as CUSUM and CUSUMSQ.

The mathematical models can be specified as follows:

Economic Indicators

$$HDI_t = f(GDP_t\ UNE_t FDI_t CPI_t) \quad (5.1)$$

Where HDI is Human development index of the country at period t which is the function of; GDP is the Gross Domestic Products of the country at period t, CPI is the Inflation of the country at period t, UNE is the Unemployment of the country at period t, FDI is the Foreign Direct Investment of the country at period t,

Demographic Indicators

$$HDI_t = f(POP_t FERT_t GINI_t) \quad (5.2)$$

Where HDI is Human development index of the country at period t which is the function of; POP is the Population of the country at period t, GINI is the Gini Index of the country at period t, FERT is the Fertility Rate of the country at period t,

Policy Framework

$$HDI_t = f(ICT_t TRA_t) \quad (5.3)$$

Where HDI is Human development index of the country at period t which is the function of; ICT is the Information and Communication Technology of the country at period t, TRA is the Trade of the country at period t.

The Mathematical form of the model is as follows:

Economic Indicators

$$HDI_t = \beta_0 + \beta_1 CPI_t + \beta_2 UNE_t + \beta_3 GDP_t + \beta_4 FDI_t + + \varepsilon_t \quad (5.4)$$

Where all other variables are as defined previously, expect beta β_0 which represents the constant, $\beta_{1\text{-}4}$ are the coefficients and ε_t is the error term.

Demographic Indicators

$$HDI_t = \beta_0 + \beta_1 FERT_t + \beta_2 POP_t + \beta_3 GINI_t + \varepsilon_t \quad (5.5)$$

Where all other variables are as defined previously, expect beta β_0 which represents the constant, $\beta_{1\text{-}3}$ are the coefficients and ε_t is the error term.

Policy Framework

$$HDI_t = \beta_0 + \beta_1 TRA_t + \beta_2 ICT_t + \varepsilon_t \quad (5.6)$$

Where all other variables are as defined previously, expect beta β_0 which represents the constant, $\beta_{1\text{-}2}$ are the coefficients and ε_t is the error term.

5.4. Variables definition and expected signs

This sub-section outlines the conceptual definitions of variables employed in the empirical model and provides a theoretical justification for the anticipated direction of their influence on the Human Development Index (HDI).

5.4.1 Economic Indicators

The selection of variables is informed by both theoretical and empirical considerations, particularly the post-development and capability approaches which highlight the complex influences on human development:

- GDP per capita serves as an indicator of macroeconomic performance and is often associated with the income aspects of HDI (Hasan, 2013; Shah, 2016).
- CPI (Inflation) indicates macroeconomic volatility, which can diminish real income and limit access to health and education services (Ogbebor et al., 2020).
- FDI reflects global interconnectedness and the significance of capital inflows, yet studies show varied results regarding its advantages for development (Sharma & Gani, 2004; Reiter & Steensma, 2010).
- The Gini Index directly gauges income inequality, which has been demonstrated to have a reverse impact on HDI (Grimm et al., 2010; Basuki & Saptutyningsih, 2016).
- The Fertility Rate and Population Growth indicate demographic stresses, as fertility generally shows a negative correlation with HDI (Hafner & Mayer-Foulkes, 2013).
- Trade openness and ICT development serve as policy framework indicators representing institutional capability and infrastructure, essential for sustainable human development (Nowakowski, 2005; Khan et al., 2019; Bankole et al., 2011).

The anticipated signs of the independent variables are derived from theoretical as well as empirical findings from previous research. For example, inflation (CPI) and unemployment (UNE) are expected to negatively impact the HDI, as they signify macroeconomic instability that reduces access to income, healthcare, and education. On the other hand, GDP and FDI are anticipated to positively influence HDI by encouraging economic growth, generating income, and fostering capital formation. Meanwhile demographic factors, a high fertility rate often has a negative relationship with HDI because it places greater strain on educational and health systems, particularly in economies with limited resources (Hafner & Mayer-Foulkes, 2013). Similarly, a higher Gini Index signifies increased income inequality, which is often linked to inferior development results and consequently negatively affects HDI (Grimm et al., 2010). Nonetheless, the population growth factor may have a dual impact, beneficially affecting the workforce size while possibly putting pressure on public services if not properly managed.

Table 2: Summary of variable definitions, expected signs and relationships for economic indicators

S/N	Variables	Proxy	Variables definition	Measures	Expected signs	Source
1	Human Development	HDI_t	HDI is a composite statistic that evaluates countries based on their average achievements in the three primary categories of human development: life expectancy (health), education, and standard of living (income)	Overall wellbeing	Dependent	UNDP Data Centre
2	Consumer Price index (Inflation)	CPI_t	Consumer Price Index (CPI) monitors the average change in prices spent by urban consumers for a basket of consumer goods and services	Changes in Prices over time	- Negative	Macro trends
3	Unemployment rate	UNE_t	The labour force is the total number of persons who are employed or actively looking for work	The number of people actively looking for a job as a percentage of the labour force	- Negative	Macro trends
4	Gross Domestic Products	GDP_t	Gross domestic product is the total financial value of all final goods and services produced inside a country over a specified time period, usually a quarter or a year.	Economic activities	+ Positive	SARB
5	Foreign Direct Investment	FDI_t	Foreign Direct Investment is an investment made in one country by a firm or individual in assets or a business in another	Total level of direct investment	+ Positive	Macro trends

Source: Authors Computation

5.4.2 Demographic Indicators

Table 3: Summary of variable definitions, expected signs and relationships for demographic indicators

S/N	Variables	Proxy	Variables definition	Measures	Expected signs	Source
1	Population Rate	POP_t	The population rate measures how quickly a population expands or declines.	Population size and population density	Ambiguous	World Bank
2	Gini Index	$GINI_t$	The Gini Index is a statistical dispersion indicator used to quantify income, wealth, or consumption inequality within a nation or social group.	Distribution of income or wealth within a country	-Negative	Standardized World Income Inequality Database
3	Fertility Rate	$FERT_t$	The fertility rate is a measure of the average number of children born to a woman in her lifetime	Average number of children that would be born to a woman	-Negative	World Bank

Source: Authors Computation

5.4.3 Policy Framework

Table 4: Summary of variable definitions, expected signs and relationships for policy framework

S/N	Variables	Proxy	Variables definition	Measures	Expected signs	Source
1	Information	ICT_t	ICT is referred to the	A wide range	+ Positive	World Bank

	and Communication Technology		convergence of computing, telecommunications, as well as digital technologies that enable the generation, processing, transmission, and storage of information	of technologies		
2	Trade	TRA_t	Trade referred to as the voluntary exchange of products and services between individuals, businesses, or countries	Annual Growth of trade	+ Positive	World Bank

Source: Authors Computation

5.5. Data Descriptions

To study the relationship between the determinants of Human Development Index, time series data for the period of 1990 to 2021 is collected. The study uses the annual secondary data and the Sample size of the data 31. Data for this study is obtained from SARB, Macrotrends, World Bank, SWIID and UNDP Data Centre, E-views software was used to analyse the data. The variables to be used in this study are: Economic indicators (Human Development Index, Consumer Price Index, Unemployment, Gross Domestic Products and Foreign Direct Investment), Demographic Indicators (Population rate, Gini Index and Fertility Rate), Policy Framework (Information Communication and Technology and Trade).

5.6. Estimation Technique (Pre-Tests)

Several tests were carried out throughout the study in order to present the findings of the research, so simplifying the analysis and recommendations that would follow. This study will be using the ARDL method and below are the procedure that will be taken.

5.6.1. Descriptive Statistics

Descriptive statistics are a set of techniques for summarising and organising data in an appropriate manner. They provide a brief description of a dataset's characteristics, assisting

researchers in identifying patterns, trends, and relationships in the data (Pallant, 2022; Fisher & Marshall, 2009). Descriptive statistics are frequently employed as a first step in data analysis, laying the foundation for subsequent investigation and hypothesis testing.

5.6.2. Visual Inspection

This approach is the quickest technique to determine the data's meaning in relation to our analysis and hypothesis. The graphical results of the tests are used for visual inspection; the bar graphs and line charts from the normal distribution tests are used for this purpose. Visual inspection is only the first conclusion, which may be disputed by additional research, but it is useful in determining potential directions for the results. Gujarati and Porter (2009) suggest that a visual examination can reveal patterns of a continuous trend line or a variable that fluctuates.

5.6.3. Unit Root and Stationarity Test

The unit root test is a stationarity (or nonstationarity) test that has acquired popularity in recent years (Gujarati 2004). Unit Root Test is a statistical technique that is used to detect the existence of a unit root in time series data. A unit root is a feature of time series data that shows a high level of persistence or reliance on previous values (Phillip 1988). Moreover, the presence of a unit root in time series data can result in biased estimates as well as unreliable inferences. As a result, before employing any estimation technique, it is critical to evaluate for the existence of a unit root in time series data. The Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test are all unit root tests. The equation below shows the order autoregressive model, for unit root testing. (Gujarati 2004)

$$Y_t = \rho Y_{t-1} + u_t \qquad -1 \leq \rho \leq 1 \qquad (5.7)$$

Where ut is a word for white noise error.

We know that if $\rho = 1$, then the unit root in equation 1 becomes a random walk model with no drift, which is a nonstationary stochastic process. EQ1 is manipulated as follows for theoretical reasons: Subtract Y_{t-1} from both sides of EQ1 to get.

$$Y_t - Y_{t-1} = \rho Y_{t-1} + u_t$$

$$(\rho - 1)Y_{t-1} + u \quad (5.8)$$

Which can be alternatively written as:

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad (5.9)$$

Where $\delta = (\rho - 1)$ and Δ, as is common, is the first-difference operator.

Thus, instead of estimating (4.3), we estimate (4.4) and test the (null) hypothesis that $\delta = 0$. If $\delta = 0$, then ρ = 1, indicating that we have a unit root, indicating that the time series under discussion is nonstationary. The unit root test is an important step in time series analysis because it helps to verify the reliability of any estimate technique's results. The ADF test is one of the most often used unit root tests, however depending on the nature of the data and research issue, researchers may choose to employ other tests. (Gujarati 2004).

The Augmented Dickey-Fuller (ADF) test is a common statistical technique to identify the existence of a unit root in a time series dataset. The presence of a unit root shows that the time series is nonstationary, which might have consequences for model construction and forecasting, (Rahman, Islam & Rahman 2018). They further stated that the ADF test is an extension of the Dickey-Fuller test, which is a simplified version of the test that does not take certain statistical factors into account that can affect the results. The ADF test was conducted by regressing the time series' first difference on the lagged values and additional lagged differences. The null hypothesis of the ADF test is that the time series has a unit root, whereas the alternative hypothesis is that the time series is stationary (Rahman, Islam, & Rahman, 2018). The ADF test generates a t-statistic, which is used to assess whether to reject the null hypothesis.

$$\Delta Y_t = \beta_t + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{m} \propto \Delta Y_{t-i} + \varepsilon_t \quad (5.10)$$

The ADF test here consists of estimating the following regression:

Where ε_t is a pure white noise error term and where $\Delta Y = (Y_{t-1} - Y_{t-2})$, $Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term in (EQ4) is serially uncorrelated. In ADF we still test whether δ = 0 and the ADF test follows the same asymptotic distribution as the DF statistic, so the same critical values can be used. (Gujariti, 2004).

Phillips and Perron (1988) established unit root tests, which became popular in time series econometrics analysis. The test was created in such a way that serial correlation has no effect

on the asymptotic distribution of the test value when using a non-parametric technique. The test statistics can be regarded as Dickey-Fuller statistics that have been strengthened against serial correlation by employing the Newey-West heteroskedasticity and autocorrelation-consistent covariance matrix estimator. The test regression for P-P is as follows:

$$\Delta X = \propto' Z_t + \pi y_{t-1} + \varepsilon_t \quad (5.11)$$

Where Z_t is the vector component of either constant or a trend. The P-P test is exact for any serial correlation and heteroskedasticity in the residuals εt by changing the test statistics $t\pi$=0. Therefore, regarding the null hypothesis that π=0, the asymptotic distribution of P-P test statistics is the same as that of ADF test statistics and normalised bias statistics. Regarding the ADF test, the P-P test has the added advantage of being more robust to general kinds of heteroskedasticity in the residual. The null hypothesis for the P-P and ADF unit root tests is that a time series X_t is non-stationary.

According to the literature, ADF and P-P unit root tests have low size properties (Maddala and Kim, 1998). Nonetheless, most of the research utilised more than one unit root test to check whether they could yield the same result. The unit root test technique was developed by Kwiatkowski, Phillips, Schmidt, and Shin (1992), who postulate that the null hypothesis presupposes that the series is stationary. The structure of the hypothesis differs from that of the ADF and P-P tests. The KPSS test is like other unit root tests, but its null hypothesis assumes series stationarity. The functional model with a trend looks like this:

$$Y_t = \beta' x_t + \varepsilon_t \quad (5.12)$$

Where x_t has either constant or as constant plus trend deterministic components. In addition, Y_t is the time series of interest, and ε_t denotes an error term in the regression fit. The intercept or as intercept plus trend can be used to estimate equation 4.8. The KPSS is the Lagrange multiplier (LM), and the LM statistics are as follows:

$$LM = \sum s\,(t)^2/T^2 + f_0 \quad (5.13)$$

Where f_0 denotes an estimated residual at frequency, and $s(t)$ is a cumulative residual function based on the residuals $\varepsilon_t = y_t - \beta' x_t(0)$. Finally, this sort of unit root test has the same limitations as conventional ADF and P-P tests in terms of size and power. Virmani (n.d.) indicated that KPSS has more effective size adjusted power attributes than the earlier.

5.6.4. Optimal Lag Selection

The autoregressive distributed lag (ARDL) model is a popular econometric technique for analysing variable dynamics. It is particularly effective to examine long-run and short-run relationships, making it a useful tool for both policymakers and researchers. The accuracy and dependability of the ARDL model, however, are also dependent on the choice of a suitable lag length. The number of lagged terms of both independent and dependent variables found in the model is referred to as the lag length (Enders, 2010). The optimal lag length must be chosen to ensure that the model appropriately represents the underlying dynamics of the data. An inappropriate lag length can result in biased and untrustworthy results.

To determine the optimal lag length for the ARDL model, several factors can be used. These criteria create a balance between model complexity and model fit. According to Verbeek (2012) overfitting takes place when the model has an excessive number of lags, resulting in false correlations and inflated standard errors. Underfitting, on the contrary, occurs when the model fails to capture the actual dynamics of the data by excluding relevant lags. Therefore, among the most commonly used lag selection criteria is the AIC, which penalises both overfitting and under fitting while balancing model complexity as well as goodness of fit. The optimal lag length is the one with a lowest AIC value. The BIC penalizes model complexity similarly to the AIC, but more severely, favouring parsimonious models. The optimal lag length is the one with the lowest BIC value. The HQIC is a compromise between AIC and BIC, balancing model complexity and goodness of fit. The optimal lag length is the one with the lowest HQIC value. (Enders, 2010; Lütkepohl, 2005; Verbeek, 2012).

5.6.5. ARDL Bounds Test

In terms of methodology, the study adopts the ARDL approach for investigating the determinants of the Human Development Index. According to Duasa (2007) the ARDL framework was developed by Pesaran and Shin (1995, 1999), Pesaran et al. (1996), and Pesaran (1997). There are several advantages of utilising this technique instead of the traditional Johansen (1998) and Johansen and Juselius (1990) techniques. The key advantage of the ARDL model in terms of long-run relationship power and testing is that it may be carried out regardless of the order of integration, a combination of (0) and I (1) variables as

regressors which indicates that the order of integration of suitable variables may not be the same (Verma, 2007). Another advantage is that the technique is appropriate for small or finite sample sizes whereas other Cointegration strategies require all variables to be of the same level of integration (and in big samples). Moreover the ARDL allows for various variables to have different optimal lags, which the usual Cointegration test does not allow for (Ali, Abdullah & Azam, 2017). The existence of Cointegration implies that both long-run as well as short-run coefficients can be determined via an unrestricted error correction model (UECM). To build an ARDL bounds Cointegration model this study expresses the equation as follows:

Economic Indicators

$$\Delta HDI_t = \alpha_0 + \emptyset_1 HDI_{t-1} + \emptyset_2 FERT_{t-1} + \emptyset_3 POP_{t-1} + \emptyset_4 GINI_{t-1} + \sum \beta_{1i} \Delta HDI_{t-1} + \sum \beta_{2i} \Delta FERT_{t-1} + \sum \beta_{3i} \Delta POP_{t-1} + \sum \beta_{4i} \Delta GINI_{t-1} + \mu_t \quad (5.14)$$

Demographic Indicators

$$\Delta HDI_t = \alpha_0 + \sum \beta_{1i} \Delta HDI_{t-1} + \sum \beta_{2i} \Delta FERT_{t-1} + \sum \beta_{3i} \Delta POP_{t-1} + \sum \beta_{4i} \Delta GINI_{t-1} + \emptyset_1 HDI_{t-1} + \emptyset_2 FERT_{t-1} + \emptyset_3 POP_{t-1} + \emptyset_4 GINI_{t-1} + \mu_t \quad (5.15)$$

Policy Framework

$$\Delta HDI_t = \alpha_0 + \emptyset_1 HDI_{t-1} + \emptyset_2 TRA_{t-1} + \emptyset_3 ICT_{t-1} + \sum \beta_{1i} \Delta HDI_{t-1} + \sum \beta_{2i} \Delta TRA_{t-1} + \sum \beta_{3i} \Delta ICT_{t-1} + \mu_t \quad (5.16)$$

If the calculated F-statistic lies above the upper bound critical value, the null is rejected, confirming the existence of a long-run relationship among the variables. If it lies below the lower bound, no cointegration is inferred. A statistic falling between the two bounds implies inconclusive results.

5.6.6. Estimating Short-Run Coefficients

After conducting the Cointegration test and discovering its presence, it recommends estimating an error correction model (ECM). This assists in determining the rate at which the

variables adapt to their long-run equilibrium value (Gujarati and Porter, 2010). The error correction model can be represented in ARDL as follows:

Economic Indicators

$$\Delta HDI_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta HDI_{t-1} + \sum_{i=0}^{p} \alpha_{2i} \Delta CPI_{t-1} + \sum_{i=0}^{p} \alpha_{3i} \Delta UNE_{t-1} + \sum_{i=1}^{p} \alpha_{4i} \Delta GDP_{t-1} + \sum_{i=1}^{p} \alpha_{5i} \Delta FDI_{t-1} + + \varphi ECM_{t-1} + \mu_t \quad (5.17)$$

Where all variables are as defined with the exception of ECM_{t-1}, which is the Error Correction Term. ECM is a residual from the estimated Cointegration equation 4.14, and φ is a parameter that indicates the long-run adjustment speed. Ideally, the ECM coefficient should be negative, statistically significant, and less than unity.

Demographic Indicators

$$\Delta HDI_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta HDI_{t-1} + \sum_{i=1}^{p} \alpha_{2i} \Delta FERT_{t-1} + \sum_{i-1}^{p} \alpha_{3i} \Delta POP_{t-1} + \sum_{i=1}^{p} \alpha_{4i} \Delta GINI_{t-1} + \varphi ECM_{t-1} + \mu_t \quad (5.18)$$

Where all variables are as defined with the exception of ECM_{t-1}, which is the Error Correction Term. ECM is a residual from the estimated Cointegration equation 5.15, and φ is a parameter that indicates the long-run adjustment speed. Ideally, the ECM coefficient should be negative, statistically significant, and less than unity.

Policy Framework

$$\Delta HDI_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta HDI_{t-1} + \sum_{i=1}^{p} \alpha_{1i} \Delta TRA_{t-1} + \sum_{i=1}^{p} \alpha_{2i} \Delta ICT_{t-1} + \varphi ECM_{t-1} + \mu_t \quad (5.19)$$

Where all variables are as defined with the exception of ECM_{t-1}, which is the Error Correction Term. ECM is a residual from the estimated Cointegration equation 5.16, and φ is a parameter that indicates the long-run adjustment speed. Ideally, the ECM coefficient should be negative, statistically significant, and less than unity.

5.6.7. Research Reliability and Validity

Since this is a secondary data study, all of the data used in this study was taken from reliable institutions such as SARB, the World Bank, Macrotrends, SWIID, and the UNDP Data Centre. The SARB is a self-governing organization that is not influenced by the government. The SARB is accountable to Parliament and must disclose its financial statements and reports on a regular basis. Its activities have a considerable impact on the cost of goods and services, the availability of credit, and the financial system's stability. The World Bank Database is useful for tracking progress towards internationally agreed-upon development targets, such as the SDGs (Sustainable Development Goal). The World Bank has a varied role in global development and poverty alleviation. Its activities include lending, grants, technical assistance, research, information sharing, involvement with the corporate sector, and global cooperation. The overarching responsibility of the organisation is to contribute to the establishment of a more equal, prosperous, and sustainable world. Macrotrends is a reputable organisation that is dedicated to providing accurate and unbiased information to its users. The organisation also takes precautions to preserve its users' privacy and ensure the security of its website. Macrotrends provides users with a range of economic trend information, including historical data, projections, and analysis.

The Standardised World Income Inequality Database (SWIID) is an extensive dataset of income inequality data from 1960 to the present for over 200 nations. The SWIID is a great resource for income inequality researchers. It has been used to investigate the history and implications of income disparity, as well as the effectiveness of various programmes aimed at reducing inequality. The SWIID is also used to track income inequality trends over time and across nations. The UNDP Data Centre is an important part of the UNDP's operations, serving as a resource for scholars, policymakers, and the general public. The data centre's dedication to data quality, transparency, and accessibility assures that the information it provides is accurate, dependable, and useful for studying and advancing human development worldwide. In light of the above, it is possible to conclude that this study is based on accurate and valid data.

5.6.8. Delimitations

The study looks at a period over 1990-2021 in South Africa, to determine the Determinants of Human Development Index. Similar concepts and their potential influence on the outcome are not considered in this study, and also events that occurred outside of this time frame.

5.6.9. Limitations of the ARDL Model

Although the ARDL bounds testing method is beneficial for modelling relationships in small samples with varying orders of integration, it does have its drawbacks. Firstly, the model might be prone to omitted variable bias if essential structural or institutional factors influencing HDI are left out. Secondly, structural breaks caused by changes in regime or policy alterations can undermine the assumption of parameter stability, which may skew long-term estimates. Third, although ARDL helps alleviate endogeneity with lagged regressors, it does not -completely remove reverse causality, especially when feedback loops exist (e.g., between GDP growth and HDI). Fourth, choosing the best lags based on information criteria in small samples can result in unstable models. Finally, the model presumes that the dynamic structure stays unchanged over time, which might not be the case during times of economic or political unrest. These constraints are recognized in the analysis of the results and direct future studies to utilize more sophisticated methods like SVAR or dynamic panel estimators for validation.

5.7. Diagnostic tests (Post Tests)

The classical assumption ensure that variables are not violated.

Table 5: Diagnostic Tests

DIAGNOSTIC & NULL HYPOTHESIS	**TEST**	**CONCLUSION**
1. NORMALITY TEST **H_0: Residuals are normal distribution**	Jarque- Bera	Probability> 0.5 Accept the null hypothesis
2. HETEROSKEDASTICITY **H_0: No heteroskedasticity**	Breusch- Pagan Godfrey	Pro. Chi > 0.05 Accept null hypothesis
3. SERIAL CORRELATION **H_0: No Serial Correlation**	Breusch- Pagan Godfrey	Pro. Chi > 0.05 Accept null hypothesis
4. MULTICOLLINEARITY **H_0: No Multicollinearity**	Variance Inflation Factor	Values of Centred VIF are <10 Accept the null hypothesis

5. STABILITY **H_0: No misspecified variables**	Cusum	Probability >0.05 Accept the null hypothesis

5.7.1. Serial Correlation

According to Gujarati & Porter (2009), Serial correlation (autocorrelation) refers to the degree of association between residuals or errors across various periods in statistical modelling. Econometrics and time-series analysis involve assessing residual data for signs of serial correlation since such dependence violates fundamental assumptions of independence required for efficient parameter estimation and correct hypothesis testing. Moreover the LM test for serial correlation is a standard approach for detecting serial correlation in regression model residuals. The LM test assumes that when there is no serial correlation, the residuals should be strongly correlated with their lagged values. With the null hypothesis of no serial connection, the test statistic has a chi-square distribution. (Hamilton, 1994).

Gujarati & Porter (2009) further stated The LM test for serial correlation is a common method used to test for the presence of serial correlation in the residuals of a regression model. The LM test is based on the idea that if there is no serial correlation, the residuals should not be significantly correlated with their lagged values. The test statistic follows a chi-square distribution under the null hypothesis of no serial correlation. The null hypothesis (H0) in the LM test indicates that there is no serial correlation in the residuals, whereas the alternative hypothesis (H1) is that there is.

Moreover Hamilton (1994) the LM test statistic can be computed by regressing the residuals on their lagged values and then computing the coefficient of determination (R-squared) from this supplementary regression. The LM test statistic adopts a chi-square distribution using degrees of freedom that are equal to the number of delays used in the supplementary regression under the null hypothesis. In empirical research, the LM test for serial correlation has been commonly employed to detect and address the issue of serial correlation in econometric models. It helps researchers in determining if the assumption of identically and independently distributed errors holds, but and if not, to adjust their models accordingly.

5.7.2. Heteroskedasticity

Heteroskedasticity refers to a statistical phenomenon in which the variability of the error terms in a regression model is not constant across all levels of the independent variables (Johnston, 2003). In other words, the spread or dispersion of the residuals differs for different values of the predictors. Moreover, the violation of the assumption of homoscedasticity (constant variance) can lead to biased and inefficient estimates of the regression coefficients and can affect the validity of statistical inference. According to Greene (2008) Heteroskedasticity is a statistical phenomenon that occurs when the variance of the error terms in a regression model is no longer constant across all levels of the independent variables. In other words, the spread or dispersion of the residuals may differ from the predictor value. The violation of the homoscedasticity assumption (constant variance) can result in biased and inefficient estimates of the regression coefficients, affecting the validity of statistical inference.

The Heteroskedasticity equation is as follows;

$$E(u_i^2) = \sigma_i^2 \qquad (4.20)$$

The subscript of σ^2 indicates that the conditional variances of u_i (= conditional variances of Y_i) are no longer constant Gujariti (20024).

Various graphical and statistical approaches may be used to detect heteroskedasticity in a regression model. Plotting the residuals compared to the expected values or independent variables is a common graphical approach. If the spread of the residuals changes systematically with the predictor values, this indicates heteroskedasticity. Another graphical technique is to examine the patterns by plotting the absolute or squared residuals against the anticipated values or independent variables (Greene, 2008).

According to Breusch & Pagan (1979) the Breusch-Pagan test (also known as the White test) is a statistical test that is frequently employed to officially test for heteroskedasticity. The test depends on regressing the squared residuals on the independent variables, and the presence of heteroskedasticity can be determined if the resulting model indicates a significant relationship. The Goldfeld-Quandt test examines the variances of the residuals among different subsets of the data. Johnston (2003) futher explained that heteroskedasticity might be problematic as it violates one of the basic assumptions of OLS regression, which is homoscedasticity. When there is heteroskedasticity, the OLS predictor remains unbiased but

inefficient, resulting in incorrect standard errors as well as confidence intervals. As a result, hypothesis testing relying on these standard errors might produce incorrect results. Lastly to address heteroskedasticity, several techniques can be employed: Heteroskedasticity-consistent standard errors, weighted least squares (WLS), and Transformations.

5.7.3. Normality Test

A normality test is a statistical approach for determining whether or not a dataset contains a normal distribution. The symmetric, bell-shaped probability density function indicates the normal distribution, also referred to as the Gaussian distribution or bell curve. Many statistical methods depend on an assumption of normality, for instance, parametric hypothesis tests as well as confidence intervals. As a result, before implementing these methods, it is important to determine if the data roughly follows a normal distribution. (Shapiro & Wilk, 1965).

The Jarque-Bera (JB) Test of Normality is an asymptotic, or large-sample, test of normality. This is also based on OLS residuals. This test computes the skewness and kurtosis of the OLS residuals first and then employs the following test statistic:

$$\boldsymbol{JB} = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right] \qquad (4.21)$$

Where n= sample size, S= skewness coefficient, and K= Kurtosis coefficient. S=0 and K=3 for a normally distributed variable. Therefore the JB normality test is a test of combined hypothesis that S as well as K are 0 and 3, respectively. In that case, the JB statistics will be expected to be equals to 0 (Gujarati 2004).

Therefore various tests and graphical techniques can be employed for this purpose, such as the Shapiro-Wilk test, Kolmogorov-Smirnov test, and Q-Q plot. These tests assist in determining if the data fit the normality assumption needed for various statistical analyses (Anderson & Darling, 1952).

5.7.4. Multicollinearity

Multicollinearity is a statistical phenomenon in regression analysis that occurs when two or more predictor variables have a high degree of correlation. It could contribute to unstable parameter estimates as well as inflated standard errors when evaluating the individual impacts of these factors on the dependent variable. Multicollinearity challenges the concept of predictor variable independence, which is critical for accurate regression analysis (Gujarati 2004).

According to Belsley, Kuh & Welsch (1980) the various techniques for detecting the multicollinearity are correlation coefficient, variance inflation factor, and eigenvalue method.

- Correlation Coefficients that are High- Pairwise correlations between independent variables may be high (in absolute value). If the correlation is greater than 0.8, severe multicollinearity might be present.
- High R^2 with low t-Statistic Values- Individual regression coefficients may be insignificant, yet the overall fit of the equation may be high.
- High Variance Inflation Factors (VIFs) - A VIF indicates how much multicollinearity has increased in the variance of an estimated coefficient. It examines how well an explanatory variable can be described by all of the other explanatory variables in the equation.

VIF is calculated as:

$$VIF = \frac{1}{1-R^2} = \frac{1}{Tolerance} \tag{4.22}$$

Where, Tolerance is the inverse of VIF. If the tolerance is lower, therefore it is more likely that there is multicollinearity between the variables. VIF = 1 shows that the independent variables have no correlation with one another. If the value of VIF is $1 < VIF < 5$, it indicates that the variables are moderately correlated. The VIF challenging value ranges from 5 to 10, indicating strongly correlated variables. If VIF $\geq$ 5 to 10, there will be multicollinearity between the predictors in the regression model, and if VIF > 10, the regression coefficients will be estimated feebly due to the presence of multicollinearity. (Belsley, Kuh, & Welsch, 1980).

5.7.5. Ramsey Test

The Ramsey test is a statistical test used in econometrics to identify potential misspecifications in a regression model. It is also referred to as the specification error test or the RESET (regression specification error test). James H. Ramsey developed the test and published it in his 1969 paper titled "Tests for Specification Errors in Classical Linear Least Squares Regression Analysis." The Ramsey test examines if a regression model has omitted variables or functional form misspecifications. It is particularly helpful for identifying problems caused by omitted nonlinearities or higher-order terms. The test is based on the notion that if a model is correctly defined, including all significant variables and functional forms, then the model's residuals should not reveal any systematic patterns. (Ramsey, 1929).

Moreover Ramsey (1929) the Ramsey test entails adding new variables into the regression model so as to account for any nonlinear relationships or higher-order components. The newly discovered terms can be powers of existing independent variables or interaction terms. The Ramsey test's null hypothesis is that the extra terms are zero, showing that the model is correctly defined. The alternative hypothesis proposes that the new terms are non-zero, meaning that the model was misspecified. The Ramsey test has been frequently used to examine the relevance of regression models in numerous fields related to economics and econometrics. It enables the detection and correction of any potential misspecifications, enhancing the reliability as well as validity of empirical results.

5.7.6. Stability Testing

Stability testing in econometrics refers to the study of the consistency or stability of links between economic variables throughout time. It examines whether a model's statistical characteristics and parameters remain consistent as well as reliable across time periods or sub-samples. Stability tests play a major role in econometric analysis because unstable variable relationships can lead to unreliable and misleading conclusions. (Davidson & MacKinnon, 1993).

In econometrics, there are different methods and approaches for conducting stability tests, and the method employed depends on the particular context as well as the question. According to Davidson & MacKinnon (1993) the most commonly used approaches are**:**

- Chow Testing: The Chow test created by economist Gregory Chow is a popular approach for determining structural stability. It involves creating separate regression

models for various time periods or sub-samples and comparing the results using an F-test to see if the estimated parameters differ significantly.

- CUSUM Testing: The Cumulative Sum of Squares test is a graphical tool for determining the stability of regression parameters over time. It illustrates the total difference between the predicted parameters as well as their mean values, assisting researchers detect any systematic deviations or shifts.
- Recursive estimation: Recursive estimation is the process of estimating a model repeatedly throughout rolling time periods or sub-samples. It provides an examination of parameter stability by examining how estimates vary when new data is added.
- Rolling Regression: Similar to recursive estimation, rolling regression includes estimating a model with a fixed window of data that "rolls" over time. Researchers can examine the model's stability over time by comparing the determined coefficients across a variety of windows.

5.8. Conclusion

This chapter describes the strategies and processes used in the ARDL model. The tests that will be carried out will make sure the data is thoroughly examined, and once it has passed all diagnostic testing as well as has satisfactory stationarity outcomes, it may be employed to draw conclusions regarding the topic. The methods employed were chosen because they were better suited to the specific data compared to other frameworks.

CHAPTER 6: FINDINGS AND DISCUSSIONS

6.1 Overview

Using the ARDL technique, this chapter presents the empirical analysis conducted in this study attempts to analysis the determinants of Human Determinants Index in South Africa from 1990 to 2021. The chapter is structured into several section where the empirical results are organised as follows: first introduction of the chapter, then the unit root test stationery test, descriptive statistics, visual inspection after, followed by Objective 1 which is a section consisting of ARDL bounds test, Cointegration results, long run analysis, Diagnostic and stability results. Followed by Objective 2, which consists of the following: the tabulated representation of all the variables, the graphical Representation of all the variables, comparisons of Economic indicators, Demographic indicators and Policy Framework in each era. The diagnostic tests are employed to validate the findings of the other tests conducted in the study. Lastly, vertical presentation of dependent variable, Presidential eras, Comparisons of Economic indicators, demographic indicators and policy framework in each era, Policy distinctions between the presidencies from 1990 to date.

6.2 Descriptive statistics

Economic indicators

Table 6: Descriptive statistics for economic indicators

	HDI	GDP	FDI	CPI	UNE
Skewness	-0.689931	-0.768032	-0.041680	0.771978	1.084632
Jarque-Bera	2.538885	4.059284	2.155110	3.810743	3.282010
Probability	0.243875	0.098171	0.618458	0.131677	0.224162
Observations	32	32	32	32	15

Interpretation: Throughout the study period, South Africa's GDP growth averaged 2.14%, with considerable variations shown by a standard deviation of 1.95 percentage points, indicating macroeconomic instability. Inflation averaged 6.13%, indicating moderate pricing pressures aligned with the higher end of the inflation-targeting range. The unemployment

rate, averaging 25.6%, emphasizes ongoing labor market issues, especially among young people and unskilled workers. HDI held a mean value of 0.651, aligning with a medium human dev-4elopment classification, whereas the FDI-to-GDP ratio had an average of 1.32%, indicating limited integration into global capital flows.

Demographic indicators

Table 7: Descriptive statistics for demographic indicators

	HDI	**GINI**	**FERT**	**POP**
Skewness	-0.689931	1.035027	1.316219	-0.574728
Jarque-Bera	2.822198	8.715374	8.081103	4.374937
Probability	0.243875	0.012808	0.017588	0.112200
Observations	32	28	27	32

Interpretation:

GINI: The average GINI value is 0.613, signifying a reasonable degree of income inequality in South Africa. The elevated standard deviation (0.046) and positive skewness indicate considerable variability among regions, with certain areas facing significant disparities. The Jarque-Bera test shows non-normality (p-value = 0.013), implying possible complications in analysing the data using conventional statistical techniques.

FERT: With an average of 2.68 children for each woman, fertility rates in South Africa seem moderate compared to worldwide averages, with a standard deviation of 0.74 suggesting a significant variation in fertility rates. The positive skewness (1.316) indicates that rises fertility rates tend to be prevalent in particular demographic groups or rural regions, and the Jarque-Bera test supports non-normality (p-value = 0.018), emphasizing the necessity for caution in presuming consistent fertility trends nationwide.

POP: South Africa has an average population of 56.98 million, accompanied by a low standard deviation of 2.71 million, suggesting a concentration of people in urban regions. The negative skewness of -0.575 signifies that the data is more concentrated at the upper end, indicating a scarcity of areas with particularly low population densities. The results of the

Jarque-Bera test indicate that this variable adheres to a normal distribution, affirming the reliability of inferences drawn from conventional statistical tests.

Policy Framework indicators

Table 8: Descriptive statistics for policy framework indicators

	HDI	**ICT**	**TRA**
Skewness	-0.689931	0.111235	3.01484
Jarque-Bera	2.822198	0.189823	175.8901
Probability	0.243875	0.909453	0.000000
Observations	32	14	31

Interpretation:

ICT: With a mean of 0.72 and a standard deviation of 0.16, South Africa's ICT development appears moderately advanced but with some variability. The positive skewness (0.111) indicates a fairly symmetrical distribution of the variable, and the Jarque-Bera test supports normality (p-value = 0.909), rendering the variable appropriate for inferential statistical analyses.

TRA: The average value of trade openness (TRA) stands at 0.48, with a large standard deviation of 0.22, indicating notable variability in trade exposure across regions or sectors. The notably high skewness (3.015) indicates that the distribution is significantly right-skewed, with certain sectors or regions facing unusually high levels of trade exposure. The Jarque-Bera test significantly denies normality (p-value = 0.000), suggesting that this variable needs meticulous handling to prevent erroneous conclusions in econometric models.

PRELIMINARY TESTS

6.3 Visual Inspection

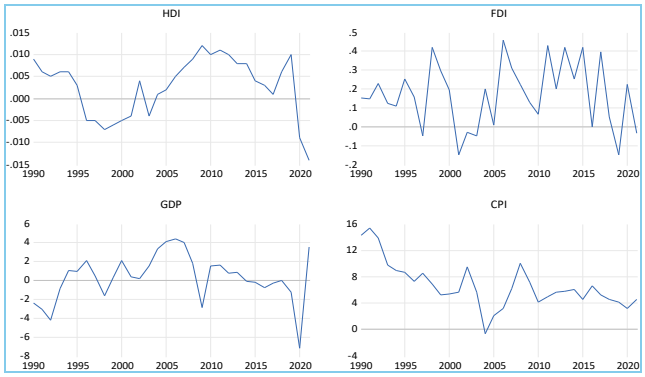
Prior to conducting formal unit root tests, a visual inspection of the time series plots for all variables was undertaken. This preliminary analysis aimed to identify the general trends, fluctuations, and potential structural breaks in the data series over the study period.

The visual patterns indicate that certain variables, like economic growth and inflation, exhibit significant cyclical variations and potential structural changes associated with macroeconomic shocks, whereas others, including ICT penetration and trade openness, reveal consistent upward or downward movements. These patterns suggest a potential non-stationary behavior. On the other hand, some series seem to oscillate around a stable average, indicating possible stationarity.

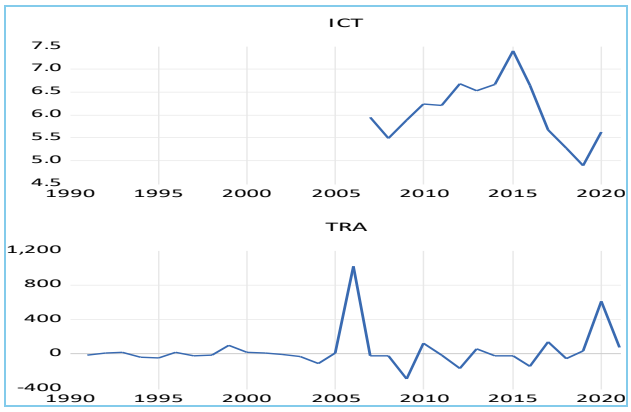
Economic Indicators **(**HDI, GDP, FDI, and UNE), Demographic indicators (POP, GINI, and FERT) and Policy framework (ICT, TRA) are the variables that are used for visual inspection. If it is discovered that the variables in question have unit root (non-stationary) levels, the variables are compared and the unit root test is repeated. Figure 5.1 represents illustrations that give a graphic and informal perception of stationarity.

Figure 6.1: Visual Inspection

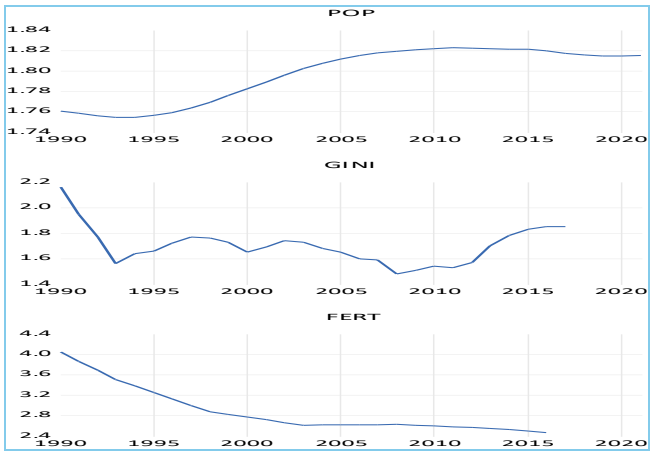
a. Economic Indicators



b. Demographic indicators



c. Policy framework



6.4 Unit Root Tests

Econometric analysis was employed to determine the explanatory variable's stationarity. Since this study will be analysing time series data, it is critical to investigate the characteristics of numerous elements to avoid misleading regression issues. Understanding non-stationarity is critical because it aids in determining the best model for projection when the analysis period extends and panels vary over time.

6.5 Augmented Dicky-Fuller Tests

Table 9: Augmented Dicky-Fuller test at first difference with trend and intercept (Economic indicators)

Variables	Level test statistic	First Difference test statistic	T-Statistics	T-Statistics	Critical Values			Order of Integration
					1%	5%	10%	
HDI	0.8612	0.0005	-1.3302	-5.5005	-4.2967	-3.5683	-3.2183	I(1)
CPI	0.0304	0.0004	-3.8035	-5.7319	-4.3393	-3.5875	-3.2292	I (0)
FDI	0.0012	0.000	-5.1558	-10.003	-4.2967	-3.5684	-3.2184	I (0)
GDP	0.0442	0.0002	-3.6221	-5.9064	-4.2967	-3.5683	-3.2183	I (0)
UNE	0.9929	0.0070	0.1177	-5.1267	-4.2846	-3.5628	-3.2152	I (1)

Source: Author's computation from EViews 12

Interpretation:

The results indicate that HDI and Unemployment (UNE) are non-stationary in levels but attain stationarity at first difference, thereby being classified as integrated of order one, I(1). Conversely, the remaining variables—Consumer Price Index (CPI), Foreign Direct Investment (FDI), and Gross Domestic Product (GDP)—are found to be stationary at level, and thus are integrated of order zero, I(0). These findings suggest a mixed order of integration across the economic indicators.

This mix of I(0) and I(1) variables justifies the use of the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, as ARDL models are robust in the

presence of variables with different integration orders, provided none is integrated of order two, I(2).

Table 10: Augmented Dicky-Fuller test at first difference with trend and intercept (Demographic indicators)

Variables	Level test statistic	First Difference test statistic	T-Statistics	T-Statistics	Critical Values			Order of Integration
					1%	5%	10%	
POP	0.0102	0.0343	-4.3150	-3.7908	-4.3743	-3.6032	-3.2380	I (0)
FERT	0.8128	0.0001	-1.4859	-6.0533	-4.2967	-3.5684	-3.2184	I (1)
GINI	0.0232	0.0001	-3.9567	-6.6132	-3.7115	-2.9810	-2.6299	I (0)

Source: Author's EViews 12 computations

Interpretation:

The population size (POP) and GINI coefficient are stationary at level, confirming their I (0) status. Fertility rate (FERT), however, is non-stationary in levels but achieves stationarity after first differencing, indicating I (1) behaviour.

Table 11: Augmented Dicky-Fuller test at first difference with trend and intercept (Policy Framework indicators)

Variables	Level test statistic	First Difference test statistic	T-Statistics	T-Statistics	Critical Values	Order of Integration

					1%	5%	10%	
TRA	00411	0.0006	-3.6764	-5.5831	-4.3098	-3.5742	-3.2217	I (0)
ICT	0.4352	0.0411	-2.2733	-3.6763	-4.3240	-3.5806	-3.2253	i (1)

Source: Author's computation from EViews 12

Interpretation:

The trade openness (TRA) variable is stationary at level, confirming I(0) status. Conversely, the ICT development index is non-stationary at level but becomes stationary after first differencing, classifying it as I(1).

OBJECTIVE 1: To determine the impact of the determinants of HDI [Economic Indicators/Demographic Issues/Policy Framework] on Human Development.

6.6 Economic Indicators (Consumer Price Index, Gross Domestic Product, Foreign Direct Interest & Unemployment rate)

6.5.1. Lag Selection

Table 12: Lag Selection

Lag	Lag L	LR	FPE	A/C	SC	HQ
0	-19.7352	N/A	-0.000026	3.53360	3.76184	3.51277
1	35.00065	**62.5553***	**-0.00005***	**-0.71432***	0.65503	**-0.84114***
** Indicates lag order selected by the criterion*						

Source: Author's computation from EViews 12

According to Posanda and Buckey (2004), the Akaike and Schwartz Information Criteria are employed to calculate the amount of data lost. Lag selection is conducted to determine the best lag length for the model. This was established utilising lag length criterion such as Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SC), and Hannan-Quinn Criterion (HQ). As a result of their strength and consistency, the SC and HQ, the information criteria, were used in this investigation.

6.5.2. ARDL bounds testing.

The ARDL bounce test is a statistical test used to detect Cointegration between two or more time series that are not integrated in the same order. This test is particularly efficient for detecting Cointegration between time series with non-stationary or mixed-order integration. The ARDL bounce test requires the estimation of an autoregressive distributed lag (ARDL) model. The ARDL framework is a hybrid model that combines elements of the autoregressive and distributed lag techniques (Johansen, 1991). The first step in conducting the ARDL bounce test is to estimate an ARDL model with the dependent and independent variables being the two-time series of interest. The F statistics are then computed for the lag values of the independent variable(s). The F-statistic is greater than the upper bound of the critical values table if the two-time series are cointegrated. (Pesaran, Shin, and Smith, 2001).

6.5.2.1. Bounds testing

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 13: Bounds testing

Test Statistic	Value	Significant	I (0)		I (1)
F-statistic	6.169854	10%	3.03		4.06
K	4	5%	3.47		4.57
		2.5%	3.89		5.07
		1%	4.4		5.72

Source: Author's computation from EViews 12

Following the general rule of ARLD Cointegration, namely if the f-stats is greater than the upper bound critical value, there is Cointegration and if the f-stats is lower than the critical value of the lower bound, there is no Cointegration. This result shows that the calculated F-value is 6.16 which is above the upper and lower bounds test. The critical value of the upper

bound is 5.72 at 1% significant level. This means that the null hypothesis of no cointegrating relationship can be rejected, which implies that HDI is cointegrated with UNE, FDI and GDP.

6.5.2.2. Long run analysis

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 14: Long run analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP)	0.003427	0.001953	1.754726	0.1397
D(FDI)	-0.019564	0.001156	-0.855572	0.0216
D(CPI)	-0.000897	0.000785	-1.143531	0.3046
C	0.005681	0.043700	0.130001	0.9016

Source: Author's computation from EViews 12

Representation:

HDI= - (0.003427GDP-0.019564FDI-0.000897CPI) + 0.005681

Long run interpretation:

Gross Domestic Products

There is a statistically positive insignificant relationship between Human Development index and Gross Domestic Products. This implies that a 1 percent increase in GDP will, on average, results in a 0.343 percent increase in HDI.

Foreign Direct Index

There is a statistically negative significant relationship between Human Development index and Foreign Direct Index. This implies that a 1 percent increase in FDI will, on average, results in a 1.96 percent decrease in HDI.

Consumer Price Index

There is a statistically negative insignificant relationship between Human Development index and Consumer Price Index. This implies that a 1 percent increase in CPI will, on average, results in a 0.089 percent decrease in HDI.

The findings indicated that GDP has a positive yet statistically insignificant retionlation with HDI over the long term. While GDP growth is generally anticipated to enhance human development through increased income and public service delivery, this outcome may indicate South Africa's ongoing income disparity, elevated unemployment, and structural dualism. Economic growth in South Africa has not been widely inclusive, indicating that rises in overall income might not result in significant enhancements in education, health, or income equality. This finding is consistent with post-development theory, which cautions against overreliance on economic growth indicators as proxies for human well-being. Nonetheless the findings are in contrary to Miraç, Ali, & Arif, (2014), who argued that Gross Domestic Products per capita have statistically significant effects on the level of development. Sangaj (2016) is also in contrary to that, Sangaj (2016) argued that the Gross domestic product per capita had a positive influence on the human development index, indicating that these countries were able to provide more products and services while also improving their citizens' living conditions.

The results confirm a negative insignificant relationship between Human Development Index and Foreign Direct Investment. According to the results of the long-run coefficient estimation, there is an inverse relationship between Foreign Direct Investment and human development. When FDI benefits are not dispersed evenly across the population, it can worsen current inequalities and result in a decline in HDI for specific populations. This is possible if FDI flows are focused on enclave industries that generate few local jobs and profits that are primarily repatriated. This is argued by Reiter and Steensma (2010) who stated that FDI promotes the process of Human development. Meanwhile also argued that Sharma & Gani (2004), Foreign Direct investment appears to have a good effect on human development in both groupings of countries.

The results confirm a negative insignificant relationship between Human Development Index and Consumer Price Index. According to the results of the long-run coefficient estimation, there is an inverse relationship between inflation as well as human development. High and

persistent inflation may reduce purchasing power, making it more difficult for people to afford essential products and services, affecting their overall well-being. This can have a negative impact on HDI components such as health and education. Nonetheless other authors Ogbebor, Oguntodu & Oyinloye (2020) agreed that the findings suggested a long-term relationship between inflation as well as standard of living.

6.5.3. ECM short run dynamic ARDL estimation

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 15: ECM short run dynamic ARDL estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP)	0.001564	0.000243	6.439684	0.0013
D(FDI)	-0.015974	0.002256	-7.081280	0.0009
D(CPI)	-0.000897	0.000300	-2.986833	0.0306
CointEQ (-1) *	-0.287275	0.017937	-6.595999	0.0007

Source: Author's computation from EViews 12

Table 15 the results obtained from this study shows that the error correction term is negative and significant, with a probability value of 0.001 and a coefficient of -0.287, which is an indication of the speed of adjustment from a period of disequilibrium to a period of disequilibrium to a of equilibrium. Ozturk and Acaravci (2010) cited that for short-run disequilibrium dynamics to return to long-run equilibrium, the error correction term must be negative and statistically significant. Jardoon et al. (2015) add that if the error correction term is positive, the model ought to be questioned. Furthermore, the 28.7 percent of disequilibrium is adjusted for the next period or system corrects its previous period disequilibrium at a speed of 26.6% within one period. Then the 95.4 percent variation in the dependent variable is explained by the independent variable as indicated by R-Squared coefficient.

6.6. DEMOGRAPHIC INDICATORS (Population rate, Fertility rate and Gini Index)

6.6.1. Lag Selection

Table 16: Lag Selection

Lag	Lag L	LR	FPE	A/C	SC	HQ
0	205.2869	N/A	-0.000022	3.53360	15.2900	15.4278
1	382.9448	**286.989***	**-0.000899***	**-0.71432***	**-26.9510***	27.6401
** Indicates lag order selected by the criterion*						

Source: Author's computation from EViews 12

According to Posanda and Buckey (2004), the Akaike and Schwartz Information Criteria are employed to calculate the amount of data lost. Lag selection is conducted to determine the best lag length for the model. This was established utilising lag length criterion such as Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SC), and Hannan-Quinn Criterion (HQ). As a result of their strength and consistency, the SC and HQ, the information criteria, were used in this investigation.

6.6.2. ARDL bounds testing.

6.6.2.1. Bounds Test

Dependent variable: HDI

Included observations: 39 after adjustments.

Table 17: Bounds test.

Test Statistic	Value	Significant	I (0)	I (1)
F-statistic	8.544489	10%	2.72	3.77
K	3	5%	2.79	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

Source: Author's computation from EViews 12

Table 17 shows that the calculated F-value is 8.54 which is above the upper and lower bounds test. The critical value of the upper bound is 5.61 at 1% significant level. This means that the null hypothesis of no cointegrating relationship can be rejected, which implies that HDI is cointegrated with FERT, POP and GINI. So, there is an existing long run relationship between variables.

6.6.2.2. Long run analysis

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 18: Long run analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	-0.222008	0.007536	-1.255514	0.8306
FERT	0.034540	0.00600	5.757150	0.0000
POP	0.327076	0.067118	4.873176	0.0001
C	-0.646434	0.129546	-4.99005	0.0001

Source: Author's computation from EViews 12

Representation:

HDI= - (-0.222008GINI+0.034540FERT+0.327076POP)-0.646434

Long run interpretation:

Gini Index

There is a statistically negative insignificant relationship between Human Development index and Gini Index. This implies that a 1 percent increase in GINI will, on average, results in a 22.2 percent decrease in HDI.

Fertility rate

There is a statistically positive significant relationship between Human Development index and Fertility rate. This implies that a 1 percent increase in FERT will, on average, results in a 3.45 percent increase in HDI.

Population rate

There is a statistically positive significant relationship between Human Development index and Population rate. This implies that a 1 percent increase in POP will, on average, results in a 32.7 percent decrease in HDI.

The results reported confirms a negative insignificant relationship between Human development Index and Gini Index. According to the results of the long-run coefficient estimation, there is an inverse relationship between Gini Index and human development. Income inequality may hinder access to quality healthcare, education, and various other critical services, limiting human development. Inequality can cause social unrest as well as instability, delaying growth even more. Nonetheless authors like Basuki & Saptutyningsih (2016) and Astuti (2018) agreed that the Gini coefficient has a significant negative association with HDI, as does the proportion of the poor. Meanwhile other researchers such as Cifuentes et.al (2008) argued that the Gini index was positively associated with HDI.

The results reported confirms a negative insignificant relationship between Human development Index and Fertility rate. According to the results of the long-run coefficient estimation, there is inverse relationship between Fertility rate and human development. Increased access to education and healthcare can lead to lower child mortality, enabling couples to have fewer children while still meeting the family size they desire. Better economic opportunities may encourage larger families to make contributions to household income. However, Hafner & Mayer-Foulkes (2013) conceded that Fertility has a negative relationship to human development.

The results reported confirms a positive significant relationship between Human development Index and Population rate. According to the results of the long-run coefficient estimation, there is direct relationship between Population rate and human development. An increased population means a larger workforce, which can contribute to increase economic productivity as well as the country's growth, and this can then be used to enhance health, education, and other HDI-related variables. These may also benefit from economies of scale, which means that producing goods and services becomes less expensive as the population expands, it can result in cheaper prices and greater access to important goods and services for all. On contrary Asmita and Ruslan (2017) stated that population have no effect on the Human Development Index in North Sumatra Province.

6.6.2.3. ECM short run dynamic ARDL estimation

Dependent variable: HDI

Included observations: 39 after adjustments.

Table 19: ECM short run dynamic ARDL estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GINI)	-0.0001635	0.0004605	-0.354989	0.7265
CointEQ (-1) *	-1.222008	0.141331	-8.646420	0.0000

Source: Author's computation from EViews 12

Table 19 the results obtained from this study shows that the error correction term is negative and significant, with a probability value of 0.000 and a coefficient of -1.222, which is an indication of the speed of adjustment from a period of disequilibrium to a period of disequilibrium to a of equilibrium. Furthermore, this implies that the speed of adjustment towards the long run equilibrium is 122.2% or system corrects its previous period disequilibrium at a speed of 122.2% within one period. As a result, this shows that there was no evidence of short run relationship FERT and POP but only for GINI.

6.7. POLICY FRAMEWORK INDICATORS (Information Communication Technology & Trade)

6.7.1. Lag selection

Table 20: Lag selection

Lag	**Lag L**	**LR**	**FPE**	**A/C**	**SC**	**HQ**
0	-167.524	N/A	17.37021	11.36831	15.2900	11.4131
1	129.5664	**65.7944***	**-2.52177***	**-9.43776***	**9.98282***	9.61706
** Indicates lag order selected by the criterion*						

Source: Author's computation from EViews 12

According to Posanda and Buckey (2004), the Akaike and Schwartz Information Criteria are employed to calculate the amount of data lost. Lag selection is conducted to determine the best lag length for the model. This was established utilising lag length criterion such as Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SC), and Hannan-Quinn Criterion (HQ). As a result of their strength and consistency, the SC and HQ, the information criteria, were used in this investigation.

6.7.2. ARDL bounds testing.

6.7.2.1. Bounds tests.

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 21: Bounds test

Test Statistic	Value	Significant	I (0)	I (1)
F-statistic	13.8577	10%	4.19	5.06
K	2	5%	4.87	5.85
		2.5%	5.79	6.59
		1%	6.34	7.52

Source: Author's computation from EViews 12

Table 21 shows that the calculated F-value is 13.86 which is above the upper and lower bounds test. The critical value of the upper bound is 5 at 1% significant level. This means that the null hypothesis of no cointegrating relationship can be rejected, which implies that HDI is cointegrated with ICT and TRA. So, there is an existing long run relationship between variables.

6.7.2.2. Long run analysis

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 22: Long run analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ICT	-0.002990	0.001302	-2.296031	0.0473
TRA	-0.000234	-0.000048	-4.795997	0.0010
C	0.023402	0.009071	2.579817	0.0297

Source: Author's computation from EViews 12

Representation:

HDI= - (-0.002990ICT-0.000234TRA) +0.023402

Long run interpretation:

Information Communication Technology

There is a statistically negative significant relationship between Human Development index and Information Communication Technology. This implies that a 1 percent increase in ICT will, on average, results in a 0.0234 percent decrease in HDI.

Trade

There is a statistically negative significant relationship between Human Development index and Trade. This implies that a 1 percent increase in TRA will, on average, results in a 2.99 percent decrease in HDI.

The results indicate that both ICT and Trade openness exhibit statistically significant negative influences on HDI, which contrasts with typical assumptions A plausible explanation for the negative ICT-HDI relationship lies in the digital divide that characterizes much of South Africa's socio-economic environment. The adoption and use of ICT are often focused in urban regions and among wealthier populations, consequently increasing disparities in access to education, services, and employment opportunities. In the absence of fair access and digital skills, ICT could worsen exclusion and amplify existing inequalities in human development.
Similarly, the negative effect of trade openness could stem from South Africa's dependence on commodity exports and capital-intensive industries, which limits job creation and broad-based participation in global markets. Trade liberalization, lacking complementary industrial

and social policies, may displace local industries and increase income disparity. These results are consistent with those of Khan et al. (2019), who noted that trade and ICT do not consistently enhance HDI in developing nations because of institutional and structural limitations.

The results reported confirms a negative significant relationship between Human development Index and Trade. According to the results of the long-run coefficient estimation, there is an inverse relationship between Trade and Human development Index. This may result in the closing down of domestic industries and the loss of jobs in industries that are unable to compete with international goods. It can have an adverse effect on livelihoods and lead to poverty, which will affect HDI. Furthermore Sana, Dilawar, Alam, & Magda (2020) argued that trade had a favourable and considerable impact on human development.

6.7.2.3. ECM short run dynamic ARDL estimation

Dependent variable: HDI
Included observations: 39 after adjustments.

Table 23: ECM short run dynamic ARDL estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEQ (-1) *	-0.26576	0.037397	-7.128231	0.0001

Source: Author's computation from EViews 12

Table 23 the results obtained from this study shows that the error correction term is negative and significant, with a probability value of 0.000 and a coefficient of -0.266, which is an indication of the speed of adjustment from a period of disequilibrium to a period of disequilibrium to a of equilibrium. Therefore, this implies that the speed of adjustment towards the long run equilibrium is 26.6% or system corrects its previous period disequilibrium at a speed of 26.6% within one period. As a result, this shows that there was no evidence of short run relationship ICT and TRA (Policy Framework) and HDI.

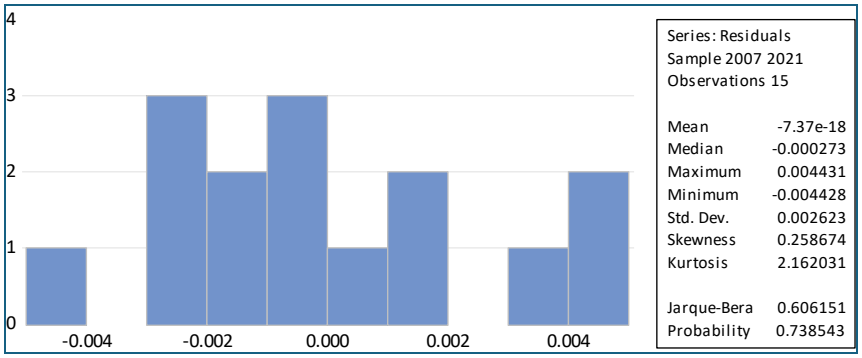
POST TEST

DIAGNOSTIC TEST

6.8. POST-TESTS FOR ECONOMIC INDICATORS (Consumer Price Index, Gross Domestic Product, Foreign Direct Interest &Unemployment)

6.8.1. Normality Test

Figure 10: Normality Test



Source: Author's computation from EViews 12

Figure 10, shows that the Jarque-Bera (JB) test is used to determine whether the residuals have a normal distribution. The null hypothesis of the test states that the residuals are normally distributed. The p-value is 0.74, which suggests that the residuals are normally distributed. In other words, we cannot reject the null hypothesis.

6.8.2. Multicollinearity

Table 24: Multicollinearity

VARIABLES	CENTERED VIF
CPI	1.31608
FDI	1.28400
GDP	1.57987
UNE	2.28350

Source: Author's computation from EViews 12

The centered Variance Inflation Factors shows the independent variables are not correlated to each other. Therefore, the null hypothesis of multicollinearity is that there is no multicollinearity in the model.

6.8.3. Serial Correlation

Table 25: LM test

Durbin Wason Stats	**2.0**		
F-statistics	0.64843	Prob. F (1,20)	0.5483
Obs* R-Squared	2.09242	Prob. Chi-Square (1)	0.3513

Source: Author's computation from EViews 12

Table 25 displays the results of the Breusch-Godfrey serial correlation LM test. The Durbin Watson stats of the model lies between 1.5 and 2.0 which implies that is no Serial Correlation, the Obs. R-squared is 0.64 and Prob. Chi-square is 0.55. As a result, because the statistic falls within the predicted range, the null hypothesis of no serial correlation cannot be rejected. Based on these findings, there is no serial correlation.

6.8.4. Heteroskedasticity

Table 26: Breusch-Pagan Godfrey Test

F-statistics	0.8029	Prob. F	0.5504
Obs* R-Squared	3.6466	Prob. Chi-Square	0.4559
Scaled explained SS	0.9417	Prob. Chi-Square	0.9185

Source: Author's computation from EViews 12

Table 26, shows Breusch-Pagan Godfrey proves that the residuals obtained from the ARDL Model are free from Heteroskedasticity. The Obs. R-squared 3.65 and Pro. Chi-Square is 0.46. Therefore, we fail to reject the null hypothesis and we conclude that there is no heteroscedasticity, we have homoscedasticity.

6.8.5. Ramsey RESET Test

Table 27: RESET Test

	Value	**Prob.**
t-statistic	1.9402	0.084

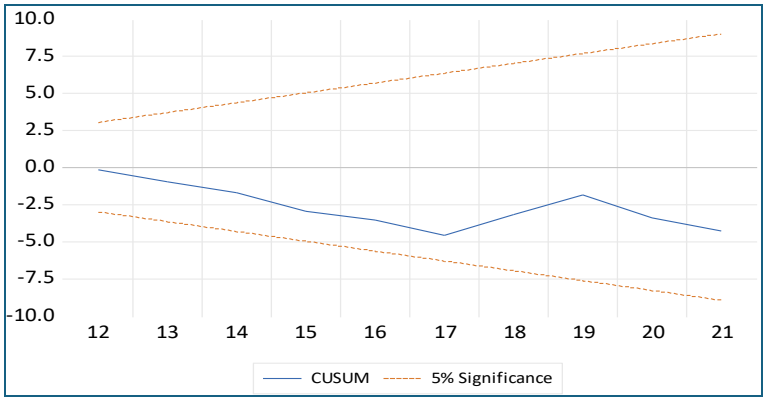
F-statistic	3.7642	0.084
Likelihood ratio	5.2412	0.022

Source: Author's computation from EViews 12

The table 6.18 Ramsey RESET Test was used to the appropriate functional form. The probability value of F-Statistics is 0.08 suggesting that the model is well specified.

6.8.6. CUSUM Test

Figure 11: CUSUM Test



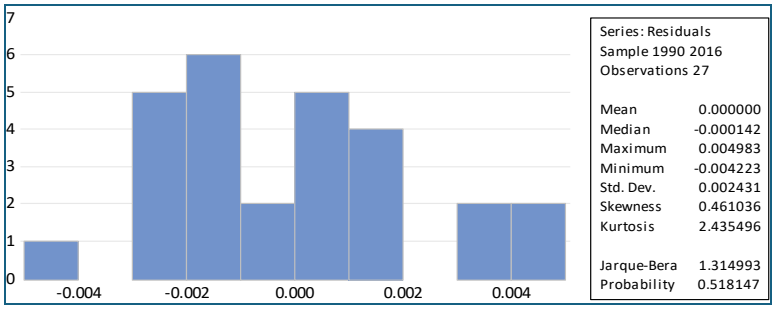
Source: Author's computation from EViews 12

The CUSUM tests, introduced by Brown et al. in 1975, are used to determine the stability of a significant relationship between variables. The diagram 6.3 remained between the 5% critical bounds (portrayed by two straight lines) which prove the stability of the parameter, indicating a consistent and significant relationship among the variables.

6.9. POST-TESTS FOR DEMOGRAPHIC INDICATORS (Population rate, Fertility rate and Gini Index)

6.9.1. Normality Test

Figure 12: Normality Test



Source: Author's computation from EViews 12

Figure 12 shows that the Jarque-Bera (JB) test is used to determine whether the residuals have a normal distribution. The null hypothesis of the test states that the residuals are normally distributed. The p-value is 0.52, which suggests that the residuals are normally distributed. In other words, we cannot reject the null hypothesis.

6.9.2. Multicollinearity

Table 28: Multicollinearity

VARIABLES	CENTERED VIF
GINI	1.39364
FERT	4.22488
POP	3.64166

Source: Author's computation from EViews 12

The centered Variance Inflation Factors shows the independent variables are not correlated to each other. Therefore, the null hypothesis of multicollinearity is that there is no multicollinearity in the model.

6.9.3. Serial Correlation

Table 29: LM test

Durbin Watson Stats	1.54		
F-statistics	1.32581	Prob. F (1,20)	0.3129

Obs* R-Squared	3.18605	Prob. Chi-Square (1)	0.2033

Source: Author's computation from EViews 12

Table 29 displays the results of the Breusch-Godfrey serial correlation test. The Durbin Watson stats of the model lies between 1.5 and 2.0 which implies that is no Serial Correlation, the Obs. R-squared is 1.33 and Prob. Chi-square is 0.20. As a result, because the statistic falls within the predicted range, the null hypothesis of no serial correlation cannot be rejected. Based on these findings, there is no serial correlation.

6.9.4. Heteroskedasticity

Table 30: Breusch-Pagan Godfrey Test

F-statistics	0.72492	Prob. F	0.5475
Obs* R-Squared	2.33246	Prob. Chi-Square	0.5063
Scaled explained SS	1.21482	Prob. Chi-Square	0.7495

Source: Author's computation from EViews 12

Table 30 shows Breusch-Pagan Godfrey proves that the residuals obtained from the ARDL Model are free from Heteroskedasticity. The Obs. R-squared 2.33 and Pro. Chi-Square is 0.51. Therefore, we fail to reject the null hypothesis and we conclude that there is no heteroscedasticity; we have homoscedasticity.

6.9.5. Ramsey RESET Test

Table 31: RESET Test

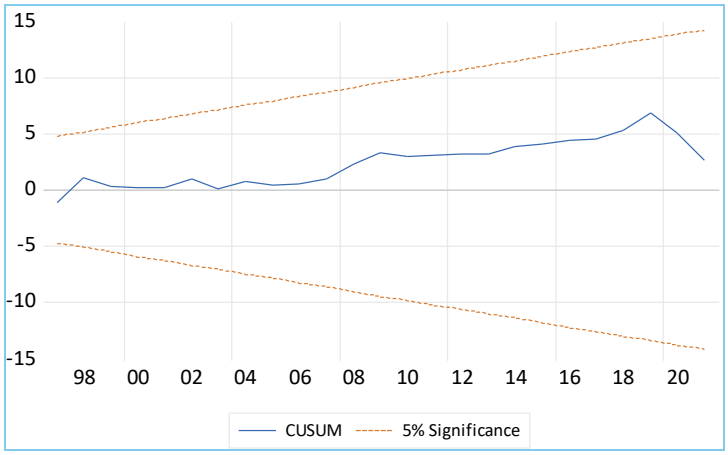
Ramsey Reset Test		
	Value	Prob.
t-statistic	0.65150	0.5215
F-statistic	0.42445	0.5215
Likelihood ratio	2.45808	0.1169

Source: Author's computation from EViews 12

The table 31 Ramsey RESET Test was used to the appropriate functional form. The probability value of F-Statistics is 0.15 suggesting that the model is well specified.

6.9.6. CUSUM Test

Figure 13: CUSUM Test



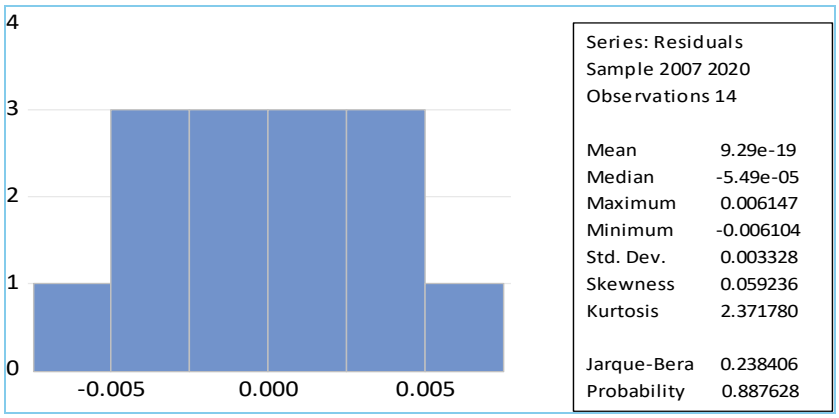
Source: Author's computation from EViews 12

The figure 13 remained between the 5% critical bounds (portrayed by two straight lines) which prove the stability of the parameter, indicating a consistent and significant relationship among the variables.

6.10. POST-TESTS FOR POLICY FRAMEWORK INDICATORS (Information Communication Technology & Trade)

6.10.1. Normality Test

Figure 14: Normality Test



Source: Author's computation from EViews 12

The Figure 14 shows that the Jarque-Bera (JB) test is used to determine whether the residuals have a normal distribution. The null hypothesis of the test states that the residuals are normally distributed. The p-value is 0.89, which suggests that the residuals are normally distributed. In other words, we cannot reject the null hypothesis.

6.10.2. Multicollinearity

Table 32: Multicollinearity

VARIABLES	CENTERED VIF
TRA	1.065239
INT	1.065239

Source: Author's computation from EViews 12

The centered Variance Inflation Factors shows the independent variables are not correlated to each other. Therefore, the null hypothesis of multicollinearity is that there is no multicollinearity in the model.

6.10.3. Serial Correlation

Table 33: LM test

Durbin Watson Stats	1.54		
F-statistics	0.51205	Prob. F (1,20)	0.6062
Obs* R-Squared	1.33438	Prob. Chi-Square (1)	0.5131

Source: Author's computation from EViews 12

Table 31 displays the results of the Breusch-Godfrey serial correlation LM test. The Durbin Watson stats of the model lies between 1.5 and 2.0 which implies that is no Serial Correlation, the Obs. R-squared is 1.33 and Prob. Chi-square is 0.51. As a result, because the statistic falls within the predicted range, the null hypothesis of no serial correlation cannot be rejected. Based on these findings, there is no serial correlation.

6.10.4. Heteroskedasticity

Table 34: Breusch-Pagan Godfrey Test

F-statistics	0.22855	Prob. F	0.7994
Obs* R-Squared	0.55855	Prob. Chi-Square	0.7563
Scaled explained SS	0.23651	Prob. Chi-Square	0.8885

Source: Author's computation from EViews 12

Table 34 shows Breusch-Pagan Godfrey proves that the residuals obtained from the ARDL Model are free from Heteroskedasticity. The Obs. R-squared 0.56 and Prob. Chi-Square is 0.76. Therefore, we fail to reject the null hypothesis and we conclude that there is no heteroscedasticity, we have homoscedasticity.

6.10.5. Ramsey Test

Table 35: Reset Test

	Value	**Prob.**
t-statistic	1.492594	0.1664

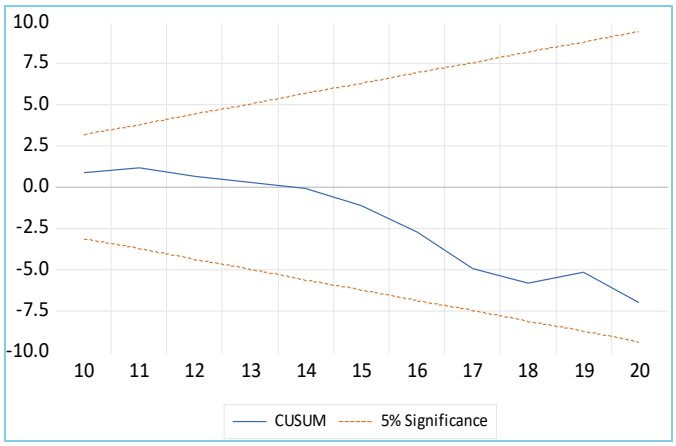
F-statistic	2.227636	0.1664
Likelihood ratio	2.815819	0.0933

Source: Author's computation from EViews 12

The table 31 Ramsey RESET Test was used to the appropriate functional form. The probability value of F-Statistics is 0.17 suggesting that the model is well specified.

6.10.6. CUSUM Test

Figure 15: CUSUM Test



Source: Author's computation from EViews 12

The figure 6.7 remained between the 5% critical bounds (portrayed by two straight lines) which prove the stability of the parameter, indicating a consistent and significant relationship among the variables.

6.10.7. Conclusion for objective 1

This study reveals a complex and nuanced set of relationships between the Human Development Index and its economic, demographic, and policy-related determinants. Although certain variables like population growth aligns with theoretical predictions by demonstrating a statistically significant positive influence on HDI, others, ike GDP, trade openness, and ICT either show statistically insignificant results or surprisingly negative impacts. These results highlight the importance of situating empirical findings within South Africa's broader institutional and socio-economic context. The limited impact of GDP highlights the constraints of overall growth in addressing inequality and improving fair access

to education and healthcare. Similarly, the negative impacts of ICT and trade can be linked to structural problems like the digital divide and trade trends that prioritize capital-intensive industries. These results strengthen the need for inclusive policies and validate the theoretical emphasis of post-development and capability approaches, which prioritize equity, participation, and sustainability over purely quantitative growth indicators.

7. OBJECTIVE 2: To determine the trajectory and movement between determinants of HDI and human development.

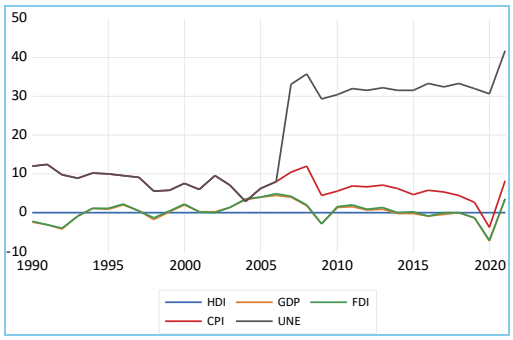
7.1. Vertical presentation of dependent variable

Table 36: Growth rate table

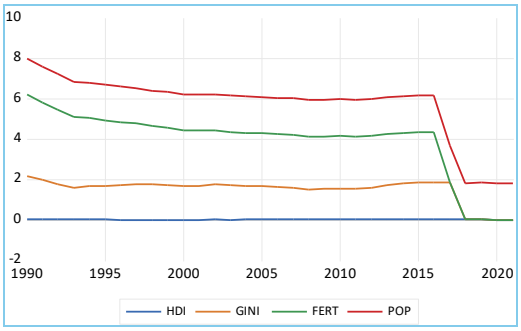
YEAR	HDI	GDP	CPI	FDI	UNE	GINI	POP	FERT	ICT	TRA
1990										
1991	0,006	-3.1	1.01	0,0	-0.04	2.5	2.59	-4.43	179,9	12,37
1992	0,005	-4.2	-1.46	-3.1	-0.19	2.35	2.08	-4.61	192,3	37,22
1993	0,006	-0.9	-4.16	-4.2	-0.14	2.18	1.83	-4.86	117,2	-36,60
1994	0,006	1.1	-0.78	-0.9	-0.08	2.17	1.75	-3.59	174,1	-44,55
1995	0,003	1.0	-0.26	1.1	-0.12	2.15	1.66	-3.73	24,4	43,50
1996	-0,005	2.1	-1.33	1.0	-0.03	2.17	1.54	-3.9	93,9	-13,41
1997	-0,005	0.5	1.24	2.1	-0.02	2.2	1.4	-4.03	78,1	-6,31
1998	-0,007	-1.6	-1.72	0.5	-0.15	2.18	1.25	-4.2	41,6	143,24
1999	-0,006	0.3	-1.7	-1.6	-0.15	2.15	1.12	-1.84	29,9	33,46
2000	-0,005	2.1	0.16	0.3	-0.05	2.08	0.97	-1.88	18,7	36,59
2001	-0,004	0.4	0.36	2.1	-0.13	2.1	0.89	-1.88	5,7	12,67
2002	0,004	0.2	3.79	0.4	-0.07	2.09	0.91	-1.95	4,4	-46,90
2003	-0,004	1.5	-3.82	0.2	-0.15	2.08	0.93	-1.99	20,2	-104,62
2004	0,001	3.4	-6.37	1.5	-0.12	1.99	0.94	0.11	-11,1	62,16
2005	0,002	4.1	2.75	3.4	-0.11	1.9	0.95	0.08	1,6	1112,49
2006	0,005	4.4	1.18	4.1	-0.09	1.8	0.97	0.11	6,0	-25,00
2007	0,007	4.0	2.93	4.4	-0.03	1.68	1.02	0.08	4,5	-20,19
2008	0,009	1.8	3.9	4.0	1,00	1.51	1.14	0.11	18,6	-293,51
2009	0,012	-2.9	-2.86	1.8	2.67	1.52	1.2	-0.57	140,0	109,13
2010	0,010	1.5	-3.13	-2.9	-1.76	1.51	1.2	-0.57	41,5	-19,61
2011	0,011	1.6	0.91	1.5	0.37	1.47	1.27	-0.58	20,7	-184,13
2012	0,010	0.8	0.73	1.6	0.25	1.41	1.34	-0.58	13,4	84,94
2013	0,008	0.9	0.06	0.8	0.57	1.48	1.37	-0.58	5,4	-14,70
2014	0,008	-0.1	0.35	0.9	0.26	1.46	1.59	-1.06	6,0	-11,96
2015	0,004	-0.2	-1.59	-0.1	1.15	1.35	2.1	-1.07	4,0	-146,54
2016	0,003	-0.8	2.03	-0.2	-0.03	1.4	0.98	-1.12	4,0	129,45
2017	0,001	-0.3	-1.39	-0.8	0.23	1.38	0.39	-1.09	11,1	-55,24
2018	0,006	0.0	-0.67	-0.3	1.32		1.23	-1.11	11,7	38,85
2019	0,010	-1.2	-0.4	0.0	-1.2		1.3	-0.87	0,9	685,91
2020	-0,009	-7.2	-0.91	-1.2	4.43		1.23	-0.88	2,8	55,24
2021	-0,014	3.6	1.4	-7.2	1.04			-0.89	16,29	6.1696

Source: Author's computation from EViews 12

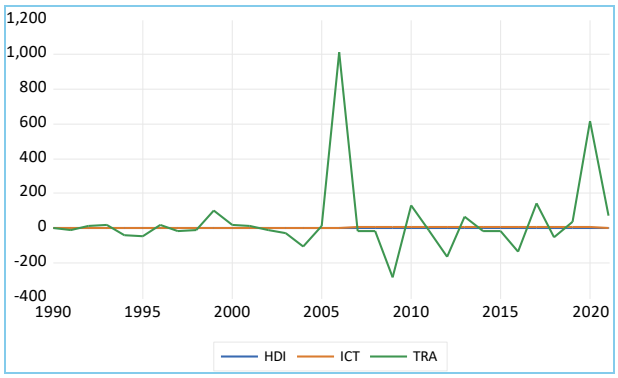
Figure 16: Growth rate graphs



Economic indicators



Demographic indicators



Policy Framework

Source: Author's computation from EViews 12

Table 36 shows the growth rate of all the variables in South Africa from 1990 to 2021, figure 7.1 represents the growth rate table in a graphical form. Over the past few years, HDI growth rate was at its highest by 0.011 percent in 2011 during the presidency of Cyril Ramaphosa, this rise can be caused by various factors like improved access to healthcare as well as a decline in HIV/AIDS deaths, as stated in the UNDP report (UNDP, 2011). Moreover, HDI was the lowest by -0.014 percent in 2021 during the presidency of Cyril Ramaphosa. The GDP growth rate was at its highest by 4.4 percent in 2000 during the presidency of Thabo Mbeki, according to Ncube (2016) South Africa witnessed a period of political stability, which created favourable environment for economic growth. GDP was the lowest by -7.2 percent in 2020 during the presidency of Cyril Ramaphosa. CPI in 2004 was the lowest by -6.4 percent during the presidency of Thabo Mbeki. However, it was the highest by 3.9 percent in 2008 during that same era, according to Manigham (2013) during this period worldwide oil prices skyrocketed, increasing the cost of energy and transport in South Africa. FDI was at its highest by 4.4 percent in 2007 during the presidency of Thabo Mbeki. However, in 2021 it was the lowest by -7.2 percent during the presidency of Cyril

Ramaphosa, Foreign direct investment (FDI) in South Africa fell sharply, dropping by 61% to $5.4 billion from $13.9 billion in 2020 (UNCTAD, 2022). UNE was at its highest by 4.43 percent in 2020 during the presidency of Thabo Mbeki and it was the lowest by -1.76 percent in 2010 also during the same era. GINI was at its highest by 2.5 percent in 1991 during the presidency of FW De Klerk, this discrimination resulted in significant inequalities and poverty amongst black South Africans. It was the lowest by -1.35 percent in 2015 during the presidency of Jacob Zuma. POP was at its highest by 2.59 percent in 1991 during the presidency of FW De Klerk and it was the lowest by -0.39 percent in 2017 during the presidency of Jacob Zuma. FERT was at its highest by 0.11 percent in 2004, 2006 and 2008 respectively during the presidency of Thabo Mbeki, according to World Health Organization (2020) fertility rate was high, averaging 2.9 children born of a woman during that era. FERT was the lowest by -4.86 percent in 1993 during the presidency of FW De Klerk. TRA was at its highest by 1112.49 percent in 2005 during the presidency Thabo Mbeki, TRA was the lowest by -292.6 percent in 2008 during the presidency of Thabo Mbeki, South Africa's trade fell dramatically in 2008, with total exports as well as imports falling by 18% and 20.5%, respectively (WTO, 2009). Lastly ICT was at its highest by 192.3 percent in 1992 during the presidency of FW De Klerk, South Africa got access to international technological markets and knowledge with the easing of sanctions and the opening of the economy, resulting in a spike in technology creation and use (Dahlman 2007). Meanwhile it was the lowest by -293.1 percent in 2008 during the presidency of Thabo Mbeki.

7.2. Presidential eras

7.2.1 Apartheid era FW De Klerk presidency: 1990- 1994

7.2.1.1 Economic Indicators

The HDI is a composite measure of a nation's life expectancy, education, and per capita income data, and it is used to categorise countries into four distinct tiers of human development. When a country's life expectancy, education level, and GNP per capita are all higher, it scores higher. South Africa's HDI increased partially during the Apartheid era, rising from 0.577 in 1990 to 0.601 in 1994 (UNDP, 1995). However, the HDI in 1994 remained much lower than the global average of 0.679. Dempster (2023) cited that this was due to apartheid's huge inequities in South Africa, with the black majority population having

significantly fewer opportunities and resources than the white minority population. During the Apartheid era, the High-Index Composite Index (HDI) was primarily due to increases in life expectancy, while education and per capita income levels for the black majority population remained low, resulting in a significantly lower overall HDI when compared to the global average.

During the period 1990–1994, South Africa's GDP fell by 0.3% on average per year (World Bank 2023). Several factors were involved in this situation. One key aspect was the implementation of international sanctions on South Africa due to its apartheid practices, which had a significant adverse effect on the economy (Dempster 2023). Furthermore, political instability during the country's democratic transition added to economic uncertainty and a deterioration in economic performance. High unemployment, particularly among the black community, lowered aggregate demand and had a negative influence on GDP growth. It is worth noting that the apartheid era left a strong and lasting impact on the South African economy, with the effects remaining obvious today in the form of high levels of inequality and poverty in the country.

FDI inflows in South Africa were extremely low during the Apartheid era. South Africa received only US$1.2 billion in FDI inflows in 1990 (Davenport 1996). One key aspect was the imposition of international sanctions on South Africa because of its apartheid policies, which had significant adverse effects on the economy. Foreign investment was also discouraged by the country's political instability as it moved to democracy. During the Apartheid era, South Africa's economy performed poorly, making it less appealing to foreign investors. According to Dempster (2023), FDI inflows to South Africa began to rise in the early 1990s as the government moved to deconstruct apartheid and prepare for democratic elections. South Africa received $2.4 billion in foreign direct investment in 1994. However, in comparison to other emerging countries, this was still comparatively modest.

From 1990 to 1994, the CPI in South Africa rose by an average of 15.4% per year during the Apartheid era (StatsSA 2023). International sanctions imposed on South Africa as a result of its apartheid policies made imports more difficult and expensive, contributing to inflation. Political instability during the country's transition to democracy also led to uncertainty and inflation (Faulkner & Loewald 2008). Furthermore, as the country prepared for democratic elections in the early 1990s, the economy began to grow. This raised demand for goods and

services, which increased inflation. It is vital to remember that the Apartheid era had a significant and long-lasting impact on inflation in South Africa. The Apartheid era's high inflation rates eroded the purchasing power of households and businesses, making economic growth difficult.

During the Apartheid era (1990–1994), South Africa's Unemployment Rate skyrocketed. The unemployment rate was 17% in 1990 World Bank (2023) and unemployment rate has risen to 26% since 1994. Rodman (1994) stated that one key issue was that international sanctions imposed on South Africa because of its apartheid practices had a considerable negative impact on the economy, resulting in job losses. Political insecurity throughout the country's transition to democracy exacerbated economic uncertainty and employment losses. Moreover, during this time, inflation was strong, reducing the purchasing power of both households and businesses. Southall (2014) stated that the South African economy grew slowly, reducing employment creation. Unemployment was especially high among black people. In 1994, the black South African unemployment rate was 35%, while the white South African jobless rate was 10%. The apartheid regime, which discriminated against black South Africans in every aspect of life, including employment, contributed to the problem.

7.2.1.2 Demographic Indicators

The Gini index in South Africa was very high during the Apartheid era. In 1990, the Gini index in South Africa was 0.64. This meant that the top 10% of earners in South Africa earned 64% of the country's income (SWIID 2019). Moreover, the Gini index in South Africa declined slightly during the Apartheid era, from 0.64 in 1990 to 0.63 in 1994 (World Bank 2019). However, this decline was very small, and the Gini index remained very high. The high Gini index during the Apartheid era was due to the apartheid system, which discriminated against black South Africans in all aspects of life, including employment and education. According to Klasen (1997) this discrimination led to high levels of poverty and inequality among black South Africans. It is vital to remember that the Apartheid era had a significant and long-lasting impact on South Africa's inequalities in income. Apartheid's influence may still be observed in the nation's high Gini index today. Aside from all this, it is important to note that the Gini index is a stationary measure of inequality. It ignores the complexities of inequality, such as the fact that people might move between income

categories over time. However, the Gini index is still a popular measure of inequality, and it provides a valuable picture of a country's income distribution.

During the Apartheid era (1990–1994), South Africa's Population kept expanding. During this time, the population increased at a rate of almost 2.5% annually (StatsSA 2022). High birth-rates and a drop in death rates were the primary contributors to this growth. According to Caldwell & Caldwell (1993) the country's infrastructure and resources were put under pressure due to the rapid population expansion. Due to the black majority population's lack of access to opportunities as well as basic amenities, the apartheid system also made poverty and inequality a bigger issue. Moreover, it is significant to remember that South Africa's population has been significantly and permanently impacted by the Apartheid era. The nation's resources and infrastructure are nevertheless being strained by the rapid population expansion. Apartheid's impact is still visible in the country's extreme inequality and poverty levels today.

7.2.1.3 Policy Framework

Information and Communication Technology (ICT) in South Africa was characterised by restricted access, expensive prices, and unequal distribution during the Apartheid era 1990–1994. The majority of South Africans, especially black South Africans, lacked access to ICT (Odendaal, 2018). Black South Africans had limited access to ICT because of a number of discriminatory regulations that the apartheid regime put in place. For instance, educational institutes that provided ICT training frequently barred admission to black South Africans. ICT was extremely expensive during the Apartheid era, making it unavailable to the majority of South Africans. According to Hesmondhalgh (2014) during the era, South Africa's ICT distribution was incredibly unequal. ICT resources were primarily located in white urban regions. Rural black communities had very little access to ICT. Moreover, during the Apartheid era, South Africa's ICT infrastructure was underdeveloped. ICT service deployment and maintenance became challenging and costly as a result. Despite the difficulties, the ICT industry made some promising advancements during the apartheid era. The National Telecommunications Policy was introduced by the South African government in 1991 with the goal of liberalizing the ICT industry and increasing accessibility for all South Africans. However, it wasn't until after apartheid ended that this policy was completely put into practice.

In South Africa, Trade fell from 1990 to 1994 due to apartheid. There were multiple reasons causing this matter. South Africa found it challenging to conduct business with other nations because of the international sanctions placed on it because of its apartheid policies (UNCTAD 2023). Foreign trade was hampered at the time by the political instability in the country as it made the transition to democracy. Dempster (2023) cited that the Apartheid era's dismal economic performance made South Africa less appealing to foreign trading partners. During the Apartheid era, the value of South Africa's exports and imports somewhat decreased. Nevertheless, the decline was not severe, and South Africa continued to be a significant trading country. It is important to highlight that South Africa's trade was significantly and permanently impacted by the Apartheid era. Trade with other nations was challenging due to the nation's status as a pariah state. Even after apartheid ended, it took a long time for South Africa to regain its reputation and gain favour as a trading partner with other nations.

7.2.2 The Nelson Mandela's Presidency: 1994- 1999

7.2.2.1 Economic Indicators

From 1994 until 1999, Nelson Mandela served as president of South Africa. South Africa's HDI rose over this time, rising from 0.69 to 0.71 (UNDP, 2000). The HDI of South Africa is still very low when compared to other nations around the globe, despite this large rise. When Mandela was president of South Africa, the HDI rose because of a variety of factors. Dempster (2023) cited that government expenditure on education was one of the contributing factors. Multiple initiatives have been implemented by Mandela's administration to increase education access for all South Africans, regardless of race or social and financial status which are stated in the South African Schools Act 84 of 1996. This includes increasing the number of schools, hiring more teachers, and offering low-income kids a free education. The government's investment in healthcare was another element that contributed to the HDI rise in South Africa. Furthermore, the government implemented multiple initiatives to increase individuals' access to healthcare in South Africa, including the expansion of the public healthcare system and the provision of free treatment to the underprivileged. Finally, the government's economic initiatives also aided in South Africa's rising HDI. Many measures have been put into place by Mandela's administration to encourage economic development and growth, including spending on infrastructure as well as providing tax breaks to

companies. Many South Africans experienced an increase in their standard of living and job opportunities because of these policies.

According to the World Bank (2023), South Africa's GDP increased on average by 3% annually. The economy increased at an average rate of just 1.5% annually during the apartheid era; thus, this was a huge improvement. The growth during the Mandela administration, meanwhile, was not dispersed equally. The country's income was split between the richest 10% of the population, who received more than 60% of it, and the lowest 50%, who received less than 10% (World Bank 2023). The government tried to encourage economic change, but the inequality remained. The growth of the economy during that period was influenced by a variety of different factors. Spence (2013) stated that the end of international isolation was one of the factors. South Africa was able to rejoin the global economy and attract international investment when apartheid ended. The government's emphasis on infrastructure development was another element. Moreover, the government made significant investments in power plants, bridges, and roads, which contributed to improve the business environment in the nation (Ellis 2001). However, the economy faced substantial challenges under the Mandela administration. The worldwide economic recession in the late 1990s was one challenge. The high prevalence of HIV/AIDS, which had a detrimental effect on the workforce, was another issue. The economic expansion that occurred was generally a positive factor. The persistent imbalance, however, was a significant obstacle.

Foreign Direct Investment (FDI) in South Africa expanded significantly, rising from R1.2 billion in 1994 to R4.2 billion in 1999 (UNCTAD 2023), furthermore this indicated a 28% average annual growth rate. According to Arvanitis (2006), firstly a significant barrier to foreign investment was eliminated with the end of apartheid and the installation of a democratic government in South Africa. Secondly, Mandela's administration implemented several policies to entice foreign investment, including tax reductions and regulatory reform. Thirdly, South Africa's economy had significant growth in the 1990s, which increased its appeal to foreign investors. Moreover, the South African economy benefited from the rise in FDI in several ways. It increased economic growth, created jobs, and contributed to infrastructure development. It is crucial to remember that not everyone benefited equally from FDI. The majority of the FDI went to South Africa's relatively well-established mining,

financial services, and telecommunications industries. Due to this, the most vulnerable South Africans did not gain as much from the rise in FDI as they would have.

The Consumer Price Index (CPI) fell sharply, from 11.7% in 1994 to 6.6% in 1999 (StatsSA 2023). Several factors contributed to this drop in inflation. Throughout Mandela's administration, the South African Reserve Bank (SARB) maintained tight controls on monetary policy and raised interest rates to combat inflation. To reduce the budget deficit, the South African government has put fiscal restrictions in place, such as lowering spending and raising taxes. The government also took action to boost economic competition, which assisted in keeping costs low (Dempster 2023). Moreover, it's important to understand that the decline in inflation were not without expense. A sluggish pace of economic growth and a rise in unemployment were the results of the restrictive monetary policy and fiscal restraint measures. However, the government believed these expenses were required in the long run to lower inflation and produce a more stable economic environment.

From 25.2% in 1994 to 23.8% in 1999, the Unemployment Rate in South Africa decreased slightly but remained high (StatsSA, 2018). The effects of apartheid, the world recession in the early 1990s, and the government's preference for social reconciliation above economic growth were some of the causes of this. The Reconstruction and Development Programme (RDP), which included investments in social and infrastructure initiatives, was one of several measures that Mandela's administration put into place to combat unemployment (O'Malley, 2016). Moreover, unemployment remained a significant issue; however, these initiatives were not entirely successful. Young people and women experienced unusually high unemployment rates. In comparison to the rest of the nation, the unemployment rate in the former homelands was much higher. The worldwide recession and the Asian financial crisis both contributed to an increase in unemployment in the late 1990s. Mandela's presidency was a moment of significant achievement for South Africa, despite the country's high unemployment rate. To improve the lives of all South Africans, the government introduced a number of measures as the nation made the transition from apartheid to democracy.

7.2.2.2 Demographic Indicators

During 1994–1999, the Gini index in South Africa rose, according to Harmse (2013) the Gini index rose from 0.59 in 1994 to 0.63 in 1999, as stated in the study by the University of

Bayreuth. This increase in inequality could have several factors. One explanation is that some South Africans, though not all, saw new economic prospects because of the country's transition from apartheid to democracy. White people, as well as those with higher levels of education, were frequently the beneficiaries of this transition because they were already better off (Orthofer 2016). Inequality has increased for several reasons, one of which is that the government's social policies have not always been successful in reducing inequality and poverty. For instance, the government's policies on affirmation programmes were implemented to assist black South Africans who had suffered from apartheid-era disadvantage programmes, which came under criticism for being ineffective and benefiting a tiny percentage of black people at the expense of the majority. And last, the rise in inequality in South Africa was partly a result of the late 1990s worldwide economic recession. The recession caused a reduction in economic growth and employment losses that disproportionately impacted the poor.

South Africa's Population increased from 40.3 million in 1994 to 44.8 million in 1999, this represents a 1.1% annual growth rate (StatsSA, 2020). In comparison with previous periods, the population growth rate was quite slow throughout this period. This was due to a variety of issues. Fertility declined from 6.2 children per woman in 1994 to 5.5 children per woman in 1999 (UNDP 2020). Moreover, the average life expectancy increased from 56.2 years in 1994 to 58.3 years in 1999 rate. Emigration has resulted in a net outflow of people. The rate of population growth was also unequally distributed across the country. The provinces with the highest growth rates were Gauteng and KwaZulu-Natal, which are the most populated. The Northern Cape and Free State provinces, which had fewer people, had the slowest growth rates (Burger and Matthews, 2004). South Africa's population growth during Nelson Mandela's presidency had a variety of implications for the growth of the nation. On the one hand, it raised the need for resources such as housing, education, and healthcare. On the other side, it created a new generation of employees capable of contributing to the country's economy. It is worth noting that South Africa's population growth rate has slowed since Nelson Mandela left office. The fertility rate has dropped below the replacement level, indicating that the population is not reproducing rapidly. This is because of a variety of factors, including improved access to education and contraception, as well as changing norms in society.

7.2.2.3 Policy Framework

South Africa's ICT sector had significant growth and development, several factors contributed to this remarkable expansion and development (Heeks 2002). The end of apartheid and the transition to democracy opened new prospects for economic and social development. The rapid global expansion of internet and mobile telecommunications technologies. Moreover, the government's pledge to use ICT to improve South Africans' lives and improve economic growth. The implementation of the White Paper on Telecommunications Policy in 1996 was one of government's main successes in the ICT sector. The statement presented a vision for a competitive and open telecommunications market, which was important in attracting investment and promoting sector growth. In 1998, the Universal Service and Access Agency of South Africa (USAASA) was established, which was a significant development. USAASA oversees promoting universal access to telecommunications services and has been instrumental in connecting rural and underserved populations. ITU (2023) cited that during that period the number of South Africans using ICT increased significantly. For example, the number of mobile phone subscribers grew from slightly more than one million in 1994 to more than ten million by 1999. In addition, the number of internet users increased from a few thousand in 1994 to over 500,000 by 2005. The growth of ICT in South Africa had several positive impacts. For example, it helped to create jobs, boost economic growth, and improve the delivery of public services. It also helped to connect South Africans to the global economy and to each other.

Nelson Mandela’s presidency marked a period of significant shifts in South African Trade. The newly elected government was determined to open the economy and grow trade with the rest of the globe (International Trade Centre 2023). This was seen as an important aspect of the country's Reconstruction and Development Programme (RDP), which attempted to overcome the legacy of apartheid and improve the lives of all South Africans. According to Department of Trade, Industry and Competition (2023) one of the first actions taken was to lower taxes on imported commodities. This made it easier and cheaper for South African enterprises to obtain inputs from abroad, and it rendered South African goods more competitive in foreign markets. The government also struck several trade agreements with other countries, including the United States. The United States, the European Union, and the Southern African Development Community (SADC) are all involved. These agreements provided South African enterprises with access to new markets and aided in the reduction of

trade barriers. As a result of these reforms, South African trade expanded dramatically during the 1990s. Between 1994 and 1999, exports climbed by more than 100%, while imports increased by more than 50%. This expansion aided in the creation of jobs and boosted the South African economy. (Kaplan, 2000)

7.2.3 The Thabo Mbeki's Presidency: 1999-2008

7.2.3.1 Economic Indicators

South Africa's HDI grew from 0.601 in 1999 to 0.684 in 2008 because of significant improvements in per capita income, education, and life expectancy (UNDP, 2009). Furthermore, several causes for this development, the South African economy grew on average at a rate of 4.2% annually. Many South Africans' lives were better because of the boom in the economy, which also produced more jobs and higher earnings. According to StatsSA (2023) investment in social services rose, the government increased spending on social services like healthcare and education. Many South Africans saw improvements in their quality of life because of this investment. Moreover, access to social services was increased, including water and sanitation. Doe (2023) stated that many South Africans' well-being and health have improved because of the access expansion. It is crucial to remember that there were difficulties throughout that period. The HIV/AIDS pandemic had a catastrophic effect on many South Africans, and the nation continued to experience high levels of poverty and inequality. Furthermore, the HDI did, however, show a generally upward trend during the Mbeki administration. It's important to remember that the HDI is a composite index, and the rises were mostly attributable to increases in life expectancy. The poorest South Africans continued to have relatively low levels of education and per capita income. However, the HDI showed a generally upward trend, and the nation significantly improved the quality of life for its residents.

In South Africa, consumer price inflation (CPI) averaged 6.1% from 1999 to 2008. During the same period, the global average CPI was 3.8% (World Bank, 2023). That during this time the global oil prices spiked significantly, raising the cost of energy as well as transport in South Africa. Food costs rose dramatically during this period because of a variety of circumstances, including droughts and floods (Manigham 2013). Furthermore, wages in South Africa increased dramatically during this period, contributing to demand-pull inflation.

Moreover, the South African government implemented several steps to try to reduce inflation, including interest rate hikes and price controls. These initiatives, however, were ineffective, and the CPI remained high throughout that time. High inflation can have a number of negative effects on an economy, including lowering purchasing power, discouraging investment, as well as making it difficult for firms to prepare for the future.

FDI inflows to South Africa surged significantly, South Africa received $2.3 billion in FDI in 1999. South Africa's FDI inflows had grown to $14.8 billion by 2008 (Mkrtchyan & Mkrtchyan 2017). The South African economy was largely stable, making it more appealing to foreign investors. The country had completed its democratic transition, and the political environment was largely stable. The government undertook a few economic reforms, such as tariff reductions and the privatisation of state-owned firms, which made the country more appealing to foreign investors (Taylor 2008). Furthermore, the global economy was thriving, which contributed to an increase in FDI inflows to South Africa. FDI inflows to South Africa were notably solid in the mining, manufacturing, as well as financial services sectors. Smith (2023) cited that it is important to remember that the surge in FDI was not without its critics. Some critics contended that the government was too concentrated on soliciting foreign investment and not enough on improving the home economy. Moreover, others contended that increased FDI was causing job losses in certain areas of the economy (Jones, 2023). Despite these complaints, the growth in FDI is widely regarded as a beneficial development. FDI can help to create jobs, stimulate economic growth, transfer technology and skills.
During the Thabo Mbeki administration (1999–2008), South Africa's GDP increased at an annual rate of 4.1% (StatsSA 2023). This was a major improvement over Apartheid-era economic performance, and it had one of the greatest growth rates in the world at the time. Several reasons contributed to the country's significant economic growth. Ncube (2016) cited that South Africa experienced a period of political stability, which generated a favourable atmosphere for economic growth. The government introduced a variety of economic changes, such as macroeconomic stability and privatisation, which aided economic growth. Moreover, the global economy grew rapidly, which helped South Africa as a commodity exporter. It should be noted, however, that economic growth was not evenly distributed. In terms of economic progress, the black majority population has remained behind the white minority population. Eberhard & Ndlovu (2014) further stated that the unemployment rate remained high, hovering at approximately 25%. It is worth noting that the Mbeki period ended in 2008,

when the global financial crisis devastated South Africa's economy. South Africa's economy went into recession in 2009, and GDP growth has been slow thereafter.

7.2.3.2 Demographic Indicators

South Africa's Population increased considerably, the population increased from 44.8 million in 1999 to 50.7 million in 2008, a 1.3% annual growth rate (StatsSA, 2011). There are various primary drivers of population growth during this period. According to World Health Organization (2020) fertility rate remained high, averaging 2.9 children per woman. South African mortality rates fell over this period as healthcare and other socioeconomic variables improved. During this time, South Africa witnessed a net inflow of migrants, primarily from neighbouring African countries. Moreover, it is vital to note that South Africa's population growth rate has slowed in recent years. Net migration has also dropped since the fertility rate has decreased. The country of South Africa is expected to have 65 million people by 2030 and 80 million by 2050 as a result. (StatsSA 2022).

South Africa's Gini index fell significantly, from 0.63 in 1999 to 0.61 in 2008 (SWIID 2020). However, the drop was minor, and the Gini index stayed quite high. Tobbett & Lilburne (2010) cited several programmes aimed at reducing income disparities, such as the Black Economic Empowerment (BEE) initiative and the Expanded Public Works Programme (EPWP). However, these strategies were ineffective in terms of lowering inequality. One factor is that apartheid left a legacy of extreme inequality that was difficult to remove. Additionally, Milanovic (2011) the government did not do enough to address the core causes of inequality, such as the black majority population's lack of access to good education and work opportunities. It should be noted that the Gini index is a fixed measure of inequality. It does not account for the dynamics of inequality, such as the fact that people might move between income groups over time. However, the Gini index is still a commonly employed indicator of inequality, and it provides a good overview of a country's income distribution. Furthermore, it is worth mentioning that economists disagree regarding the effectiveness of the BEE and EPWP programmes in reducing inequality. Some economists believe these programmes have been beneficial in lowering inequality, while others believe they have had little influence.

7.2.3.3 Policy Framework

Information and communication technology (ICT) advanced fast in South Africa, this was the result due to a variety of circumstances. According to ITU (2023) the government spent extensively on ICT, particularly in education and infrastructure. This investment aided in increasing access to ICT for all South Africans. The government liberalised the telecoms industry, resulting in increased competition as well as lower costs for ICT services. Moreover, this made ICT more affordable for South Africans. Mobile phones were immensely popular in South Africa. This was due to a variety of reasons, including lower prices and better network coverage. Mobile phones have made information and communication technology (ICT) more accessible and affordable to South Africans, particularly in rural regions. As a result of these causes, ICT penetration rates in South Africa expanded dramatically. Only 2% of South Africans had an internet connection in 1999. This percentage had risen to 30% by 2008 (Department of Communications, 2008). The development of ICT in South Africa had several good consequences. ICT has aided in the advancement of education, healthcare, and economic progress. Furthermore Heeger & Badenhorst (2010) cited that ICT also contributed to the empowerment and voice of South Africans. It is worth noting that the expansion of ICT in South Africa was not without hurdles. The digital divide, or the gap between people who have and do not have access to ICT, was one concern. The digital divide was especially visible in South Africa, where a huge majority of the population was impoverished and lacked access to basic essentials like power and water. Another issue was a lack of ICT skills and knowledge.

Trade in South Africa rose dramatically, South African exports went up from R165 billion in 1999 to R612 billion in 2008. South African imports surged in value from R194 billion in 1999 to R780 billion in 2008 (SARB, 2009). During Thabo Mbeki's presidency, the South African economy grew at an annual rate of 4.2% on average. This growth in the economy increased demand for both imports and exports. Asmal (2004) stated that the South African government pursued a variety of trade liberalisation policies. Tariffs and other trade obstacles were reduced as part of these initiatives. Trade liberalisation made it simpler for South African businesses to sell goods and services to other countries. Moreover, the South African government made significant investments in infrastructure. This investment strengthened the country's transport and logistics systems, allowing South African businesses to deal with other countries more easily. It is crucial to emphasise that the expansion in trade during Thabo Mbeki's presidency was not without difficulties. Furthermore, during this time, South

Africa's trade imbalance (the difference between the value of imports and exports) worsened. South Africa's trade declined significantly in 2008, with overall imports and exports falling by 18% and 20.5%, respectively (WTO, 2009). The decrease can be attributable to several internal and external causes. This decreased domestic demand, resulting in lower imports. The global financial crisis of 2008 sparked a massive recession in major economies, including those of South Africa's trading partners, such as the United States and Europe (UNCTAD, 2009). Moreover, South Africa's economy was already slowing in 2008 due to high interest rates and rising inflation. As a result, worldwide demand for South African exports fell. South Africa is a significant exporter of commodities such as minerals and metals. The price of commodities dropped dramatically in 2008 because of the worldwide recession, severely reducing South Africa's export revenues. This was due to a variety of circumstances, notably the fact that South Africa imports a significant amount of energy and raw materials, both of which are frequently expensive (Davies, 2015). Despite these obstacles, the expansion in trade during Thabo Mbeki's presidency had several good consequences for the South African economy. Trade contributed to employment creation and economic growth. Trade also aided South Africa's integration into the global economy.

7.2.4 The Jacob Zuma’s Presidency: 2009-2018

7.2.4.1 Economic Indicators

South Africa's Human Development Index (HDI) grew, rising from 0.601 in 1999 to 0.678 in 2008 (UNDP, 2009). Several types of causes contributed to this growth; the South African economy increased at a 5% annual rate. This economic expansion resulted in job creation and higher earnings, which enhanced the lives of many South Africans. According to World Health Organization (2014) the government expanded spending on social services like education and healthcare. This greater spending resulted in higher life expectancy and education levels. The government also made strides in improving access to basic amenities like water and electricity. Moreover, this greater access to essential services contributed to the rise of the HDI as well. It is crucial to note, however, that the HDI is a composite measure, and the rises in the HDI was mostly due to increases in life expectancy and income levels. Many South Africans' education levels stayed low, and the country's total HDI remained below the worldwide average. It is also worth noting that were several difficulties,

such as high levels of inequality, unemployment, and corruption. These issues continue to plague South Africa today.

The CPI in South Africa grew from 5.9% in 1999 to 10.3% in 2008, variety of causes contributed to this advancement (StatsSA 2023). The worldwide food crisis of 2007–2008 caused food prices in South Africa to skyrocket. The global financial crisis of 2008 also had a detrimental influence on the South African economy, causing the rand's value to fall and the price of imported commodities to rise (Headey and Fan, 2008). Domestic issues such as rising wages and high energy prices also contributed to inflation during this period. Moreover, the rise in the CPI had a severe impact on families, particularly low-income households. It lowered households' purchasing power and made it harder for them to afford essentials. Inflation rates rose in several countries around the world during this period because of the global food and financial crises.

South Africa's GDP rose at an annual rate of 3.25% (African Development Bank, 2022), this was higher than Africa's overall GDP growth rate of 2.7% per year during this period. However, GDP growth in South Africa was uneven. During the first half of Jacob Zuma's presidency 1999–2004, the economy grew at a quicker rate, averaging 4.3% each year. GDP growth dropped to 2.2% per year in the second half of his term 2005–2008 (Krugman 2009). It's crucial to remember that GDP growth isn't a perfect indicator of economic sustainability. It makes no allowance for income distribution or life quality. The most frequently used indicator of economic performance, though, is GDP growth.

South Africa's Unemployment rate fell the unemployment rate was 26% in 1999, furthermore the unemployment rate had dropped to 23% by 2008 (Macrotrends 2022). A variety of reasons contributed to the fall in unemployment. The South African economy grew at an annual pace of 4.5% on average, this economic expansion resulted in the creation of jobs. According to SAIIA (2022) the South African government implemented several job-creation initiatives, including the Expanded Public Works Programme and the Small Business Development Agency. The South African government invested in education and skills training, which increased the competitiveness of South African workers in the labour market. However, it is vital to highlight that South Africa's unemployment rate remained high. In 2008, the unemployment rate remained at 23%, implying that one out of every four South Africans was unemployed. Moreover, it is also worth mentioning that South Africa's unemployment rate is not evenly distributed. Unemployment is especially prevalent among

South African youth and black South Africans. In 2023, the youth unemployment rate was 46%, while the black South African unemployment rate was 38% (StatsSA 2023). The South African government has put in place a number of programs to combat unemployment, but the problem remains serious.

Foreign direct investment (FDI) in South Africa increased significantly, in 1999 FDI inflows to South Africa were US$2.4 billion. By 2008, FDI inflows to South Africa had increased to US$13.1 billion (UNCTAD, 2023). This increase in FDI was due to several factors. South Africa experienced a period of political stability, which made it more attractive to foreign investors. The South African economy grew at an average rate of 4.5% per year, which created new opportunities for foreign investment (DTIC, 2023). Moreover, the South African government implemented a number of policies to attract foreign investment, such as tax breaks and investment incentives. Inflows of foreign direct investment into South Africa were concentrated in a few sectors, notably mining, finance, and manufacturing. Foreign direct investment also played an important part in the construction of South Africa's infrastructure, such as roads, trains, and ports. It is worth noting that the 2008 global financial crisis had a detrimental influence on FDI inflows to South Africa. South Africa's FDI inflows fell from $13.8 billion in 2007 to $13.1 billion in 2008 (World Bank 2023). FDI inflows to South Africa, on the other hand, began to rebound in the years following the global financial crisis. It is crucial to note that opinions on the effect of FDI on South Africa are diverse. Some say that FDI has benefited the economy by providing jobs and supporting economic growth. Others believe that foreign direct investment was concentrated in a few areas and did not benefit all South Africans equitably (UNCTAD, 2023). Furthermore, some say that FDI was not always properly regulated, which resulted in corruption and environmental damage. In total, FDI expanded dramatically, but its total influence on the South African economy is debatable.

7.2.4.2 Demographic Indicators

South Africa's Gini index increased significantly, rising from 0.62 in 1999 to 0.64 in 2008 (SWIID 2022). A variety of causes contributed to the rise in income inequality. First time in office, the South African economy increased significantly, but the advantages were not distributed. The wealthiest 10% of South African earnings profited the most from the growth of the economy, while the bottom 50% saw little to no benefit. The government was marred by corruption scandals, which diverted resources away from critical public services and into

the enrichment of a small elite. Dempster (2023) cited that the unemployment rate remained high, particularly among black people. As a result, many South Africans were unable to participate in the country's economic prosperity. It should be noted that the Gini index is a fixed measure of inequality. Moreover, it does not account for the dynamics of inequality, like the fact that people might move between income categories over time. However, the Gini index is still a commonly employed indicator of inequality, and it provides a good perspective on a country's income distribution. It's also worth mentioning that the Gini coefficient isn't the only way to quantify inequality. Other indicators of inequality, like the Palma ratio and the Atkinson index, might provide distinct perspectives on the country's income distribution.

South Africa's Population increased from 44.8 million in 1996 to 50 million in 2008. This indicates an annual growth rate of 1.1% on average (StatsSA 2023). The nation's population growth rate fell during due to a variety of issues. In South Africa, the fertility rate fell from 3.2 children per woman in 1996 to 2.6 children per woman in 2008. A variety of reasons contributed to the result, women's education and career prospects have been expanded, as has their access to contraception. South African life expectancy grew from 58.8 years in 1996 to 62.5 years in 2008 (Friedman & Guyatt, 2008). Moreover, several factors contributed to this, including improved healthcare and the availability of antiretroviral medications for HIV/AIDS patients. Despite a slowing in population growth, South Africa's population grew. This was due to both natural rise (births minus deaths) and net migration (people entering South Africa minus persons leaving South Africa). It is vital to note that the rate of population growth in South Africa is expected to reduce further in the future. This is because the fertility rate is predicted to continue to drop while life expectancy is expected to level.

7.2.4.3 Policy Framework

South Africa's ICT sector experienced substantial growth and development throughout Jacob Zuma's term as Deputy President 1999–2005 as well as President 2009–2018. Department of Communications and Telecommunications (DCT 2004) it is stated that number of variables fuelled its further development. During this period, the South African government made major expenditures on ICT infrastructure and services. For example, in 2004, the government implemented the Universal Service and Access Obligation (USAO), which aimed to provide all South Africans with access to essential telecommunications services. Moreover, the country's government also deregulated the ICT sector in order to foster competition and

innovation. For example, in 1997, the government dissolved Telkom, the state-owned telecommunications corporation. During this time, there was an increase in demand for ICT services from both enterprises and consumers (Gillwald 2023). This was due to a variety of factors, including the increased popularity of mobile phones and the rise of the internet. As a result of these circumstances, South Africa's ICT sector expanded substantially. South Africa's internet user base grew from 1.2 million in 2000 to 11.7 million in 2008. South Africa's mobile phone user base expanded from 4.3 million in 2000 to 30.2 million in 2008 (World Bank, 2023). The expansion of the ICT sector has benefited the South African economy in a variety of ways. The information and communications technology sector provided jobs, encouraged economic growth, and increased productivity. The ICT sector contributed to the improvement of South African education and healthcare systems. In addition to the, Jacob Zuma was an outspoken booster of the ICT sector. In 2008, he released the White Paper on Information and Communications Technologies, which described the government's objectives for the ICT sector. The White Paper aimed to foster ICT sector development and ensure that all South Africans have access to ICT services. Since Jacob Zuma's departure, the ICT sector has continued to grow and thrive. However, the sector continues to face several issues, including high unemployment and inequality.

South African Trade increased greatly; the overall value of South Africa's trade rose from R377 billion in 1999 to R1.4 trillion in 2008 (World Bank, 2023). During this time, the South African economy flourished rapidly, increasing demand for both imports and exports. During this time, the South African government introduced a variety of trade liberalisation policies, making it simpler for South African businesses to deal with other countries (Department of Trade, Industry and Competition 2023). The country's government invested extensively in infrastructure during this period, which boosted the country's ability to trade with other countries. The country's trade with China grew at a particularly rapid pace. South African-China commerce climbed from R12 billion in 1999 to R122 billion in 2008 (World Bank, 2023). Furthermore, during this time, Ebrahim-zadeh (2011) stated that China grew to become South Africa's major trading partner. It is worth noting that South Africa's trade imbalance rose during this time. South Africa's trade imbalance rose from R67 billion in 1999 to R245 billion in 2008. South Africa's trade deficit increased because it purchased more products and services than it exported. Some economists were concerned about the expansion in the trade imbalance because it left South Africa more exposed to foreign shocks. However,

due to substantial inflows of foreign direct investment and foreign loans during this period, the South African economy was able to sustain the trade deficit.

7.2.5 The Cyril Ramaphosa's Presidency: 2009-To Present

7.2.5.1 Economic Indicators

South Africa's HDI rose from 0.636 in 2008 to 0.696 in 2022 under the leadership of Cyril Ramaphosa (UNDP, 2023). This rise can be attributed to a variety of things, South African life expectancy has risen from 54.5 years in 2008 to 63.9 years in 2022. Furthermore, this rise can be attributed to a variety of factors, including increased access to healthcare and a decrease in HIV/AIDS fatalities. South Africa's educational standards have greatly increased since 2008. According to UNDP (2023) report the net enrolment rate for primary education has risen from 94.2% in 2008 to 98.4% in 2022. Secondary education net enrolment has increased from 76.5% in 2008 to 86.7% in 2022. The country's per capita income rose from $5,020 in 2008 to $6,350 in 2022. The country's per capita income rose from $5,020 in 2008 to $6,350 in 2022. This rise is attributed to a variety of variables, including economic growth and a decrease in poverty rates. Human Development Report 2022–2023: Building Our Future in a Transcendental World, Oxford University Press It is crucial to highlight that the HDI is a composite measure, and the rises in the HDI are the result of advances in all three of its components: life expectancy, education, and per capita income. However, it is also crucial to remember that South Africa's HDI remains relatively low, and the country is categorised as having medium human development. Despite improvements, there are still significant barriers to increasing human development in South Africa. Crime Statistics Quarterly Report is cited that poverty and inequality are widespread in South Africa, limiting human development. South Africa has a high crime rate, which makes it difficult for people to attain their full potential. South Africa has a high unemployment rate, which can lead to poverty and societal exclusion (SAPS 2023). The South African government is aware of these issues and is striving to resolve them. However, improving human development in South Africa will take time and commitment.

The CPI in South Africa rose significantly, South Africa's CPI was 10.6% in 2008. CPI had risen to 7.5% by 2022 (StatsSA 2023). A lot of reasons contributed to the increase in the CPI, the 2008 global economic crisis had a substantial influence on the South African economy, resulting in job losses and rising commodity and service costs (National Treasury 2023).

Furthermore, the South African economy has struggled, with low growth and rising unemployment. As a result, prices for products and services have risen. Higher wages, higher energy prices, or greater input costs can all contribute to this. It is crucial to remember that the CPI is only one measure of inflation cited in the report of the Central Bank of South Africa (2023). Other measurements of inflation include the producer price index (PPI) and the wholesale pricing index (WPI). Moreover, they measure different components of the economy, these inflation indicators may differ from the CPI. It is also worth noting that the rise in CPI was not limited to South Africa. In recent years, CPI has risen in several other countries as well. This is attributable to a variety of global factors, including the COVID-19 pandemic and the conflict in Ukraine.

South Africa received US$3.9 billion in FDI in 2009 and FDI inflows to South Africa had climbed to US$10.7 billion by 2022 (UNCTAD, 2023). This surge in FDI inflows can be attributed to a variety of factors. Ramaphosa's government undertook a variety of economic reforms, including modernising the regulatory environment as well as investing in infrastructure, making South Africa more appealing to international investors. South Africa had a period of political stability, which made it a more appealing destination for international investment. The global economy expanded rapidly, increasing demand for South African goods, and attracting international investment (Smith 2023). However, in 2021, South Africa experienced a sharp decrease in foreign direct investment (FDI), falling by 61% to $5.4 billion from $13.9 billion in 2020 (UNCTAD, 2022). An amalgamation of both internal and external factors can be a cause for this drop. The political climate in South Africa in 2021 was characterised by concerns about corruption and governance, regular cabinet reshuffles, and policy uncertainty and volatility (Levy, Hirsch, Naidoo & Nxele, 2021). Furthermore, potential investors become risk averse as a result of this. With high unemployment and slow economic growth in 2022 following the COVID-19 epidemic, the South African economy was already struggling. This reduced investor confidence even more. According to Hagerman (2012) South Africa's infrastructure limitations, particularly among the energy and logistics domains, continued to create hurdles for companies and imped the attraction of investment.

South Africa's GDP increased at an annual pace of 1.7% on average, during the same period, the worldwide average GDP growth rate was 3.0% per year (World Bank 2023). South Africa's GDP growth rate, on the other hand, was higher than that of other African countries.

South Africa's GDP expanded faster than Kenya's (1.4% per year), Nigeria's (1.3% per year), and Angola's (0.2% per year) (World Bank 2023). It is worth noting that South Africa's GDP growth rate has been variable. The 2008–2009 global financial crisis had a substantial negative influence on the South African economy, resulting in a recession in 2009 (IMF 2023). Moreover, the COVID-19 pandemic also caused a recession in the South African economy in 2020. Despite the unpredictability of South Africa's GDP growth rate, the country's economy has risen overall. This is due to a combination of circumstances. Since Cyril Ramaphosa's appointment, the South African government has made significant investments in infrastructure. This investment has contributed to increased economic activity and employment growth. South Africa liberalised its trade policies. This has simplified the export of South African goods and services to other countries cited in the World Bank (2023) report. The South African government has taken initiatives to enhance the business environment. This has made it easier for companies in South Africa to establish and operate. South Africa's growth in GDP has been dismal overall. The South African economy, on the other hand, has increased overall, and the government has taken initiatives to enhance the business environment as well as boost economic growth.

South Africa's population growth is falling due to a variety of challenges, South Africa's Unemployment rate remained high. During this period, the official unemployment rate averaged 27.3% (StatsSA 2023). Thus, nearly one in every three South Africans was unemployed. There are several reasons behind South Africa's high unemployment rate. Dempster (2023) cited that the South African economy has risen modestly in recent years, which has hindered employment creation. Most South Africans lack the skills required for well-paying professions. Moreover, South Africa's high crime rate discourages investment and employment creation. According to International Labour Organization (2023) corruption redirects resources away from productive activity and into the hands of corrupt individuals, stifling growth in the economy and employment creation. The South African government has developed multiple programmes aimed at reducing unemployment. The Expanded Public Works Programme, which gives unemployed people temporary work, and the National Development Plan, which promises to create 11 million jobs by 2030, are two examples. However, these programs have had minimal success, and unemployment in South Africa remains high. South Africa's high unemployment rate has several negative implications. Poverty, criminality, and social instability result. It also has a negative impact on economic growth and development.

7.2.5.2 Demographic Indicators

South Africa's Gini index fell significantly, from 0.63 in 2008 to 0.62 in 2022 (SWIID 2023). However, this decrease was minor, and the Gini index remained quite high. It should be noted that the Gini index is a set measure of inequality. It does not account for the dynamics of inequality, like the fact that people might move between income categories over time cited in a report StatsSA (2023). However, the Gini index is still a widely used measure of inequality, and it provides a good overview of a country's income distribution. There are several reasons why South Africa's Gini index has remained high. Apartheid established a profoundly unequal society, and the country's high Gini index reflects the effects of apartheid. Moreover, South Africa's unemployment rate is significant, which leads to income disparity. Many South Africans lack the necessary skills to obtain jobs that pay well. South Africa's Population rate has declined in recent years, the annual population growth rate averaged 1.1%. This was a decrease of 1.5% each year over the previous decade (StatsSA 2023). South Africa's fertility rate has been falling in recent years. This is due to a variety of causes, including increasing access to education and contraception for women, as well as growing living costs. South Africa's life expectancy has risen in recent years. This can be attributed to a variety of causes, including improved healthcare and diet. South Africa has lost more people than it is gaining. This is due to a variety of circumstances, including economic hardship and criminal activity. South Africa's population growth rate is dropping, which has several ramifications for the country (Dempster 2023). For example, it implies that fewer people will be employed in the future. This could result in skill deficits and slow economic growth. It also implies that there will be fewer people to care for the elderly in the future. This may place a further burden on government resources. The South African government is conscious of the ramifications of decreasing population growth and is taking steps to alleviate them. For instance, to ensure that the workforce has the necessary skills for the future, the government makes investments in education and skill training. To increase life expectancy, the government is also investing in healthcare and nutrition.

7.2.5.3 Policy Framework

South Africa's trade expanded the overall value of trade in products and services rose from US$228 billion in 2008 to US$369 billion in 2022 (World Bank, 2023). This amounts to an

annual growth rate of 4.5% on average. A variety of causes contributed to South Africa's trade expansion. Global trade expanded dramatically, South Africa which is an export-oriented economy benefited from this. In recent years, South Africa has diversified its trading relationships, lessening its reliance on traditional partners like the United Kingdom and the United States (Department of Trade, Industry and Competition 2023). As a result, South African trade has become more resilient to shocks in specific markets. In recent years, South Africa's manufacturing sector has expanded, generating more goods for export. This has helped to increase trade in South Africa; however, a variety of problems have impeded South Africa's trade growth. Moreover, the global recession had a substantial negative influence on South African trade, which dropped precipitously in 2009. According to Kaplan & Davies (2021) the COVID-19 pandemic also had an adverse effect on South African trade, which fell in 2020. Load shedding, or the government's purposeful disconnection of energy, has also harmed South Africa's trade by interrupting production and exports. Despite these obstacles, South African trade is likely to expand in the next few years. This is due to a combination of circumstances. The African Continental Free Trade Agreement (ACFTA), a trade pact between 54 African countries, is anticipated to enhance trade between African countries, including South Africa. South Africa's digital economy is expanding. South Africa's digital economy is fast expanding, which is predicted to enhance trade in digital goods and services. The South African government is focusing on export promotion, which is projected to improve South African trade in the next few years.

South Africa's ICT sector expanded significantly; this was due to a variety of circumstances. During this time, the South African government made significant investments in information and communication technology. This investment helped in expanding broadband access, improving ICT service quality, and lowering ICT service costs Gillwald (2023). During this time, the private sector made significant investments in ICT. This investment helped in the development of new ICT goods and services, as well as the expansion of the reach of ICT services. The need for ICT services expanded significantly. Moreover, this was due to a variety of factors, including the rise of the digital economy, the increased use of ICT in businesses, and the increased use of ICT by consumers. As a result of these reasons, South African ICT penetration expanded dramatically over this period. For example, from 11% in 2008 to 65% in 2022, the percentage of homes with an internet connection grew. Additionally, from 75% in 2008 to 95% in 2022, the percentage of enterprises with internet connections grew (World Bank, 2023). South Africa's ICT rise has had a variety of positive

effects on the country's economy and society. For example, ICT has assisted in the creation of jobs, the acceleration of economic growth, and the enhancement of government service delivery. ICT has also aided in improving access to education and healthcare, as well as reducing social exclusion Gillwald (2023). However, several problems remain to be overcome to ensure that ICT benefits all South Africans. For example, the cost of ICT services remains too expensive for some, and there is still a digital gap between urban and rural areas. In addition to the foregoing, here are some additional significant developments in South African ICT during Cyril Ramaphosa's presidency. In 2013, the South African Connect broadband expansion programme was launched ICASA (2023). Moreover, this programme has contributed to the expansion of internet connectivity for millions of South Africans. The introduction of the Presidential Commission regarding the Fourth Industrial Revolution in 2018 This commission was tasked with recommending ways for South Africa to prepare for and benefit from the Fourth Industrial Revolution. In 2019, the Digital Development Agency was established. This organisation oversees driving South Africa's digital transformation. South Africa's ICT boom has the potential to revolutionise the country's economy and society. It is, however, critical to guarantee that the benefits of ICT are enjoyed by all South Africans.

7.2.6 Conclusion

These five presidents' approaches to human development strategy reflected their varied political views as well as South Africa's shifting socioeconomic the background. While each president has made major contributions to South Africa's human development, the country still faces issues such as poverty, inequality, and unemployment. To address these problems, ongoing commitment to efficient and inclusive policies that prioritise human development will be required. HDI was fluctuating throughout from1990 and dropped in 1996 to negative HDI until 2001 then it rose to a positive HDI in 2002 but dropped again in 2003. In 2004 until 2019 HDI has been fluctuating until 2020 were it dropped to a negative HDI. A rise in the HDI, which combines indicators of health, education, and living standards, indicate that South Africans are becoming better. This could indicate an increase in life expectancy, educational achievement, income, and access to fundamental necessities. If rising HDI is accompanied by declining inequality, it indicates that historically disadvantaged populations are gradually catching up with respect to health, education, and living conditions. This helps to create a more fair and just society. A more educated and healthier population may lead to a

more productive workforce, thus boosting economic development and growth. This can result in greater opportunities for employment and higher living standards for everyone. A higher HDI can help South Africa's international standing by attracting foreign investment and establishing stronger business relationships. Furthermore, a greater HDI can assist in addressing socioeconomic inequities and reducing poverty within the country. Meanwhile a drop HDI could lead to political instability, increased social unrest, and an increase in wealth disparities.

7.3. Comparisons of Economic Indicators, Demographic Indicators and Policy Framework in each era

7.3.1 Economic Indicators

According to the World Bank (2023), South Africa's GDP growth rate grew slowly and was unpredictable during the FW De Klerk Apartheid era. During this time, the average annual growth in GDP was only 1.5%. Several factors contributed to this, including political instability, economic sanctions, and the government's apartheid practices (Kotze, 2000). During Nelson Mandela's administration, South Africa's economy started to recover following the end of Apartheid. During Mandela's presidency, the average annual growth in GDP was 3.2%. This was due, in part, to the government's economic liberalisation and black economic empowerment efforts (Olivier et al., 2003). Under Thabo Mbeki's presidency, the South African economy improved. Over this period, the average annual growth in GDP was 4.1%. This was due in part to the government's sustained emphasis on economic liberalisation as well as infrastructural spending (World Bank, 2015). Furthermore, during Jacob Zuma's administration (2009–2018), economic growth stagnated. During this period, the average annual growth in GDP was only 1.8%. This was due to a variety of circumstances, including corruption scandals, political instability, and a worldwide economic recession (Jones, 2013). Finally, under Cyril Ramaphosa's presidency (2018–present), the South African economy has begun to show indications of recovery. During this time, the average annual growth in GDP was 2.1%. This is due, in part, to the government's focus on economic reform and luring investment (StatsSA, 2022). As a result, South Africa's growth in GDP has fluctuated dramatically during the last 30 years, varying from a high of 5.4% in 2007 under Thabo Mbeki's presidency to a low of -6.3% in 2020 under Cyril Ramaphosa's administration.

South Africa's CPI has fluctuated over the last three decades. StatsSA (2023) cited that under the Apartheid era, the country had the highest CPI of 20.5% in 1994 from 12.3%, whereas under the Nelson Mandela Presidency (1994-1998), the country experienced the lowest CPI of 20.5% in 1998 from 20.5% in 1994. CPI climbed from 5.7% in 1999 to 11.1% in 2008 during Thabo Mbeki's presidency (1999-2008). Furthermore, during Jacob Zuma's presidency, the CPI fell to 6.1% in 2018. Under Cyril Ramaphosa's presidency, the CPI was 5.8% in 2022. As a result, South Africa's CPI growth rate has varied greatly over the last 30 years, ranging from 20.5% during the FW de Klerk era to 5.7% in 1998 under Nelson Mandela's presidency.

According to Dollar (2001) the Apartheid era, FDI in South Africa was heavily influenced by international sanctions and political instability. Moreover, the FDI inflows fell from $3.9 billion in 1990 to $1.4 billion in 1993. However, the political reforms undertaken by President F.W. de Klerk in 1990 resulted in a gradual increase in FDI inflows in 1994. Nelson Mandela Presidency, the election of Nelson Mandela as South Africa's first black president in 1994 heralded a new era for foreign direct investment in the country. The Mandela administration developed strategies to encourage international investment, such as the formation of the South African Investment Promotion Centre (SAIPC 2023) and the construction of special economic zones (SEZs). FDI inflows increased as a result, rising from US$1.8 billion in 1994 to US$3.3 billion in 1998 (World Bank, 2023). Thabo Mbeki administration (1999–2008) during Thabo Mbeki's administration, the country experienced a period of continuous economic growth. In 2007, FDI inflows peaked at $11.4 billion. However, the 2008 global financial crisis resulted in a dramatic drop in FDI inflows, which plummeted to US$2.3 billion in 2009 (UNCTAD, 2010). The Jacob Zuma presidency was characterized by political instability and economic insecurity, which hampered FDI inflows. Moreover, during this time, FDI averaged $4.4 billion per year. Presidency of Cyril Ramaphosa, the election of Cyril Ramaphosa as president in 2018 has given South Africa renewed hope for FDI. Ramaphosa has promised to restructure the economy and enhance the business environment. As a result, FDI inflows have surged in recent years and are expected to reach US$7.2 billion by 2022. As a result, South Africa's FDI growth rate has varied greatly over the last 30 years, ranging from US$7.2 billion by 2022 during Cyril Ramaphosa to US$2.3 billion in 2009 during Thabo Mbeki.

7.3.2 Demographic Indicators

The Gini Index in South Africa was about 0.60 during the FW de Klerk government. Smith (2023) indicates that the richest 10% of the population held almost 60% of the country's wealth, while the lowest 50% controlled approximately 5%. Meanwhile, there was small progress towards eliminating inequality under Nelson Mandela. Moreover, the Gini Index has dropped marginally to around 0.59. Inequality, however, remained a serious issue in South Africa. Under Thabo Mbeki, the Gini Index continued to fall, reaching a low of 0.57 in 2006 (World Bank 2020). However, inequality began to rise again at the end of Mbeki's presidency. The Gini Index grew substantially under Jacob Zuma, reaching a record high of 0.67 in 2015. This was due to a variety of issues, including corruption, cronyism, and nepotism, and a decrease of economic growth. Since Cyril Ramaphosa's election as president in 2018, the Gini Index started to fall again. In 2021, the Gini Index was 0.63. It remains to be seen, however, whether this reduction will be sustained in the long run.

The Apartheid era in South Africa was a time of immense political and social upheaval, which had a considerable impact on the country's Population growth. During this time, the population increased by 1.9% per year, which was lower than the overall average growth rate of 2.4% over the years (United Nations, 2022). Nelson Mandela's presidency, there was a time of tremendous hope and optimism as the country moved from a white-minority government to a democracy. Moreover, during this time, the population increased by 1.2% each year, which was significantly lower than the overall average growth rate. South Africa saw economic growth and stability during Thabo Mbeki's presidency, as the country adopted a series of economic reforms. During this period, the population grew by 0.4% per year, the slowest rate of any of the time periods. South Africa's economy continued to decline during Jacob Zuma's administration, resulting in political scandals and corruption (Southall, 2018). Moreover, this time, the population increased by 1.2% each year, which was somewhat faster than the overall average growth rate. South Africa witnessed economic recovery and reform throughout Cyril Ramaphosa's presidency, with the country implementing several economic transformations. During this period, the population grew by 0.4% per year, the slowest rate.
During the FW De Klerk era, South Africa's total fertility rate (TFR) was anticipated to be 5.3 children per woman. This was an enormous drop from the 1980s TFR of 6.3 children per woman (World Bank, 2008). Fertility falls have been associated with a variety of factors, including rising urbanisation, higher education and access to contraception, and a growing

knowledge of the risks of HIV/AIDS. Furthermore, fertility declined under Nelson Mandela's administration (Shisana, Rehle, Simbayi, Zuma, Jooste, Zungu & Onoya, 2014). In 1998, the TFR was expected to be 4.1 children per woman. The ongoing existence of the same situations that led to the drop in fertility during the FW De Klerk era was attributed to this decline. During Thabo Mbeki's presidency, the TFR continued to fall. In 2008, the TFR was predicted to be 3.1 children per woman. The sustained effectiveness of family planning programmes, as well as increasing access to education and employment opportunities for women, have been highlighted as reasons for the reduction (United Nations, 2008). Meanwhile, there was an improvement during Jacob Zuma's administration. In 2018, the TFR was predicted to be 2.4 children per woman. The continued effectiveness of family planning programmes, increasing access to education and employment opportunities for women, and a drop in HIV/AIDS prevalence were all attributed to this decline. In 2023, the TFR is expected to be 2.2 children per woman. The sustained success of family planning programmes, increasing access to higher education and job opportunities for women, as well as a decrease in HIV/AIDS prevalence, are all contributing factors to this decline.

7.3.3 Policy Framework

According to the Heidenheimer (1999) FW De Klerk government took some initial initiatives to liberalise South Africa's telecommunications market, but growth was slow. The government was also sceptical about implementing ICT policies that could be considered to favour one race over another. Meanwhile Mandela administration prioritised ICT. The government issued the White Paper on Telecommunications in 1996, outlining a vision for a competitive as well as affordable telecommunications sector. The government also formed the Universal Service Agency (USA) to ensure that basic telecommunications services are available to all South Africans (Department of Communications 2016). Furthermore, during the Mbeki administration continues to invest in ICT infrastructure and promote ICT use across all areas of society. The government established the National ICT Policy Framework in 2003 with the goal of making South Africa a global leader in the use of ICT. The government also launched the Broadband Initiative, which sought to offer all South Africans inexpensive broadband access. Under Zuma presidency's record on ICT is more mixed. The government made some headway in increasing broadband access, but it also encountered obstacles in regulating the telecoms sector and encouraging government use of ICT. The Ramaphosa administration has pledged to make ICT a significant driver of economic growth.

The government has published the National ICT Policy Green Paper, which sets a vision for South Africa's ICT future. The administration has also established the Presidential Digital Economy Task Force to supervise ICT policy execution. (Department of Communications 2014).

The end of Apartheid during FW de Klerk's presidency opened South Africa up to the world economy, resulting in expanded trade opportunities. In 1994, the country became a member of the General Agreement on Tariffs and Trade (GATT), indicating its commitment to global trade liberalisation (World Trade Organization, 2023). Nelson Mandela's administration focused on encouraging economic and social development, with trade playing an important role. The government implemented initiatives to encourage foreign investment, diversify export markets, and promote regional integration. South Africa established the Southern African Development Community (SADC) in 1994, significantly improving its trading connections with its neighbours (OECD 2002). Thabo Mbeki's presidency prioritised trade liberalisation and economic growth. The government also adopted the African Growth and Opportunity Act (AGOA), which granted South African exports preferential access to the US market. South Africa also signed trade treaties with the European Union and Mercosur, broadening its market reach (Eke 2011). The economic problems faced by Jacob Zuma's administration were poor growth, significant unemployment, and trade imbalances. Nonetheless, the government pursued commercial expansion, striking new deals with China and India. In 2013, South Africa hosted the BRICS conference, further strengthening its relations with emerging economies (Cheeseman 2015). The presidency of Cyril Ramaphosa has prioritised economic recovery and the creation of jobs, with trade playing a key role. The government has adopted reforms aimed at making conducting business easier, encouraging investment, and increasing exports. According to the African Union (2023) report the South Africa is also actively involved in the African Continental Free Trade Area (AfCFTA) discussions, which are aimed at creating a single market for products and services across the continent.

7.4. Policy distinctions between the Frederik Willem De Klerk, Nelson Mandela, Thabo Mbeki, Jacob Zuma, and Cyril Ramaphosa

7.4.1 Frederik Willem De Klerk (1989-1994)

South Africa's last apartheid president, de Klerk's policies were primarily aimed at eliminating the apartheid system and building a new constitutional order. He took a reactive strategy to human development, addressing the immediate needs of marginalised communities while contending with the legacy of racial discrimination and inequality. His key policies were as follows: first, the release of political prisoners and the unbanning of anti-apartheid organisations; second, negotiations with the African National Congress (ANC); and finally, the drafting and adoption of a new constitution enshrined democratic principles as well as equal rights. (Sparks, 2011).

7.4.2 Nelson Mandela (1994-1999)

Mandela's governance was characterised by a focus on reconciliation, reconstruction, as well as development. He prioritised correcting South Africa's deep-seated social and economic inequities that had afflicted the country throughout apartheid (Seekings, 2001). The key policies were as follows: firstly, the Truth and Reconciliation Commission was established, then affirmative action programmes to promote racial equity were implemented, and finally, the Reconstruction and Development Programme (RDP) was established to address poverty and infrastructure needs.

7.4.3 Thabo Mbeki (1999-2008)

Mbeki's approach to human development was characterised by an emphasis on economic growth and poverty alleviation. He saw economic empowerment as critical to eliminating social disparities and raising living standards (Steinberg, 2008). His key policies included the following: first, the implementation of the New Partnership for Africa's Development (NEPAD) to encourage regional economic integration; second, the implementation of the Accelerated Shared Growth Initiative of South Africa (ASGISA) to boost economic growth and job creation; and third, the expansion of access to education and healthcare.

7.4.4 Jacob Zuma (2009-2018)

Zuma's governance was overshadowed by charges of corruption and state capture, which hindered his capacity to solve human development concerns effectively (Vines, 2023). Despite these controversies, he implemented some noteworthy policies. The major policies

were as follows: first, the National Development Plan (NDP) was introduced to set long-term economic and social development goals, followed by the expansion of social welfare programmes, like the Child Support Grant, and investment in infrastructure development projects.

7.4.5 Cyril Ramaphosa (2018-present)

Ramaphosa's presidency has been focused on restoring public confidence, combating corruption, and reviving the economy (Freund, 2020). In his approach to human development, he has emphasised inclusive economic growth and social justice. The major policies were as follows: first, the establishment of the Zondo Commission to investigate state capture; second, the implementation of the National Anti-Corruption Strategy; and finally, the establishment of the Black Economic Empowerment (BEE) programme to increase economic involvement of black South Africans.

7.5. Conclusion

The policy differences between these presidents provide important insights into South Africa's development trajectory. While priorities and techniques have changed, the pursuit of a more fair and affluent society remains a guiding thread. Over time, the government's objectives shifted from apartheid dismantling to reconciliation, economic prosperity, and social welfare. These shifts reflect shifting situations and the nation's developing requirements. While each president implemented different policies, several continuities existed, such as the preservation of the democratic framework and the addressing of socioeconomic inequities. However, certain policies contradict each other, such as Mbeki's HIV/AIDS denial or Zuma's corruption problems. Furthermore Individual leadership styles influenced policy formulation and execution. Mandela's attraction and emphasis on reconciliation stood in contrast to Mbeki's technocratic approach and Zuma's populist signals. Moreover each president faced multiple challenges and succeeded to some extent. Mandela's attempts at reconciliation laid the groundwork for a harmonious transition, meanwhile Mbeki's economic policies had mixed outcomes. Zuma's social programmes helped some, while corruption hindered growth during his presidency. Ramaphosa's reform efforts are still persisting, despite financial challenges and societal unrest .These five presidents' approaches to human development strategy reflected their varied political views as well as South Africa's

shifting socioeconomic the background. While each president has made major contributions to South Africa's human development, the country still faces issues such as poverty, inequality, and unemployment. To address these problems, ongoing commitment to efficient and inclusive policies that prioritise human development will be required.

CHAPTER 8: SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1. Overview

The main purpose of the study was to investigate the determinants that influence the Human Development Index in South Africa between 1991 and 2021. The CPI is used as a proxy for inflation, GDP is used as a proxy for economic growth, and the Gini index is used as a proxy for inequality. The ARDL method was used to determine the relationship between variables. This chapter summaries the research and includes a study summary, major conclusion based on the findings in the study, delimitations of the study, recommendation for policy based on empirical findings and further recommendations.

8.2. Summary of the study

The main aim of this study was to determine the relationship between the determinants of the human development index in South Africa. Using a time series dataset from 1991 to 2021 and the ARDL approach, this study seeks to investigate the short-run and long-run influence of the determinants of the Human Development Index. The study's findings will help the government provide more detailed information on the relationship between economic indicators, demographic indicators, and policy frameworks for human development. Despite extensive government intervention, this will boost the country by preventing the spread of economic issues. With a rise in government spending in the economy, it will also help the government decide what to emphasise to achieve positive outcomes. The analysis can be used by policymakers to implement future macroeconomic policies since South Africa is governed by policies.

Chapter 2, of this study provides theoretical as well as empirical literature on past studies on the same variables that are being investigated in this study. According to statistics and the reviewed literature, South Africa, like many other countries, has faced significant challenges and made great progress in human development. Furthermore, South Africa faces unique challenges because of its apartheid history, which has left a legacy of economic and social disparities. It is critical to address these historical disparities to achieve real changes in human development. Government policies, social programmes, and international cooperation can all help South Africa address the root issues of HDI and promote human development.

Furthermore, education and skill development must be prioritised to empower individuals and bridge the gap between different socio-economic categories. South Africa can provide its inhabitants with the tools they need to participate effectively in the economy as well as contribute to overall human development by investing in quality education and vocational training. Efforts should also be taken to promote inclusive economic growth and minimise income inequalities, which would not only improve living standards but also encourage social cohesion and stability in the country. The studied theoretical and empirical literature will assist in understanding whether the variables have a long-run and a short run relationship.

In Chapter 3, the study explores the post-development theory the study is based on the post-development theory, a country with a high HDI is more likely to be committed to human development. This implies that the government will most likely invest in health, education, and other social programmes that benefit the public. Meanwhile, a country with a low HDI may face several difficulties in human development. Poverty, inequality, access to education and healthcare, and environmental degradation are examples of potential challenges. The theory can assist governments in identifying and addressing the underlying causes of these difficulties. The theorists, for example, contend that colonialism and globalisation have played a significant role in underdevelopment. Addressing structural disparities is critical for human growth. Secondly capability approach by Amartya Sen, which suggests that development is measured by people's ability to live a life they value, focusing on individual freedom and well-being. The legacy of Apartheid in South Africa has led to extreme poverty, inequality, and unemployment. The approach acknowledges that health spending can improve people's capacities, enabling them to reach their full potential and lead dignified lives. Integrating Sen's capabilities approach into the Human Development Index can help policymakers develop more inclusive strategies, address inequalities, and promote a society where everyone has an equal chance to prosper. This approach acknowledges the historical legacy of Apartheid and the potential for investment in addressing these issues.

Chapter 4 of the study focused on the methods to be employed. The unit root test for variable stationarity was performed first and then the Cointegration test followed. Lastly, the diagnostic tests were performed. The chosen variables for study included: CPI as a proxy for Inflation, GDP as a proxy for Economic growth, Unemployment, Foreign Direct Investment, Gini index as a proxy for Income inequality, Population, Fertility rate, Trade and Information and Communication Technology. The study period covered 1990 through 2021.

In Chapter 5 some of regression analysis results presented are consistent with the current economic situation in South Africa. The ARDL boundary test for co-integration analysis revealed that the null hypothesis of no cointegrating relationship was rejected, which implies that HDI is cointegrated with the Economic indicators and therefore so there is an existing long run relationship between variables. Secondly that the null hypothesis of no cointegrating relationship was rejected, which implies that HDI is cointegrated with the Demographic indicators and therefore so there is an existing long run relationship between variables.

Lastly that the null hypothesis on cointegrating relationship was rejected which implies that HDI is cointegrated with Policy framework. Therefore, so there is an existing long run relationship between variables. The results that GDP has a positive insignificant relationship, this suggests that, even though there is a positive relationship between economic growth (as measured by GDP) and human development (as measured by HDI), it is not statistically significant. This means that an increase in GDP does not always result in a statistically significant improvement in HDI. FDI has a negative insignificant relationship, this implies that foreign direct investment (FDI) has a negative relationship with HDI, whereas the relationship is statistically not significant. This could indicate that FDI has little or no effect on human development. CPI has a negative insignificant relationship with HDI for Economic indicators. This implies that inflation (as measured by the CPI) may be inversely influenced by HDI, but the link is statistically insignificant. This could indicate that inflation has no effect on human growth, or it could be caused by other factors impacting both variables. For Demographic indicators GINI has a negative insignificant relationship, this suggests that, while there may be a link between income disparity and human development, it is statistically insignificant. In other words, reducing income inequality (higher GINI) may not always result in a statistically significant improved HDI. FERT has a negative relationship, this implies that higher reproductive rates may be linked to lower HDI. It is important to note, however, that this relationships is not statistically significant, which means it may not be conclusive. POP has a positive significant relationship, this suggests that having a larger population is related with a statistically significant rise in HDI. This could be due to a variety of factors, including economies of scale, more diversity of skills and resources, or increased need for innovation and technological improvement. Lastly with Policy framework TRA had a negative significant relationship, this implies that trade policies established during the study period may have been related to a statistically significant fall in HDI. This could be due to a variety

of circumstances, including unfair trade agreements, job cuts in specific industries, or damaging the environment. ICT had a negative significant relationship, this indicates that the ICT policies introduced during the period may have been related with a statistically significant fall in HDI. This could be result of factors such as the digital divide, a lack of access to technology for disadvantaged populations, or the possible harmful societal repercussions of some ICT interventions. Moreover the results of short-run indicates that for Economic indicators all variable are negative and significant. Meanwhile in Demographic indicators the results shows no evidence of short-run on FERT and POP. Policy framework the results also show no evidence on short-run. The results of this study can be regarded as reliable and useful, as evidence indicates that the models agree with the CLRM's assumptions in terms of the stability and diagnostic tests done.

8.3. Major conclusions

- The findings of this study with regards to Economic indicators illustrates the following: GDP growth is a major driver of HDI advancement. A rise GDP typically contributes to a rise HDI since it shows more economic resources available for human development. GDP and HDI should have favourable long-run relationships. High and volatile inflation can have an adverse effect on an economy's HDI by eroding purchasing power and causing uncertainty. In the long run, moderate and stable inflation is typically regarded as beneficial to economic growth and development. High unemployment rates may hinder HDI because they represent squandered human potential and social insecurity. Assuming all other variables remain constant, there should be a negative long-run relationship between unemployment and HDI. Foreign companies may dominate certain industries, reducing domestic firms' possibilities to grow and compete. A decline in FDI may result in decline investment and job creation and, in the long run, may contribute unfavourably to HDI.
- Moreover, with regards to Demographic indicators the findings illustrate the following: Given that South Africa has one of the highest Gini indexes in the world, income inequality as measured by the Gini Index can also have an impact on HDI. HDI can suffer from high income inequality since a sizeable segment of the population does not have access to the resources they need. Population expansion can have two effects on the Human Development Index (HDI); it can boost economic growth by supplying a larger labour force, or it can strain public services and

infrastructure where rapid population growth is not matched by improvements in resources and development. Higher education, better family planning, and economic possibilities for women are all related to the fertility rate, which is a measure of the average number of children born to women of childbearing age. As a result of a decreased dependent population relative to the working-age population, HDI may improve with time. A negative impact on Fertility rate may result in a reduced population equals a fewer number of possible workers, which might result in labour shortages, especially in skilled industries. This has the potential to impede economic growth and productivity, which in a long run will affect HDI negatively.

- Furthermore, the findings illustrate the following with regard to Policy framework: A rise in ICT have an adverse effect on an economy's HDI. Inequitable access to ICT has the potential to worsen existing economic gaps, putting some communities and individuals behind in terms of education, work possibilities, and overall well-being. A rise in TRA have an adverse effect on an economy's HDI. Businesses may be compelled to reduce jobs as they struggle to compete with imports. This can result in increasing poverty and unemployment, which may negatively impact people's health, education, and standard of living.
- Previous studies on the underlying determinants of the Human Development Index (economic indicators, demographic indicators, and policy framework) have found both positive and negative effects. Miraç, Ali, and Arif (2014) suggested that GDP per capita has statistically significant impacts on the level of growth. Meanwhile, Reiter and Steensma (2010) stated that FDI boosts human development, which is contrary to the findings. Ogbebor, Oguntodu, and Oyinloye (2020) agreed, however, that the findings revealed a long-term link between inflation and the standard of living. According to Astuti (2018), the Gini coefficient, as well as the percentage of the poor, has a substantial negative association with HDI. Meanwhile, Hafner and Mayer-Foulkes (2013) concurred that fertility is unfavourable for human development. However, according to Asmita and Ruslan (2017), population has minimal impact on the Human Development Index in North Sumatra Province.Khan, Ju, and Hassan (2019) contended that empirical findings show that ICT promotes human development. Furthermore, Sana, Dilawar, Alam, and Magda (2020) found that trade has a positive and significant impact on human development, which contrasts with our findings. This study discovered a complex pattern of relationships among numerous variables and the HDI in South Africa. While certain relationships

were statistically significant, the impact sizes varied considerably. Further research is required to understand the root causes and inform successful policy actions.

8.4. Scientific Contribution of the study

- The studies reviewed literature and findings are multifaceted and complex. By recognising both significant and insignificant relationships, the statement goes beyond basic generalisations and recognises South Africa's specific context. This motivates scholars to dive deeper into specific components and how they interact in the context of South Africa.
- The existence of insignificant relationships highlights questions regarding the underlying causes of a lack of influence. This could be the result of data limitations, methodological difficulties, or the existence of moderating factors that have not yet been explored. As a result, the statement encourages more research to explore these options and improve our understanding of the processes impacting HDI in South Africa.
- Policymakers must have an in-depth knowledge of the links between determinants and HDI. The statement contains useful information for developing focused and effective initiatives to address key barriers hindering South African human development.
- The statement enables for relevant comparisons with other countries by emphasising specific relations within South Africa. This can help in identifying differences and similarities in the determinants of HDI across varied contexts, thus contributing to a broader comprehension of global human development.

8.5. Policy Recommendations

- Promote Social Inclusion and Equity
- South Africa's average HDI is hampered by ongoing inequality and socio-economic exclusion. The government should intensify efforts to foster social cohesion through inclusive policies that ensure equal access to quality education, healthcare, and employment opportunities. This involves encouraging dialogue between groups and implementing equity-focused redistributive methods
- Reform Public Expenditure for Developmental Impact

- Considering the long-term cointegration between HDI and economic-demographic factors, public spending needs to be adjusted to optimize developmental benefits. This includes performing cost-effectiveness evaluations, focusing on at-risk populations, and emphasizing funding in health, education, and income stability, particularly for historically disadvantaged communities.
- Invest in Human Capital Formation
- Enhancing educational results is crucial. Policymakers ought to increase access to primary and secondary education, invest in early childhood development, enhance teacher training, and encourage vocational and technical education that meets labour market demands. Additionally, focused assistance like conditional cash transfers, scholarships, and school meal programs ought to be increased to minimize educational inequalities.
- Strengthen Social Protection and Housing Interventions
- To tackle poverty and enhance living conditions, current social safety nets (such as child support and disability allowances) need to be broadened and improved. Investments in affordable, high-quality housing and essential services (water, sanitation, electricity) are also vital for enhancing multidimensional well-being.
- Bridge the Digital Divide and Modernize Infrastructure
- The negative impact of ICT on HDI underscores digital inequality. The government should to implement universal service policies that ensure fundamental broadband access, especially in rural and underserved areas. The expansion of public Wi-Fi infrastructure and digital literacy initiatives is essential to guarantee that ICT positively impacts education, healthcare, and entrepreneurship.
- Recalibrate Trade and Industrial Policy
- The negative relationship between trade openness and HDI indicates that trade liberalization must be accompanied by industrial enhancement and support for SMEs. Strategic trade agreements must focus on enhancing value-added exports and boosting industrial competitiveness. The expansion of financing mechanisms, technical support, and market access for small and medium enterprises (SMEs) is essential to promote inclusive growth.

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Appendix

Appendix 1: ARDL Long Run form and Bounds test.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 1, 1, 1, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 11/20/23 Time: 12:36
Sample: 1990 2021
Included observations: 15

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005681	0.043700	0.130001	0.9016
@TREND	0.000958	0.000441	2.173549	0.0818
HDI(-1)*	-0.287275	0.398860	-0.720241	0.5036
GDP(-1)	0.003427	0.001953	1.754726	0.1397
FDI(-1)	-0.019465	0.009109	-2.136778	0.0857
CPI(-1)	0.000922	0.001078	0.855572	0.4313
UNE**	-0.001101	0.001312	-0.838751	0.4399
D(GDP)	0.001564	0.001156	1.353676	0.2338
D(FDI)	-0.015974	0.004848	-3.294967	0.0216
D(CPI)	-0.000897	0.000785	-1.143531	0.3046

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.011929	0.021796	0.547324	0.6077
FDI	-0.067756	0.091481	-0.740657	0.4922
CPI	0.003210	0.007576	0.423786	0.6893
UNE	-0.003831	0.003805	-1.006894	0.3602

EC = HDI - (0.0119*GDP -0.0678*FDI + 0.0032*CPI -0.0038*UNE)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	6.169854	10%	3.03	4.06
k	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72
Actual Sample Size	15	Finite Sample: n=30		
		10%	3.43	4.624
		5%	4.154	5.54
		1%	5.856	7.578

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-0.720241	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

ARDL Long Run Form and Bounds Test
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 1, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 12/15/23 Time: 20:17
Sample: 1990 2021
Included observations: 26

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.646434	0.129546	-4.990005	0.0001
@TREND	0.000626	0.000244	2.565169	0.0189
HDI(-1)*	-1.222008	0.176827	-6.910768	0.0000
GINI(-1)	-0.025451	0.004772	-5.332895	0.0000
FERT**	0.034540	0.006000	5.757150	0.0000
POP**	0.327076	0.067118	4.873176	0.0001
D(GINI)	-0.001635	0.007536	-0.216947	0.8306

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	-0.020827	0.003091	-6.738926	0.0000
FERT	0.028265	0.002002	14.11668	0.0000
POP	0.267655	0.048991	5.463350	0.0000

EC = HDI - (-0.0208*GINI + 0.0283*FERT + 0.2677*POP)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	16.14149	10%	3.47	4.45
k	3	5%	4.01	5.07
		2.5%	4.52	5.62
		1%	5.17	6.36
Actual Sample Size	26	Finite Sample: n=35		
		10%	3.8	4.888
		5%	4.568	5.795
		1%	6.38	7.73
		Finite Sample: n=30		
		10%	3.868	4.965
		5%	4.683	5.98
		1%	6.643	8.313

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-6.910768	10%	-3.13	-3.84
		5%	-3.41	-4.16
		2.5%	-3.65	-4.42
		1%	-3.96	-4.73

ARDL Long Run Form and Bounds Test
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 11/23/23 Time: 19:01
Sample: 1990 2021
Included observations: 14

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.023402	0.009071	2.579817	0.0297
@TREND	-0.000168	0.000237	-0.707419	0.4972
HDI(-1)*	-0.266576	0.301640	-0.883756	0.3998
ICT**	-0.002990	0.001302	-2.296031	0.0473
TRA**	-2.34E-05	4.87E-06	-4.795997	0.0010

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ICT	-0.011216	0.015561	-0.720801	0.4893
TRA	-8.76E-05	0.000109	-0.800713	0.4439

EC = HDI - (-0.0112*ICT -0.0001*TRA)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	13.85773	10%	4.19	5.06
k	2	5%	4.87	5.85
		2.5%	5.79	6.59
		1%	6.34	7.52
Actual Sample Size	14		Finite Sample: n=35	
		10%	4.517	5.48
		5%	5.457	6.57
		1%	7.643	9.063
			Finite Sample: n=30	
		10%	4.577	5.6
		5%	5.55	6.747
		1%	7.977	9.413

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-0.883756	10%	-3.13	-3.63
		5%	-3.41	-3.95
		2.5%	-3.65	-4.2
		1%	-3.96	-4.53

Appendix 2: Error Correction Model Regression

ARDL Error Correction Regression
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 1, 1, 1, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 11/20/23 Time: 12:32
Sample: 1990 2021
Included observations: 15

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005681	0.003200	1.775157	0.1360
@TREND	0.000958	0.000243	3.943705	0.0109
D(GDP)	0.001564	0.000243	6.439684	0.0013
D(FDI)	-0.015974	0.002256	-7.081280	0.0009
D(CPI)	-0.000897	0.000300	-2.986833	0.0306
CointEq(-1)*	-0.287275	0.038551	-7.451757	0.0007

R-squared	0.921192	Mean dependent var	-0.001267
Adjusted R-squared	0.877409	S.D. dependent var	0.005675
S.E. of regression	0.001987	Akaike info criterion	-9.315101
Sum squared resid	3.55E-05	Schwarz criterion	-9.031881
Log likelihood	75.86326	Hannan-Quinn criter.	-9.318118
F-statistic	21.04023	Durbin-Watson stat	2.726330
Prob(F-statistic)	0.000101		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	6.169854	10%	3.03	4.06
k	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-7.451757	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

ARDL Error Correction Regression
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 0, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 10/04/23 Time: 21:11
Sample: 1990 2021
Included observations: 31

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP)	0.001121	0.001302	0.860819	0.3979
CointEq(-1)*	-0.120409	0.016995	-7.085174	0.0000

ARDL Error Correction Regression
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 1, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 12/15/23 Time: 20:19
Sample: 1990 2021
Included observations: 26

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.646434	0.074585	-8.667094	0.0000
@TREND	0.000626	8.05E-05	7.780419	0.0000
D(GINI)	-0.001635	0.004605	-0.354989	0.7265
CointEq(-1)*	-1.222008	0.141331	-8.646420	0.0000

R-squared	0.782173	Mean dependent var	-0.000231
Adjusted R-squared	0.752470	S.D. dependent var	0.003445
S.E. of regression	0.001714	Akaike info criterion	-9.759657
Sum squared resid	6.46E-05	Schwarz criterion	-9.566104
Log likelihood	130.8755	Hannan-Quinn criter.	-9.703921
F-statistic	26.33257	Durbin-Watson stat	2.626554
Prob(F-statistic)	0.000000		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	16.14149	10%	3.47	4.45
k	3	5%	4.01	5.07
		2.5%	4.52	5.62
		1%	5.17	6.36

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-8.646420	10%	-3.13	-3.84
		5%	-3.41	-4.16
		2.5%	-3.65	-4.42
		1%	-3.96	-4.73

ARDL Error Correction Regression
Dependent Variable: D(HDI)
Selected Model: ARDL(1, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 11/23/23 Time: 19:03
Sample: 1990 2021
Included observations: 14

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.023402	0.004177	5.602438	0.0003
@TREND	-0.000168	0.000170	-0.984824	0.3504
CointEq(-1)*	-0.266576	0.037397	-7.128231	0.0001

R-squared	0.850073	Mean dependent var	-0.001000
Adjusted R-squared	0.822814	S.D. dependent var	0.005791
S.E. of regression	0.002438	Akaike info criterion	-9.008087
Sum squared resid	6.54E-05	Schwarz criterion	-8.871146
Log likelihood	66.05661	Hannan-Quinn criter.	-9.020763
F-statistic	31.18462	Durbin-Watson stat	2.176485
Prob(F-statistic)	0.000029		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	13.85773	10%	4.19	5.06
k	2	5%	4.87	5.85
		2.5%	5.79	6.59
		1%	6.34	7.52

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-7.128231	10%	-3.13	-3.63
		5%	-3.41	-3.95
		2.5%	-3.65	-4.2
		1%	-3.96	-4.53

Appendix 3: Heteroscedasticity Tests

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.802979	Prob. F(4,10)	0.5504
Obs*R-squared	3.646613	Prob. Chi-Square(4)	0.4559
Scaled explained SS	0.941662	Prob. Chi-Square(4)	0.9185

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/20/23 Time: 12:42
Sample: 2007 2021
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.69E-05	3.03E-05	1.551129	0.1519
GDP	4.91E-07	8.43E-07	0.582571	0.5731
FDI	-9.90E-06	1.22E-05	-0.811533	0.4360
CPI	-2.17E-06	1.50E-06	-1.446934	0.1785
UNE	-9.90E-07	8.81E-07	-1.123441	0.2875

R-squared	0.243108	Mean dependent var	6.42E-06
Adjusted R-squared	-0.059649	S.D. dependent var	7.17E-06
S.E. of regression	7.38E-06	Akaike info criterion	-20.53540
Sum squared resid	5.44E-10	Schwarz criterion	-20.29939
Log likelihood	159.0155	Hannan-Quinn criter.	-20.53792
F-statistic	0.802979	Durbin-Watson stat	2.039341
Prob(F-statistic)	0.550364		

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.724929	Prob. F(3,23)	0.5475
Obs*R-squared	2.332462	Prob. Chi-Square(3)	0.5063
Scaled explained SS	1.214828	Prob. Chi-Square(3)	0.7495

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 12/15/23 Time: 20:16
Sample: 1990 2016
Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000270	0.000185	1.456183	0.1589
GINI	3.82E-06	1.13E-05	0.338330	0.7382
FERT	-8.76E-06	6.35E-06	-1.379598	0.1810
POP	-0.000137	9.57E-05	-1.430049	0.1661

R-squared	0.086387	Mean dependent var	5.69E-06
Adjusted R-squared	-0.032779	S.D. dependent var	6.95E-06
S.E. of regression	7.06E-06	Akaike info criterion	-20.74721
Sum squared resid	1.15E-09	Schwarz criterion	-20.55523
Log likelihood	284.0873	Hannan-Quinn criter.	-20.69012
F-statistic	0.724929	Durbin-Watson stat	1.433665
Prob(F-statistic)	0.547464		

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.228549	Prob. F(2,11)	0.7994
Obs*R-squared	0.558550	Prob. Chi-Square(2)	0.7563
Scaled explained SS	0.236508	Prob. Chi-Square(2)	0.8885

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 12/15/23 Time: 20:26
Sample: 2007 2020
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.77E-06	3.47E-05	-0.252353	0.8054
ICT	3.11E-06	5.67E-06	0.548611	0.5942
TRA	9.62E-09	1.85E-08	0.518601	0.6143

R-squared	0.039896	Mean dependent var	1.03E-05
Adjusted R-squared	-0.134668	S.D. dependent var	1.25E-05
S.E. of regression	1.33E-05	Akaike info criterion	-19.42803
Sum squared resid	1.95E-09	Schwarz criterion	-19.29109
Log likelihood	138.9962	Hannan-Quinn criter.	-19.44071
F-statistic	0.228549	Durbin-Watson stat	2.018395
Prob(F-statistic)	0.799373		

Appendix 4: Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.648433	Prob. F(2,8)	0.5483
Obs*R-squared	2.092424	Prob. Chi-Square(2)	0.3513

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/20/23 Time: 12:42
Sample: 2007 2021
Included observations: 15
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	-1.56E-05	0.000523	-0.029920	0.9769
FDI	0.001610	0.006856	0.234781	0.8203
CPI	-0.000225	0.000730	-0.307895	0.7660
UNE	0.000146	0.000522	0.279549	0.7869
C	-0.002878	0.017404	-0.165395	0.8727
RESID(-1)	-0.319993	0.473036	-0.676467	0.5178
RESID(-2)	-0.428557	0.479275	-0.894178	0.3973

R-squared	0.139495	Mean dependent var	-7.37E-18
Adjusted R-squared	-0.505884	S.D. dependent var	0.002623
S.E. of regression	0.003219	Akaike info criterion	-8.334817
Sum squared resid	8.29E-05	Schwarz criterion	-8.004393
Log likelihood	69.51112	Hannan-Quinn criter.	-8.338336
F-statistic	0.216144	Durbin-Watson stat	1.934731
Prob(F-statistic)	0.960923		

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.764706	Prob. F(2,21)	0.4780
Obs*R-squared	1.832898	Prob. Chi-Square(2)	0.3999

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 12/15/23 Time: 20:15
Sample: 1990 2016
Included observations: 27
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	-0.001974	0.004549	-0.433961	0.6687
FERT	0.000782	0.002455	0.318442	0.7533
POP	0.008850	0.036319	0.243680	0.8098
C	-0.014746	0.069880	-0.211015	0.8349
RESID(-1)	0.217448	0.220905	0.984349	0.3361
RESID(-2)	0.144748	0.234296	0.617799	0.5434

R-squared	0.067885	Mean dependent var	0.000000
Adjusted R-squared	-0.154047	S.D. dependent var	0.002431
S.E. of regression	0.002612	Akaike info criterion	-8.864249
Sum squared resid	0.000143	Schwarz criterion	-8.576285
Log likelihood	125.6674	Hannan-Quinn criter.	-8.778622
F-statistic	0.305882	Durbin-Watson stat	2.064943
Prob(F-statistic)	0.903852		

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.325807	Prob. F(2,9)	0.3129
Obs*R-squared	3.186048	Prob. Chi-Square(2)	0.2033

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 12/15/23 Time: 20:25
Sample: 2007 2020
Included observations: 14
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ICT	-0.002893	0.002464	-1.174411	0.2704
TRA	5.08E-07	5.02E-06	0.101118	0.9217
C	0.017479	0.014978	1.167003	0.2732
RESID(-1)	0.415082	0.348316	1.191681	0.2639
RESID(-2)	0.537514	0.513394	1.046981	0.3224

R-squared	0.227575	Mean dependent var	9.29E-19
Adjusted R-squared	-0.115725	S.D. dependent var	0.003328
S.E. of regression	0.003515	Akaike info criterion	-8.190996
Sum squared resid	0.000111	Schwarz criterion	-7.962762
Log likelihood	62.33697	Hannan-Quinn criter.	-8.212124
F-statistic	0.662904	Durbin-Watson stat	1.984749
Prob(F-statistic)	0.633261		

Appendix 5: Descriptive statistics

	HDI	GDP	FDI	CPI	UNE
Mean	0.002719	0.325000	0.169812	6.645672	26.86000
Median	0.004500	0.450000	0.178139	5.754600	25.30000
Maximum	0.012000	4.400000	0.459312	15.33480	34.30000
Minimum	-0.014000	-7.200000	-0.150534	-0.692000	22.50000
Std. Dev.	0.006688	2.511136	0.172833	3.440287	3.379729
Skewness	-0.689931	-0.768032	-0.041680	0.771978	1.084632
Kurtosis	2.538885	4.059284	2.155110	3.810743	3.282010
Jarque-Bera	2.822198	4.642097	0.961051	4.054804	2.990775
Probability	0.243875	0.098171	0.618458	0.131677	0.224162
Sum	0.087000	10.40000	5.433968	212.6615	402.9000
Sum Sq. Dev.	0.001386	195.4800	0.926009	366.9027	159.9160
Observations	32	32	32	32	15

	HDI	GINI	FERT	POP
Mean	0.002719	1.703214	2.882074	1.796935
Median	0.004500	1.695000	2.625000	1.813200
Maximum	0.012000	2.160000	4.043000	1.822716
Minimum	-0.014000	1.480000	2.468000	1.754615
Std. Dev.	0.006688	0.144992	0.448357	0.026591
Skewness	-0.689931	1.035027	1.316219	-0.574728
Kurtosis	2.538885	4.784711	3.503461	1.600016
Jarque-Bera	2.822198	8.715374	8.081103	4.374937
Probability	0.243875	0.012808	0.017588	0.112200
Sum	0.087000	47.69000	77.81600	57.50193
Sum Sq. Dev.	0.001386	0.567611	5.226628	0.021919
Observations	32	28	27	32

	HDI	ICT	TRA
Mean	0.002719	6.081017	38.03134
Median	0.004500	6.077454	-11.84574
Maximum	0.012000	7.405394	1015.429
Minimum	-0.014000	4.894244	-290.1305
Std. Dev.	0.006688	0.671732	228.8831
Skewness	-0.689931	0.111235	3.010484
Kurtosis	2.538885	2.474721	12.99604
Jarque-Bera	2.822198	0.189823	175.8901
Probability	0.243875	0.909453	0.000000
Sum	0.087000	85.13424	1178.972
Sum Sq. Dev.	0.001386	5.865910	1571624.
Observations	32	14	31

Appendix 6: Unit Root Tests

Economic Indicators

Null Hypothesis: D(HDI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.500467	0.0005
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HDI,2)
Method: Least Squares
Date: 12/15/23 Time: 18:09
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HDI(-1))	-1.056744	0.192119	-5.500467	0.0000
C	0.000824	0.001982	0.415982	0.6807
@TREND("1990")	-9.24E-05	0.000107	-0.866268	0.3940

R-squared	0.529893	Mean dependent var	-6.67E-05
Adjusted R-squared	0.495070	S.D. dependent var	0.007095
S.E. of regression	0.005042	Akaike info criterion	-7.647525
Sum squared resid	0.000686	Schwarz criterion	-7.507405
Log likelihood	117.7129	Hannan-Quinn criter.	-7.602699
F-statistic	15.21685	Durbin-Watson stat	1.996533
Prob(F-statistic)	0.000038		

Null Hypothesis: D(CPI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.731896	0.0004
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPI,2)
Method: Least Squares
Date: 12/15/23 Time: 18:06
Sample (adjusted): 1995 2021
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CPI(-1))	-2.447809	0.427050	-5.731896	0.0000
D(CPI(-1),2)	1.312935	0.341022	3.850005	0.0009
D(CPI(-2),2)	0.721151	0.248436	2.902762	0.0085
D(CPI(-3),2)	0.558126	0.173753	3.212177	0.0042
C	-2.152515	1.048358	-2.053225	0.0527
@TREND("1990")	0.082876	0.051218	1.618108	0.1206

R-squared	0.718529	Mean dependent var	0.080767
Adjusted R-squared	0.651513	S.D. dependent var	3.301100
S.E. of regression	1.948732	Akaike info criterion	4.365365
Sum squared resid	79.74872	Schwarz criterion	4.653329
Log likelihood	-52.93243	Hannan-Quinn criter.	4.450992
F-statistic	10.72163	Durbin-Watson stat	1.810490
Prob(F-statistic)	0.000032		

Null Hypothesis: D(FDI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.00399	0.0000
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDI,2)
Method: Least Squares
Date: 12/15/23 Time: 18:07
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI(-1))	-1.591887	0.159125	-10.00399	0.0000
C	0.019435	0.082596	0.235299	0.8158
@TREND("1990")	-0.001465	0.004433	-0.330449	0.7436

R-squared	0.787787	Mean dependent var	-0.008357
Adjusted R-squared	0.772068	S.D. dependent var	0.440185
S.E. of regression	0.210154	Akaike info criterion	-0.187313
Sum squared resid	1.192447	Schwarz criterion	-0.047193
Log likelihood	5.809692	Hannan-Quinn criter.	-0.142487
F-statistic	50.11540	Durbin-Watson stat	2.216311
Prob(F-statistic)	0.000000		

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.906415	0.0002
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 12/15/23 Time: 18:08
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.530896	0.259192	-5.906415	0.0000
C	0.781926	1.122437	0.696632	0.4920
@TREND("1990")	-0.039002	0.061354	-0.635695	0.5303

R-squared	0.572712	Mean dependent var	0.383333
Adjusted R-squared	0.541061	S.D. dependent var	4.105764
S.E. of regression	2.781451	Akaike info criterion	4.978462
Sum squared resid	208.8846	Schwarz criterion	5.118582
Log likelihood	-71.67693	Hannan-Quinn criter.	5.023287
F-statistic	18.09463	Durbin-Watson stat	1.923818
Prob(F-statistic)	0.000010		

Null Hypothesis: D(UNE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.126726	0.0070
Test critical values:	1% level	-4.886426	
	5% level	-3.828975	
	10% level	-3.362984	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UNE,2)
Method: Least Squares
Date: 12/15/23 Time: 18:10
Sample (adjusted): 2009 2021
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNE(-1))	-1.559797	0.304248	-5.126726	0.0004
C	-3.653727	2.682768	-1.361924	0.2031
@TREND("1990")	0.196628	0.110505	1.779359	0.1055

R-squared	0.725926	Mean dependent var	-0.153846
Adjusted R-squared	0.671112	S.D. dependent var	2.351104
S.E. of regression	1.348330	Akaike info criterion	3.634785
Sum squared resid	18.17994	Schwarz criterion	3.765158
Log likelihood	-20.62610	Hannan-Quinn criter.	3.607987
F-statistic	13.24327	Durbin-Watson stat	1.916544
Prob(F-statistic)	0.001546		

Demographic Indicators

Null Hypothesis: D(FERT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.053336	0.0001
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FERT,2)
Method: Least Squares
Date: 12/15/23 Time: 17:52
Sample (adjusted): 3 32
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FERT(-1))	-1.141250	0.188532	-6.053336	0.0000
C	0.370466	0.261859	1.414753	0.1686
@TREND("1")	-0.014348	0.013902	-1.032082	0.3112

R-squared	0.576073	Mean dependent var	0.006667
Adjusted R-squared	0.544671	S.D. dependent var	0.967779
S.E. of regression	0.653038	Akaike info criterion	2.080277
Sum squared resid	11.51438	Schwarz criterion	2.220396
Log likelihood	-28.20415	Hannan-Quinn criter.	2.125102
F-statistic	18.34514	Durbin-Watson stat	2.064091
Prob(F-statistic)	0.000009		

Null Hypothesis: D(POP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.790830	0.0343
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(POP,2)
Method: Least Squares
Date: 12/15/23 Time: 17:57
Sample (adjusted): 1997 2021
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP(-1))	-0.373307	0.098476	-3.790830	0.0015
D(POP(-1),2)	0.610780	0.182557	3.345689	0.0038
D(POP(-2),2)	-0.589851	0.239900	-2.458730	0.0250
D(POP(-3),2)	0.806997	0.224170	3.599936	0.0022
D(POP(-4),2)	-0.456662	0.292959	-1.558793	0.1375
D(POP(-5),2)	0.633305	0.261011	2.426359	0.0267
C	0.002559	0.000960	2.664940	0.0163
@TREND("1990")	-9.33E-05	4.02E-05	-2.319531	0.0331

R-squared	0.738782	Mean dependent var	-8.34E-05
Adjusted R-squared	0.631221	S.D. dependent var	0.000888
S.E. of regression	0.000540	Akaike info criterion	-11.95743
Sum squared resid	4.95E-06	Schwarz criterion	-11.56739
Log likelihood	157.4678	Hannan-Quinn criter.	-11.84925
F-statistic	6.868524	Durbin-Watson stat	1.828470
Prob(F-statistic)	0.000575		

Null Hypothesis: D(GINI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.613200	0.0001
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GINI,2)
Method: Least Squares
Date: 12/15/23 Time: 18:03
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GINI(-1))	-1.298386	0.196333	-6.613200	0.0000
C	-2874.765	2889.397	-0.994936	0.3301
@TREND("1990")	179.4675	176.7405	1.015430	0.3205

R-squared	0.656070	Mean dependent var	302.0000
Adjusted R-squared	0.626164	S.D. dependent var	10810.88
S.E. of regression	6610.004	Akaike info criterion	20.53872
Sum squared resid	1.00E+09	Schwarz criterion	20.68389
Log likelihood	-264.0034	Hannan-Quinn criter.	20.58053
F-statistic	21.93708	Durbin-Watson stat	2.137918
Prob(F-statistic)	0.000005		

Policy Framework

Null Hypothesis: D(ICT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.676386	0.0411
Test critical values:	1% level	-4.323979	
	5% level	-3.580622	
	10% level	-3.225334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ICT,2)
Method: Least Squares
Date: 12/15/23 Time: 18:13
Sample (adjusted): 1994 2021
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ICT(-1))	-1.268548	0.345053	-3.676386	0.0013
D(ICT(-1),2)	0.290159	0.269656	1.076034	0.2931
D(ICT(-2),2)	0.170464	0.199346	0.855117	0.4013
C	-0.395245	0.513852	-0.769182	0.4496
@TREND("1990")	0.007219	0.025523	0.282831	0.7798

R-squared	0.510617	Mean dependent var	0.018637
Adjusted R-squared	0.425507	S.D. dependent var	1.412771
S.E. of regression	1.070814	Akaike info criterion	3.135148
Sum squared resid	26.37279	Schwarz criterion	3.373042
Log likelihood	-38.89208	Hannan-Quinn criter.	3.207875
F-statistic	5.999492	Durbin-Watson stat	2.134982
Prob(F-statistic)	0.001854		

Null Hypothesis: D(TRA) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.583098	0.0006
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRA,2)
Method: Least Squares
Date: 12/15/23 Time: 18:15
Sample (adjusted): 1996 2021
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TRA(-1))	-4.270289	0.764860	-5.583098	0.0000
D(TRA(-1),2)	2.543795	0.628166	4.049557	0.0007
D(TRA(-2),2)	1.856666	0.478437	3.880691	0.0010
D(TRA(-3),2)	1.131077	0.344721	3.281137	0.0039
D(TRA(-4),2)	0.468299	0.198546	2.358640	0.0292
C	9.251038	2.644553	3.498148	0.0024
@TREND("1990")	-0.344839	0.120067	-2.872062	0.0098

R-squared	0.795660	Mean dependent var	0.117446
Adjusted R-squared	0.731132	S.D. dependent var	7.500289
S.E. of regression	3.889088	Akaike info criterion	5.779030
Sum squared resid	287.3751	Schwarz criterion	6.117749
Log likelihood	-68.12740	Hannan-Quinn criter.	5.876569
F-statistic	12.33039	Durbin-Watson stat	2.012493
Prob(F-statistic)	0.000011		