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**The Impact of Human Capital Development on Economic Growth  
in South Africa**

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## ABSTRACT

Human development index as the measure of human capital development has always attracted interest of economists, researchers and policy makers. Government across the globe, South Africa in particular is also trying to improve the human capital by pumping more investments on, such as education and health. But the issue whether improved level human capital result in economic growth is still divisive.

This study uses HDI (human development index) as the proxy for human capital and GDP (Gross Domestic Product) as proxy for economic growth for the period 1980-2011. The Johansen cointegration test was employed to analyse the long run relationship between HDI and its determinants as specified in the model.

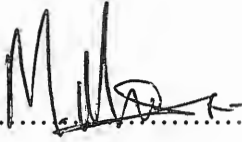
The empirical results of the study concluded that education has an important role in HDI; health and income has positive indirect impact on economic growth. All the HDI variables (education, health and income) have impact on economic growth in the long run, thus the composition of HDI and its effects has strong impact on the economic growth of South Africa.



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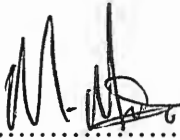
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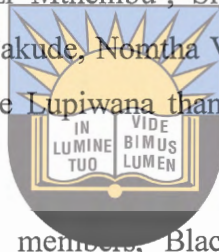
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Finally, I thank these organizations and members, Black Management Forum young professionals, Eastern Cape Business Youth Chamber and Eastern Cape Planning Commission.



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God Bless to you all,

## **DEDICATION**

*To my Mother Ndzukie the entire family and Friends*



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## ACRONYMS AND ABBREVIATIONS

ANC- African National Congress

ADF- Augmented Dickey Fuller

BRIC- Brazil, Russia, India and China

BRICS- Brazil, Russia, India, China and South Africa

DF- Dickey Fuller

GDP-Gross Domestic Product

GDPps- Gross Domestic Product per capita

GE- Government Expenditure

GNI- Gross National Income

GXED- Government Expenditure on Education

GXH- Government Expenditure on Health

GNP- Gross National Product

HDI- Human Development Index

HD- Human Development

HDR- Human Development Report

I – Investment

NGOs- Non-Government Organizations

OP- Trade Openness

PP- Phillips Perron

S.A- South Africa

SARB- South Africa Reserve Bank

U.S- United State of America

UNDP- United Nations Development Programme

VAR- Vector Autoregressive

VECM- Vector Error correction Model



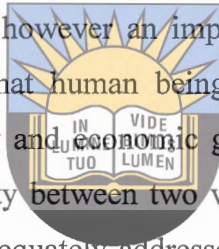
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## CHAPTER 1:

### INTRODUCTION AND BACKGROUND OF THE STUDY

#### 1.1 Background

The interest over the past few decades on relationship between human capital development and economic growth has attracted great attention in both theory and applied research. Thus far, the process underlying human capital development and economic growth is inadequately and poorly understood. “The major source of per capital output in any country; whether developing or developed, with a market economy or centrally planned is an increase in productivity”. Per capita output growth is however an important component of economic welfare, Costanza et al (2009) revealed that human beings are the most important and promising source of growth in productivity and economic growth”. Previous literature has managed to detect the bidirectional causality between two variables; economic growth and human capital. However, the literature inadequately addressed the impact of expenditure of both education and health on economic growth.



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The main purpose of this study is to investigate the impact that human capital has on economic growth. Human capital is defined by Schultz (1972), as set of skills which an individual acquires through training and experience, and which increases the value in the market. To sustain competitiveness in the country human capital becomes an instrument used to increase productivity. Human development becomes the process of gaining and accumulating human capital. For the purposes of this study, the human capital development will be measured by the human development index (HDI).

Human development index (HDI) is defined on the human development reports (HDR) as the average achievements in a country in three basic dimensions of human development; A long and healthy lifestyle (health), access to knowledge (education) and a decent standard of living (income). The HDI measures health through life expectancy Education through mean years of schooling and expected years of schooling and Income looks into decent standard of living measured through gross national income per capita.

The history revolving around human capital development holds that economic growth can be achieved for as long as individuals are equipped with knowledge and necessary skills to contribute into economic activities. Johnson (2011) confirmed on his findings that, technically advanced human capital and a growing knowledge base appear to be part of this wellspring of growth in developed and developing countries.

Taylor (2008), Johnson (2011) and Naude and Krugell 2005) have contributed in the literature on human capital development, while physical infrastructure investment may ordinary take long time to be completed, the impact of human capital development could be longer but the relationship that it has had with economic growth provides significance that is relatively greater than that of physical infrastructure investment. Human capital development in South Africa, as Taylor (2008) revealed that prior 1994 the South African educational system was characterized by, amongst many other factors, inequality of provision and resourcing. However, education has been the central contributor to human capital development. However, this study contrast that view by incorporating the human development index as the measure of human capital development. (Naude and Krugell 2005), stated that, since the inception of the new government post 1994, South Africa has been endeavoring in many economic activities such as, infrastructural investment, international trade standards and expenditure to developmental programs. But, Du Plessis and Smit (2005) pointed out that, spending by general government especially on developmental activities declined to an average of 2.2% per annum from 1994 to 2004; this explained a decrease in the rate from 2.4% which occurred ten years prior 1994.

Chandra (2010) indicated that, human capital development is supposed to bring to the economic system the externalities and other indirect effects such as high educational attainments and achievement of children. Which the attainments, according to Schultz (1972) are beneficial to the economic system as they add value to the individuals. In past few decades researchers tend to benchmark the human capital development against education, Krueger and Lindahl, (2001) on the other hand human capital development can be measured by healthy life and decent standard of living (Income) can be included to measure human capital development as per the top perspective of John,(2005). In upholding this view, the present study takes into account assertion made by Kruger and Lindahl (2001) and John (2005) that human capital can be measured by both healthy life and income. Therefore, this study combines the above mentioned two views and includes education to justly the use of

human development index (HDI) for measuring human capital development. According to Human Development Reports (HDR) education, health and income constitutes human development index (HDI).

## 1.2 Problem Statement

Research has been done to test the whether investment on education and health yield any accumulated returns or not. The question that remains is; are there any chances of reaching targeted outcome of economic growth?

It is problematic that human capital is narrowly defined by education. Asghar et al (2012) believed that health plays a significant role in formation human resources. However, an ideal human capital development is the one that takes formation from education and income as ingredients of human capital formation. The remedy to the problem is of great importance for the purpose of practical application and theoretical importance.

With the above in mind, the issue of a narrow definition of human capital being subject to education has brought about many unreliable outcomes that test relationship between economic growth and human capital development. As far as human capital is concerned, it takes more than educated people to contribute to economic growth. Van Leeuwen (2009), human capital proxies variables supposed to reflect the fluctuations of human capital, this seeks to take into account all the human capital inducers such education and training, health and income. This study efforts to curb the problem of unreliable research outcomes by making use Human Development Index as previous defined, that it takes into account education, health and income.

Adding to the problem is the contradiction of results with regards to what actually drives the economic growth, more especially for a developing economy such as South Africa. Gordhan (2012) argues that education takes up the largest share of government spending, on the same spirit, total spending on health services has increased strongly over that past three years from 63 billion 2007/08 to R113 billion between 2008 and 2009. Considering the fact that there has been an increasing spending on education and health, but does these investment yield any economic returns.

### 1.3 Objectives

The main purpose of this study is to examine the causal relationship between capital and economic growth for South Africa over the period 1980-2011. Furthermore;

- To analyze the trends in human capital development and economic growth in South Africa
- Based on the empirical results, make conclusions and policy recommendations.

### 1.4 Hypothesis

The hypothesis to be tested is arranged as follows:

H<sub>0</sub>: Human capital development does not have long-run relationship with economic growth in South Africa

H<sub>1</sub>: Human capital development does have long-run relationship with economic growth in South Africa.



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## 1.5 Justification of the study

Too much literature on HDI and EG done for developed countries or cross-country case, which allows a big gap in developing and country-specific cases. Econometrical estimation of the relationship between economic growth and human capital development has not been fully articulated more specially for the developing countries. However, the importance of the relationship between economic growth and human capital development has increasingly grown over the past decades. This stands to reason that the subject is essential to policy makers and economists to be used as base in influencing economic decisions. The policy influence that will emanate from this study will be that which seek to outline whether or not government expenditure on variables such as education and health (as defined above) do have significant contribution to economic growth.



It is necessary to determine the relationship between economic growth and human capital development as many studies conducted on country-specific do not set a definite reason about the impact of human capital development on economic growth. Regarding the available literature that has been reviewing the relationship between economic growth and human capital development proved to be less reliable, because of the restrictiveness in the definition of human capital. This is also because; the most popular method to proxy the human capital development over time has been educational index. Effect of human capital development is given attention in order to detect its contribution to the economic performance. This study will therefore be an addition into the literature of South Africa regarding the economic growth and human capital development. And provide a substantial answer to the question; of whether the relationship between economic growth and human capital development exists or not.

## 1.6 Organization of the study

This study is divided into six (6) chapters arranged as follows: following chapter 1 above of introduction and background is Chapter 2 which outlines overview of South Africa's Human Development Index (HDI) and Economic Growth Chapter 3 provides a review on theoretical and empirical literature while Chapter 4 focuses on research methodology, specification of the model and data analysis. Chapter 5 presents econometric regression results and interpretation. Finally Chapter 6 concludes the study, provides policy recommendations and implications of the results.



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## CHAPTER 2:

# OVERVIEW OF SOUTH AFRICA'S ECONOMIC GROWTH AND HUMAN DEVELOPMENT INDEX

## 2.1 Introduction

The purpose of this chapter is to outline the trends of human development index and gross domestic product in South Africa over the years 1980 to 2011. The chapter further looks at the variables that make up the HDI and their relative influence and contribution to the human development index. Comparisons between South Africa and the BRICS economies (which comprises of those major developing economies in the world namely Brazil, Russian Federation, India, China and South Africa); selected industrialized economies; and selected African economies will be discussed so as to evaluate the overall performance of the South African economy. This chapter also provides an overview of the South Africa's economic growth. Lastly, the chapter ends with some concluding remarks.



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## 2.2 The Origin and Composition of Human Development Index

The use of the term "Human Capital" in the modern neoclassical economic literature dates back to Jacob Mincer's article "Investment in Human Capital and Personal Income distribution" in *The Journal of Political Economy* in 1958. Then Schultz (1961) also contributed to the development of the subject matter. The best-known application of the idea of "human capital" in economics is that of Gray Becker's book entitled "Human Capital", published in 1964 that became a standard reference for many years. According to these authors, human capital can be developed by investing in education, training and health care. Human capital is a means of production, into which additional investment yields additional output. Human capital is substitutable, but not transferable like land, labor, or fixed capital. Modern growth theory sees human capital as an important determinant of economic growth.

The notion of human capital arose out of the awareness that neither physical capital nor education alone is enough to explain long run growth. Many social indicators such as educational enrolments and life expectancy became combined in a common term: human capital. Often, human capital is implicitly referred to as formal and informal education. Yet, it can also contain factors such as health costs and income.

The definitions of human capital applied by historians of pre-modern economies remained very broad. For example Nakamura (1981), for pre-modern Japan, defines human capital broadly as ‘labor skills, managerial skills, and entrepreneurial and innovative abilities-plus such physical attributes as health and strength’. Van Leeuwen (2009) also uses several measures as indicators of human capital of slaves in Peru and La Plata in the eighteenth century such as physical strength and skills. As such they see human capital on the one hand as ability and education of an individual and, on the other, as the costs of physically raising a child or his health.



### 2.3. Education Index, Life Expectancy and Gross National Income

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The HDI proxies below make it possible to track changes in S.A development levels over the past 31 years. According to Anand and Sen, (1994). Education index as a proxy is measured by mean of years of schooling for adults with estimated age 25years and expected years of schooling for children of school entering age. Expected years of schooling are capped at 18years. The indicators are normalized using a minimum value of zero and maximum values are set to the actual observed maximum value of mean years of schooling from the countries in the time series, 1980–2012, that is 13 years estimated for the South Africa in 2010.

According to the Human Development Report prepared by United Nations Development Programme, life expectancy at birth component of the HDI is calculated using a minimum value of 20 years and maximum value of 83.57 years. This is the observed maximum value of the indicators from the countries in the time series, 1980–2012. Thus, the longevity component for a country where life expectancy birth is 55 years would be 0.551, the life expectancy at birth is estimated in South Africa at 50years for 2013.

The decent standard of living component is measured by GNI per capita instead of GDP per capita. The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing GNI, Anand and Sen (1994). The data sources used for these following figures (2.1, 2.2 and 2.3 and 2.7) was HDR, 2010.

**Figure 2.1: Education index**

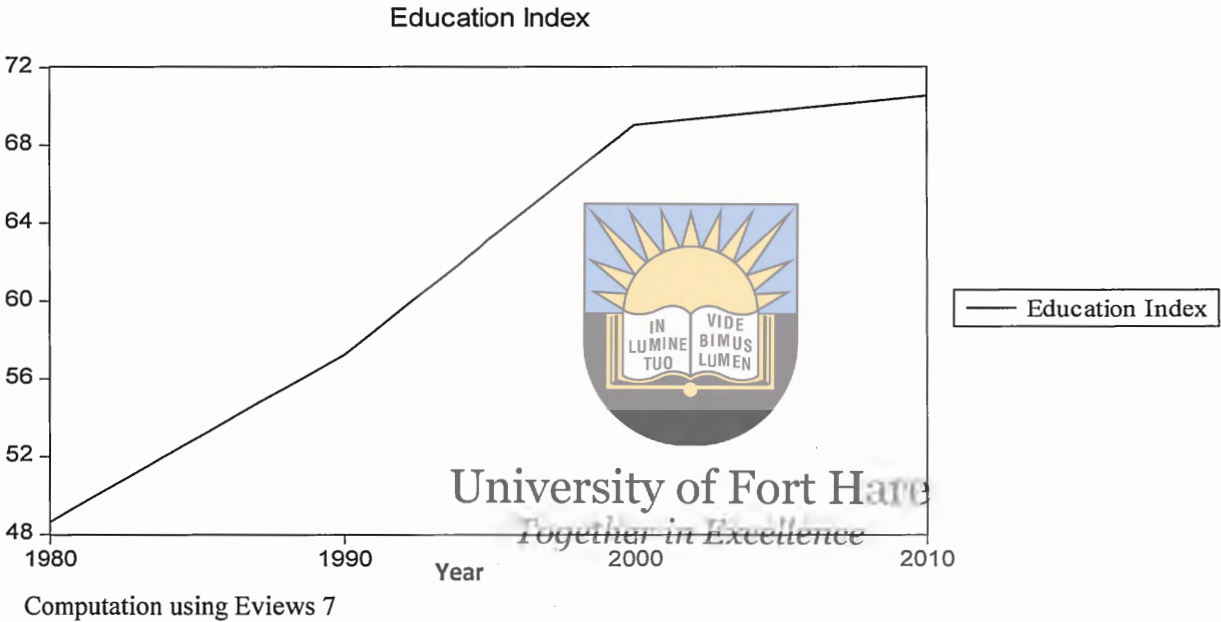


Figure 2.1 depicts education index between 1980 and 2000, and is trending upwards. From as low as 49% in 1980 it increased to 63% in 1994 and kept on increasing until early 2000s and increased at very low pace ranging between 67% and 71% for a long period. According to the World Bank report (2012), the Pro-poor orientation of public spending has contributed to improved social development indicators in a range of areas. MDGs<sup>1</sup> on primary education, gender, several health indicators and environmental sustainability are likely to be achieved. Social grants expenditure and the number of beneficiaries have quadrupled before 1994.

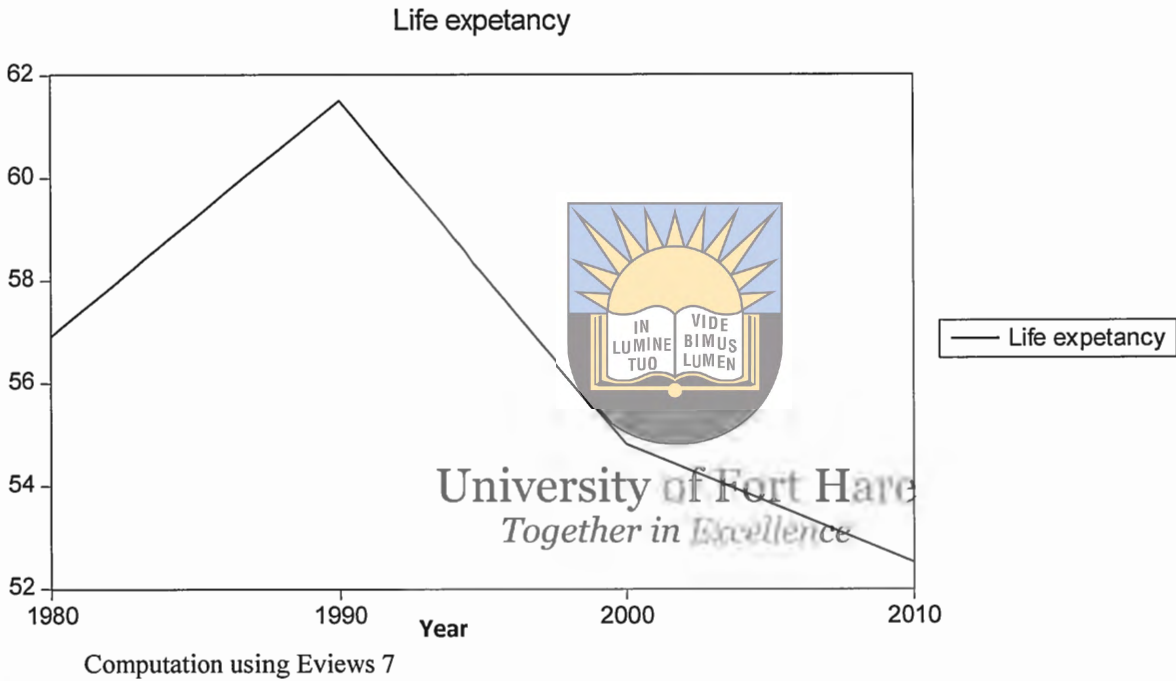
The World Bank Reports, (2012) records that, in 1980s and through 1990s education was redefined in order to play a decisive role in the establishment of the "new future". Education was used purposefully and aggressively to direct and build the future. Amongst other initiatives implemented, Blumfield (2008), alluded, increase in education access rates,

<sup>1</sup> Millennium Development Goals- to achieve universal primary school

distribution of support structures also in formally disadvantaged areas, training of teachers and subsequently performance started to improve.

These initiatives resulted in positive outcomes which saw education index trending upwards positively.

**Figure 2.2: Life expectancy**



South Africa’s Life expectancy had an increasing indicator in the first set of the overall 31 years. It was until late 1980s and beginning 1990s when life expectancy shockingly started to decline, the concerning change saw 61 years decreasing going down to be 54 years in the late 1990s.

ANC-NHPSA (1994) which was later modified by Steyn et al (2006) pointed out that, non-natural causes of fatalities in South Africa are the three times higher than the WHO<sup>2</sup> estimated for the world and tuberculosis by far was the most frequently disease with annual case load increase by 4% while HIV/AIDS emerged as a major public health problem with 2000 reported cases at the end of 1993.

These factors resulted in a considerable drop in life expectancy during the early 1990s, from 61.6 years in 1992 to 49.7 in 2006, and are also reflected in the increased infant and child

<sup>2</sup> World Health Organization

mortality. Steyn et al (2006) and Kaiser (1996) also outline the significant contribution made by dietary and poor nutritional status of the people, poor-economic circumstances as well as unhealthy lifestyle.

According to the report by Stats SA (2014), life expectancy at birth stands at 61 years, having increased from an estimated 52 years in 2005. The rise in life expectancy can be attributed to two important trends: first, the number of AIDS related deaths is estimated to have decreased from 363 910 deaths in 2005 (51% of all deaths) to 171 733 deaths in 2014 (31% of all deaths). This can be associated with the increased rollout of antiretroviral therapy (ART).

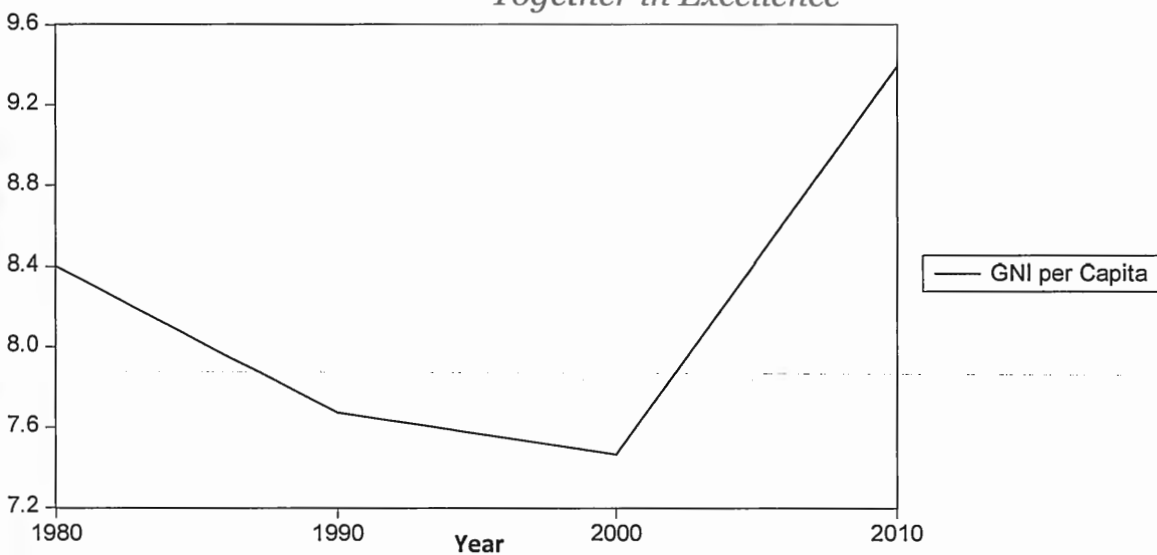
The decline in IMR points to an improvement in the general health & living standards of the population and the life expectancy rate increase hence the index started to decrease slightly.

The statistics on health further notes the simultaneous movement whereby there was a rise in life expectancy and a decline in the CBR<sup>3</sup>.



**Figure 2.3: GNI per Capita**

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GNI per Capita  
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Computation using Eviews 7

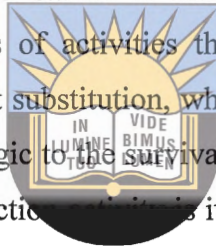
The gross national income per capita on figure 2.3 shows a decline since 1980 to 2000s, even though the declined became better in 1990s. Kaiser (1996) stated that inadequate provision of social services and the private sector being unable to generate much needed jobs during the

<sup>3</sup> Crude birth Rate

period of 1985 through to 1992 resulted in poor and declining gross national product per capita.

WBR<sup>4</sup> (2014) reported that even though economic growth and rising social welfare payments have made a dent into poverty levels, A 30% increase in per capita GDP since the late 1990s and a sharp expansion of the social grant coverage enabled a significant decline in the poverty rate - from 50.8% of the population living below R422 a month. These significant changes carried on into a constant 2009 Rands and again in 2000 to 34.5% in 2010 furthermore, during 2000s the GNI per capita starting to increase.

McCarthy (2005) noted that, the GNI index started to increase from 1960 until the early 1990s; this sector developed on the basis of activities that added value to the mineral resources of the country and through import substitution, which in time became an intensive effort to establish industries that were strategic to the survival of a beleaguered economy. An outstanding feature of South Africa's production is its growing capital intensity over time. According to World Bank Data (2012), this is revealed in increasing capital/labour and average capital/output ratios. The concomitant productivity performance has been poor.



Until the mid-1990s the productivity of capital declined sharply, and the growth in labour productivity, in spite of the growth in real capital per worker, was meagre, and hence total factor productivity also performed weakly, often falling. Productivity performance turned around in the mid-1990s. The capital/output ratio started to decline, and labour, capital and total factor productivity showed some improvement, but at the cost of employment, with capital/labour ratios still increasing in a labour abundant economy.

The statistical outline of human development presented in figure 2.1, 2.2 and 2.3 above shows significant changes and progress in investment to human development, 14 years before 1994 and 17 years thereafter. These indicators confirm the developmental trajectory of South African economy pre and post 1994.

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<sup>4</sup> World Bank Reports-April 2014

## 2.4 Comparison of HDI with other Industrialized Economies

In comparison to the performance of other industrialized economies, South Africa's performance since the 1980 till 2011 is negatively skewed. Table 1 shows the fluctuation of Human Development Index of South Africa and the other selected industrialized economies and their performance since 1980 to 2011. The countries were randomly selected by the author.

**Table2.1: The HDI of Selected Countries**

Period	Australia	Canada	Japan	Austria	Germany	United States	Switzerland	Italy	South Africa
1980-84	86.8	88.8	88.6	86.2	86.3	89.0	89.5	86.1	<b>67.0</b>
1985-89	88.0	91.1	89.9	87.6	87.1	90.4	90.2	86.9	<b>69.9</b>
1990-94	87.3	85.7	82.7	79.0	79.5	87.0	83.3	76.4	<b>76.6</b>
1995-98	90.6	87.9	86.8	85.9	86.4	89.7	87.3	82.5	<b>71.7</b>
2000-11	92.9	90.8	90.1	88.5	90.5	91.0	90.3	87.4	<b>70.2</b>

Source: World Bank Data 2012

South African HDI rate shown on Table 2.1 above indicates that, S.A HDI was already below the rate of other industrialized nations in the 1980s. The period 1980 to 1985 saw S.A with 67.0% and that already being the lowest rate amongst other countries. Just above United States Switzerland was at 89.5 % and 89.0% for USA. The HDI fluctuation in the following period supported Blumfield (2008) and Steyn et al (2006) that investments on education and on health had an influence on the rate of HDI. For that reason; 1985 to 1989 saw Canada in the top of the list followed by USA and then Switzerland at the third place with 91.1%, 90.4% and 90.2%. On the other hand S.A trailed at 69.9% but that rate marked a 2.9% improvement compared to the previous period.

Whilst Becker (1964) discusses the formation of human capital through the working experience at specific firms or working places. Both workers and firms have thereby incentives to maintain long run relationships, when investments in education and job

formation take place. For that reason and more, the period 1990 and 1994, South Africa's HDI was, at its highest rate, 76.6% which is relatively low as compared to other countries (selected). Australia had the highest rate of HDI during this period with a leading rate of 87.3% followed by Canada of 85.7%. Compared to the nine countries Italy had the lowest HDI of 76.4% which is relatively below that of South Africa and South Africa was ranked 8<sup>th</sup> of the nine countries during that period.

Australia and United State are countries that continued to perform better in the 1995 – 1998 period and that caused the two countries to remain the best on the rankings respectively.

Fedderke and Simkins (2001) “if a country is behind in the accumulation of human capital it is likely to remain forever behind. Countries ahead in the growth race will steadily out-accelerate any lagging country”, as outline in table 2.1 above South Africa is lagging behind and there is strong likelihood it will be continuously be behind. South Africa showed no better performance as it was surpassed by Italy. This resulted in South Africa not doing well compared to the other nine countries; this resulted in South Africa dropping down the rankings. Rankings in the period 2000-2005 to 2011 showed a great improvement in number of countries. Germany, Switzerland and Japan are countries that improved greatly and surpassed Unites State of America. Canada ranked 2<sup>rd</sup> whilst Australia retained the 1<sup>st</sup> ranking with its 92.9% on the other hand, South Africa remained at rank 9 with a low rate as compared to the previous period of 70.2%.

## **2.5 Comparison with the other African economies**

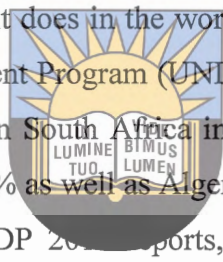
The countries used below were randomly selected for the purposes of comparison with South Africa. And out of approximately all African Countries, South Africa's performance was ranked the highest.

**Table 2.2: HDI of selected Africa Countries.**

Development Category	Country	African Rank	World Rank	HDI
<b>High Development</b>	Libya	1	53	75.5%
	Mauritius	2	72	70.1%
	Tunisia	3	81	68.3%
	Algeria	4	81	67.7%
<b>Medium Development</b>	<b>South Africa</b>	<b>9</b>	<b>110</b>	<b>59.7%</b>

Source: human development report, 2012

In the African region as seen on Table 2.2 above, South Africa's Human Development Index is considered to be performing better than it does in the world rankings. A report on human development by United Nations Development Program (UNDP) shows that in Africa, only 8 countries have the highest rate of HDI than South Africa including first placed Libya with 75.5% HDI, Mauritius 70.1%, Tunisia 68.3% as well as Algeria 67.7% all forming part of the high developing category. According UNDP 2012 reports, South Africa is grouped with countries such as Egypt 62.0%; Botswana 53.7% and Morocco 46.7% are all grouped under the second best category of medium developing countries in terms of human development. Whilst South Africa is performing compared to other African countries such as Zambia 39.5%, Togo 42.8% and Nigeria 42.3%.



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## 2.6 The BRICS economies and HDI comparison

China, Russia, India and Brazil are the fast growing economies in the world. According to Awan (2007), these four countries have huge human resources and their total population is about 41 percent of the world, their combined area is 26 percent of the world and their total GDP is 18 percent of world. In size, Russia is the largest country in the world, having 11.5 % of area. China and India are No.1 and No.2 largest populous countries of the world as well as largest countries in Asia and are equal to the United States in terms of size. Brazil is the largest country in Latin America and Southern Hemisphere.

Xu, (2011) stated that recently these four countries particularly China and India have attracted the attention of the whole world due to their constant fast economic growth particularly at a time when the advanced economies have been facing economic downturn since 2008. The miraculous growths of BRIC countries have also won the attention of the

researchers all over the world. The BRIC association has grown and along its historical growth journey in 2010, it extended its membership to South Africa. The core mandate of the BRICS forum is to encourage commercial, political and cultural cooperation between the BRICS nations.

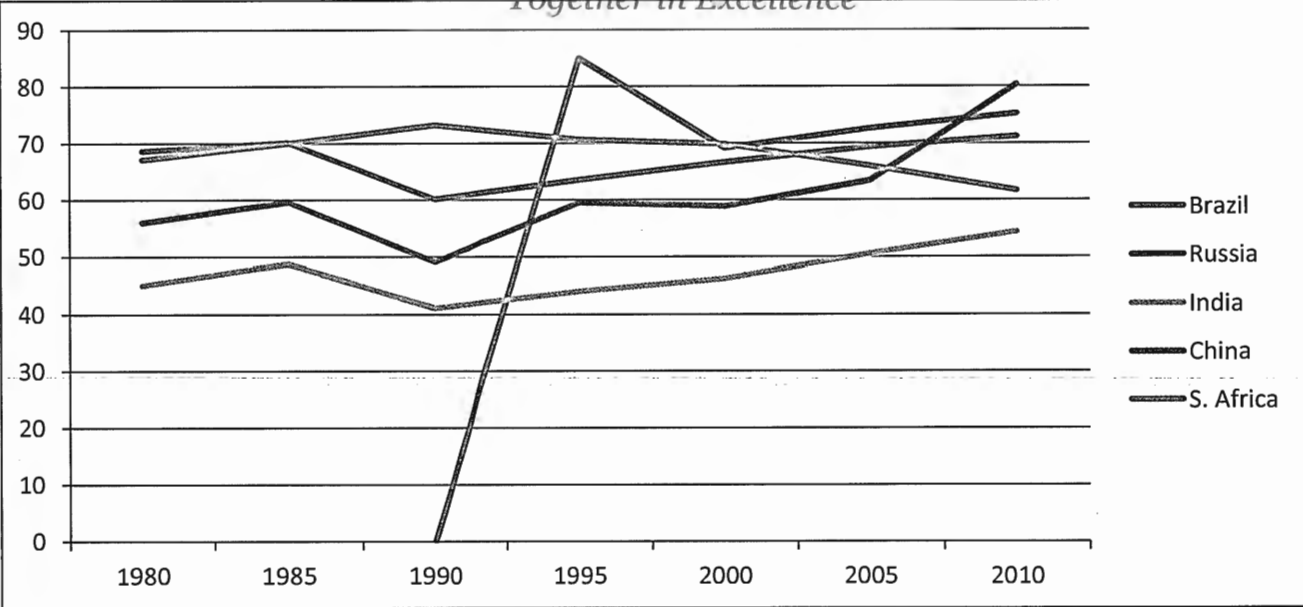
Now the researchers are extensively investigating different aspects of the economic growth of the BRICS countries. As these five countries have abundant human resources and their governments have been following human resources development policies to obtain demographic dividend.

**2.6.1 The Comparison of HDI amongst BRICS Countries.**

The data shows that Russia, India and Brazil have improved their HDI, whilst South Africa has seen a decline in its HDI since the mid-1990s. This underscores the point that South Africa needed to be evaluated from the experiences in Russia, especially from Brazil and India.



**Figure 2.4: HDI rate for the BRICS countries (1980-2010)**



Source: World Bank Data 2012

Unveiling the performance of HDI in BRICS it indicates that the countries hardly reached the 70% rate between the periods of 1980 to 1990. On two five year periods between 1980 and 1990, all these countries experienced an appreciating the rates, showed by an increasing

indicator in the figure 2.4. The second period from 1985 to 1990 shows a decline in the HDI indicators Brazil, India and China, whilst S.A indicator was on the increasing move since 1980. Unveiling the mystery of post-1980 Brazil's growth slump requires going back to the early 1970s, perhaps the early 1950s. On both occasions, the country was hit by long lasting adverse terms of trade shocks: an oil shock in one case, a coffee price slump in the other, Bacha and Bonelli (2004). The inferences of negative externalities due to economic crisis were also supported in the study by Stewart et al (2012) which refers that, because of heavy aid dependence and less integration with financial markets, sub-Saharan Africa was less badly affected, while in the 1980s sub-Saharan Africa and Latin America suffered most. In aggregate terms, the fall in gross domestic product (GDP) was much greater in the 2000s than the 1980s.

S.As performance rate was very low in 1990; it started at a high note at a rate more than 71% (Figure 5). As it is shown above, South Africa therefore was heavily declining, unlike Russia, which started at a high note 80% + rate and still managed to remain on top of other BRICS countries although it declined significantly.



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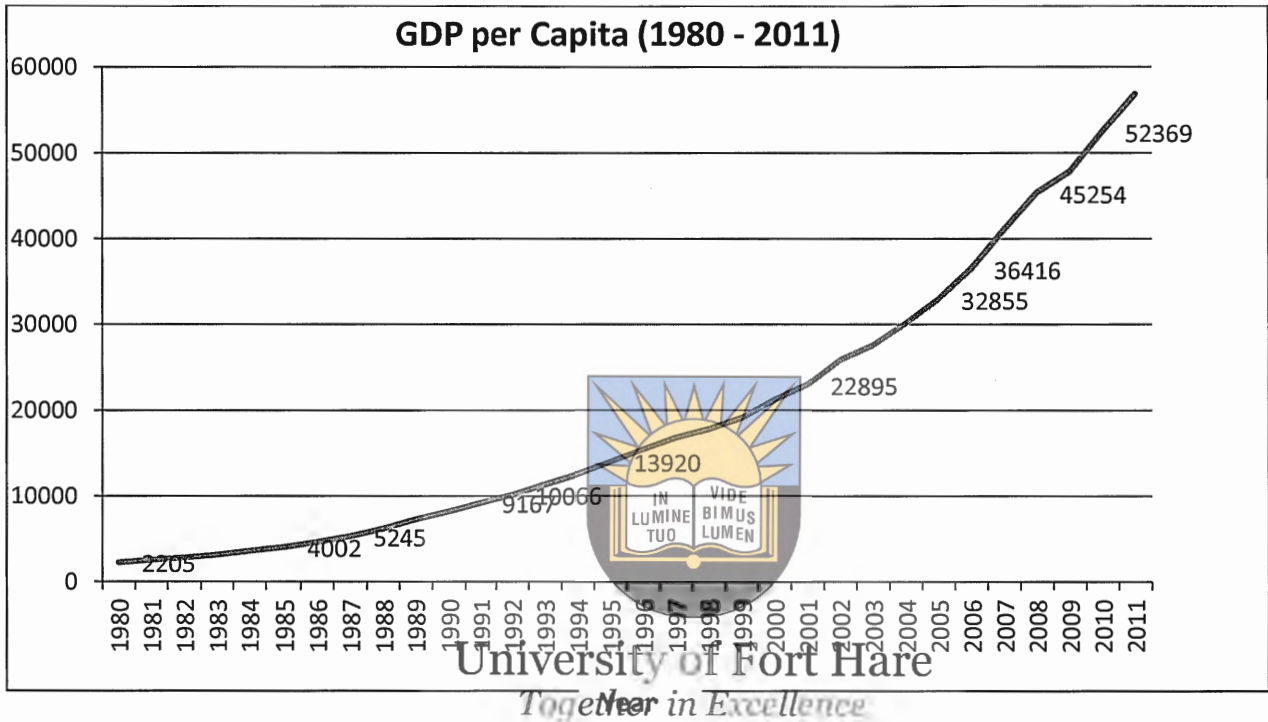
The period between 1990 and 1995 the HDI rate is marked with improvement for all the BRICS countries except S.A as its rate decreased from 72.1% to 70.5%. The overall HDI is very high amongst the BRICS as compared to other countries in the global economy. The period between 1995 and 2000 is marked with decreasing HDI rate in all these countries but India and Brazil are having increasing rates. South Africa continued to perform poorly even in the following period (2000 to 2005) where it went down from 69.7 % to be 65.8% in the 2002/3. This performance made South Africa to be the third best amongst the BRICS countries during this period. From This result is also supported by a wealth analysis based on the Human Development Index.

The final period 2005 to 2010, shows a great in all the BRICS countries except South Africa. It is understandable that during this period South Africa was joining the group of BRIC This period also indicate the continued decline in the South African rate as it becomes 61.5%. India is another country that continued to experience a great increase from 50.4% to be 54.2% but still remains below the South Africa rate.

## 2.7. The Economic Growth South Africa

The diagrams below show the GDP per capita of South African for the period 1980 to 2011.

**Figure 2.5: Gross Domestic Product per capita**



Source: SARB 2013

Over time, the annual growth rate of South Africa differs across the past respective decades. That is also links to the changes in the GDP per capita on figure 2.5 above. These fundamental changes in the economic growth are interlinked and better explained through changes in national employment levels and other important macroeconomic indicators. The GDP per capita of South Africa since 1980 has been increasing very slowly.

The period of 1985 to 1988 marked a steady increase in the GDP per capita, from a smaller value in the 1985 to relatively high rate in the 1988. The GDP per capita indicator shows once again another slow increase between years 1989 to 1992. Positive economic performance started to show up during the political transition in South Africa, 1994. The growth rate as measured by the GDP per capita upturned to more than R10 000 to become R 13 920 in 1996. The indicator continued to increase; fluctuations did also take place and substantially below what was deemed necessary to support a lasting transition to democracy in South Africa.

The evidence on growth in GDP per capita is not showing a positive image of South Africa's total output, the declining growth performance of the South African economy mirrors a declining growth rates elsewhere in the world. On the other hand middle income countries as a whole grew their economic growth rate at 2.7% per annum on average over the 1980-90 periods, and at 3.9% per annum on average over the 1990-98 periods. In the case of East Asia the acceleration was from 8.0 to 8.1% per annum over the same period. Thus South Africa as a middle income country has performed well below the average maintained by its peer economies. The reason is that, in the mid-1990's the GDP per capita indicator does show evidence of a recovery in growth performance, though it remains to be seen how sustainable the recovery will prove to be. The sharp increase in the growth performance of the US economy is that GDP measurement has been improved in order to take better account of quality improvements in output in the economy, especially as concerns the contribution of information technology to production methods.



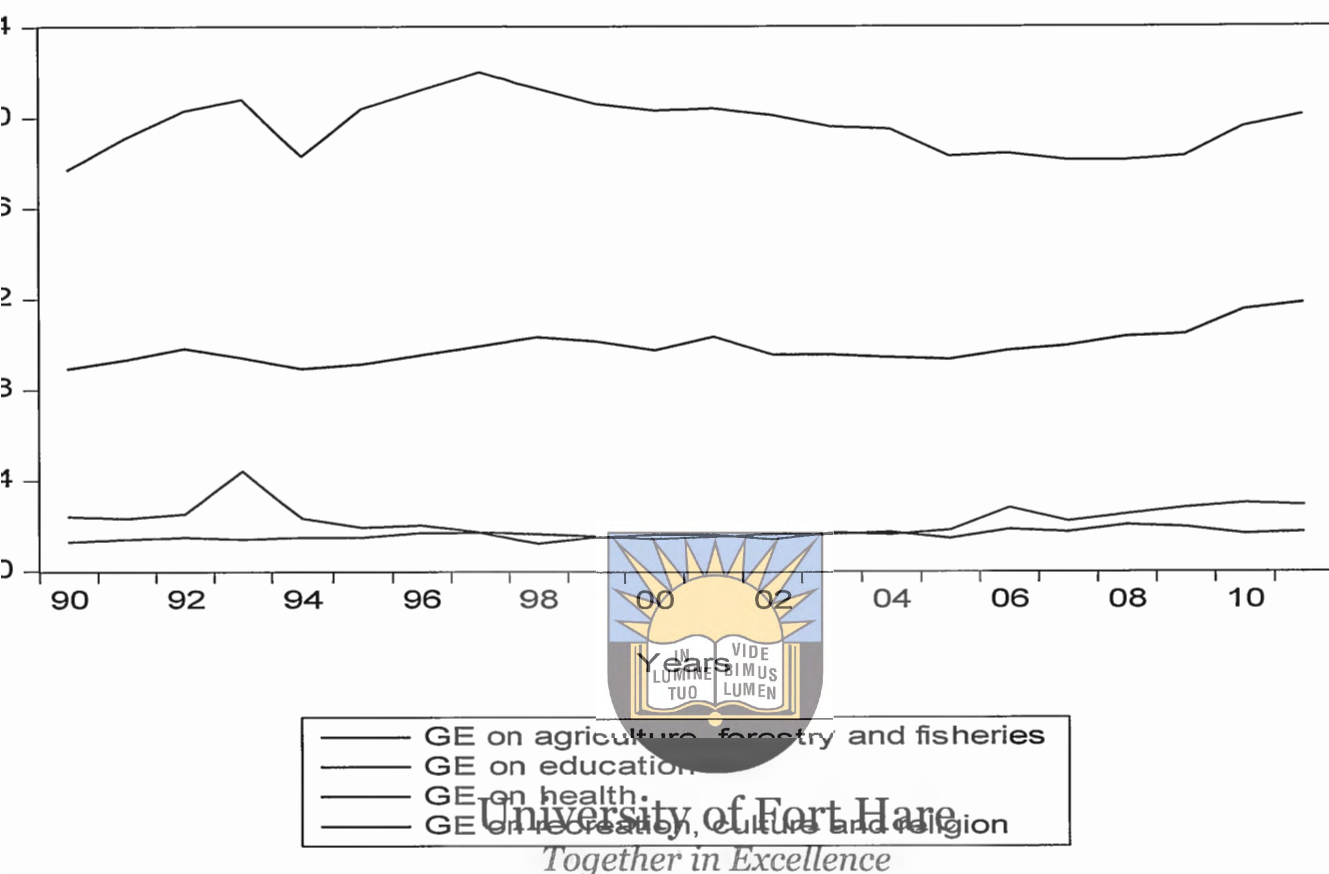
Smit and Du Plessis, (2005) stated that, the South African Reserve Bank has made some attempts to correct its measures of GDP in order to bring the measure in line with revised international best practice. While it is true that the revision of GDP figures has indeed had an impact, the impact is not such as to allay significantly growth concerns for the economy. Moreover, on either measure of GDP it emerges that South Africa has not been able to sustain the growth upsurge of the mid-1990. Regardless of which data we consider therefore, growth must remain a central concern for policy makers in South Africa. Understanding the fundamental determinants of growth in South Africa is the pressing need that follows.

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## 2.8 Government Expenditure: on different Sectors in South Africa

The economic development status over the period ahead is uncertain due to the current global economic environment. Government Expenditure in order to achieve and promote faster and inclusive growth is used. The composition of expenditure has changed in order to support inclusive development and encouraging growth.

**Figure 2.6: Government expenditure on four different sectors**



Source: South African Reserve Bank (2013)

In figure 2.6 above, the indicators show different government expenditures, the expenditure on education, on agriculture, forestry and fisheries, health and recreation, culture and religion.

Public expenditure on education comprised 22-24% of total government expenditure in the late 1980s and 1990s and around 7% of GDP in 1996. On both these indicators of expenditure, South Africa compares favourably with countries having a similar GNP per capita and with countries in the Southern African region.

The annual average increase in nominal expenditure between 1983 and 1995 was 15.9% and 15.5%. For the period 1990-1995. In real terms the corresponding figures were 4.6% and 5.6%.

A feature of education expenditure is the high proportion of current expenditure devoted mainly to salaries<sup>5</sup>. Current expenditure comprised over 93% of total education expenditure for the period 1987-1996. The share of basic education in the budget (approximately 47% in

<sup>5</sup> Estimates of National Expenditure 2013 report. ISBN: 978-0-621-41454-7

1995) compares favourably with many developing countries. This figure increased from about 39% in 1987. Figure 6, shows expenditure on education has been higher than the other sectors as from 1990 to 2011.

Real health care<sup>6</sup> expenditure increased by an average of 2.9 per cent between 1980 and 1997 while real per capita expenditure increased by only 1.3%. Total public sector health care expenditure as a %age of GDP increased from 2.3% in 1980 to 3.3% in 1997.

With respect to the relationship between recurrent and development expenditure, a concern is that real recurrent expenditure has remained constant during the period under review despite significant increases in development expenditure (nearly 260%) over this period. As most of this new health facility development relates to clinics and given the difficulties associated with effecting a geographic redistribution of health personnel, it is likely that many new facilities will remain unoperational in the short- to medium-term.



The majority of health care expenditure is attributable to personnel costs (68%), while pharmaceutical supplies (13%) and other supplies (6%) accounted for the next largest component. The distribution of health care expenditure by level of care highlights the bias towards curative hospital-based health care. Acute hospitals accounted for 76% of recurrent public sector expenditure while non-hospital primary care services (i.e. clinics, community health centres, school and environmental health services) only accounted for 11% of expenditure. Academic and other tertiary hospitals accounted for 44% of recurrent public sector health care expenditure.

South Africa has a substantial private health sector, both in terms of human and physical resources. 59 % of doctors, 93 % of dentists and 89 % of pharmacists work in the private sector. In addition there are between 350,000 and 500,000 traditional healers. There is a range of hospitals within the private sector and there has been a proliferation of NGOs in recent years

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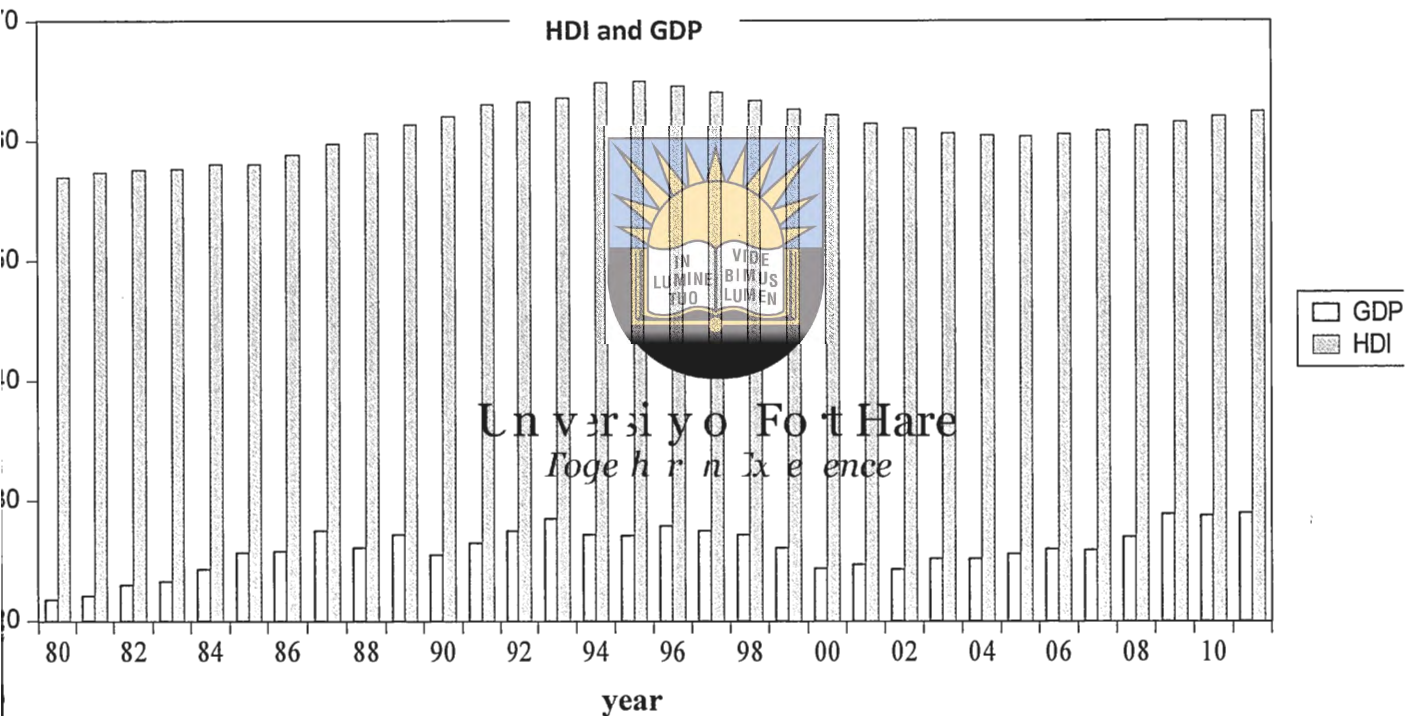
RP: 343/2012

<sup>6</sup> Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington DC: National Academy Press, 1990, p244.

Investing on education provides only a very broad measure of investment in human capital. Increasing educational investment is believed to be a factor determining growth in GDP per capita or is this observed increase in education a result of continuing economic growth.

## 2.9 Overview of South Africa Human Development Index: Comparison with Gross Domestic Product

Figure 2.7: Comparison for HDI of and GDP (1980-2011)



Computation using Views 7

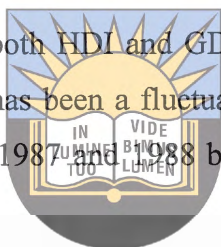
Figure 2.7 above illustrate the trends in the human development index and comparison is made with gross domestic product in South Africa from 1980 to 2011.

The diagram above depicts the collective comparison of HDI and GDP in percentage, HDI performed well considering the first four years from 1980 up 1983; it continued to rise though it was stable at 58.1% for two years 1984 and 1985. On the other side the GDP rate was increasing 1980 as it is shown in the figure below for period of five years South Africa experienced increased in the GDP percentage rate of 3.9%. International interferences to the economic performance of South Africa cannot be denied and it is plausible to draw inferences such as global economic crises in the 1980s. As a result, the South African currency lost value, the gold price dropped and inflation rates were high. Apart from the internationally

inclined growth impediments there have been nationally originating which resulted in the drop GDP and thus slow increase in the HDI, Haniva and Maia (1994).

The five year later, 1985 – 1990 marked another noticeable increase in both rates of HDI and GDP, despite the fact that trends were reversing compared to late 1960s/1970s, in subsequent years as pressure for political change intensified, both domestically and internationally. Rodrik (2006) stated that the resistance of the ruling party to implement reforms led to the African National Congress (ANC) calling for economic sanctions, including trade and investment restrictions, being imposed by the international community. Economic growth and investment in South Africa suffered tremendously in the face of political isolation.

The analysis thus far showed increase for both HDI and GDP for period of 10 years; from 1980 to 1990 and within this period there has been a fluctuation of these rates, that is HDI increases and then GDP increases after. In 1987 and 1988 both rates decrease by 0.9% and 1.4% for HDI and GDP respectively.



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Abbas (2008) argued that, Human capital has been found to be a positive and significant contributor to economic growth in many empirical cross-country models. Other studies confirmed that human capital can effect economic growth in several ways. The increase of HDI continued from 1990 into 2004 the HDI rate was never below 60.1% throughout. It is worth to mention that economic climate and political transition in the country contributing into fluctuation of HDI. The political negotiation five years before 1994 and the success of political changes five years after reflected positively on the rates in which HDI and GDP was increasing in that 10 years. From 1990 to 1994 the HDI was increase at 2.8% rate whilst it increased at 2.3% five years after 1994. On the other hand the GDP has increase from 25.5% in 1990 to be 27.2% in 1994. The period from 1995 to 1999 marked a very stable growth for GDP of which one year of that five was marked by a decrease from 27.2% in 1998 to be 26.1% in 1999.

South Africa was welcomed as a democratic country by the international community; the external challenges associated with its re-integration in a fast globalising world economy compounded the domestic predicaments, DU Plessis and Smit, (2005). Between 2000 and 2002 the GDP experience decrease and the GDP rate ranging at 24.3%. Since 2003 to 2001 GDP was then not less 25%. This does not withstand the fact that it fell during the global

economic crisis in 2008/2009. On the other hand, the HDI was not less than 60% from 2000 to 2011.

## 2.10 Conclusion

The change in the developmental landscape of South Africa had significant role in influencing new developmental framework, through reconstruction and development program. South Africa had, at one time, possessed not only the potential for catch-up growth (and hence the requisite social capital), but had to an extent realized that potential is a matter of historical record. The long run economic performance of the South African economy is contested ground. The controversy is not chiefly about the data - though that has been disputed too – but the evaluation of the data. As it is shown in the figures (mentioned above) that it is now evident that South African economy is failing to regain its economic potential that it use have many decades ago.



Based on the discussions above it can be concluded that during and after 1994 there was a political transition<sup>7</sup>, as expected it led to economic growth in the country. But 'Successful' in that transition is brought to question. Was the political transition really economically successful for the long term.? Economic development has been realized, South Africa joining the BRIC nations has brought economic relief and the economic strategies have since been strengthened. The Human capital development has played a vital role in the fast economic growth of China, India and Brazil while Russia, which was endowed with human capital right from the beginning, could not materialize the potential of human capital during its transitional period from planned economy to market economy since 1990s. South African GDP pc has been increase although heavy fluctuation due to other economic factors causes delays. The current growth rate is not enough for a very populous country like South Africa. Emerging is that South Africa has not done enough in terms of converting the resources into accumulative returns. In contrast, India, China and Brazil have been fully utilizing their human capital potential by following human capital developing policies and this factor not only has triggered their economic growth but also alleviated poverty in these countries. The government must identify priority sectors such as primary education and health that have the highest potential for HD improvement. Government expenditures for HD should be

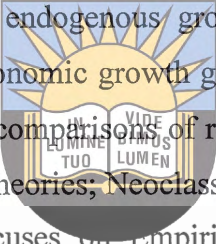
<sup>7</sup>See Nathan, L, 2004. Accounting for South Africa's successful transition to democracy. Development Research Centre LSE. Discussion Paper no.5

distributed predominantly to low income groups and areas since it is here that the highest marginal impact will be had. Government must also have the institutional capacity to efficiently allocate these expenditures.

## **CHAPTER 3: LITERATURE REVIEW**

### **3.1 Introduction**

This chapter discusses both theoretical and empirical literature. The first section will focus on the economic theoretical models to be used in the study. The first section begins with a discussion of long-run economic growth with the neoclassical model of capital accumulation and AK growth theory. But given the limitations associated with the neoclassical growth theory, this section furthers discussion to endogenous growth theories. The relationship between human capital development and economic growth generate insight into endogenous growth theories, this will also lead into the comparisons of related and alternative economic theories. Finally the section discusses these theories; Neoclassical, Keynesian, AK, Lucas and Romer growth theory. Second section focuses on Empirical literature review revealing experiences of other countries and essentially zoom into the outcomes of such.



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### **3.2 Theoretical Literature review**

#### **3.2.1 Economic Growth Theories**

##### **3.2.1.1 Exogenous Growth Models**

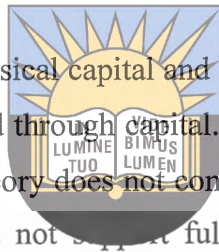
###### **3.2.1.1.1 Neoclassical growth theory**

The neoclassical theory implies that economists can take the long-run growth rate given exogenously (Martin and Sunley, 1996). The fundamental element of the neoclassical theory that sets it apart from the array of other growth theories is the credence from the founders of the theory that economic growth is driven by capital. According to (Banerjee and Duflo, 2004) they reiterated and advanced on the work done by (Ferrara and Guerrini, 2008) in revising the work by (Solow-Swan, 1956) by postulating that savings, investment and together with technological growth contribute to economic growth exogenously, this means to say that output is induced by the technological knowledge. This thought was supported by

(Benhabib and Spiegel, 2002) that the rate of technological progress is determined by a scientific process that is separate from and independent from the economic forces. Neoclassical approach, further indicate that, government spending and other economic factors such as tax restructuring have no real effects on output and unemployment.

Cesaratto (1999) argued that the aggregate production function can exhibit a constant and even increasing marginal product of capital. This point out that, firms generate capital that will ease and contribute to productivity and production and eventually economic growth. Cesaratto (1999) supported the motion by Frankel (1962) that, when firms accumulate more capital and some of that increased capital will be the intellectual capital that creates technological progress, and this technological progress will offset the tendency for the marginal product of capital to diminish.

It stands without a doubt that terms like physical capital and human capital can be abandoned and that not all investments can be financed through capital. Linking underlying principle of neoclassical theory, it is evident that the theory does not compliment the principal context of this study, and thus the neoclassical does not support fully the notion of human capital development and economic growth.



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Solow provided the most basic version of neoclassical growth model;

$$Y = F(K,AL).....(1)$$

Where Y is output, K is capital, L is labor and A is a measure of the level of technology. And the model further outlines that AL can be seen as the labor force measured in efficiency units, it incorporates both amount of labor and the productivity of labor as determined by the available technology.

Capital accumulation seem to be in the centre of economic growth as per the growth models developed by the first economist who reviewed the economic growth

$$Y=AK ..... (2)$$

In the case where the marginal production of capital is exactly constant, aggregate Y is proportional to the aggregate stock of capital (K). In this scenario, A is a positive constant, hence this called AK theory. According to the AK theory, an economics' long run growth

rate depends on its savings rate (s). This seeks to explain that if a fixed fraction of s of output is saved and there is a fixed rate of depreciation  $\alpha$ , the rate aggregate net investment is:

$$\frac{dK}{dt} = sY - \alpha K \dots\dots\dots(3)$$

The model implies that the growth rate is given by:

$$g = \frac{1}{Y} \frac{dY}{dt} = \frac{1}{K} \frac{dK}{dt} = sA - \alpha \dots\dots\dots(4)$$

Hence an increase in savings rate s will lead to a permanently higher growth rate.

Why Lucas, reached a conclusion that, human capital accumulation is the engine of growth, hence growth itself will be endogenous as well.



$$Y = AK^\alpha(uhL)^{1-\alpha} \dots\dots\dots(5)$$

Where Y, A, K and L are level of output, k is capital and A being level of technology. The variable u is defined as the proportion of total labor time spent working, and h is what Lucas calls the stock of human capital. With that consideration, the production function can be rewritten in per capital terms as;

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$$Y = AK^\alpha(uh)^{1-\alpha} \dots\dots\dots(6)$$

Which is a constant return to scale production function is k and uh. Capital accumulation proceeds via the usual differential equation,

$$\dot{K} = y - c - (\xi + \alpha)k \dots\dots\dots(7)$$

While h accumulates according to

$$\dot{h} = \phi h(1 - u) \dots\dots\dots(8)$$

$$\dot{h}/h = \phi(1 - u) \dots\dots\dots(9)$$

Here u is used to depict the fraction to which the venture in working activity takes place, whilst 1- u, instead of working, is the proportion that which production and accumulation of knowledge is showed. In between the two interpretations mentioned above, according to Lucas, accumulation of human capital is found.

According to this approach, experience and productivity is regarded and cumulative investment and it important for cross-country income differences and for growth.

$$Y_{tt} = F(K_{tt}, A(t)L_{tt}) \dots\dots\dots(10)$$

Where A(t) reflects the stock of knowledge at time t. and the fundamental ides is that, labor is more productive given the accumulation of knowledge. In turn, depends on experience which is a function of past investment. Hence:

$$G(t) = \int_{-\infty}^t I(v)dv = k(t)\dots\dots\dots(11)$$

Romer (1994), with no depreciation, the sum of past investment is equal to the aggregate capital stock. And when  $A(t) = G(t)^\eta$ , with  $\eta < 1$ . This means that investment raises the productivity of labor but at decreasing rate.



**3.2.1.1.1 Criticism of Neoclassical growth theory**

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The resurgence of growth theory took place in the 1980s, McCallum (1996). The advancement of growth theory involved the development of endogenous growth models, arose in response to a perception that the neoclassical framework was increasingly becoming inadequate for the analysis of actual growth experiences. However, the evident trouble with the neoclassical growth model is that it fails to explain even the most basic facts of actual growth behaviour.

One might object to the model on the grounds that it does not, in the end, shed light on economic growth. In the steady state of the neoclassical model, all growth is due to advances in technology, but technological progress is taken as exogenous. It might seem that the model unravels the mystery of economic growth simply by assuming that there is economic growth. Indeed, this critique helped to motivate the recent theories of endogenous growth.

**3.2.1.1.1.2 The Neoclassical Theory challenges**

The Magnitude of International Differences; suppose, for the moment, that all economies were in their steady states. The neoclassical model predicts that different countries should have different levels of income per person, depending on the various parameters that

determine the steady state. These findings might once again call into question the assumption that all countries operate with the same production function. Perhaps poor countries have not only low saving and high population growth, but also poor production technologies. But it should be clear that the magnitude of the unexplained differences makes this explanation unsatisfactory.

The Rate of Convergence; much of the recent debate over economic growth has centered on the issue of convergence. Convergence has usually been defined as a tendency of poor economies to grow more rapidly than rich economies. Convergence in this sense might more properly be called mean reversion. Whether convergence is found in the data depends on the sample being examined.

The Neoclassical does not necessarily predict convergence. If countries are in different steady states, then rich countries remain rich, and poor countries remain poor. On the other hand, if all countries have the same steady state and differ only in initial conditions, then the model does predict convergence. Those who reject the neoclassical model on the grounds that it predicts convergence, which does not occur in large samples of countries, appear to be assuming this very special case of identical steady states.

Rates of Return; a third critique of the neoclassical model emphasizes the predicted differences in rates of return. If poor countries are poor because they have small capital stocks, then the marginal product of capital should be high. We should, therefore, observe higher profit rates and higher real interest rates in poor countries. Moreover, capital should be eager to flow from rich to poor countries. There is some evidence for return differentials of this sort. Because the profit rate is capital income divided by the capital stock, it also equals the capital share of income divided by the capital-income ratio. If one accumulates data on investment to obtain data on capital stocks, one finds that capital-income ratios are more than twice as large in rich as in poor countries.

A more challenging goal is to explain the variation in economic growth that we observe in different countries and in different times. For this purpose, the neoclassical model's assumption of constant, exogenous technological change becomes a problem.

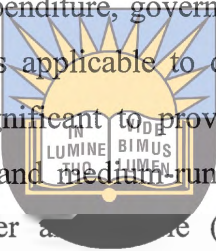


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**3.2.1.1.2 Keynesian growth theory**

The Keynesian model is also commonly presented in the form of injections and leakages in addition to the standard aggregate expenditures format. Sevitenyi (2012) the occurrence of public expenditure growth has been a topical issue between two contending proponents. The Keynesians present two parallel views in terms of the relationship between public expenditure and Economic growth. Supporting this view, some scholars concluded that expansion of government expenditure contributes positively to Economic growth.

However, some scholars, such as Nurudeen and Usman, (2010) did not support the claim that increasing government expenditure promotes economic growth, instead they assert that higher government expenditure may slowdown overall performance of the economy. For instance, in an attempt to finance rising expenditure, government may increase taxes and/or borrowing. Keynesian model is not always applicable to different economic condition in different countries, but rather they are significant to provide economists with variety of choices of possible explanations for short and medium-run deviations of employment and output from their long-term trend, Burger and ... (2009). By understanding the



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Keynesian framework makes it possible and effective to explain the role of human capital development into economic growth.

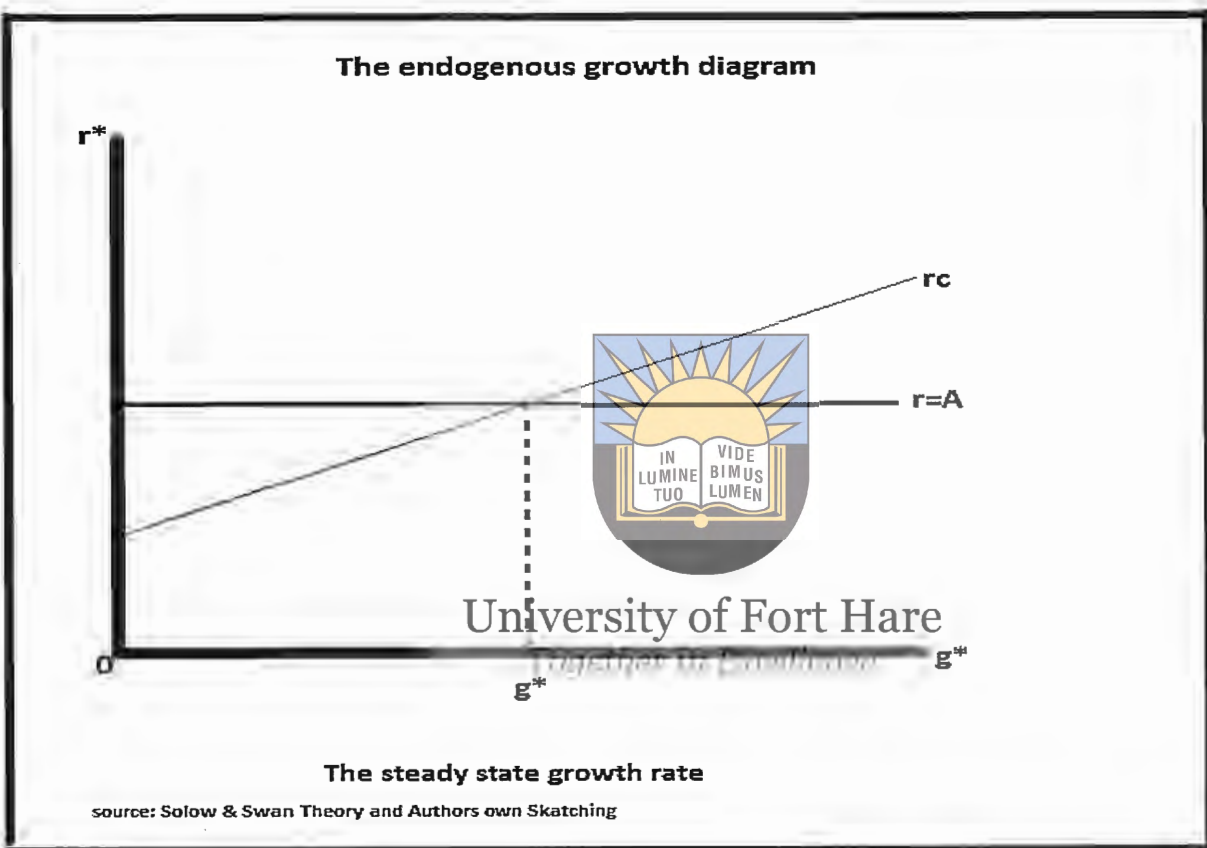
**3.2.1.1 Endogenous Growth Models**

Before looking at some specific models in more detail it is worthwhile to look again at the distinction between endogenous and exogenous growth models. It has been evident that key diminishing returns have not been in existence and less is said about the inputs being accumulating. And the returns on investment are denoted by a constant A\*.

$r = A^* \dots\dots\dots(12)$

r denote the returns. Since our concern is with endogenous growth models, rather than let the growth rate be n, we denote it by  $\gamma_k$  which is constant in the steady state

**Figure 3.1: The Endogenous growth model**



$$r = \rho + \gamma k \dots \dots \dots (13)$$

There are two equations in  $r$  and  $\gamma k$  so we can plot this as in figure 3.1. Notice that the intersection of the two curves yields the equilibrium growth rate. Suppose that  $A^*$  increases. Then it is apparent from the figure that  $\gamma k$  will increase. Hence the focus of attention in endogenous growth models is to understand the determinants of  $A^*$ .

**Figure 3.2: The exogenous growth model**

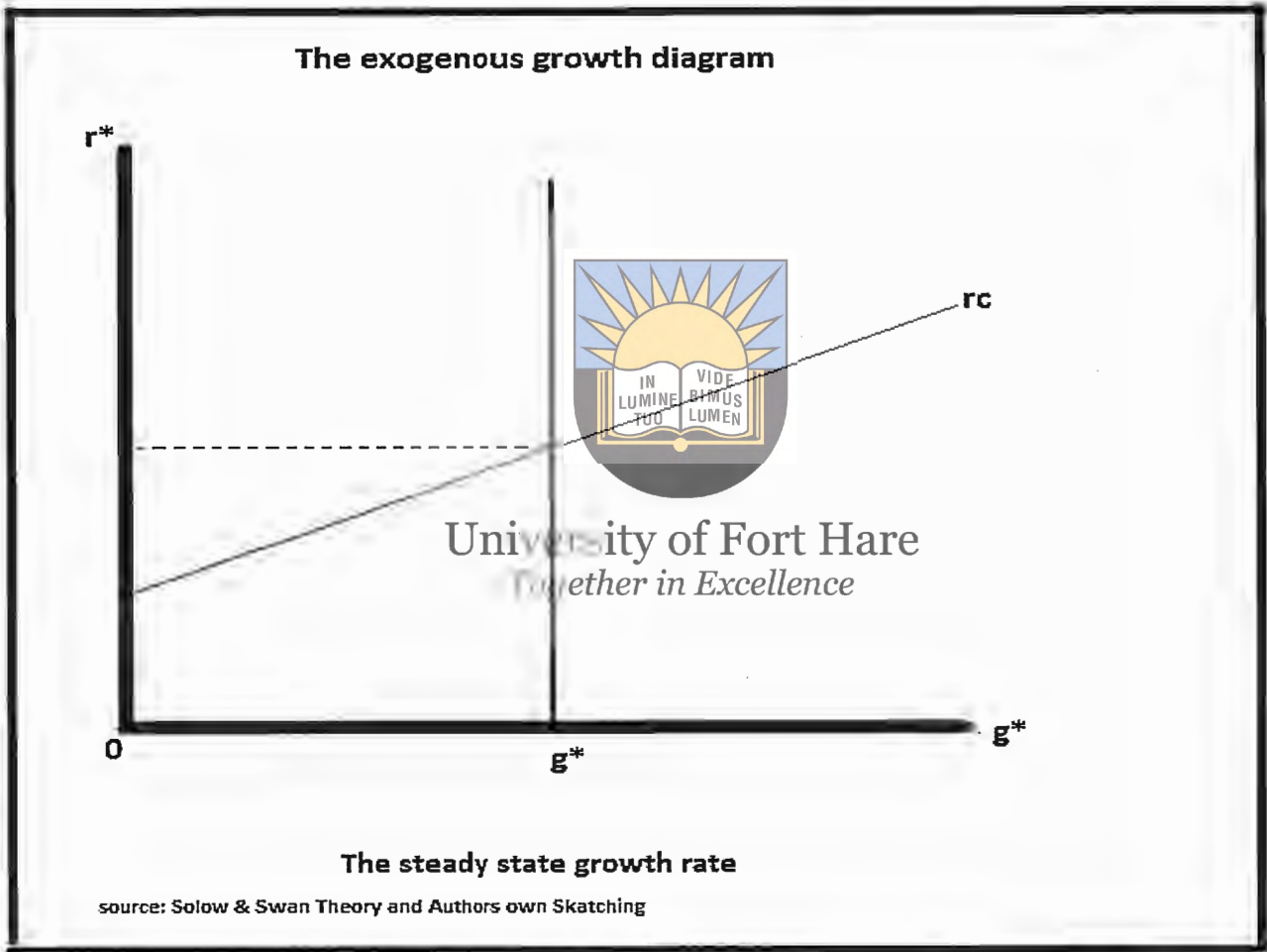


Figure 3.2 shows the exogenous growth model, using the same equation  $r = \rho + \gamma k$  it appears that the growth rate is exogenous. Where  $r^*$  is interest rate,  $g$  is the exogenous growth rate. The comparison of the two figures (3.1 and 3.2) showed that, in exogenous growth model (figure 3.2), a change in any of the parameters that determine the return to consumption affect  $r^*$ , but not the growth rate. Whereas, in the endogenous growth model such changes do affect growth rate, but not interest rate.

### 3.2.1.2.1 The AK Theory

One of the first versions of endogenous growth theories was AK theory, which is the one that does not draw a distinction between capital accumulation and technological progress. This theory does not draw definite line between the two schools of thoughts from neoclassical and endogenous growth theorists that it assumes constant exogenous savings and fixed level of technology. On the same vein the AK theory joins physical and human capital. Whelan (2005), suggested the stickiest assumption of AK model as that production does not include diminishing returns to capital, which means that with this strong assumption the model can lead to endogenous growth.



The above mentioned supports the assumption by Hussein and Thirlwall (2000) that intellectual capital originates from inducers such as technological and human capital. The AK growth theory shows increasing marginal product of capital and this is done by firms when they accumulate more and more capital, and increased capital leads to the intellectual capital that creates technological progress. The AK theory is deviated from neoclassical model by that the returns on capital assumption replace the diminishing returns to capital as asserted in the neoclassical. But the AK model fails capture the entire context of human capital development which this study is referred to, and that is because its premise is that, even the intellectual capital that increases economic growth is based on the occurrence of innovations.

Appleton and Teal (1998) define endogenous growth as the long run economic growth at a rate determined by forces that are internal to the economic growth, This theoretical line of thinking was stimulated and taken further by researchers and economists such Lucas and Romer of which great extent of their ideologies are employed in this study.

### 3.2.1.2.1 Lucas Model: A Human Capital Approach

Lucas (1988) in his study attributed the economic growth to human capital, that, accumulation human capital raises the productivity of both labor and physical capital. This assertion gives the main feature of the Lucas growth model which is human capital approach to endogenous growth. The basic idea of this model is that, people divide their time between work and education or training. A trade-off then occurs since when taking training or any

educational activity people give up part of their work income but on the same spirit, it raises the future productivity and eventually wages, (Bethmann, 2004).

The decision concerning the accumulation of human capital depend on the dynamic feature of the economy, which gives substance to why Lucas, reached a conclusion that, human capital accumulation is the engine of growth, hence growth itself will be endogenous as well. (Arnold et al 2007). (Arnold et al 2007), further postulated that under Lucas model a measure of average years of education in working-age population to proxy the human Capital stock, which is a natural choice for the Lucas model and now the alternative of using changes in years of education as a proxy for the accumulation of human capital is not suitable or rather not sufficient. As the Lucas model refers to a net investment in human capital rather than the required measure of gross investment into human capital.

Income growth is the main contributor to *directly increasing* the capabilities of individuals and consequently the human development of a nation since it encapsulates the economy's command over resources (Ranis 2004). For example, while the citizens of the Indian state of Kerala<sup>8</sup> have life expectancies and literacy rates comparable to those of many developed countries, the fact that they cannot enjoy many of the benefits of citizens of such countries (such as better housing, transportation, or entertainment) demonstrates the importance of GDP as an instrument for achieving a wide range of capabilities.

Gorth, (2008) added on the notion that economic growth is through endogenous growth theories when advancing the Uzawa and Lucas growth models. The growth generating activity (the "growth engine") is human capital accumulation. But the model's specification of how human capital is formed has been disputed for several reasons. One of the criticisms is concerned with the assumption that human capital formation is linear in quality-corrected time.

If the economy is endowed in relative terms with a greater amount of physical capital, then it appears that consumption is initially high and decreases along the optimal path toward a given steady-state solution. Such a steady state exhibits a lower amount of physical capital. Conversely, if the economy is endowed with a greater amount of human capital, then the level of consumption is initially low, and it increases toward a given steady-state solution. Such a steady state exhibits a higher amount of physical capital. In the standard one-sector

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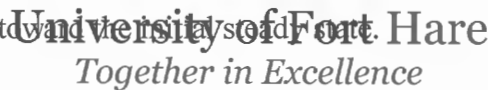
<sup>8</sup> See Res, 2011. Socio-economic factors and longevity in a cohort of Kerala State, India.

model Caballe and Santos, (1993), postulated that increases in physical capital do not affect the level of human capital accumulated, which is exogenously given. And according to this latter model, all optimal orbits converge to a unique level of capital accumulation. Caballe and Santos, 1993 further explained that, on endogenous growth framework, an increase in physical capital may affect the time de-voted to education and thus may induce changes in the amount of human capital accumulated in the economy. Since the level of human capital affects the value of the marginal productivities, a change in physical capital may move the economy to a different steady state. Indeed, we find that an increment in physical capital from a given steady-state solution can lead to the following three situations:

(a) The normal case: the level of human capital goes up and the economy converges toward another steady state with a higher level of physical capital.

(b) The paradoxical case: the level of human capital goes down and the economy converges toward another steady state with a lower level of physical capital; and

(c) The exogenous growth case: the level of human capital remains constant and the economy converges back toward the original steady state.



### 3.2.1.2.2 Romer Growth Model

Romer (1994), economic growth occurs whenever people take resources and rearrange them in ways that make them more valuable. Further to that, Richards (2010) explained that it takes more scientists in universities to generate progress and growth. This points-out vividly that accumulation of human capital takes further than what education investment can offer. Before anything, this endogenous growth model; Romer, coined from the school of thought that steady-state growth rate is determined endogenously. Ickes (1996) suggested that, a higher growth rate could be achieved if the externality associated with investment could be internalized, which complements the idea by Lucas (1988) that, the idea of economic growth is based on the premise that people divide their time between work and training. However, all these assertions do not deviate much, if not similar, to the Romer model which states that experience and productivity are closely related. Similarly to the Lucas approach to economic growth that, growth can be attributed to knowledge accumulation through education investment, the Romer approach also acknowledged the knowledge accumulation, but this

time, through experience and thus, that knotted to productivity and other developmental injections, as explained above, brings about growth.

This model upholds to the endogenous growth theory that the path of economic growth is dictated by the level of technological change, which level is determined mostly by the efficiency of human capital.

Howitt (2005) contrasted the neoclassical growth model by stating that, variables such human capital and human health variables have a significant function in the development of economic growth, this proposition follows the idea that for people to continue to produce same quality of products knowledge growth is necessary that could sustain per capita output. This supported the Romer perspective of human capital development.



### 3.3 Empirical Literature Review

Asghar et al (2012), conducted a study employed econometric techniques for data period that covers 36 years (1974 – 2009) such ADF for root test, PP and Ng-Perron test are utilized to check the stochastic properties of the variables. The long-run relationship among variables is confirmed through Johansen and Juselius co-integration test. But for causality purpose both VECM based causality and Toda-Yamamoto causality tests are employed. Stability of the model is confirmed through Cumulative sum techniques (CUSUM) and Cumulative sum techniques Squared (CUSUMSQ). The results entailed that health plays significant role in the formation of human resources; people need to be healthy or protected from sickness. It means health and education both are primary ingredients of human capital formation. However, the government of Pakistan has failed to reap the maximum benefits from human capital due to less emphasis and less budget allocation to social and as result, the government spending on health and education has remained low. The conclusion supported findings that there is a positive impact of human capital to economic growth.

Adebiyi (2006) used Nigerian context to conduct an empirical investigation of public education expenditure and defence spending. Making use of annual time series data from 1970 to 2003 and appropriate statistical tools are employed to explore the relationship between these variables.

It examines stochastic characteristics of each time series by testing their stationary using Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests. This is followed by estimating the error correction model of public education expenditure. The effects of stochastic shocks of public education expenditure and defence spending are explored, using vector autoregressive (VAR) model.

A regression analysis of the relationship between the military spending and the public education expenditure in Nigeria from 1970 to 2003 is positive and statistically significant in all the techniques employed. It should be pointed out that the statistical analyses conducted in this study are concerned only with reported public expenditures on education. Inasmuch as private education and private expenditures on public education are excluded.

The study concludes that it is not unlikely that military activity has served to enhance the productive capability of the Nigerian economy via some modernizing effect. There is sufficient evidence to suggest that formal education makes a positive contribution towards economic growth. Consequently, the definition of nation's wealth has widened to accommodate not only physical capital but also human capital as an independent factor of production required to achieve high and sustainable economic growth rates.

Thus, in the short and long run, the impact of military expenditure on Nigeria's stock of human capital, particularly education, has been positive.

Cooray (2009) examined the effect of the quantity and quality of education on economic growth. Using a number of proxy variables for the quantity and quality of education in a cross section of low and medium income countries. The empirical analysis was based exclusively on a sample of 46 low and middle income economies as defined by the World Bank. The efforts made by the low and middle income economies to increase enrolment ratios and allocate resources efficiently in an effort to achieve the MDG of 'education for all', this study focused on a group of economies. The data is a single cross section averaged over the 1999-2005 period. This study however faced a major constraining factor in the choice of the sample period due to the availability of most education quality variables only from 1999 onward.

The various used in the study were unpacked as follows; education quantity is measured by: (1) primary, secondary and tertiary enrolment ratios, (2) total government expenditure on education as a percentage of GDP and (3) expenditure per student at the primary and secondary levels as a percentage of GDP per capita.

Estimation was carried out by using both the OLS and GMM techniques. GMM estimation used to correct for any endogeneity bias that may be present in the models. The instruments used for GMM estimation are the adult literacy rate, labour force with secondary education as a % of total and the labour force participation rate. The instruments are selected on the basis of Shea's partial  $R^2$ . All variables have been converted into logarithmic form for the empirical estimation.

This study finds that education quantity as measured by enrolment at the primary, secondary and tertiary levels exert a positive and significant effect on economic growth. The effect of government expenditure on economic growth is largely indirect through its impact on improved education quality. Unlike enrolment ratios which have a direct impact on economic growth, total government expenditure on education has no statistically significant effect on economic growth. Finally, increase in schooling life expectancy is associated with a 0.19% increase in income per capita. Similarly, most of the interaction terms are significant. The estimated values for the interaction terms suggest that increased government expenditure lead to improved education quality. The results in Table 4 indicate that increased government expenditure on schooling lead to increased survival rates, schooling life expectancy, an increase in trained teachers and better test scores. Increased government expenditure also lead to increased pupil-teacher ratios at the primary level and reduced pupil-teacher ratios at the secondary level. The results suggest that the effect of the government expenditure through its interaction with the quality variables maybe more important than through its direct impact on economic growth. Physical capital is statistically significant in all equations. The initial level of GDP is negative but significant only in equations (9), (11) and (12).

Benhabib and Spiegel (1994) used a cross-country context to conduct a growth accounting regressions using GDP, average years of schooling of the labour force as an ordinary input in the production function. The study further uses estimates of physical and human capital stocks to examine cross-country evidence on the determinants of economic growth. We begin with estimation of a standard Cobb-Douglas production function in which labor and human and physical capital enters as factors of production. Our findings shed some doubt on the traditional role given to human capital in the development process as a separate factor of production. In our first set of results, we find that human capital growth has an insignificant and usually negative effect in explaining per capita income growth. This result is robust to a number of alternative specifications and data sources, as well as to the possibility of bias

which is encountered when regression per capita income growth on accumulated factors of production. The results concluded; most importantly human capital stocks are positively correlated with physical capital accumulation and significant at 5% level for all specifications. The results implied that the role for human capital as agent in attracting physical capital is justified.

Johnson (2011) used Nigerian context to investigate the relationship between economic growth development and human capital development for the period from 1985 to 2009. The study adopts conceptual framework that employs the theoretical and ordinary least square OLS to analyze the relationship using the GDP as proxy for Economic growth; total government expenditure on education and health, and the enrolment pattern of tertiary, secondary and primary schools as proxy for human capital. To statistically and scientifically prove that human capital development has a significant impact on economic growth, a statistical analysis was embarked upon where a multiple regression model was used to evaluate the relationship between human capital development and economic growth for the periods specified above and final out outcomes showed that regression performed on the model revealed that all the variables accounted for 99% variations in the gross domestic product (GDP) of Nigeria. The conclusion confirmed that there is strong positive relationship between human capital development and economic growth.

Van Zyl and BongaBonga, (2009) carried out an econometric analysis on human capital development and economic growth in South African economy. The estimation was conducted with the aid of time series data from 1979 through 2006. The dataset used to carry out this empirical investigation is 1979:1 to 2006:4 and the variables used in the study include GDP, Human capital which is made up of education and training, Government spending (education and training), capital stock and employment. Using the granger causality, CES (constant elasticity of substitution) production model, and auto-regressive distributed lag modelling approach for co-integration the authors estimate and assess the relationship between human capital increase through government spending and economic growth in South Africa. The null-hypothesis of the study is that increase in human capital in the form of increase in education and training should improve the efficiency of human resource based in the economy and ultimately result in higher levels of economic growth. The results reached in the study indicate that increase in human capital in South Africa does not translate into high technological change and ultimately higher economic growth rates and the null hypothesis

that government expenditure on education and training results in an increase in the level of technological change was rejected. Conclusion of the study holds that, the possible reasons why the return on the national education and training is not significant in South Africa may include the misallocation of resources in education and training. And fiscal stimulation of human capital does not render efficient and high returns for the South African economy.

Ntongwa (2012) conducted a study on economic growth and human development, a link mechanism, a study which covered over 40 countries. The study uses multiple regressions model used to test the empirical relationship mechanisms between economic and human development. This is based on descriptive approach (quantitative) that led to a description of the determinants as found from practice in the existing situation. A description of practices allowed an analysis to be performed based on the practical reality so as to arrive at conclusions that address the reality. Using the human development report 2011's methodology on whether or not the economic growth activates the human development.

The results showed that political policies and technology invested in a country have a positive impact on both human development and economic growth. The increase of consumption on health and education forces the economic to grow. This relationship is termed two ways chain relations, which depends on the activating factor on each side

Appleton and Teal (2009) examined the effect that human capital has on the economic growth; the aim of their study was to show comparison between African and South Asia. Human capital, physical capital, GDP and indirect effects of investment in human capital are all used as variables to estimate relationship between economic growth and human capital development. With efficient use of data heavily extracted from United Nations development program's HDR for the period that runs from 1080 to 2009, apart from highlighting health as of the significant contributors to human capital development, the study showed that expenditure on education may affect health such that ill-health may have indirect effects on labor productivity by adversely affecting schooling. The study defied the conversational wisdom that education has high returns in terms of economic growth and reached a conclusion that physical and human capital are complements and there is still slow growth of human capital in Africa compared to South Asia. And finally poor health combined with education could warrant such outcomes.

Ranis (2004) made an examination of Human development and economic growth in the context of India. The study provided analysis on the relationship and the two-way linkages involved. The study started by first reviewing some of the theoretical debates on economic growth/human development linkages. The study observed three main important components of human developments, income, health and education in using the capabilities approach.

Ranis (2004) argued that capabilities approach, as applied this study goes far beyond individual attributes to analyse the role of social environment on human choices and agency. The study noted that income growth clearly strikes one as the main contributor to directly increasing the capabilities of individuals and consequently the human development. Education and health on the other side have a strong effect on labour productivity.

Conclusions suggested by empirical analysis pointed that, at micro levels there is great potential for a positive causality. Furthermore, individual's consumptions and households consumptions can be an important element in increasing human development and respond to the real needs of the population than do government programs. Whilst at the macro level, the distribution of the increased income from economic growth will also have a strong impact on human development. Since poorer households understandably spend a higher proportion of their income on goods which directly promote better health and education, economic growth whose benefits are directed more towards the poor will have a greater impact on human development.

In the case of cross country, Wilson and Briscoe (2004) examined the impact of human capital on economic growth in European economy using Cobb-Douglas production function with variables. The study added useful variables to improve the econometric value of the estimation. The variables included in the study include gross output, physical capital, labor stock, materials and intermediate inputs. The model also includes the s explanatory variable, efficiency variable which measures how inputs values correspond to output values. The results proved that an increase in European economic growth is associated with increase in both education and training.

The study also points out that, in depth comparison explains the difficulty of establishing a causal link between education and training inputs on the one hand and economic output. Evidence from the social standards reveals the benefit to the economy arising from increased education. Estimation demonstrated that, high investment have had a significant impact on economic growth as depicted by the statistics of when; 1percent increase in school enrolment rates (School enrolment in this regard takes both education and training into account) it leads to an increase in GDP of between 1 and 3 percent and then additional year of schooling

increases stock of human capital and increase growth by 1percent each year. Overall conclusion of the study acknowledges that, vocational training, education and regular training all yield accumulative returns measured by economic performance (GDP).

Hanushek (2013) conducted a cross-country study to examine the relationship between economic growth and education in developing countries using the role of human capital. Using the cross-sectional data through cross-sectional regression to detect the actual relationship was used, the study concentrated on how school resources and other factors influence student's outcomes. The study acknowledges that measuring the human capital is not limited to the proxies that are often mentioned such education, health and income but a lot of other factors. Conclusion reached has it that, the impact of alternative measures of human capital can be seen in the long run growth. Further to that, the estimated impacts of cognitive skills on growth are very large.



Haldar and Mallik (2008). This study examines the time series behavior of investment in physical capital, human capital (comprising education and health) and output in a co-integration framework, taking growth of primary gross enrolment rate and a dummy for structural adjustment programme (openness which has been initiated in 1991) as exogenous variables in India from 1960 to 2006.

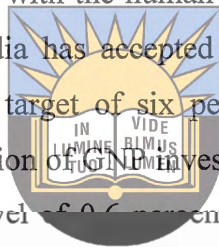
The study made an effort to establish a relationship among physical capital investment, investment in education and health on per capita GNP growth using annual data for India. They found that investment in education and health are very important and has a significant positive long run effect on per capita GNP growth. They have also found that the year eight enrolment has positive and significant effect on GNP growth after three years. India has opened its economy in 1991 and the growth has significantly increased after that period. The results were further explained by the Generalised Impulse Response Analysis.

One can conjecture a number of factors. Good health and nutrition enhance workers' productivity. Healthier people who live longer have stronger incentives to invest in developing their skills, which increases workforce productivity by reducing incapacity, debility, and number of days lost to sick leave. These findings are supported by Schultz's (1997) study where he mentioned about scholastic performance. Zon and Muysken (2005) argued that economic growth is driven by knowledge accumulation in the traditional Lucas

Model (1988) and as such is based on labour services supplied by healthy people.

Investment on health and education work differently for different countries, but it is a fact that for India's health and education i.e., overall human capital expenditure has definitely long run impact on growth. Unfortunately the expenditure on such an important area is not consistently supported by the Government of India.

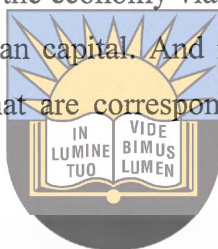
In fact the expenditure on human development is inconsistent and severely inadequate. Public expenditure on education and health is an important policy instrument for realizing social sector development. The Government of India has initiated various policies and programmes in this direction since independence but the progress of human capital in India is very slow compared to many developing countries. Recognizing the contribution of education to economic development and keeping in line with the human capital investment revolution in economic thought, the Government of India has accepted the concept of 'investment' in education in its 1968 Policy and fixed a target of six percent of national income to be invested on education by 1986. The proportion of GDP invested in education was 3.8 percent in 2005-06. Compared to the very low level of 0.6 percent in 1951-52, this marks a very significant progress but still it is well below the average of many developing countries in the world. The results indicate that the impact of human capital on economic growth depends on the measure of human capital used.



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Boozer et al (2003) developed and analysed empirical strategies to estimate the strength of connection between Human capital development and economic growth. This study is the continuation of the study that was conducted by the (Ramirez, Stewart and Ramiz, 2000) which used data from 1970 to 1992. The previous study used a cross-country regressions that showed a significant relationship in both directions, with health and education important in the formation of the relationship between EG to HD; and the investment rate and income distribution significant in the human development to economic growth. Boozer 2003 further measures and explores some of the empirical determinant of the relationship between economic growth and human capital development. Human development as measured by health and education, GDP, physical capital and income distribution were used as the variables. Results revealed that there is evidence of positive relationship running from either side between human capital and economic growth although it was further stated that the relationship was not automatic in either direction.

Roux (1994) conducted a research on human capital and economic growth in context of South Africa making use of data that covers time from 1960 to 1990. Fundamentally, Roux (2004) efforts to analyses the causal relationship between economic growth which is measured by GDP and human capital measured by secondary schooling. The variables used in this study-work includes, as mentioned above GDP, Human capital, Physical capital, military expenditure and total government expenditure. The author developed an estimation model to estimate the concomitant of the variables and Engle granger for causality was also adopted. The results showed that there is no statistical evidence supporting either a positive or negative relationship between defence spending and education spending. By the same token, there is therefore little, if any, evidence to support the possibility that the military has improved the productivity and efficiency of the economy via a benign positive spin-off effect on education and the enhancement of human capital. And it was concluded that economic growth does not yield sufficient returns that are corresponding to amount of injection on human capital.



Bills and Klenow (2000) used a model in order to examine the ability to build on the human capital of one's elder's plays an important role in linking growth to schooling. The model was calibrated to quantify the strength of the effect of schooling on growth by using evidence from the labor literature on.

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The study examined a model with finite-lived individuals in which human capital can grow with rising schooling attainment and thereby contribute to a country's growth rate. Each generation learns from previous generations; the ability to build on the human capital of one's elders plays an important role in the growth generated by rising time spent in school. The authors also incorporate into the model a positive externality from the level of human capital onto the level of technology in use. The model was calibrated in order to quantify the strength of the effect of schooling on growth. To do so, they introduce a measure of the impact of schooling on human capital based on exploiting Mincerian returns to education and experience (Jacob Mincer, 1974) commonly estimated in the labor literature. Our calibration requires that the impact of schooling on human capital be consistent with the average return to schooling observed in estimates of the Mincer equation conducted on micro data across 56 separate countries. They also required that the human capital returns to schooling exhibit diminishing returns consistent with the observed higher returns to schooling in countries with low levels of education. The authors went further to discipline the calibration by requiring

that average human-capital growth not be so high that technological regress must have occurred on average in the world over 1960–1990. The principal finding was that the impact of schooling on growth probably explains less than one-third of the empirical cross-country relationship, and likely much less than one-third. The conclusion was robust to allowing a positive external benefit from human capital to technology.

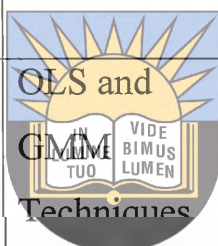
If high rates of schooling are not generating higher growth, what accounts for the very strong relationship between schooling enrolments and subsequent income growth? The overall of this study found a strong positive correlation between initial schooling enrolment and the subsequent growth rate of per capita GDP across countries.

Umut, (2011) investigated the impact of human capital on economic growth in fourteen countries with half of these countries developed and half developing. Umut (2011) used annual data for variables of GDP growth rate, primary school enrolment, secondary school-enrolment, tertiary school enrolment, public expenditure on education and health expenditure in order for analyzing impacts of human capital on economic growth. Health expenditure includes public expenditure and private expenditure on health. The countries included are the United States of America, United Kingdom, Italy, Spain, New Zealand, France, Japan, Brazil, Turkey, China, Israel, India, Islamic Republic of Iran and South Korea. The data is balanced panel and involve from 1999 to 2008.

The study applied the generalized method of moments (GMM) and panel analysis techniques. The analysis and conclusion theoretically; when human capital increases or quality of human capital improves economic growth and welfare increase. In this sense, as education of the society or health of the population increase productivity increases, correspondingly, economic growth increases. Therefore this study confirmed that human capital development has an impact on economic growth. The empirical analysis of the study showed different outcomes compared to the theoretical review, and the empirical analysis mixed outcomes when it comes to the existence and direction of relationship between human capital and economic growth.

**Table 3.1 Summary of selected empirical literature on the impact of human capital development and economic growth**

Study	Country	Methodology	Variables
ADEBIYI, M, A. 2006,	Nigeria		
Asghar et al (2012)	Pakistan	Cointegration techniques	Health and education
Johnson (2011)	Nigeria	OLS	GDP, Government Spending, enrolment pattern on tertiary, secondary and primary.
Cooray (2009)	Australia	OLS and GMM Techniques	Quality and Quantity of education, Primary, secondary and tertiary enrolment ratios. Total government expenditure on education.
Benhabib and Spiegel (1994)	Cross-country	Cobb-Douglas aggregate production function	GDP and years of schooling
Van Zyl and Bomga-Bonga (2009)	South Africa	Granger causality	GDP, human capital (education and Training), Government spending, capital stock and unemployment.
Appleton and Teal (2009)	Africa and South Asia	Granger causality	Human and physical capital, GDP, Indirect effects of investments on human capital
Ntongwa (2012)	Cross-country	Empirical relationship	HDI and GDP

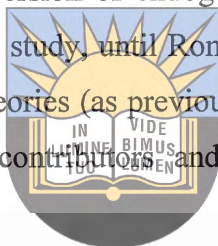


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		mechanisms	
Ranis, 2004	India	Capabilities approach	Incomes Health and Education. Economic growth (GDP)
Wilson and Briscoe (2004)	European Economy	Cobb-Douglas production function	Gross output, labor stock, materials, intermediate inputs and production function variables.
Hanushek, 2013	Cross-country	Cross-sectional regression	Cognitive skill, GDP, school attainment and human capital
Boozer et al (2003)	United States	Granger causality	GDP, health, education, physical capital and income distribution.
Roux (1994)	South Africa	Single Granger causality	GDP, human capital, military expenditure and total government spending
Umut (2011)	Cross-country	GMM	GDP growth rate, primary school enrolment, secondary school-enrolment, tertiary school enrolment, public expenditure on education and health expenditure

### 3.4 Assessment of Literature

The theoretical literature review points at the economic growth theories that are either applied in developed or developing economies. Neoclassical as one of the first economic growth theories and neoclassical proved to be inadequate in addressing the issue of economic growth by solely attributing it to exogenous economic factors. The development of other theories such as endogenous theories mark the inadequacy of theories such as neoclassical to meaningfully articulate on human capital and economic growth. Point is economic growth is not only caused by the capital. As McCallum (1996) support the motion that determinants of economic growth are more than what was stated on neoclassical. This was further outlined under endogenous theory under the first version of endogenous growth theory AK theory through Lucas and, for the purposes of this study, until Romer growth theory. The inclusion of above mentioned endogenous growth theories (as previously explained), support the view of this study about the human capital contributors and eventually the human capital development.



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The empirical review through this study takes into account cross-country and together with country-specific interpretation.

Findings seem to be providing evidence of possible linkages on human capital development and economic growth in emerging economies. Given the different sets of studies reviewed also the different variables were used although in some cases results were similar, they varies on other instances.

It became evident that in some studies a relationship does exist between human capital development and economic growth, however, what stems out of the empirical is that, other researchers used education or education and training as the measure of human capital such as Appleton and Teal (2009) and Van Zyl and BongaBonga (2009) respectively. The empirical literature review does not only reveals studies that rely on cross-country approach but also studies that contain dated results.

## CHAPTER 4:

### RESEARCH METHODOLOGY AND ANALYTICAL FRAMEWORK

#### 4.1 Introduction

This chapter will discuss the econometric methodology employed in the data. Entailed in this chapter is model specification, granger causality test, definition of variables, expected prior, stationery test, cointegration and diagnostic checks.

#### 4.2 Model Specification

This study will adopt and modify the model of Omojimate (2011), Howitt, (2005) and Ferrara and Guerrini, (2008), with some modifications to Keynesian growth model. The empirical approach takes the form:

$$Y = F(\text{HDI} + \text{GXED} + \text{GXH} + \text{OP} + \text{I}) \quad (4.1)$$



And the econometric equation is as follows.

$$y_t = \beta_0 + \beta_1 \text{HDI} + \beta_2 \text{GXED} + \beta_3 \text{GXH} + \beta_4 \text{OP} + \beta_5 \text{I} + \epsilon \quad (4.2)$$

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#### Where:

Y= gross domestic product

HDI= human development index

GXED= government expenditure on education

GXH= government expenditure on health

OP= trade openness

I= investment

The main variable here is Y which is gross domestic product and also the HDI- human development index. HDI intends to shift the focus of development towards three factors seen as key in expanding the opportunities available to people. These three factors Education, Health and Income are difficult to measure so the proxies are deemed to be

the best indicators of the level of these targets are chosen to form the indices instead. Furthermore, the proxies chosen are relevant.

**Where:**

$t$  represent the time subscript,  $\beta$  is the constant term and  $\epsilon$  is the error term of the linear function and  $Y$ , HDI, GXED, GXH, OP and together with  $I$  are as previously explained.

### 4.2.1 Definition of variables

The variables used in the study are;

GDP is used as a variable for economic growth. Anand and SEN (1994) defined HDI as an index utilized to rank the development of a country by examining the achievements of the inhabitants of the country.

Human Development index is used to measure human capital development and for this reason Education, health and Income are used as proxy variables.

Trade openness refers to the degree to which country has trade with other countries or economies, export and imports are used as proxy variables for trade openness and portfolio investment ratio formation is used to measure investment. Squalli and Wilson, (2006)



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### 4.2.2 Expected Prior

A positive relationship between  $\beta_1$  and economic growth expected which Ranis (2004) supported by stating that GDP has a strong effect on literacy and health outcomes, both through private expenditures and government programs. Thus, insofar as higher incomes facilitate the achievement of other crucial human development objectives, it also has an *indirect* effect on human development. The impact of economic growth on a nation's human development level, of course, also depends on other conditions of the society.

In this paper a negative relationship in short-run Economic growth and for  $\beta_3$  and  $\beta_2$  expected, whilst a positive relationship could only take place in the long-run. Chu et al 1995. Public expenditures can and have played an important role in physical and human

capital formation over time. Appropriate public expenditures such as education and health can also be effective in boosting economic growth, although there are few chances of positive relationship in the short run, when limits to infrastructure or skilled manpower become an effective constraint to an increase in production. Umut, (2011) as education of the society or health of the population increase productivity increases, correspondingly, economic growth increases. Therefore this study confirmed that human capital development has an impact on economic growth. Haldar and Mallik (2008). Investment on health and education work differently for different countries, but it is a fact that for India's health and education i.e., overall human capital expenditure has definitely long run impact on growth.

Finally, both  $\beta_4$  and  $\beta_5$  are expected to have a positive relationship with economic growth. The estimated relationship between for  $\beta_4$  is supported by Naanwaab et al (2012) whom in a cross country study found that Africa's GDP growth trend is closely linked with its exports volumes to other parts of the world. The growth rate was slow during the 1960s to the mid-1970s compared to the global average of 6.1%; this caused the region's export share in the global market to decline from 30% to 10% which is almost half of the original growth rate. But with time, as most African countries began to open up their markets to the rest of the world, the share of exports in GDP has reversed its descent.

The positive expected relationship between  $\beta_5$  and economic growth is reinforced by Anwer and Sampath (1999) who found that there is a short and long run relationship between investment and economic growth. The results also found a bi-directional causality, unidirectional causality from GDP to investment and from investment to GDP.

#### 4.2.3 Stationarity test

Stationarity test are conducted to detect and get rid of the unit root problem. Given the several tests of stationarity, this study makes use of, and focuses the analysis on those that are prominently discussed in the literature and there are

- i. Graphical analysis and

- ii. The unit root test

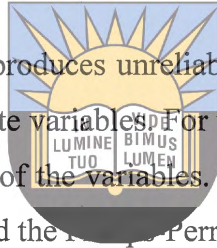
### 4.2.3.1 Graphical Analysis

The plot of that nature often gives a clue about the likely nature of times series. A stationary process is usually depicted by a graph that fluctuates around the mean value/straight line, but a non-stationary series is shown by a graph that moves randomly without any clear pattern.

### 4.2.3.2 Unit root Testing

The purpose of the Unit Root test is to determine whether the series is consistent with an I(1) process with a stochastic trend, or if it is consistent with an I(0) process, that is it is stationary, with a deterministic trend.

Non-stationary data used in estimation produces unreliable t-statistics of the estimated coefficients that have theoretically infinite variables. For the purposes of this study unit root test are used to test for stationarity of the variables. Therefore, two tests are used; Augmented Dickey Fuller (ADF) test and the Phillips Perron (PP) test.



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#### 4.2.3.2.1 Augmented Dickey Fuller (ADF) Test

This is test is the improvement of the Dickey-Fuller test (DF) which was developed by Dickey and Fuller (1979). Dickey-Fuller test is rarely appropriate, and there is automatically some implied interest in the power of the Augmented Dickey-Fuller test (ADF, Dickey and Fuller (1979) or the Phillips-Perron test (PP, Phillips (1987), Phillips and Perron (1988), and Perron and Ng (1996), which allow for a more general process. The ADF is given by the following equation;

$$\Delta y_t = a_0 + y_{y_{t-1}} + a_2 t + \sum_{i=1}^p \beta_i \Delta y^{t-1+u_t} \quad (4.3)$$

ADF test given by the above equation begin by testing the significance of the coefficient of  $Y_{t-1}$ . The augmenting is done to remove the possibility of autocorrelation among error terms. Subsequently, in the event that the calculated values are greater than the critical values, we reject the null and state that the variable is stationary. However, under Monte Carlo results, Hendry and Neale (1991) conclude that the ADF test is not consistent against a fractional alternative.

#### 4.2.3.2.2 Philips-Perron (PP) test

A problem with the ADF test is that it involves the limitation of extra differenced terms in the testing equation. The power of the testing procedure is reduced due to the incurred loss of degrees of freedom. The it was based on such limitation that a alternative suggestion was made by Philips and Perron (1988) who have the testing equation;

$$\Delta y_{t-1} = \alpha_0 + \gamma y_{t-1} + e_t$$

(4.4)



The PP test using the above equation, takes a correlation to the  $t$  statistics of the coefficient  $\gamma$  from the AR(1) regression to account for the serial correlation in  $e_t$ .

They devise a procedure for adjusting the Dickey-Fuller static to allow for autocorrelation In the residual from the equation. The PP versions of Dickey-Fuller tests are in that the serial correlation between disturbances can be an auto-regression or moving average form. PP test suffer severe distortions where autocorrelation of the error are predominantly negative, with the actual size much greater than the nominal size. However, both ADF and PP test are usually used together and where no clear conclusion is visible.

#### 4.2.3.2.3 Ng Perron Test

The study will use Ng Perron test for further analysis to obtain robust results. The Ng Perron test was developed to rectify some short-comings with the PP and the ADF tests because sometimes, conclusions originating from ADF and PP tests which are roughly the same, they too are sensitive to the lag length selected. Dufour and King (1991) argues that the Ng Perron test offer a second-best solution; the tests has power close to point optimal tests with power 50%. Thus, when checking for unit roots these tests should be used with data sampled at as many different sampling frequency as feasible. Tom et al, (2011), supported the NP test by stating that this test uses a modified lag selection criteria, which is the improvement of ADF and PP tests. Since it is

advantageous to use the Ng Perron as compared to the ADF and PP tests, Ng Perron will take precedence when there is conflict between the two tests

#### 4.2.4 Cointegration Test

Cointegration tests are performed in case of non-stationarity of the series to ascertain long-term relationships amongst the variables human development index and economic growth. Having established the order of integration and stationarity of our variables, the cointegration test will be undertaken. Cointegration test will help establish if there is a long-run relationship between the human capital development measured by human development index and economic growth measured by gross domestic product, Trade openness, investment and consumption.

The concept of integration was introduced by Granger (1977) and he has shown that macroeconomic models containing nonstationary stochastic variables can be constructed in such a way that the results are both statistically sound and economically meaningful. His work has also provided the underpinnings for modelling with rich dynamics among interrelated economic variables. Granger (1977) has achieved this breakthrough by introducing the concept of cointegrated variables, which has radically changed the way empirical models of macroeconomic relationships are formulated today. The cointegration concept was further extended by Engle and Granger (1987), it is built on the premise that the linear combination of two non-stationary series results in a stationary series.

The cointegration is defined by as a long-term relationship between two series. This makes cointegration an appropriate analysis technique to test and validate the hypothesis that a long-term relationship between human capital development and economic growth, by ascertaining the existence of a long-term unit proportionate relationship between human development index and gross domestic product, together with Investment and trade openness.

Johansen test is applied in this study for further analysis of cointegration relationship. Kapingura (2010) alluded that, Engle and Granger approach alone is not sufficient in testing cointegration relationship sighting an example that, in an event of more than just two variables instead of one, there could be more than one cointegration relationship.

### 4.2.4.1 The Steps of the Johansen Approach

**Step1:** Testing the order of integration of the variables, this first step is set to test the order of integration of the variables under examination.

**Step2:** This step involves setting the appropriate lag length of the model. Also in step2 there's estimation of the model and the determination of the rank of  $\Pi$ .

**Step 3:** With regards to the deterministic components in the multivariate system the choice of the appropriate model is made. An analysis of the normalised co-integrating vector(s) and speed of adjustment coefficients is made.

**Step 4:** includes the determination of the number of co-integrating vectors. Causality test on the error correction model to identify a structural model and determine whether the estimated model is reasonable is done in this last step.

Furthermore on the Engle and Granger shortcomings is that it relies on two-step estimator. The first step involves generating residuals and the second step involves testing the stationarity of the residuals. Moreover, any error that might occur in the first step will be carried on to the next step, step two.

In light of the above, it is prudent that Johansen cointegration be considered for the cointegration testing. Therefore, Johansen approach is based on two statistics, maximal eigenvalue of the stochastic matrix and trace of the stochastic matrix, shown in the following equations (4.5) and (4.6) respectively;



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$$\lambda_{trace}(r) = -T \sum_{i=r-1}^k \ln(1 - \hat{\lambda}_i) \dots \dots \dots (4.5)$$

$$\lambda_{trace(r,r+1)} = -T \ln(1 - \hat{\lambda}_{r+1} ) \dots \dots \dots (4.6)$$

Here  $T$  is the sample size and  $\hat{\lambda}_i$  is the  $i$ :th largest

The Johansen cointegration approach requires the estimation of the approach lag length which is used in the estimation and cointegration testing. After the determining the long relationship between economic growth and human capital development, the short run dynamics of the relationship are examined too. If cointegration among variables in detected, then a vector error-correction model (VECM) can be used.

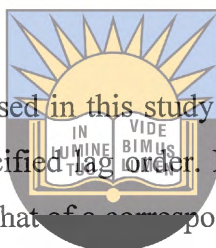
According to Lozano (2008:13) the VECM is used to establish the causal long-term or equilibrium relationship among a set of variables. Furthermore, the two statistical properties are required of the variables used in the VEC model: nonstationary and cointegrated.

#### **4.2.5 Diagnostic checks**

The model will be diagnosed in order to detect errors. This stage is crucial as it validates the parameter estimations outcomes achieved by the estimated model. Diagnostic checks test the stochastic properties of the model, such as residual autocorrelation, heteroskedasticity and normality.

##### **4.2.5.1 Autocorrelation LM test**

The Lagrange Multiplier (LM) test is used in this study is multivariate test statics for residual serial correlation up to the specified lag order. Harris (1995), argued that the lag order for this test should be same as that of a corresponding VAR. The LM statistics tests the null hypothesis of no serial correlation against an alternative of autocorrelation residuals. It is a recommended testing procedure whenever the researcher is concerned with the possibility that the errors exhibit autocorrelation.



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##### **4.2.5.2 Heteroskedacity test**

This study uses the method by Harvey to test the null hypothesis that the errors terms have no heteroskedacity problem and are independent of the regressors and that there is no problem of misspecification. The test is run by regressing each product of the residuals on the cross products of the regressors and testing the joint significance of the regression.

##### **4.2.5.3 Residual normality test**

The residual normality test used in this study is the multivariate extension of the Jarque-Bera normality test, which compares the third and fourth moments of the residuals those from the normal distribution (E-Views 7 manual). The joint test is based on the null hypothesis that residuals are normally distributed. The Jarque-Bera statistic testing as explained by the Mantalos (2010) points to non-normality in the residuals. However, the absence of normality in the residuals may not render cointegration tests invalid.

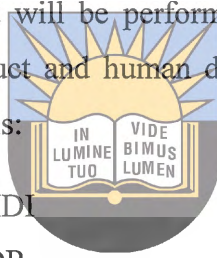
#### 4.2.6 Granger Causality test

Bhullar (2013) employed the granger causality test to analyse the relationship between HDI as a proxy for Human Capital Formation and GDP Per Capita Income PPP as a proxy for economic growth. The approach was appropriate for the purposes of the study as focused to a single equation, the equation was used to establish actual relationship that exist between investments on human capital development through the use of HDI and economic growth and through the use of GDP. According to Bhullar (2013), the bidirectional causality holds between HDI and GDP. In other words increase in GDP leads to enhancement in the HDI. Once human development reaches to a certain level it further causes increase in GDP.

In this section, a granger causality test will be performed to verify the direction of causality between gross domestic product and human development index, the test is conducted under the following hypothesis:

H<sub>1</sub> GDP does not Granger Causes HDI

H<sub>2</sub> HDI does not Granger Cause GDP



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Other hypothesis includes that of other variables in the equations such as Investment, trade openness If H<sub>2</sub> is rejected then the causality runs from human development index to gross domestic product. Thus the expansion of investment on human capital development would results into more increased HDI.

#### 4.3 Data Sources

The empirical investigation to be carried out is based on the South African economy covering the dataset period from 1980 to 2011. Data sources includes; South African Reserve Bank, Quantec data, World Bank Data and Annual reports from the United Nations Human Development.

## CHAPTER 5:

### ESTIMATION AND INTERPRETATION OF RESULTS

#### 5.1 Introduction

This chapter looked at the analysis and the results which explain the impact of human development index on economic growth in South Africa. The analysis follows the analytical framework presented in Chapter Four. The chapter is divided into five subsections. The unit root test is presented first, followed by cointegration tests. This leads to the formulation of the vector error correction model (VECM) which is followed by diagnostic checks and the granger causality analysis. A conclusion for the chapter is at end provided.



#### 5.2 Descriptive Statistics

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The correlation matrix results of the variables under investigation are presented in table 5.1, and the results revealed that economic growth (GDP) is positively related to the Government expenditure on education (GXED), government expenditure on health (GXH), human capital development (HDI), Investment (I) and openness. The results further show that openness is more related to the GDP than most of other variables and this complies with the expectations made into the previous chapter/s that most of this control variable are positively related to the economic growth. Further tests will be carried out in the next sections.

ble 5.1 Correlation Matrix (Relationship between savings and the variables used in the study)

	GDP	GXED	GXH	HDI	I	OP
GDP	1.000000	0.361264	0.465725	0.286786	0.531432	0.906709
GXED	0.361264	1.000000	0.963453	0.673050	0.197247	0.226334
GXH	0.465725	0.963453	1.000000	0.540171	0.240089	0.324190
HDI	0.286786	0.673050	0.540171	1.000000	0.179693	0.084624
I	0.531432	0.197247	0.240089	0.179693	1.000000	0.374722
OP	0.906709	0.226334	0.324190	0.084624	0.374722	1.000000



## 5.3 Unit root test

### 5.3.1 Informal Unit Root Test

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#### 5.3.1.1 Graphical tests

Informal test for stationarity is a graphical analysis of the series. Figure 5.1 below, the GDP, GXED, GXH, HDI and OP are all trending up with fluctuations while I showed no fluctuations. The test results shows that most of the variables have unit root in levels but become stationary after first differencing, according to figure 5.1 only I is stationary at level.

**Figure 5.1: Unit root test-Graphical analysis at levels**

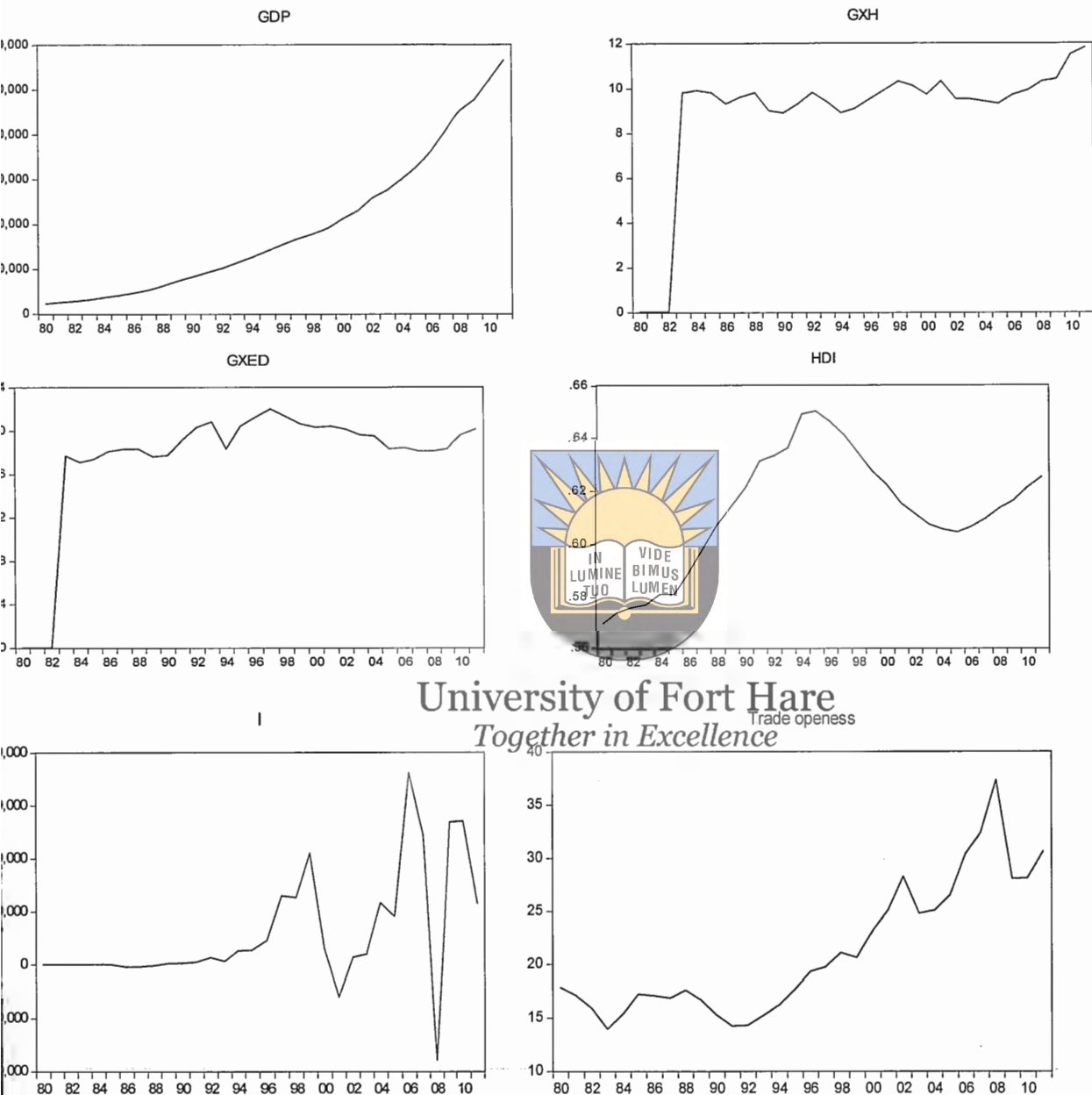
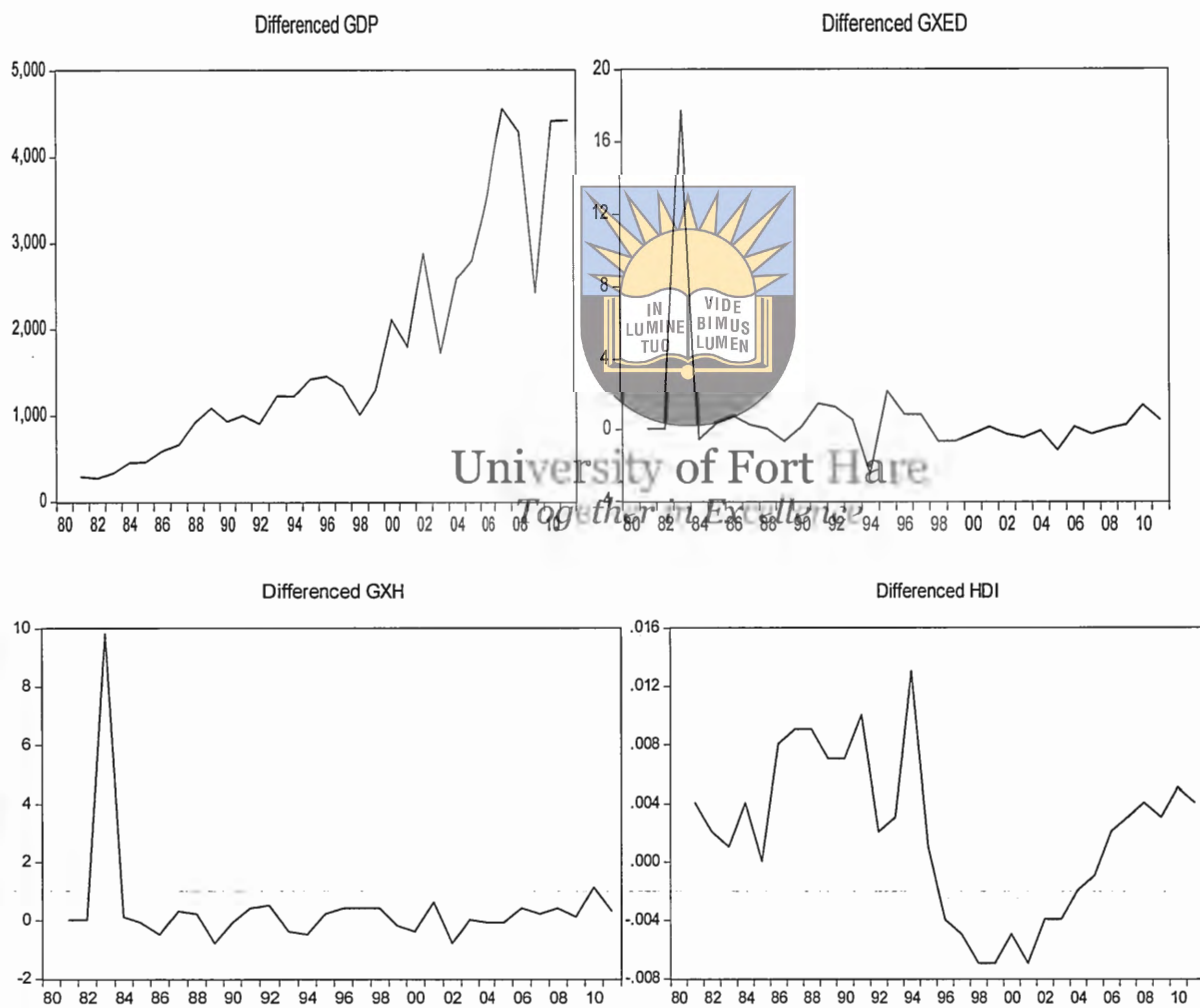


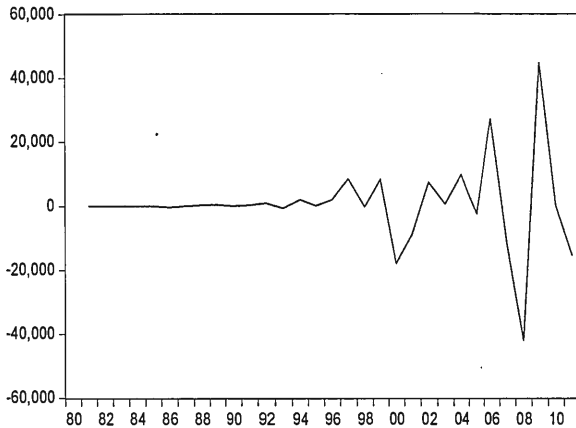
Figure 5.1 suggest an upward trend for all tested variables except for I which exhibits an up and down ward trend, and all but one (I) reveal evidence of non stationarity at levels as they all do not fluctuate around their mean. However, as presented on figure 5.2 below, after first differencing, the results show fluctuation of trends moving around its mean but the fluctuation around the mean is not vast. Considering that even after differencing, there are still variables with variances that are not steady, the study cannot conclude stationarity at this stage, and this requires the study to further carry out formal unit root test.

Based on the results of the variables stationarity at level not all variables are stationary, therefore first difference stationary test is necessary. Figure 5.2 below show the results of the stationarity test at first difference. All variables became stationary, despite HDI and Op showing weak stationarity, all are integrated of order one based on graphical analysis a preliminary conclusion can be made that all variables are stationary at first difference.

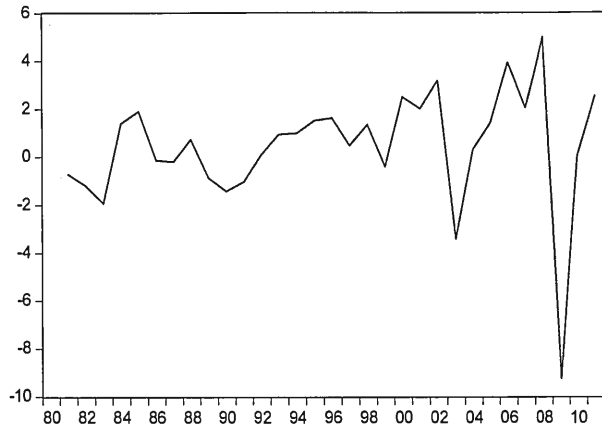
**Figure 5.2: Unit root test-Graphical analysis at first difference**



Differenced I



Differenced Trade openness



Based on the analysis of informal analysis alone, a stationarity status of the variables cannot be reached as yet, and that necessitated the stationarity analysis using the formal hypothesis testing.



### 5.3.2 Formal unit root test.

The study employed two tests for stationarity, thus the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP). Dickey and Fuller extended their test procedure suggesting an augmented version of the test which includes extra lagged terms of dependable variable in order to eliminate autocorrelation, Asteriou and Hall, (2006). The PP test developed a generalization of the ADF test allows fairly mild assumptions concerning the distribution of errors.

The critical values for the ADF and PP tests are obtained from MacKinnon (2010) one-sided p-values while. The methods inserted in the unit root testing such as intercept, trend and intercept and trend in the levels of the time series in order to specify the deterministic terms in the augmented Dickey-Fuller regression which is in terms of the first differences of the time series, MacKinnon (2010).

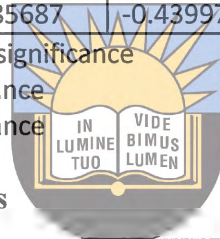
Table 5.2 and table 5.3 below show the results tests at level and test at first difference respectively. As previously mentioned in Chapter 4, PP test will take the precedence over ADF in an event of conflicting results. Both ADF and PP tests test the null hypothesis of a unit root. The null hypothesis of a unit root is rejected in favour of the stationary alternative in each case if the test statistic is more negative than the critical value. Thus, a rejection of the null hypothesis means that the series do not have a unit

root. The results were carried out under three models, that is, with no constant and trend, with constant but no trend, with both trend and constant.

**Table 5.2 Unit root tests: Level Series**

Variable	Augmented Dickey Fuller Test			Phillips Perron Test		
	Constant	Constant and trend	None	Constant	Constant and trend	None
GDP	13.76444	-2.609478	23.35344	31.57545	5.979688	24.43707
GXED	-3.457395	-2.983084	0.101033	-8.643385	-4.462062	-0.101033
GXH	-3.358516	-3.220111	-0.200610	-5.796648	-6.019794	-0.207623
HDI	-3.396940	-3.572649	-0.570085	-1.853734	-1.517576	-0.919184
I	-0.355684	-2.374069	-1.067895	-4.108164	-5.799714	-3.436699
OP	-0.652594	-2.753438	-0.685687	-0.439978	-2.633446	-1.785267

**Note:** \*\*\* represents stationary at 1% level of significance  
 \*\* represents stationary at 5% level of significance  
 \* represents stationary at 10% level of significance



**5.3 Unit root tests: First Difference Series**

Variable	Augmented Dickey Fuller Test			Phillips Perron Test		
	Constant	Constant and trend	None	Constant	Constant and trend	None
$\Delta$ GDP	-1.521400**	-0.179630**	-1.806597*	-0.302189**	-3.641418**	1.168990**
$\Delta$ GXED	5.709576***	6.181310***	5.564877***	5.709576***	6.233576***	5.564877***
$\Delta$ GXH	5.480410***	5.658771***	5.319338***	5.480866***	5.667024***	5.319353***
$\Delta$ HDI	2.131495*	2.107413**	2.053591**	2.118382**	2.115250***	2.020045**
$\Delta$ I	1.532502***	1.843112	0.956554***	16.21472***	16.20337***	14.13396***
$\Delta$ OP	1.410508***	2.038956	0.543706***	7.066491***	10.15038***	5.751371***

**Note:** \*\*\* represents stationary at 1% level of significance  
 \*\* represents stationary at 5% level of significance  
 \* represents stationary at 10% level of significance

Source: Author's computation using Eviews 7

The results in table 5.3 show that all the variables are stationary in first differences. This suggests that that differencing once was all that was required to bring these variables to stationarity. First differencing the series removes all the weaker stationary components in all cases and the null hypothesis of non Stationarity is clearly rejected at the 1% significance level except for GDP which was stationary at level, suggesting that all our variables are integrated of order 1. From the above tests, we conclude therefore that all series are first difference stationary I (1), thus the variables, are integrated of the same order.

However taking into account the problems highlighted about the ADF and the PP in case of short samples, the Ng Perron test was carried out as a robustness check. The results are reported in table 5.4 and table 5.5.

**Table 5.4: Ng-Perron in Level Series**

Variables	MZ <sub>α</sub>		MZ <sub>t</sub>		MSB		MPT	
	Deterministic terms		Deterministic terms		Deterministic terms		Deterministic terms	
	C	c,t	C	c,t	C	c,t	C	c,t
GDP	-5.43	-2.80	-1.44	-1.61	0.44	0.08	4.33	0.56
GXED	-2.54	-1.12	-2.07	-0.90	0.45	0.22	6.32	0.67
GXH	-4.40	-3.45	-2.11	-4.89	0.07	0.43	4.54	0.22
HDI	-1.37	-3.54	-1.81	-1.33	0.33	0.11	1.52	5.09
I	-0.46	-0.91	-0.33	-3.12	0.23	0.12	3.229	0.55
OP	-4.23	-5.23	-2.01	-3.88	0.43	0.70	2.33	3.31

**Note:** \*\*\*denotes significance at 1%

\*\* Significance at 5%

\* Significance at 10%



**Table 5.5: Ng-Perron in First Difference Series**

Variables	MZ <sub>α</sub>		MZ <sub>t</sub>		MSB		MPT	
	Deterministic terms		Deterministic terms		Deterministic terms		Deterministic terms	
	C	c,t	C	c,t	C	c,t	C	c,t
ΔGDP	-17.47***	-17.11***	-5.16***	-5.86**	0.19*	0.18**	0.45**	8.22**
ΔGXED	-8.48**	-12.34**	-6.90**	-3.525**	0.33**	0.11***	3.43**	7.15**
ΔGXH	-12.67***	-7.33***	-5.88***	-5.40***	0.09***	0.33**	1.70**	4.88**
ΔHDI	-11.04***	-10.66***	-4.54***	-5.34***	1.12***	0.44***	0.87**	3.78***
ΔI	-10.09***	-11.54***	-3.22***	-1.67**	0.29**	0.17**	1.33**	8.11**
ΔOP	-9.23***	-8.78***	-7.22***	-5.11**	0.22***	0.50***	3.23***	9.37***

**Note:** \*\*\*denotes significance at 1%

\*\* Significance at 5%

\* Significance at 10%

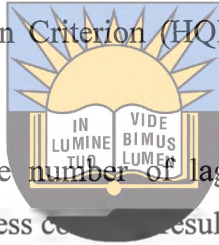
c denotes constant and c,t denotes constant and trend

Consistent with the ADF and the PP, all variables were not stationary at their level series. However in the first difference all variables are stationary. This again suggest that all that was required was to difference the variables once to make them stationary. This makes it possible to examine if there is a long-term relationship between the variables of interest employing the Johansen cointegration technique.

## 5.4 Cointegration

Cointegration implies the existence of a long run relationship between variables. If variables are cointegrated, it means they are integrated of the same order, but within them exists a linear combination of at least one or more variables are integrated of order zero. The most frequently used test for the cointegration rank is the likelihood ratio (LR) test (Johansen, 1988). Its popularity stems from the fact that it is conceptually simple since it an LR test and the test statistic is easy to compute by reduced rank regression.

Table 5.6 below shows the lag length criteria obtained from the unrestricted VAR and the common information criteria are the Akaike Information Criteria (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQI), Final Prediction Error (FPE) and the Likelihood Ratio (LR).



The VAR model was estimated for large number of lags, then reducing down by re-estimating the model for one lag less until less conflicting results were reached.

The information criterion approach produces conflicting results as LR and FPE both selects 1 lags whilst the AIC, SC and HQ select 3 lags. An optimal lag length is required to produce uncorrelated and homoscedastic residuals. In this study the optimal lag length was chosen based on the Schwarz Information Criterion (SIC).

The lag length results in show that a lag1 is chosen by two information criterion the Likelihood Ratio (LR) and the Final Prediction Error (FPE) information criterion. While lag3, is chosen by three information criterions, the Akaike information criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQI). Lag3 was chosen, the choice of this lag length was based on the fact that Akaike information criterion (AIC) is more suitable and it imposes a harsher penalty for including an increasingly large number of regressors (Gujarat 2003).

**Table 5.6 VAR Lag Order Selection Criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-400.2402	NA	1.50e+11	42.76213	43.06038	42.81261
1	-250.5766	189.0488*	1188692.*	30.79754	32.88525	31.15086
2	-202.5254	30.34813	1681274.	29.52899	33.40616	30.18516
3	2536.603	0.000000	NA	-255.0108*	-249.3442*	-254.0518*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

### 5.4.1 Johansen Cointegration Test results

According to Hjalmarsson and Österholm (2007) the cointegration of variables implies that there is long run relationship. However, the strict unit-root assumption that these methods typically rely upon is often not easy to justify on economic or theoretical grounds. In this study an efforts to verify the selected variables was made through probability distribution and theoretical priors in order to ensure the consistency application of each variable.

Saikkonen and Trenkler (2000) supported this by stating that, trace test tend to have a more heavily distorted sizes whereas their power performance is superior to that of maximum eigenvalue competitors. Furthermore, the trace test proves to more advantageous for this because there at least two cointegrating relations in the process than specified under the null hypothesis.

#### 5.4.1.1 Number of cointegration vectors

The top part of Table 5.7, presents the Johansen co-integration test based on the trace test, while the bottom part presents the results of this test based on the maximum eigenvalue test.

Starting with the trace test, the null hypothesis of no co-integrating vectors is rejected, since the test statistic of about 140.43 is greater than the 5 per cent critical value of approximately 103.84. In the same way, the null hypothesis that there are at most 1 co-integrating vectors is rejected.

Furthermore, the null hypothesis that there are at most 2 co-integrating vectors is rejected because test statistics value 58.71 is greater than 54.07, but the null hypothesis that there are at most 2 co-integrating vectors cannot be rejected, since the test statistic of approximately 33.67 is now less than the 5 per cent critical value of about 35.19. The trace test, therefore, indicates at least 3 co-integrating relationships (vectors) at the 5 per cent level of significance. The maximum eigenvalue form of the Johansen test also rejects the null hypothesis of no co-integration at the same level as the trace statistic, thus it corroborate with the trace statistic results. Hjalmarrsson and Österholm (2007), Null hypothesis and even not collaborating results can occur due to structural break in the data.



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**Table 5.7: Johansen co-integration rank test results**

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.840220	140.4388	103.8473	0.0000
At most 1 *	0.589374	85.42013	76.97277	0.0098
At most 2 *	0.566030	58.71799	54.07904	0.0182
At most 3	0.456044	33.67461	35.19275	0.0722
At most 4	0.251281	15.40800	20.26184	0.2039
At most 5	0.200851	6.726243	9.164546	0.1416
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.840220	55.07865	40.96680	0.0007
At most 1	0.589374	26.70215	34.80587	0.3327
At most 2	0.566030	25.04338	28.58808	0.1329
At most 3	0.456044	18.26661	22.29962	0.1666
At most 4	0.251281	8.681757	15.89210	0.4687
At most 5	0.200851	6.726243	9.164546	0.1416
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

After ascertaining the existence of co-integrating relationships, the vector error correction model (VECM) was estimated to test for the short-run dynamics. The VECM allows a distinction between the long and short run parameters for the variables. This section therefore looks at the variables constitute the cointegrating equations. The section below shows the estimates of VECM through the E-views software with cointegrating equations.

### 5.5 Vector Error Correction Modelling

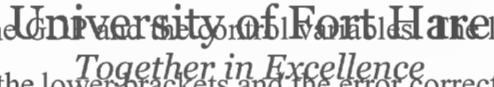
The ECM techniques allow the long run and short run dynamics to be estimated in a single step. The constant term of the single error correction framework is a combination

of the short run and long run constant. Using the number of co-integrating relationships, the number of lags and the deterministic trend assumption obtained in the previous steps a VECM is specified and estimated. Table 5.9 below show the estimates of VECM through the E-views software with specified cointegration equations. All the coefficients were significant at 1% level of significance. According to  $\alpha_2$  when the variables are in logarithms and one cointegrating vector is estimated,

**Table 5.8: Vector Error Correction Model**

Variable	GDP	GXED	GXH	HDI	I	OP	c
CointEq	1.000000	525.3978	-1278.912	45832.27	-0.368612	985.9562	-40401.05
		(705.864)	(1256.80)	(45206.7)	(0.09465)	(308.563)	(27376.9)
		[ 0.74433]	[-1.01759]	[ 1.01384]	[-3.89461]	[ 3.19532]	[- 1.47573]

Notes: Table 5.8 above depicts the percentage change in the GDP when 1% increase is assumed in each of the control variables and the signs gives the indication to the nature of relationship that exist between the GDP and the control variables. The long run effect is given by the numerical information in the lower-brackets and the error correction terms.



**5.5.1 Long Run Parameters**

The empirical results show that there is positive relationship between expenditure on education, GXED and the gross domestic product GDP, and so when the expenditure on education increases by 1% then gross domestic product increases by 525.39%. This is consistent with the expected prior that education does influence the increase of the economic growth. Adebisi (2006) mentioned that there is sufficient evidence to suggest that formal education makes a positive contribution towards economic growth. Consequently, the definition of a nation’s wealth has widened to accommodate not only physical capital but also human capital as an independent factor of production required to achieve high and sustainable economic growth rates.

On the other hand, another government expenditure on health shown by GXH of -1278.91% on table 5.9 above indicates a negative long run relation with economic growth. Peykarjou et al (2011), Alluded that health expenditures have been led to increase human capital inventory and as a result GDP growth of countries through

improving health indexes. Therefore, health expenditures and real gross domestic product in each country have mutual relationship based on theoretical principles. However the negative relationship is explained by the fact that health as indirect impact on production and thus health impacts is more effective for long-term economic growth when combined with other human resource skills such as education and training, Weil, (2006).

Human development index has a positive relation with economic growth and a 1% increase in the HDI leads to a 45832.27% increase in the GDP. The abilities, skills and healthiness of a person are critical for economic growth and development of a country thus makes the investment towards such initiatives more important. It is now undoubted that expenditure towards people is significant for purposes of human development and eventually economic growth, Adebisi, (2006).

The investment has negative long run relationship with economic growth. According to table 5.8 above, investment has small and not significant effect to economic growth.

This means a 1 percent increase in the investment does not directly cause the economic growth. Trade openness showed positive long run relationship, the openness causes faster and rates of productivity growth.

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### 5.5.2 Short Run Parameters

Short run analysis is intended to capture the short run determinants of the gross domestic product. Comparing the coefficients of the error correction terms (CointEq1), of Table 5.10 After the long run relationship has been established, the short run equilibrium parameter estimates are reported in table 5.10 below. The coefficients of the error correction terms contribute to the discussion of the short run relationship.

The estimated coefficient negative and significant and further indicates that about 8per cent of  $D(GDP)$  is corrected within 1 year.  $D(OP)$  has the most significant coefficient, with a t-value of -3.714 and has a correct negative sign, the  $D(GDP)$  has also negative sign meaning that there is disequilibrium in the short run and it will adjust in the long run. The other variables either have a wrong sign or are less significant, suggesting that the gross domestic product equation constitutes the true co-integrating relationship in the first cointegrating vector

GXEH, GXH, HDI and OP have coefficients that are negative and significant meaning that these variables converge to the long run equilibrium. Whilst, I has a positive coefficient meaning that any disequilibrium in it continues to grow. Any positive coefficient in an error correction model could also signify incomplete specifications. The adjustment coefficients entail short-run dynamics. Furthermore, the signs of the coefficients of the model estimated carry the correct signs and conform to the predictions of economic theory and previous empirical work.

**Table 5.9 Error Correction Model**

Error Correction:	D(GDP)	D(GXED)	D(GXH)	D(HDI)	D(I)	D(OP)
CointEq1	-0.001562 (0.01736) [-0.08997]	-2.36E-06 (0.00014) [-0.01684]	-1.42E-05 (7.7E-05) [-0.18475]	-7.48E-08 (1.5E-07) [-0.49093]	2.240118 (0.29281) [ 7.65032]	-0.000287 (7.7E-05) [-3.71466]



**5.6 Granger Causality test**

The study runs granger causality test using the lag length in accordance with the VECM model, in order to examine the short-run causality between control variable and economic growth.

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**Table 5.10: Granger Causality test**

Null Hypothesis:	Obs	F-Statistic	Prob.
OP does not Granger Cause GDP	30	0.74240	0.4862
GDP does not Granger Cause OP		2.99741	0.0681
I does not Granger Cause GDP	30	7.69148	0.0025
GDP does not Granger Cause I		8.76103	0.0013
GXH does not Granger Cause GDP	30	0.07060	0.9320
GDP does not Granger Cause GXH		0.74374	0.4856
GXED does not Granger Cause GDP	30	0.06806	0.9344
GDP does not Granger Cause GXED		0.14988	0.8616

HDI does not Granger Cause GDP	30	0.18070	0.8358
GDP does not Granger Cause HDI		0.08042	0.9230

The granger causality test was conducted in order to test the impact of the independent variables, openness, Human development, expenditure on education expenditure on health and investment.

A rejection of the null hypothesis imply that the first series Granger-causes the second series and vice versa. The estimated Granger causality results are reported in Table 5.10 above. The results show that there is no causal relationship between most of the control variables and the economic growth. Furthermore, the results showed unidirectional relationship between economic growth and trade openness, this causal relationship runs from economic growth depicted by GDP in the diagram to trade openness which is shown by OP. Zeren, F and Ari, A (2013), It is also possible that the causality is from the economic growth to the openness. That is because high productivity reduces the unit costs that, in turn, increase exports.

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The causality from economic growth to trade openness means that the growth observed in the country is realized internally. An internal economic growth rate is explained by investments in physical and human capital as well as research and development (R&D) efforts (also cited by Akilou, 2013). (This supports the analysis made in previous chapters and the causal relationship below).

Additionally, the results posit that there is bi-directional relationship between Investment and economic growth this causal relationship runs from economic growth (GDP) to Investment (I) and from Investment to economic growth.

This relationship lends support to Anwer and Sampath (1999) that both GDP and investment are interdependent and could cause each other simultaneously or there could be no causality among them but they might move together under the influence of other factors.

## 5.7 Diagnostic checks for the VECMs

This stage is crucial in the analysis; the VECM model was subjected to rigorous diagnostic tests. Diagnostic checks test the stochastic properties of the model, such as residual autocorrelation, heteroskedasticity, and normality.

### 5.7.1 Autocorrection LM test

The Lagrange Multiplier (LM) test is used in this study is multivariate test statics for residual serial correlation up to the specified lag order.

Table 5.11 Correlation LM Tests

Lags	LM-Stat	Prob
1	35.56883	0.4889
2	23.15677	0.0518
3	54.39364	0.0252
4	52.14719	0.0401
5	36.06614	0.4656
6	49.58680	0.0653
7	32.50266	0.6357
8	64.54036	0.0024
9	58.26758	0.0108
10	38.60723	0.3526
11	29.08222	0.7865
12	53.52815	0.0302

Probs from chi-square with 36 df.

Source: author computation using Eviews7

The serial correlation occurs in time-series studies when the errors associated with a given time period carry over into future time periods. The zero probability value indicates the presence of serial correlation whilst with the high probability we fail to reject the null that there is no serial correlation. In the above probability 0.4889 is high, therefore we fail to reject the null hypothesis and conclude that there is no serial correlation among the variables.

### 5.7.2 Heteroskedasticity test

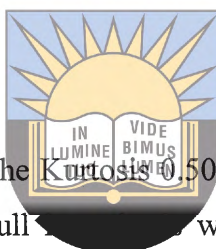
Table 5.9, below present the test results of the white Heteroskedasticity and the probability value of 0.3924 is high and this implies that the model does not suffer from heteroskedasticity problem

**Table 5.12: Heteroskedasticity test**

Joint test:		
Chi-sq	df	Prob.
554.3990	546	0.3924
554.3990	546	0.3924

### 5.7.3 Normality test

Given by table 5.14 the normality test, the Kurtosis of 0.509625 and p-value of 0.4753 is the results that we fail to reject the null hypothesis which signals an indication of normality. Skewness and JB of 0.019846 and 0.529471 with the p-values of 0.8880 and 0.7674 respectively are insignificant and therefore we fail to reject the null.



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**Table 5.13: Residual normality test**

Null Hypothesis: residuals are multivariate normal		
	Chi-sq	P-Value
Skewness	0.019846	0.8880
Kurtosis	0.509625	0.4753
Jarque-Bera	0.529471	0.7674

Therefore the diagnostic test results reveal that the model is well specified and results are reliable.

## 5.8 Conclusions

This chapter carried out an empirical analysis of the relationship between human capital development and economic growth. For stationarity, informal tests through graphical analysis and the formal tests therefore ADF and PP tests were conducted. From both the informal and formal tests the results revealed that all variables are stationary either at level or at first differencing. The robustness of the results was done through Ng-Perron test, having reached stationarity, the study conducted a cointegration test using the Johansen's cointegration

These findings indicate that HDI is subject to responsive movements as a result of changes in its proxies and fundamentals. Evidence of cointegration allowed the estimation of VECMs through the E-views software with 2 specified cointegration equations, which simultaneously provided the parameter estimates for both the long and short run relationships. The short run dynamics are consistent with literature showing the HDI, GXH, GXED and OP have positive impact on GDP whilst I have a negative impact. Followed by diagnostic checks and Granger causality analysis, proven by the diagnostic check, the model is specified and results are reliable. Entailed in the causality test is that there is no clear causality exist between the control variable and the GDP and this is against expectation from other sections in the chapter that most of this control variable are positively related to the economic growth. Bidirectional relationship between Investment and economic growth showed up.

The next chapter provides the summary of the empirical results, implications and policy recommendations.

## CHAPTER 6:

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 6.1 Introduction

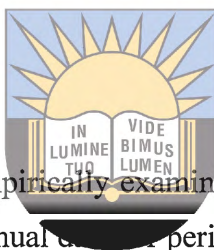
This chapter is divided into three major sections, the first sections provides summary and conclusion of the study, the second sections looks at the policy implications and recommendations and third and final section focusses on limitations of the study and areas for further research based on the findings that are presented in the previous chapter.

#### 6.2 Summary and Conclusions

The main objective of the study was to empirically examine the impact of human capital development on economic growth using annual data for the period 1980 to 2010 in the case of South Africa. The study hypothesized a positive relationship with economic growth in South Africa. An overview of both GDP and HDI was analyzed. The study further looked at trends of education and health which also encompass HDI.

The study reviewed both theoretical and empirical studies. The endogenous growth model was found to be the relevant theory in explaining the long run impact of the human capital development on growth. The empirical review showed a strong link between human capital development and economic growth in the long run. This implies that human capital development is pivotal for economic growth. Furthermore, the Trade openness had unidirectional relationship with the gross domestic product; this causal relationship runs from economic growth trade openness.

The study found that majority of variables are stationary at first difference. The cointegration test was used to examine the long-run relationship between the variables of interest. The results revealed that there is a long-run relationship between the variables of interest. The vector error correction model (VECM) was estimated to test for the short-run dynamics. All the coefficients were significant at 1% level of significance, and the estimation results of the long run parameters appeared to be consistent with other result in the study and with the expected prior. The diagnostic checks, had positive feedback in



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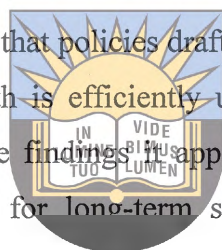
of both GDP and HDI

favor of the study under all the three estimation tools; auto-correction model, normality, Heteroskedasticity. The results indicated the presence of no serial correlation, the model did not suffer from heteroskedasticity due to the high probability value after the estimation and normality test estimation favoured the model of the study.

### 6.3 Policy Implications and Recommendations

The results of the study have revealed that human capital development does have an impact on economic growth. Expenditure on education and expenditure on health proved to have positive relationship with economic growth and thus make a significant impact on human capital development

In light of the above, the study suggests that policies drafted and implemented to ensure that investment in education and health is efficiently utilized in order to achieve a sustainable economic growth. From the findings it appears that human development seems to be a necessary prerequisite for long-term sustainable growth, given the outcomes of long run relationship between economic growth and human capital development. There current initiatives training seem not to be yielding returns that are matching its financial inputs.



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The study also recommends that the government should provide incentives to companies and NGOs in the form of taxes of grants to encourage them to increase investment in training. The education policies need strong and reasonable intervallic review in order to maintain economic and societal relevancy of education

If human development improvements are indeed a precondition for sustainable economic growth, government policy and public funding may be necessary to move a nation above the human development threshold level.

Finally, it is suggested that South Africa pays especial attention into maximal utilization of the already existing human capital through expanding employment opportunities and job creation that match the skills.

## 6.4 Limitations and areas for further research

The study was based on the South African economy only therefore the application of results may not be directly applicable in the context of other countries. Nonetheless, the study remains significant as the conclusions drawn from it may prove to be useful in the South African context. Applications to other economies must be done with caution.

The study focused on selected macroeconomic variables determining the human development index in South Africa that can be accommodated by the models. This study only considered the period from 1980 up to 2011. However the period covered is of great significance to policy formulation as the advent of democracy came with a number of policy reforms which changed the macroeconomic operation order of the economy.

The use of data from different sources might have influenced the results, also for most variables used in this study, quarterly data was not available, and therefore annual data was used. Documented information in field of this study showed that researchers did not have a conclusive measure of human capital development, HDI was used and the proxies supporting this variable. The risk involved in these proxies is that they may not correctly represent the impact of the actual variables, resulting in inconsistent results. Nevertheless, these problems seem not to have significantly affected the findings presented of this study, since they corroborate with both the theoretical and empirical facts on the impact of human capital development on economic growth.



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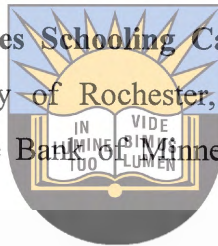
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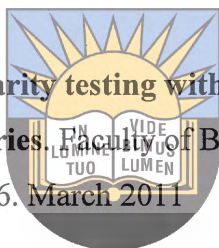
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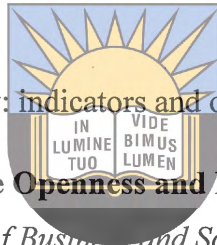
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## 7.1 Appendices

Countries used in the empirical review
United States of America
United Kingdom
Italy
Spain
New Zealand
France
Japan
Brazil
Turkey
China
Israel
India
Islamic Republic of Iran
South Korea
South Africa
Nigeria



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## 7.2. Appendices

### Data used for regression

Year	GDP	Investments	Trade Openness	GXED	GXH	HDI
1980	2205	0	17.84580499	0	0	57
1981	2494	0	17.10585405	0	0	57.4
1982	2766	0	15.89732466	0	0	57.6
1983	3094	0	13.94537815	17.7	9.8	57.7
1984	3545	0	15.32609309	17.1	9.9	58.1
1985	4002	-19.25	17.21189405	17.4	9.8	58.1
1986	4584	-426	17.05759162	18.1	9.3	58.9
1987	5245	-402.75	16.85243089	18.3	9.6	59.8
1988	6164	-180.25	17.58387411	18.3	9.8	60.7
1989	7247	193.25	16.69780599	17.6	9	61.4
1990	8172	209.25	15.24951052	17.7	8.9	62.1
1991	9167	435	14.20606523	19.1	9.3	63.1
1992	10066	1306.75	14.29048281	20.3	9.8	63.3
1993	11286	606.75	15.21407053	20.8	9.4	63.6
1994	12504	2574.5	16.17954255	18.3	8.9	64.9
1995	13920	2662.75	17.66587644	20.4	9.1	65
1996	15368	4495.75	19.27095263	21.2	9.5	64.6
1997	16699	12890.75	19.72435475	22	9.9	64.1
1998	17703	12613	21.03739479	21.3	10.3	63.4
1999	19001	20970.75	20.58739014	20.6	10.1	62.7
2000	21104	2948.25	23.06520091	20.3	9.7	62.2
2001	22895	-6000	25.04057655	20.4	10.3	61.5
2002	25763	1336	28.1875558	20.1	9.5	61.1
2003	27483	1887	24.73601863	19.6	9.5	60.7
2004	30066	11565.5	25.01593162	19.5	9.4	60.5
2005	32855	9047	26.41083549	18.3	9.3	60.4
2006	36416	36125.25	30.31420255	18.4	9.7	60.6
2007	40966	24371.25	32.32949275	18.1	9.9	60.9
2008	45254	-17885	37.30898926	18.1	10.3	61.3
2009	47676	26808.5	28.01199765	18.3	10.4	61.6
2010	52087	26969	28.04375372	19.6	11.5	62.1
2011	56504	11469.5	30.55891618	20.1	11.8	62.5