THE ROLE OF EXPORT DIVERSIFICATION ON ECONOMIC GROWTH IN
SOUTH AFRICA: 1980 - 2010

BY

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A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS OF A MASTER OF COMMERCE DEGREE IN ECONOMICS

DEPARTMENT OF ECONOMICS

FACULTY OF MANAGEMENT AND COMMERCE

UNIVERSITY OF FORT HARE

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OCTOBER 2012
ABSTRACT

This study examined the role of export diversification on economic growth in South Africa. The study used annual time series data for the period covering 1980 to 2010 and employed a Vector Error Correction Model to determine the effects of export diversification and possible factors that affect it on economic growth. Possible factors that affect export diversification considered as independent variables in this study include gross capital formation, human capital, real effective exchange rate and trade openness. Results of the study reveal that export diversification and trade openness are positively related to economic growth while real effective exchange rate, capital formation and human capital have negative long run relationships with economic growth. The study recommended the continual implementation of trade liberalisation by the South African government. The South African government is also encouraged to promote the production of a diversified export basket through subsidisation, promotion of innovation and production of new products.

Keywords: Economic growth, Export diversification, South Africa.
DECLARATION AND COPYRIGHT

I, the undersigned Mudenda Caroline, hereby declare that this dissertation is my own original work and that all reference sources have been accurately reported and acknowledged and that this document has not been previously submitted and will not be submitted at any other institution for a similar academic qualification.

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Signature

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Date
ACKNOWLEDGEMENTS

Without the great Lord Almighty I could not have reached this far as far as the academic field is concerned. It is out of His mercies, blessings and love that has seen me this far and hence forth would like to express my greatest gratitude to Him. My sincere gratitude also goes to my supervisor, Ms. I. Choga, for mentoring, guiding and advising me and all her contribution towards the success of this dissertation. Special thanks go to my parents, Mr. and Mrs. P. Mudenda for encouraging me to pursue this academic qualification. I am also indebted to my special friends - Cleo, Unity, Marlene, Luke and Tanya for all their support during my stay at University of Fort Hare, without them, life would not be as it has been. I would also want to thank my classmates Courage, Lesala and Kin for giving me confidence and support throughout the course of my studies. Furthermore, am indebted to the Govan Mbeki Research and Development Centre (GMRDC) and the Zimbabwean Presidential Scholarship for funding my postgraduate and undergraduate studies respectively.
DEDICATION

Dedicated to my young sisters “Careprince, Kesina and Liana.”
LIST OF ACRONYMS AND ABBREVIATIONS

ADF – Augmented Dickey-Fuller

AIC – Akaike Information Criterion

ARMA – Auto-Regressive and Moving Average

BOP – Balance of Payments

CAP – Capital formation

CPI – Consumer Price Index

DF – Dickey-Fuller

DOLS – Dynamic Ordinary Least Squares

DTI – Department of Trade and Industry

ECT – Error Correction Term

EU – European Union

FPE – Final Prediction Error

GATT – General Agreement on Tariffs and Trade

GDP - Gross domestic product

GEIS – General Export Incentive Scheme

GMM – Generalised Method of Moments

GMRDC - Govan Mbeki Research and Development Centre

HC- Hannan-Quinn Criterion

HI – Herfindahl Index

H-O – Heckscher-Ohlin

HUM – Human capital

IDC – Industrial Development Corporation
ISI - Import substitution industrialisation

JB – Jarque-Bera

LM – Langrage Multiplier

MPK – Marginal Product of Capital

NHI – Normalised Hirschmann Index

OLS – Ordinary Least Squares

OPEN – Trade Openness

PLC – Product Life Cycle

PP – Phillip Perron

PPF – Production Possibility Frontier

R & D – Research and Development

REER – Real Effective Exchange Rate

SACU – Southern African Customs Union

SADC – South African Development Community

SARB – South African Reserve Bank

SIC – Schwarz Information Criterion

UK – United Kingdom

UN – United Nations

US – United States

VAR – Vector Autoregressive

VECM – Vector Error Correction Model

WTO – World Trade Organisation
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CHAPTER ONE
INTRODUCTION

1.1 Background of the study

The role played by the diversification of exports on economic growth of a country’s economy has raised much debate recently in the economic field. The on-going debate is central on whether export diversification actually plays a role in the growth of an economy. Subjective evidence suggests that there are no currently developed countries with extremely high levels of export concentration (Agosin, Alvarez and Bravo-Ortega, 2009). It is therefore argued that export diversification makes countries less vulnerable to adverse terms of trade shocks by stabilising export revenues (Brenton, Newfarmer and Walkenhorst, 2007). This makes it easier to channel positive terms of trade shocks into growth, knowledge spill-overs and increasing returns to scale, creating learning opportunities that lead to new forms of comparative advantage (Brenton et al., 2007).

The import substitution strategy played a crucial significant role in promoting manufacturing industries in Latin America in the 1950s, though it had no direct considerable effects to economic development (Krugman and Obstfeld, 2006). In most developing economies such as India, Zambia and Ghana, the import substitution strategy has failed to promote the industrialisation process. This led to export diversification failing to occur, as was expected, while the productive systems suffered a lot from high trade barriers and distorted relative prices (Nouira, Plane and Sekkat, 2009). Building comparative advantage in new non-traditional exports, including labour intensive manufactures, still remains a crucial objective for small economies. Manufactured exports are believed to support sustained overall economic growth for several reasons, such as the demand for manufactured goods increases more with income increases than the demand for primary products. Hence, growth prospects for a country’s exports are higher by specialising in manufacturing.

Policy makers make use of export diversification as a source of economic growth, in cases where the size of the domestic market is small and the existing export basket is concentrated in products that have inelastic demand. In such circumstances, diversification into non-traditional exports opens up new opportunities and new markets for firms within the economy (Chandra, Boccardo and Osorio, 2007). Traditional exports are particularly vulnerable to exogenous shocks and face limited demand due to their low income elasticity and declining
terms of trade. Therefore, diversifying away from traditional exports is expected to raise growth rates and lower their income variability of the exports (Samen, 2010).

South Africa falls in the developing countries category and also faces exports instability as any other developing countries. It also heavily embarked on the import substitution policy as a strategy of international trade and growth in the 1930s. This was mainly done to protect the important gold mining sector and the infant steel and iron industry from international competition (Du plessis et al., 2000: 174). In most cases this was conducted using tariff imposition because South Africa was by then a member of the General Agreement on Tariffs and Trade (GATT). This was after the crushing of the Bretton Woods and the Gold Exchange Systems which disallowed the use of other import restrictions other than tariffs (Du plessis et al., 2000: 154).

Later in the 1950s to 1970s import substitution was perceived to have no significant positive contribution to growth of the South African economy. As a result, additional measures were proposed to provide a further stimulus to export manufacturers (Du plessis et al., 2000: 176). However, all these changes did not lead to South Africa experiencing export oriented growth. Instead, the increased economic isolation and perceived threats from the international community to the survival of South Africa’s economy led to further import substitution investment. This time the import substitution was based on the strategic industry argument. Though this strategy was not justified on economic grounds it was best presented on the perceived environment of economic warfare, the strategy was successful. It saw South Africa increasing production on products such as armaments, synthetic rubber, diesel engines and further extensions to the petrochemical industry, consequently leading to the growth of the economy (Du plessis et al., 2000: 176 - 179).

According to the world export and import data from United Nations (UN) for the period from 1962 to 2000, South Africa as an exporting economy experienced increasing diversification levels. Thereafter, the economy became relatively more concentrated in its exports between 1980 and 1995 resulting in declining export diversification levels. The period of export concentration coincides with the period when South Africa was facing high levels of sanctions due to the apartheid regime. This was followed by an increase in export diversification during the period from 1996 to 2000 (Naudé and Rossouw, 2008).

There was a slow but clear upward trend in the growth of non-gold commodity exports although it was slower in the 1970s than in the 1980s. Over the entire period, gold export
volumes declined, due to the collapse of gold prices and hence these non-gold commodities were basically the only source of export growth (Edwards and Elves, 2005). South Africa also experienced significant vertical export diversification since 1988, with the share of primary commodity exports declining from 71.8 per cent to 46.2 per cent from late 1980s to 2002 (Naudé and Rossouw, 2008). Real Gross Domestic Product (GDP) had increased by 54 per cent over the two decades and the real exchange rate was at a similar level in both years (Naudé and Rossouw, 2008). The economy had therefore become significantly more closed for the reasons that are not related to either the exchange rate or economic growth.

A central objective of the South African trade policy has been to reduce the country’s dependence on primary products, in particular the heavy dependence on gold, in the export basket. South Africa’s total exports revealed a trend of increased export diversification between 1993 and 1999, mainly resulting from the significant decline of non-monetary gold exports. On average, the specialisation indices of South African aggregate primary products and crops were in the range of 0.048 to 0.068 in the years from 1993 to 2003. Differences in the indices among the years were largely attributed to fluctuations in the export values of platinum and other metals of the platinum group. Export concentration of manufacturing products increased slightly in 1993, followed by two years of declining specialisation and stagnation with minor fluctuation between 1996 and 2003 (Petersson, 2005).

1.2 Statement of the problem

For over three decades South Africa’s economic development has been based on an Import Substitution Industrialisation (ISI) strategy, which led to a period of high economic growth in 1960s and 1980s. The ISI policy was aimed at reducing the country’s dependency on the outside world through local production of industrial goods (Du plessis et al., 2000: 176 - 179). Its implementation involved imposing high tariff rates for consumer goods, low import taxes for intermediary and capital goods, and export taxes were applied on those goods in which a country has a strong comparative advantage.

After the apartheid era South Africa abandoned the ISI strategy and became open to the international community and was able to sell its exports in a freer environment. This saw an increase in the production of products such as armaments, synthetic rubber, diesel engines and further extensions to the petrochemical industry, consequently leading to the growth of the economy (Du plessis et al., 2000: 176 - 179).
Trade liberalisation and the lifting of sanctions in the early 1990s were expected to promote trade growth. The central issue is whether these policy changes have produced sustainable and significant export-led growth and diversification into non-traditional products. The second important question is whether diversifying into non-traditional export products was accompanied by economic growth and whether there is still potential for export-led growth in South Africa.

1.3 Objectives of the study

The main objective of this study is to determine the possible relationship between export diversification and economic growth. The specific objectives are:

- To determine the composite of export products in South Africa.
- To analyse the export diversification process that has taken place in South Africa.
- To test the causal relationship between exports and output growth in South Africa.
- To determine the strength and direction of the relationship between export diversification and economic growth in South Africa.

1.4 Hypothesis of the study

The study hypothesises that increases in export diversification levels does not lead to increases economic growth in the South Africa.

1.5 Significance of the study

Though there are some suggested effects of export diversification on economic growth, there is no clear cut answer as to the existence and type of relationship between these two variables. This study seeks to answer the questions that arise on the specific relationship between export diversification and economic growth. The study helps to determine the role that has been played by export diversification on economic development in the South African context. This study will be of help to policy makers, the government, traders and the whole business community to know the role played by export diversification on the growth of the economy. The findings of this study will also help policy makers in identifying which strategy to implement when it comes to international trade policies.

1.6 Organisation of the study

The study is divided into six chapters. Following Chapter One is Chapter Two, which gives an overview of South Africa’s export diversification, Gross Domestic Product (GDP) and
factors that are perceived to affect export diversification levels. Chapter Three discusses the literature review, and is divided into two sections- that is- theoretical and empirical literature. Chapter four gives the analytical framework used in the study, that is: identifying the models, defining the variables and naming the data sources. Chapter five presents the analysis and interpretation of the empirical findings of the study. The conclusion, recommendations and limitations are presented in Chapter Six.
CHAPTER TWO
TRENDS IN EXPORT DIVERSIFICATION

2.1 Introduction

The main aim of this chapter is to shed more light on the trends of export diversification and economic growth in South Africa. This Chapter is divided into six sections. Section 2.2 looks at the history of the South African trade regime. Section 2.3 presents a detailed analysis of the export diversification trends in South Africa’s history. Section 2.4 deals with the changes in economic growth using South Africa’s real GDP; after which trends in export diversification and economic growth are analysed concurrently. Section 2.5 looks at the possible determinants of export diversification while Section 2.6 concludes the chapter.

2.2 Changes in the South African trade regime

According to Edwards and Lawrence (2006), the period from early 1980 to 1990 was characterised by a declining rate of economic development. This was associated with the collapse of the gold price leading to a decline in exports accompanied by an expanding foreign debt and political instability. In addition, the South African trade policy was highly protective and inward looking in nature in the early 1980s. This was further fostered by the financial and trade sanctions faced by the country from the outside world due to the apartheid policy. In other words, South Africa could not freely engage in international trade during the apartheid era. The inward looking strategy comprised of a lot of quantitative restrictions such as tariffs and embargoes, and a couple of forms of protections such as specific and ad valorem duties, and surcharges.

A lot of protection existed in different sectors of the economy. For example, the agricultural sector was dominated by import and export permits, price controls and specific duties that were mainly aimed at protecting the domestic producers from foreign competition (Lewis, 2001). Though the protectionism was mainly aimed at improving the country’s terms of trade by reducing imports, it also led to a significant anti-export bias that negatively affected South Africa’s exports and the currency consequently. Despite the fact that South Africa noticed the side effects of the inward looking trade regime as early as 1984, it started reducing quantitative restriction but the policy changes faced some external challenges such as the 1985 debt standstill and financial sanctions (Aron and Muellbauer, 2012).
Cassim, Onyango and Van Seventer (2004) state that the country also tried to create a free environment that could allow the country’s exports to be competitive in the world markets. Customs duty drawbacks and duty exemptions were put in place for exporters together with export subsidies by 1983. Furthermore, the dual exchange rate system was abolished in the same year allowing for the exchange rate to be determined by market forces. More so, the quantitative restrictions were also replaced by tariffs that were lower, in a move to lower the impact on cost resulting from quantitative restrictions.

Cassim et al. (2004) attribute that in 1985 the South African government changed the list of goods that needed no approval for importation (known as the positive list) in a way to improve the inflow of imports into the country. However, during the same year, a debt crisis occurred due to insufficient foreign direct investment (FDI) and short-term capital inflows resulting in a large and prolonged balance of payments deficit. This led to the dire need of some policy reversals, with the re-imposition of the dual exchange rate system coupled with a significant real depreciation of the Rand and the introduction of a 10 per cent import surcharge. By the end of 1989, the South African government had introduced sectoral adjustment programmes aimed at promoting exports.

The General Export Incentive Scheme (GEIS) was introduced in the early 1990s and was designed with the main intention of helping South African exporters to be price competitive in international markets (Flatters and Stern, 2007). Flatters and Stern (2007) further reported that the GEIS scheme was put into operation through the use of a selective system of liberal tax-free grants. Industries that exported products with both high value-added and high local content qualified for a nominal subsidy of 19.5 per cent of export turnover. On the contrast, firms involved in products with low value-added and low domestic turnover qualified for only 2 per cent export turnover.

South Africa’s openness to international markets have ever since increased due to the end of apartheid in 1994 accompanied with some other favourable policies that were more outward looking. For instance, the first democratic elections in 1994 brought relief to the foreign exchange market by ending the destabilising political events that had forced the monetary authorities to maintain direct capital controls over South African Rand. Furthermore, another significant policy change concerning the exchange rate control were made in early 1995 leading to the elimination of the financial Rand and introduction of a unitary exchange rate system (Takaendesa, Tsheole and Aziakpono, 2006).
Cassim et al. (2004) argue that the introduction of GEIS led to the publication of a study by the Industrial Development Corporation (IDC). The publication supported the use of a much more homogeneous and lower tariff structure sighting that the then existing tariff structure led to high cost implications especially for products that use imported raw materials. More so, the IDC report also suggested that the country lower its protection through the use of more-specific anti-dumping measures. In a move to create a freer international trade environment, South Africa became a member of some trade blocks such as the South African development community (SADC) in 1994, and European Union (EU) in 1999. It was also a member of Southern Africa Customs Union (SACU) since 1889 (Lehloenya, 2009). In addition, the Department of Trade and Industry (DTI) proposed the formation of a new trade administration to overlook the success of trade policy reforms so as to monitor the effectiveness of policy changes and identify reasons for any failed policies.

2.3 Export diversification trends in South Africa

South Africa is naturally endowed with a lot of rich mineral resources such as gold, platinum and diamonds. That was the major reason that led to the reluctance over the development of an internationally competitive manufacturing industry, making the mining sector to account for more than 50 per cent of its total exports before independence (Edwards and Lawrence, 2006). Edwards and Lawrence (2006) further attribute that, changes in industrial and trade policies as a result of different governments in South Africa resulted to a lot of structural changes in the country’s manufacturing industry exporting sector. Consequently, significant changes of competitiveness were intentionally manipulated in order to stabilise South Africa’s performance towards trade in manufactured goods.

According to Petersson (2005), the main objective of the South African trade policy was to reduce the country’s over-dependence on primary products. South Africa’s exports were in the past mainly concentrated on minerals such as gold, diamonds and platinum. The South African trade policy tried to address the problem by increasing openness to the world economy. South Africa’s export structure significantly changed from the early 1980s to the late 2000s. The export basket changed with the mining sector being replaced by the manufacturing sector as the leading exporting sector in the country. The bulk of the mining products exported were gold which made more than 35 per cent of the total merchandise exports. The price of gold fell drastically in the late 1980s accompanied by a significant decline in the grade of gold ore; this led to the reduction in the share of mining exports.
specifically gold in the country’s export basket. On the contrary hand the share of manufacturing products significantly increased in reaction to the relative strong export growth demand abroad. This saw South Africa’s total exports experiencing a trend of increasing export diversification between 1993 and 1999, into other sectors of the producing economy such as manufacturing exports. The diversification levels increased as a result of a significant decline in non-monetary gold exports and the resulting decline of export concentration in the aggregate of primary, crops and non-monetary gold products.

Using the value of net exports from different sectors, South Africa’s comparative advantage in exports continued to be strong in mining and metal products even in the 2000s. Other net exports from agriculture, beverages, tobacco, and refined products are small. On the same note, sectors such as automobiles, machinery and equipment, food and leather products are exported in large amounts, but are offset by even larger imports in the same sectors. It is only in mining, specifically gold, platinum, iron ore, and coal, that South Africa has large net exports (Hausmann and Klinger, 2006).

Moreover, the specialisation indices applied to exports for South Africa’s trading partners that include the United States (US), the SADC, SACU and the European Union (EU), show huge differences in size and development. This was mainly explained by considerable initial differences in trade structures. However, since the mid-1990s, the concentration indices showed a more continued converging trend. In 2003 for instance, indices for total exports and the aggregate of manufactures in exports to the US and the EU were all in the range 0.043 to 0.075, with a slightly higher value for primary, crops and gold. Exports to the SADC region generally showed very low index values during the same time period. The trend of convergence indicates the rise of a more stable and diversified export composition (Bahta, 2004). Table 2.1 on the next page, illustrates the South African export structure for 1985, 1990, 1995, 2000, 2005 and 2010.
Table 2.1: Export share of products in the South African export basket in R millions

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<td></td>
</tr>
<tr>
<td>Machinery &amp; transport Equip</td>
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<td>2515</td>
<td>8988</td>
<td>31694</td>
<td>60907</td>
<td>98491</td>
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<tr>
<td>Office &amp; telecom equip</td>
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<td>0</td>
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<tr>
<td>Electronic data processing &amp; office equip</td>
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<td>978</td>
<td>995</td>
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<tr>
<td>Telecommunications equip</td>
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<td>2387</td>
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<tr>
<td>Circuits &amp; electric components</td>
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<td>0</td>
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<tr>
<td>Automotive products</td>
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<td>2648</td>
<td>11845</td>
<td>27687</td>
<td>49073</td>
</tr>
<tr>
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<td>432</td>
<td>863</td>
<td>1644</td>
<td>1985</td>
<td>1691</td>
</tr>
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<td>Clothing</td>
<td>118</td>
<td>0</td>
<td>596</td>
<td>1512</td>
<td>1101</td>
<td>740</td>
</tr>
</tbody>
</table>

Source: Own graph constructed from data available from WTO (2012).

From Table 2.1, South Africa’s exports basket composition was mainly dominated by the mining sector prior to independence, with the sector accounting for more than 15 per cent of the country’s total exports in 1985. The main reason for the mining sector comprising the highest percentage share in the export basket was because of the reluctance of the government to promote other industries due to the abundant supply of minerals in the country. Another reason was the barriers that were faced by South African firms in foreign markets due to economic isolation experienced by the country (Faulkner and Loewald, 2008).

Before 1985, the South African export basket was dominated mainly by products from four product lines which included agriculture, fuels and mining, manufactures and the iron and steel industry (Petersson, 2005). Exports from these sectors accounted for approximately 43 per cent in 1985 and 60 per cent in 1990 of the total export basket. However, South Africa has ever since the 1990s relatively diversified its export basket. It can be seen from Table 2.1, that the country has expanded the number of products in the export basket from less than 7 in 1985 to more than 12 in 1995. This was a direct result of the lifting of sanctions and removal of trade barriers leading to freer international trade. Generally in the past the South African
export basket like any other developing economy, comprised of more primary products compared to manufacturing products. For instance, in 1985 the primary products group accounted for more than 25 per cent of the South African export basket, with manufacturing exports accounting for only 18 per cent (Naude and Rossouw, 2008).

Edwards and Golub (2004) submit that due to extensive trade liberalisation, the South African export basket structure was already experiencing some changes as early as 1990. With the abandonment of the highly infant industry protecting strategy over the infant iron and steel industry in the country, the economy realised positive exports from the industry by approximately R5610 million in 1990, constituting 7.8 per cent of total exports. The outward looking strategy which saw the encouragement of exports through the use of subsidies to even prospective exporting industries opened doors to the exportation of many more products such as:

- Chemicals,
- Pharmaceuticals,
- office and telecommunication equipment,
- electronic data processing and office equipment,
- circuits and electric components,
- automotive products,
- telecommunications office and telecom equipment, and
- machinery and transport equipment.

These newly introduced exports have increased momentously since their introduction. From Table 2.1 it can be noted that the newly introduced products constituted 37 per cent of total exports in 2005 from only 11.7 per cent in 1995.

After the demise of apartheid, liberalisation of trade and the lifting of sanctions, freer movement of products in and out of the country was encouraged with the manufacturing sector experiencing the largest share of total exports (Kusi, 2002). By 1995, manufactured goods contributed 49.44 per cent higher than the mining sector which contributed 44.81 per cent to South Africa’s total exports. The mining sector’s share declined from 54.79 per cent in 1992 to 40.52 per cent in 2010. The manufacturing sector contributed 54.99 per cent of exports in 2010 compared to 39.41 per cent it contributed in 1992. In 1999, the manufacturing sector was the most significant contributor to the GDP of South Africa as it
accounted for at least 20 per cent of the value added in the country (Hausmann and Klinger, 2006). Though the mining sector continued to be South Africa’s main foreign exchange earner (gold and diamonds), it accounted only for 8.1 per cent value added in 1999 (Nattrass, Wakeford and Muradzikwa, 2000: 13). The growth in the manufacturing exports can be attributed to increases in confidence levels by investors, causing them invest more in manufacturing firms thereby creating more output available for exportation. From Table 2.1 it can be noted that the share of agricultural products in total exports slightly increased from 3.66 per cent in 1992 to 4.18 per cent in 2010. The share of other trade declined during the period of 1992 to 2010 from 2.13 per cent to 0.32 per cent, respectively.

2.4 Economic Growth in South Africa (1980-2010)

According to Du Plessis and Smit (2005), South Africa’s economic growth is affected by a lot of factors that include, among others, the role of demand side policy intervention by the government, capital and human accumulation, monetary and fiscal policy and technological change. South Africa experienced prolonged rather slow economic growth between the years from 1984 and 1993 due to internal political instability, trade and financial isolation. Another main factor behind South Africa’s position in Africa in terms of its real GDP growth is the abundance of natural resources, a well-developed financial, legal, communications, and energy and transport sector in the country (Du Plessis and Smit, 2005).

South Africa is regarded as the economic powerhouse of Africa, leading the continent in industrial output and mineral production. In addition, the country’s stock exchange is ranked among the top 20 in the world, fostered by modern infrastructure supporting efficient distribution of goods and services throughout the southern African region (Pillay, 2002). Though mining is regarded as the main component of the South African economy, due to its fixed and non-renewable nature of such resources, it was the worst performing sub-sector during the period of 1990 to 1999 with an average real growth rate of only 0.3 per cent (Miller, Saunders and Oloyede, 2008).

However, South Africa’s economic growth currently has been rather unsatisfactory when compared to that of 1960. For instance, GDP per capita in 2004 was only 40 per cent higher than it was in 1960. South Africa’s economy experienced low economic growth and a relatively small market size which accompanied the political transition from 1990 to 1994. Bold macroeconomic reforms and policies have boosted the country’s competitiveness, economic growth and opened South Africa to international markets. Using the expenditure
side, South Africa’s real economic growth was relatively related to growth in the country’s domestic consumer expenditure. Domestic expenditure increased by an average of between 0.6 per cent in 1995 to 3.2 per cent yearly from 1995 to 2004. This was a direct result of a 5.1 per cent increase in expenditure on fixed investment, 3.7 per cent increase in expenditure on household goods and services on a yearly basis (Miller et al., 2008).

South Africa’s political turnaround in 1994 created optimistic expectations to the country’s economic performance. Furthermore, the average real GDP growth rate for the decade covering 1995 to 2004, improved remarkably by an average of 0.8 per cent to 3 per cent (Du Plessis and Smit, 2006). Miller et al. (2008) state that of the main three sectors that constituted the GDP, the tertiary sector out-performed the primary and manufacturing sectors with a real growth rate of 3.8 per cent from 1995 to 2004. During the same period the tertiary sector accounted for more than three quarters of GDP growth. Following the tertiary sector was the manufacturing sector which accounted for 17 per cent of GDP growth with the primary sector constituting 0.4 per cent of overall economic growth (Miller et al., 2008). Figure 2.1 on the next page illustrates trends that have happened in South Africa’s GDP from 1980 to 2010.

Figure 2.1: Gross Domestic Product (1980-2010)

![GDP graph]

Source: Own graph made with statistical data available from SARB (2012).

From Figure 2.1 it can be noted that real GDP was somehow very volatile in the 1980s though it generally increased from R935617 million to R1090366 million in 1980 and 1989,
respectively, reflecting a 16.54 per cent increase. However, GDP fell to R981994 million in 1982 from R985773 million in 1981, and further decreased by 1.85 per cent in 1983. This was mainly due to the fact that the economy was dominated by low-productivity and low-employment as a result of low competition faced by domestic industries from international firms due to high protectionism. In other words, domestic firms could not strive to increase productivity efficiently due to low import competition hence reducing the gross output of the country. The country’s real GDP boosted in 1984 by 5.10 per cent to R1013009 million from R963861 million in 1983. However, the increase was short-lived because by 1985, the GDP had decreased by approximately 1.21 per cent. Such variability in South Africa’s GDP was a direct result of the debt crisis for 1983, in the form of short-term foreign debt which led to the country facing financial shortages leading to the weakening of the Rand. This had a direct negative impact on the production and consumption levels of the South Africans (Flatters and Stern, 2007).

From 1985 to 1989, the South African GDP experienced sustained expansion and had reached R1090366 million by 1989. The prolonged increase in GDP for that period was closely related to the efforts of the South African Reserve Bank (SARB) of stabilising the Rand in relation to other currencies. This directly led to stability in the economy thereby maintaining positive terms of trade. The country’s GDP declined in the early 1990s, by more than 2 per cent to R1052848 million in 1992 from R1086901 million in 1990. This was a direct result of the tightening political situation, dominated by strikes, go slows and employee grievances which negatively affected productivity (Edwards and Lawrence, 2006).

GDP increased by 1.23 per cent from R1052843 million in 1992 to R1065830 million in 1993. Furthermore, gross output for South Africa continued to increase after 1994 up to when the negative effects of the global financial crisis were felt in 2009. In other words, South Africa experienced the longest period of economic expansion in the country’s recorded history between 1992 and 2008 (Mnyande, 2010). Increases in GDP were sustained due to the attainment of democracy by the country in 1994. This created an environment which reduced risk, hence creating investor confidence to invest in the country. On the same note, the South African government had also embarked on prudent fiscal and monetary policy such as the announcement of the adoption of the inflation targeting strategy by the SARB in the 2000-2001 budget. Through the use of rational expectations, inflation targeting policy has been used successfully to reduce inflationary expectations that might directly translate into
inflation thereby stabilising the economy, the exchange rate and boosting investor confidence (Nattrass et al., 2000: 233-234).

On the contrast, South Africa’s total output decreased by more than 1.5 per cent to R1786637 million in 2009 from R 1814532 million in 2008. Sluggish growth experienced by the country in 2009 was as a result of many factors which included the depreciation of the Rand, the credit crunch and the global financial crisis of 2008, which directly led to increased oil prices thereby increasing costs of production. In addition to that, GDP growth in 2010 was only 2.89 per cent, lower than the 2008 rate of 3.62 per cent. This was mainly as a result of harsh domestic economic conditions experienced by the country together with a deteriorating global environment (Naude, 2009).

2.4.1 Export diversification and economic growth in South Africa (1980-2010)

Faulkner and Loewald (2008) identified one of the central objectives of the South African government macroeconomic policy as maximising the economic benefits that accrued due to globalisation. This was to be achieved by increasing the foreign demand of the country’s exports, hence enabling excessive inward flow of foreign currency and capital into the economy. However, this could only be achieved if the country’s exports were more diversified such that export instability could be reduced. In other words, the government aimed at increasing export diversification levels by providing for a broader base of sustained export growth, less vulnerability to volatile world prices. In response to that, the government came up with supporting measures to promote other exporting industries which were facing competitive disadvantages in the foreign market, in form of export subsidies.

Liberalisation in the 1990s also played a very important role in stimulating total exports especially non-commodity exports. This was achieved by intensive privatisation together with re-directed subsidies from government firms to private firms in a move to avoid the inefficiencies associated by the public sector. As a result importing became cheaper through reduced tariffs and hence reducing input costs for firms using imported inputs. This directly led to increased levels of non-commodity produce and thereby reducing prices in both domestic and foreign markets (Faulkner and Loewald, 2008).

South Africa’s export basket was in the past relatively more diversified compared to other southern African countries. However, the country once became a victim of a more concentrated export basket during the period of 1970 to 1995. The years of less
diversification coincide with the period of economic hardship for the country as a result of isolation due to the apartheid regime, the national debt crisis of the 1980s and gold price booms in the 1970s. As is if this was not enough, South Africa also suffered from self-inflicted wounds of high import protection which directly discouraged the exportation of manufactured products as a result of high input prices (Naude and Rossouw, 2008).

On the opposite, after 1996, South Africa started to experience the positive benefits of growing international and regional economic integration, accompanied by import liberalisation. In addition to that South Africa was granted duty-free access to the US and EU markets for most industrial products. This was reinforced further by the country’s negotiation of two free trade areas with the EU (2000) and SADC (2001). This directly resulted in declining export concentration between 1996 and 1999. The reduction in export concentration levels was also a direct result of decreased non-monetary gold exports. Due to increased competition in the 1990s especially from abroad, South African manufacturing industries were able to acquire cheaper and better quality capital and intermediate goods. To add on to that, liberalisation also stimulated foreign direct investment and multinational firm’s production in the country. It further boosted competition in import competing sectors of the economy, hence increases in intra-industry trade and consequently a more diversified export basket. Export diversification through intra-industry trade specialisation also resulted from simultaneous growth in imports and exports (Petersson, 2005).

With increased trade openness associated with the country after 1994, by 2003 manufacturing firms no longer exported on a vent for surplus basis only but rather became firmly well-established in international markets. Though the country experienced some increases in export diversification levels, resource-based and low-technology manufacturing exports’ share decreased from 44.7 per cent and 19.4 per cent in 1988 to 31.4 per cent and 16.3 per cent in 2002, respectively. This was in turn associated with GDP increases in the country, as total output increased from R1064864 million in 1988 to R1386435 million in 2002 (Petersson, 2005). During this same period other factors such as direct investment, stability of the Rand and reduced inflationary pressures, also greatly contributed to GDP growth. However, in general South Africa’s data suggests a negative relationship between GDP growth and export concentration. Figure 2.2 on the next page illustrates the movements in export diversification measured by the Normalised-Hirschmann Index (NHI) and economic growth (GDP growth rate) trends in South Africa.
Figure 2.2: Export diversification and economic growth trends (1980-2010)

Source: Own graph made with statistical data available from SARB (2012) and WTO (2012).

From Figure 2.2 on the previous page, increases in export concentration are associated with declining economic growth on average, though the relationship seems to be weak. From the early 1980s to 1986, the export concentration index was well below 0.3, suggesting high levels of export diversification. During the same period economic growth was very volatile ranging from more than 6 per cent in 1980, to -1.85 per cent in 1983. In other words export composition structure had little impact on the growth of the economy during the period. The main reason behind such experiences mainly lies with the volatility of the Rand due to the exchange rate regime adopted by the government during that time and high levels of political instability. The economic environment in the country during that period directly led to investment variability and some risk adverse investors totally withdrew their investments from South Africa (Faulkner and Loewald, 2008).

In 1987 the South African export basket became more concentrated with the index increasing with more than 100 per cent to 0.56 in 1987 from 0.26 in 1986. During the same year economic growth also increased but by a larger margin from 0.02 per cent in 1986 to 2.10 per cent in 1987. The larger part of growth in the economy was a direct result of increased production in minerals enhanced by favourable gold prices in international markets during the
year (Edwards and Golub, 2004). The increase in export concentration was short-lived; by 1988 export concentration was already declining and reached 0.28 by the end of the year. On the contrast, economic growth increased during the same year to 4.2 per cent. The pillar of such continued growth and decline in export concentration in the South African economy was due to the stability of the Rand in relation to other foreign currencies (Edwards and Lawrence, 2006).

Export concentration also increased significantly by 17.29 per cent to 0.33 in 1989 from 0.28 in 1988. High concentration in a few numbers of exports products was caused by high barriers to trade that dominated the South African trade and industry policy. Associated with that export concentration increase, was a dramatic fall in GDP growth to less than 3 per cent. Odhiambo (2009) identified the causes of the dramatic decline to include trade and financial sanctions, political unrest, and debt crisis, which negatively affected prospects for substantial capital inflow especially from abroad.

Export concentration continued to increase in the early 1990s to 0.62 in 1993 from 0.41 in 1990. In other words export diversification decreased by more than 50 per cent between 1990 and 1993. Such increases were also closely associated with political unrest and the infant industry strategy which hindered production of products for international markets. In reaction to the export diversification decreases, economic growth was negative for the whole period of 1990 to 1992, and was slightly above 1 per cent in 1993. Other reasons that contributed to the decline of economic growth were insufficient domestic savings that directly led to dampening investment in both capital and human inputs, and isolation of the country from economically well countries (Fedderk, 2005).

Furthermore, export diversification increased from 1994 to 1996, averaging 0.47. The period was also associated with extensive trade liberalisation, which saw the reduction in tariff lines and levels, the abolishment of trade sanctions and achievement of political stability. All these factors worked for the good of export composition, in the sense that firms requiring imported inputs for their production could access such inputs more easily and cheaply. This directly resulted in increased non-traditional exports of the import-competing product groups, characterised by import surpluses. When levels of export diversification increased between 1994 and 1996, economic growth also increased with positive margins. Economic growth reached a peak of 4.31 per cent in 1996. Among other reasons for positive economic growth
was increased direct investment resulting from investor confidence increases due to the end of political unrest in the country (Arora and Vamvakidis, 2005).

However, though trade openness increased due to extensive trade liberalisation during the period of 1997 to 2010, the export concentration index averaged 0.55, and reached the highest of 0.59 in 2008. The 2008 export concentration index was relatively high suggesting that the South African export basket was becoming less diversified. South Africa as an emerging market economy was heavily affected by the 2008 global credit crunch, global financial crisis and depreciation in the Rand. However, economic growth associated with this period varied from positive to negative rates. For example, the economic growth rate decreased from 4.31 per cent in 1996 to 2.65 per cent in 1997, and continued to decline to less than 1 per cent in 1998. The small growth of the economy was a result of the adverse effects of the 1998 Asian crisis, which affected developing emerging economies heavily (Naude, 2009).

The economy however, recovered quickly in 1999 and the total output grew by 2.36 per cent and continued to grow in 2000. South Africa achieved high economic growth in 2000 due to increased investment associated with the expected stability of the economy due to the inflation targeting policy adopted by the South African Reserve Bank (SARB) during the same year. The economic growth rate of South Africa drastically declined in 2001 to 2.74 per cent and even failed to recover to the 2000 peak level up to 2003.

Sluggish growth in 2001 could be attributed to considerable volatility in the economy resulting from international financial uncertainty as a result of the dotcom bubble busting in the US (Faulkner and Loewald, 2008). During the years 2005, 2006 and 2007, South Africa experienced booming economic growth which averaged above five per cent. The growth of the economy however drastically declined in 2008 and even reached -1.54 per cent in 2009 due to the global financial crisis. In 2010, the South African economy gained 2.89 per cent in terms of growth. Increased total output in 2010 was attributed to relatively stable and low interest and inflation rates in the country (Devarajan and Kasendeke, 2011).

2.5 Possible factors affecting export diversification in South Africa

This section discusses the possible determinants of export diversification in South Africa. Variables taken into consideration include trade openness discussed in Section 2.5.1. Section
2.5.2 discusses the South African exchange rate while Section 2.5.3 and Section 2.5.4 deal with gross capital formation and human capital, respectively.

2.5.1 Trade openness in South Africa (1980-2010)

Trends in trade openness in South Africa have been subject to volatility due to a lot of factors such as the different trade policies adopted by the government, economic situations in neighbouring countries and political instability among others. Trade openness can be seen as the extent to which a country engages in international trade. It therefore deals with the current account section of the balance of payments. Trade openness can affect export diversification positively because the more a country increases its trade with other countries the more its ability to export diversified products increases. However, increased trade openness in the form of increased exports may lead to inefficiencies in the production of a country’s products. This can happen for those countries that have reached their optimal levels of production resulting in decreases in export diversification.

Due to political instability in the 1980s, South Africa could not produce products sufficiently to allow for more exports, and hence the unavailability of foreign currency to import, resulting in low trade openness levels in the country. Furthermore, the weakness of the Rand in comparison to other currencies made it difficult for importers to buy more commodities from abroad. This was worsened by the high protection that prevailed over imported South African products in the form of tariffs, surcharges and specific duties (Edwards and Lawrence, 2006).

On the opposite side, Kusi (2002) pointed out that the South African government also embarked on successful bilateral negotiations to further enhance trade openness and these led to South Africa joining a number of trading blocks. To date, South Africa is involved in formal trade relations with various economies by means of treaties, trade agreements and membership in international trade institutions. As a result, in 1994 Switzerland was regarded as an important destination for South African diamonds and it purchased the largest share of South African exports. South Africa was also a member of (SACU) since 1889 (Lehloeny, 2009). In order to boost its trade, it considered increasing its visibility in other trading blocks. South Africa gained preferential market access to other major trading blocs such as the EU in October 1999. In addition, South Africa successfully joined SADC in 1994, envisaging the creation of a free-trade zone which was signed to serve for over eight years in 1996.
(Department of International relations and Cooperation, 2004). This was done to further promote trade between South Africa and the international community.

However, due to extensive trade liberalisation experienced by South Africa since the early 1990s, the economy has ever since opened up to foreign markets. Trade openness, especially in terms of exports was also intensified by the economic collapse of the neighbouring country Zimbabwe. Domestic industries in Zimbabwe failed to meet domestic demand due to galloping inflation triggered by the controversial land reform program and more than required printing of money in the period of 2005 to 2008. This resulted in monetary inflation where too much money was chasing too few goods. This has seen a lot of the active population from Zimbabwe immigrating to South Africa, Botswana, United Kingdom (UK), Australia and the US with traders resorting to order products for resale from South Africa and Botswana. Even after Zimbabwe abandoned the use of its own country and resorted to the use of the Rand and the US dollar, investors have not yet built enough confidence to face the risk of investing in the country, hence under-production of products and failure to meet consumer demand. In other words, the economic situation in Zimbabwe has also created a competitive market for South African products (Noko, 2011). More so, South Africa also sells a lot of goods to other southern African countries such as Zambia, Malawi and Mozambique.

**Figure 2.3: Trade Openness in South Africa (1980-2010)**

![Graph showing trade openness in South Africa from 1980 to 2010](image)

Source: Own graph made with statistical data available from SARB (2012).
In general, South Africa experienced trade openness levels that were very low though increasing on average since 1980, slightly fell in 1981, and rose again in 1985. The actual fall in openness was; 1981 by 0.39 per cent from 0.23 to 0.21 in 1980 to 1981 respectively. Another significant decrease in trade openness was in 2003 but the trade activities of the economy rapidly recovered and increased again from 2004 up to 2008 when it significantly fell again. Trade openness level averaged 0.22 for the whole period of 1980 to 1989. The least of international trade activities happened in 1983 when the share of trade to GDP was only 20.55 per cent. The main reason for the fall in trade openness by South Africa was mainly attributed to too much deregulation of exchange controls leading to the maxi-devaluation of the Rand. Though massive devaluation was first associated with increased exports, it quickly led to a decreasing marginal propensity to import because importing became relatively expensive than before (Tsikata, 1999).

Trade openness however slightly increased by 0.48 per cent in 1985 from 20.65 per cent in 1984. Trade activities generally continued to increase in South Africa for the whole period of 1985 to 1989. The openness level raised from 22.95 per cent in 1985 to 25.51 per cent in 1989. Lewis (2001) suggested that the main reason behind the sustained increase in trade openness was the nature of exports coming from the country, for example gold and diamonds experienced high demand in the international markets especially from the developed countries such as Switzerland, Japan and the US. More so, though the country faced a huge debt crisis in 1985 and some political instability that impeded the full utilisation of resources, the South African government had already started to liberalise its trade by the late 1980s. Trade openness levels also remained below 30 per cent due to the trade barriers that distorted free trade in a move to protect domestic infant manufacturing industries.

From figure 2.3 it can be noted that total trade as a share of GDP continued to increase even in the 1990s. It was however, below 30 per cent for the first three years but increased slightly to 31.15 per cent in 1993. The South African economy continued to expand its trade activities with other countries in the 1990s, with trade openness averaging 35.42 per cent for the period. Due to the positive effects of the outward looking strategy and extensive export promotion embarked on by the South African government in 1994; in 1995 the country experienced the first highest increase of 1.23 per cent in trade openness. Trade openness continued to increase after 1995 but slightly fell in 1999 to 42.29 per cent from 42.70 per cent in 1998. Nattrass et al. (2000: 252) contended that the reason behind the fall was directly linked to decreases in imports experienced due to the negative effects of the emerging market
crisis which originated in the East Asian countries. Investors had built too much confidence in the countries and hence invested a lot into short term structure finance, leading to a surplus of short-term loans. Consequently this resulted in risky loans and unsound investment which directly led to investor confidence crash. As a result investors started to withdraw their funds also from other emerging market countries including South Africa, leading to the depreciation of the Rand hence affecting international trade.

Generally, the larger proportion of trade activities conducted by South Africa in the 1990s was in the form of exports. In other words South Africa experienced positive terms of trade during the period covering 1990 to 1999. The explanation for such a sustained growth in net exports lied behind the outward looking strategy which promoted export growth in the form of direct export subsidies on manufactured goods and incentives to exporters, duty free imports for exported goods in the clothing and textile, and the motor industries. This directly led to the availability of foreign currency for the importation of needed raw materials for further production, hence boosting domestic industries that use domestically unavailable inputs (Edwards and Alves, 2005).

Though South Africa continued to outperform its neighbours as far as international trade was concerned, it experienced some years of negative terms of trade in the 2000s. Another significant increase in trade openness occurred in 2000 when the share of imports and exports accounted for 46.21 per cent of total GDP in the country. However, South Africa started to experience decreases in net exports in 2002. On the opposite hand, due to increases in imports the country experienced increases in the level of trade openness of 52.33 per cent in 2002 from 48.39 per cent in 2000. Increases in trade openness during the period resulted from increases in commodity prices as a result of China emerging as an economic powerhouse (Faulkner and Loewald, 2008).

The first fall in trade openness in the period from 1992 to 2004 that the country experienced was in 2003. The trade openness level slightly decreased to 49.77 per cent in 2003 from 52.33 per cent in 2002. The reduction was a direct result of the Rand volatility in relation to major currencies such as the British Pound and the US dollar that occurred in 2001 (Takaendesa et al., 2006). Between 2004 and 2008, trade openness expanded to 76.05 per cent from 59.90 per cent before declining in 2009 to 60.54 per cent. The major reason for South Africa’s increased trade openness was its increased trade activities with the EU, SADC and SACU. However, as part of the global world and being an emerging market, South Africa
was not spared from the negative effects of the global financial crisis which originated in the USA in 2008.

2.5.2 The South African exchange rate (1980-2010)

According to Nattrass et al. (2000: 237), South Africa subscribed to the Bretton Woods exchange rate system before its collapse in 1973. In other words, the South African currency was pegged in relation to other currencies before 1973. During this period, major shocks in the form of significant gold price changes and political crises resulted in capital outflows and intensified trade sanctions, which complicated the management of the exchange rate. In 1979 greater flexibility was introduced into the foreign exchange market with a dual currency exchange rate system being used. The SARB announced an official exchange rate on a daily basis in line with market forces (Takaendesa et al., 2006). The exchange rate is the value of the domestic currency in terms of foreign currency. It is therefore a major factor which affects international trade because foreigners buy South African products considering the exchange rate. A low exchange rate for the Rand means that South African products are dearer in international markets thereby impacting negatively on export diversification. On the other hand, a high exchange rate for the Rand means that South African exports are cheaper in foreign markets and hence promote export diversification.

The dual currency exchange system was abandoned in 1983 with the commercial rate determined in the market subject to direct intervention by the South African Reserve Bank. A second exchange rate policy, the financial rand, applied to most non-resident portfolio and direct investment. In 1983, the financial rand was abolished. Following the debt crisis which was caused by the refusal of American banks to roll-over South Africa short term foreign debt, the Rand fell further in 1985. The Reserve Bank maintained a direct influence on the exchange rate through active intervention in both the spot and forward markets.

Currently the mission of the SARB is to protect the value of the Rand hence it tries by all means to keep the value of the country’s currency reasonable. Due to the negative effects of the flexible exchange rate system associated with volatility, the SARB opted to use the managed float system. The managed float allows the exchange rate to fluctuate under market conditions but permits the Reserve Bank to intervene in the market to minimise short run variability by adjusting the stock level of gold and foreign exchange reserves (Nattrass et al., 2000: 238). Due to the exchange rate system used, which was by nature volatile and unstable, movements in the South African currency in relation to other currencies were experienced
from time to time. Since the 1990s the SARB has adopted a non-interventionist policy in the foreign exchange rate market to complement the outward looking trade policy. The outward looking trade policy has ensured that export growth plays a critical role in promoting long-term economic growth. The flexible exchange rate brought about a lot of uncertainty and volatility in the exchange rate due to variability in market forces determining the exchange rates. In the 2000s, a lot of market participants perceived the Rand to be weak and this further led to the weakening of the Rand. Figure 2.4 below illustrates the movements of South Africa’s real effective exchange rate from 1980 to 2010.

Figure 2.4: Real Effective Exchange Rate of the Rand (1980-2010)

![Real Effective Exchange Rate of the Rand (1980-2010)](chart)

*Source: Own graph made with statistical data available from SARB (2012).*

From figure 2.4 above it can be observed that the real effective exchange rate was on average steadily appreciating from 1980 to 1984. There was however, a significant depreciation of the Rand’s real effective exchange rate in 1985 to105.7 per cent from 135.25 per cent in 1984. The depreciation was driven mainly by the collapse in the nominal exchange rate. However, relatively high inflation in South Africa and large inflows of portfolio capital during the late 1980 led to the appreciation of the real exchange rate (Takaendesa et al., 2006).
Figure 2.4 above shows that from 1988 the South African Reserve Bank was more active in stabilising the real effective exchange rate, partly out of concern for the international competitiveness of South Africa’s manufacturing exports, and in particular to prevent excessive appreciation of the real exchange rate at times when the nominal exchange rate tended to appreciate. The real effective exchange rate index (on a 2000 base year) appreciated gradually from 96.00 in the year 1988, to 104 by the end of 1992, where after it depreciated to 97.18 by the end of 1994 (Todani and Munyama, 2005).

Real effective exchange rate appreciated in the early 1990s, suggesting a relatively higher inflation rate and large inflows of portfolio capital in the country. With the lowering of inflation and speculative attacks in 1996, the exchange rate level fell drastically. Despite a disadvantageous real exchange rate between 1990 and 1992, South Africa’s exports grew. Decline in the Real Effective Exchange Rate (REER) increased the competitiveness of South African exports, resulting in significant increase in the exports of South African products. During 1993 to 1994 as the exchange rate depreciated, input prices dropped and foreign demand boomed therefore exports increased. This coincided with the ending of sanctions resulting from the apartheid policies and the adoption of more outward oriented trade policies. The Rand depreciated significantly starting from 1997 to 1998 attributing to the SARB’s selling of foreign reserves with the objective of reducing the currency crisis (Nattrass et al., 2000: 237).

The South African real effective exchange rate depreciated by around 25 per cent in 2001. The Rand depreciated against major currencies in the same year (2001), falling by around 27 per cent against the US dollar, 28 per cent against the Euro and 26 per cent against the British pound in real terms. The depreciation was caused by various adverse external and domestic developments leading to the deterioration in the country’s Balance Of Payments (BOP), hence the decline in the supply of foreign currency (Shelile, 2006).

Around October 2002, the Rand strengthened reversing past trends. The currency’s appreciation was a result of the general dollar weakness, an improvement in global commodity price, particularly gold and platinum, favourable real interest rate, differential improved investor sentiment towards the emerging market, and the elimination of South Africa’s net open forward currency position. The Rand appreciated with 29 per cent against the Euro, 67 per cent against the US dollar and 35 per cent against the British Pound from 2002 to 2004 (Caporale and Gil-Alana, 2010).
The Rand started to depreciate in 2006 to 2008 from 112.5 per cent in 2004 to 94.09 per cent in 2008. The period was largely comprised of oil shocks, world price crisis and further deterioration of the Zimbabwean economy which led many Zimbabweans resorting to the informal use of the Rand. The Rand started to appreciate in 2009 and continued to do so up to 2010 mainly due to the formal use of the Rand and the US dollar in the neighbouring Zimbabwe among other factors (Mnyande, 2010).

2.5.3 Gross Capital Formation (1980-2010)

Investment has a long and complex history in the South African economy. Foreign corporations came in the country immediately after Britain established a colony in the 19th century, though most of them focused on the production of agricultural products for exportation to Europe. However, the discovery of diamonds in the 1860s triggered the need for considerable need in capital for the full exploitation of such resources. This saw massive inflows of both direct and portfolio investment especially from foreign based investors (Khamfula, 2004). In other words, South Africa as a destination for both foreign and domestic investment has undergone a lot of changes due to inducing factors that caused policy changes. For instance in the 1980s, both domestic and foreign investment declined significantly due to growing international campaign against apartheid which led to economic isolation, and substantial political instability in the country. Resultantly, there was a slowdown in productivity due to reduced domestic and international spill-overs, hence a fall in investment profitability.

On the other hand, the domestic market had very limited income to be able to sustain the production of manufactured products especially those in the luxury basket. As a result foreign investors started to withdraw their investments. This saw approximately 20 per cent of the UK based firms and 225 US corporations leaving South Africa between 1984 and 1988 (Rattso and Stokke, 2007).

After 1985, foreign banks creditors also imposed a debt repayment schedule on the South African government and public sector borrowers. This directly led to a significant fall in portfolio investment inflows in South Africa. However, like any other emerging market economy, South Africa experienced a new dawn of increases in FDI in the 1990s due to the political transition in 1994 that reversed disinvestment pressures. After 1994, the South African government was committed at lowering the fiscal debt, inflation, liberalising the financial system and capital account. This was all done together with a more outward looking
trade regime aimed at creating a more attractive environment for investment (Rattso and Stokke, 2007).

In 1996, the South African government announced the Growth, Employment and Redistribution (GEAR) policy. The policy identified low savings as the main constraint on the growth of the country. In addition to that the GEAR policy suggested that low savings could be alleviated by positive net capital inflows. In other words FDI was preferred as a solution to address low savings and consequently economic growth. The GEAR policy hence came up with six targets to help in the achievement of the policy’s objectives. One major target was to promote investment in non-commodity sectors through the reduction of the Rand volatility. Another policy was to promote investment in public infrastructure such as roads, harbours, sea ports and railways. In addition, the GEAR policy also argued for the reduction in barriers of entry into industries so as to promote more new investment opportunities and competition (Khamfula, 2004).

Du Toit and Moolman (2007) argue that though FDI is regarded as one of the essential drivers of economic growth. Increased levels capital investment such as buying of machinery makes it possible for a country to be able to produce a wide range of products thereby impacting positively on the export diversification of the country. South Africa’s investment levels were lower than the government official target rate constituting only 25 per cent of the country’s GDP. The straining factors behind such low investment levels included job shedding to significant decline of South African exports demand in foreign markets and privatisation. In the 2000s, FDI was mainly concentrated in only five sectors of the economy which included energy and oil, food and beverages, leisure and gaming, motor and components and telecommunications. To add on to that, FDI in South Africa was mainly natural resource and market seeking based (CUTS, 2003). Figure 2.5 on the next page serves to illustrate trends in total investment in South Africa for the period from 1980 to 2010.
From early 1980s to early 1990s, South Africa experienced very low gross capital formation levels which were less than R200 000 billion. Such low investment levels were caused by a number of factors such as low confidence levels by investors to invest in the country due to political instability, economic isolation and a bleak economic future that prevailed in the country due to high levels of uncertainty. Another, significant reason for such low levels of investment in the country was the low level of savings associated with the period between 1980 and 1990 (Barbour, 2005).

After 1994, gross capital formation in South Africa followed an upward trend to around 1998 when it started to decline. From Figure 2.4 above it can be seen that investment rose from R 139860 billion in 1994 to R186953 billion in 1998. The increases in investment levels for the period between 1994 and 1998 were caused by the ability of South Africa in opening its market to the international community as a result of the end of the apartheid rule and the removal of sanctions imposed on the country. This was further fostered by the announcement of the GEAR policy in 1996, which encouraged savings and investment (Du Toit and Moolman, 2007).

However, the openness of South Africa came about with its own side effects such as the effects of the international financial market instability as a result of the global economic crisis.
that originated from the South East Asian crisis in 1998. The crisis led to the decrease in South Africa’s investment in 1999 by around 7.5 per cent from R186953 billion in 1998 to R172753 billion in 1999 (Khamfula, 2004). South Africa recovered in 2000 and recorded a positive increase of about 3.9 per cent in gross capital formation. The increase in investment was a direct result of the adoption of the formal inflation targeting as a monetary policy instrument to protect the value of the country’s currency. The adoption of the inflation targeting policy significantly boosted investor confidence as it implied more stability in the economy (Merwe, 2004).

It can be observed from Figure 2.4 above that gross capital formation in South Africa continued to rise from 2000 to 2008. Over the eight years, investment increased by more than 100 per cent. This was attributed to the stability of the economy, specifically in terms of the prevailing inflation rate and interest rates which were in most years below 10 per cent and averaged 13 per cent, respectively. From 2008 to 2009 capital formation significantly decreased to R376030 billion from R384655 billion, respectively. In 2010, though there were a lot of positive prospects of investment due to the soccer world cup hosted by the country, capital formation only increased by a small margin of less than 5 per cent. This was mainly due to the subprime crisis effects that originated in the US (Mnyande, 2010).

2.5.4 Human Capital (1980-2010)

Before 1994 South Africa was under apartheid rule which implied a lot of discrimination in many sections of life. Education was not spared from such discrimination, where schools were governed by racially segregated government agencies according to their classification and by their population groups. According to Yamauchi (2010), after 1994, discriminatory and segregating barriers that prevented African children from entering other schools were discontinued. However, in reality schools attended primarily by white children have maintained their superior quality over those attended by Africans. The government introduced the South African School Act and the Norms and Standards for School Funding to provide guidance in implementing a non-segregated education system. In spite of institutional reform, economic and spatial divides between whites and others have not changed significantly, and this reality is reflected in the education system.

South Africa is ranked among the highest in terms of income inequality in the world; its Gini coefficient is around 0.6. Given the difficulty in redistributing physical and financial assets, such as land, to Africans by drastic means, the formation of human capital to accommodate
the majority of Africans appeared to be one of the most feasible methods for improving equity in the economy. Human capital directly improves individual earning capacity. On the other hand, through the public education system, the government is expected to progressively help the poor. Equal access to quality education plays a crucial role in guaranteeing this outcome (Yamauchi, 2010). The graph below shows the changes that happened in government spending on education from 1983 to 2009.

**Figure 2.6: Government spending on tertiary education (1983-2009)**

![Graph showing government spending on tertiary education from 1983 to 2009.](image)

*Source: Own graph made with statistical data available from SARB (2012).*

It can be noted from Figure 2.6 that the South African government spent less resources on tertiary education in South Africa from the early 1980s to around 1997. This was mainly because few students especially the Africans could enrol in tertiary institutions. The main factor behind this was that a lot of Africans did not have enough resources to afford paying for tuition and stationery. Secondly, some of them could not secure places at tertiary institutions mainly because of the ethnic group they belonged to. All this was mainly due to the discrimination which prevailed under the apartheid rule (Yamauchi, 2010).

From 1997 the South African government has embarked on heavy spending in the education sector in form of building of infrastructure (school classes), bursaries, grants and scholarships. Heavy investment in education was mainly driven with the main aim of trying to achieve equitable distribution of income. By 2009 the South African government was
spending approximately R 143721 billion on tertiary education. The driver of tertiary education system is also to enhance productivity and increase the quality of products produced. This is done in order to reduce flaws and avoid defective produce, hence increased total output produced in the country. Human capital accumulation is a positive contributor to the quality of the economy’s labour force (Ickes, 1996), this affects affecting the productivity and efficiency of the economy allowing for increased export diversification.

2.6 Conclusion

South Africa was involved in limited trade activities with other countries before 1994 due to the trade regime adopted by the country. During the same period exports were fairly concentrated. The South African government has after 1994 been involved in a series of trade liberalisation policies. This was accompanied by significant increases in economic growth, trade openness and investment in both capital and human resources in the country. Though, South African exports remain concentrated on a few number of export sectors, trade openness and investment has substantially led to the successful development of the manufacturing industry for both domestic consumption and exportation. More so, export concentration indices movements were associated with opposite movements in the growth of the country’s economy.
CHAPTER THREE
LITERATURE REVIEW

3.1 Introduction
This chapter reviews theoretical and empirical literature behind export diversification and economic growth. The theoretical section reviews theories such as static theories of trade, dynamic theories of trade and the endogenous growth model. The empirical section explores studies that have been conducted by authors in different countries regarding the effect of export diversification on economic growth. This chapter is divided into three sections. Section 3.2 covers the theoretical literature, Section 3.3 discusses empirical literature and Section concludes the chapter.

3.2 Theoretical literature
The theoretical literature is discussed in line with considerations made to the static theories of trade, the dynamic theories of trade and the growth theories. The static theories review the Heckscher-Ohlin (H-O) model, the factor-price equalisation theorem and the Leontief paradox. In addition, the dynamic theories of trade are discussed in line with the Imitation Lag Hypothesis and the Product Life Cycle Theory. The last part discussed the endogenous growth model.

3.2.1 Static theories of trade
This section discusses theories of trade which focus on static effects of international trade. Static theories of international trade discussed under this section include the H-O theory, the factor-price equalisation and the Leontief paradox.

3.2.1.1 Heckscher-Ohlin theory
The H-O theory was developed by Heckscher (1919) and Ohlin (1933) (Appleyard et al., 2010). The assumptions of Heckscher-Ohlin theory as presented by Appleyard et al. (2010) and Salvatore (2007: 123) are;

- there are two countries (Country I and II),
- there are two commodities produced (commodity X and Y),
- there are two factors of production (Labour and capital),
- the two countries use the same technology in the production of goods,
- commodity X is labour intensive while commodity Y is capital intensive,
• Country I is labour abundant while country II is capital abundant,
• production of both goods happens under constant returns to scale,
• perfect competition prevails in the factor and commodity markets,
• demand conditions and tastes are given and are the same in both countries,
• is perfect mobility of factors of production between countries, and
• there is no government intervention in trade and no transportation costs and all factors of production are fully employed in both countries

In general terms the theory suggests that comparative advantage is mainly determined by differences in relative factor endowments between countries (Salvatore, 2007: 123).

According to Smit and McCarthy (2000: 47), the main distinguishing assumptions of the theory are that countries are differently endowed with factors of production (factor abundance) and that different goods use different combinations of resources in their production (factor intensity). The theory implies that each country in the world is abundantly endowed with some factor resources and less endowed with some resources. Factor abundance can be defined using the physical unit concept (Jones, 1956), in which it focuses on the relative abundance of resources in terms of ratios in different countries. The relative prices definition postulates that a country’s production of good X is said to be labour intensive if the ratio of wages (price of labour) to interest rates (rental price of capital) that is \( \frac{P_L}{P_K} \) is lower than the production of that same good in in the other nation. The concept of factor intensity implies that it takes more labour than capital to produce some commodities that it does for the production of other goods (Salvatore, 2007: 125). A product is said to be factor intensive if it use more of that factor compared to the other. For example good X is said to be labour intensive if the ratio of labour to capital (L/K) used in the production of good X is greater than the labour to capital ratio (L/K) used in the production of good Y.

The H-O theory suggests that a country will export the commodity which intensively employs its relatively abundant and cheaper factor of production. On the other hand a country will import the commodity whose production requires the intensive use of that country’s relatively scarce factor. In simpler terms, a relatively capital abundant country will export the relatively capital intensive commodity and import the relatively labour intensive product. Furthermore, the theory also advocates for the identification of the factor endowments or factor abundance as the main determinant of comparative advantage and consequently the reason behind international trade between countries (Salvatore, 2007: 132). In addition, the
theory suggests that a country should specialise in the production and exportation of the commodity in which it has a comparative advantage. In other words, the H-O theory argues that a country can only gain from international trade if it specialises in the production and exportation of the product basing on its comparative advantage.

After countries engage in international trade, both countries are able to consume and produce beyond the initial levels of their Production Possibility Frontiers (PPFs) and indifference curves mainly due to specialisation. It can therefore be deduced that export diversification comes naturally to countries endowed with a lot of production resources in relation to other countries. The theory is not always applicable in the real world as sources of comparative advantage may also come from continuous research and innovation not only from different relative factor endowments as suggested by the H-O theory.

However, the validity of the model was questioned by many authors (such as Kravis (1956), Keesing (1966) and Baldwin (1971)) due to its oversimplifying assumptions (Salvatore, 2007: 149). Further studies such as the factor-price equalisation theorem that extended the H-O model were conducted.

### 3.2.1.2 Factor-price equalisation

Further studies after the discovery of the H-O theorem were conducted by Paul Samuelson (1970) which led to the direct formation of the factor-price equalisation theorem. The theorem states that factor prices adjust and become equal after countries have engaged in international trade with each other. In other words factor prices in partner countries tend to converge towards equilibrium due to specialisation and trade (Samuelson, 1949).

The scenario that exists before countries engage in international trade shows a higher degree of factor price differences. This is mostly because of the fact of the different supply conditions accompanied by the same demand conditions of the factors of production. Furthermore, before trade the relatively abundant factor is comparatively cheaper in the country in which it is abundant and more expensive in the country in which it is scarce. The same applies to the prices of products produced in these different countries. For instance a labour intensive product is relatively cheaper in the labour abundant country but much expensive in the capital abundant country (Samuelson, 1948).

Samuelson’s argument was that as each country specialise in the production of the product which intensively uses its relatively abundant factor, the price of that factor will increase in
that country and decrease in the country in which it is scarce. The theory argues that as countries specialise, the demand for their respective abundant factors tend to increase in each country. For example, a labour abundant country will demand more labour to produce more of the labour intensive product, hence driving up the price of labour in that specific country. On the other hand, the price of the relatively scarce factor, capital in this case, will fall due to the decline in its demand.

According to Chipman (1969), the theory suggested that there was a special relationship between the demand of commodities and the prices of factors of production which seem to be true in reality though price distortions may prevail in the markets. In other words a change in demand of one commodity was assumed to have a direct impact on factor prices and prices of final products. As the price of labour increases in the labour abundant country, so do the prices of labour intensive products in the other country. On the contrary, due to the decline of wages in the capital intensive country, it consequently leads to the decrease in prices of labour intensive products. According to the factor-price equalisation theorem, trade between countries continues to expand up to a point where factor prices are equal in different countries.

The factor-price equalisation theorem seems to be realistic in the real world but only when the concept of profit maximisation by producers is completely ignored. However, in reality, profit seeking is the main drive behind the involvement in production and supply of products especially for private producers. On the same note markets are always imperfect in reality, such that equalisation of prices in different counties may not be achievable. More so, factor-price distortions and differentials may be prevalent beyond international trade due to differences in trade unions power in different countries (Choi and Harrigan, 2003).

3.2.1.3 Leontief Paradox

A lot of studies were further conducted on the H-O model after 1950. Estevadeordal and Taylor (2002), Bernhofen and Brown (2010) conducted their studies with the main objective of testing the validity of H-O theory using trade data for various countries. The first empirical test was done by Leontief in 1951 (Choi, 2001). The empirical work by Leontief on the H-O model are still very significant today because his results contradicted with what the model proposed. Leontief used an input-output table of the United States of America (USA) for the year 1947. According to Leontief, USA was deemed to be the most capital abundant country in the world by that time. In other words, following the H-O model, USA was supposed to
export relatively more capital intensive products and import relatively more labour intensive products compared to its trade partners (Choi, 2001).

On the contrast, results from Leontief’s research were more stunning and totally the opposite of the H-O model. Leontief found out that USA import substitutes were about 30 per cent more capital intensive than USA exports (Choi, 2001). In other words, USA seemed to export relatively more labour intensive products and instead imported relatively more capital intensive products. However, Leontief’s results were questioned because of the author’s use of data on import substitutes instead of imports. On the same note, more bias was caused by the tariff policy of the USA which discouraged imports and thereby increasing the production of import substitutes locally. Another study by Kravis (1956) suggested that the most protected industries during that period were the labour intensive industries. This therefore distorted the natural flow of products between the USA and its trade patterns. In other words the USA was forced to produce more labour intensive products domestically because these goods were expensive to import due to the existence of high tariffs. The reason for using data on import substitutes in place of imports was the unavailability of foreign production data on actual USA imports (Salvatore, 2007:148).

Furthermore, the year 1947 that Leontief used for testing the H-O model was very close to the World War II. This led to Leontief repeating the test in 1956 using USA trade data for 1951. Even though, the results of the 1951 test were not consistent with the H-O model, at least the results only revealed that USA exports were only six per cent more labour intensive than USA import substitutes (Choi, 2001).

Leontief’s tests were biased because they used a two factor model, that is only labour and capital were considered as factors of production. Furthermore, the study only considered physical capital as a measure of capital and completely ignored human capital such as job training and education (Salvatore, 2007: 148). Although ignored by Leontief in the study, human capital contributes a lot to productivity. Moreover, the research also ignored Research and Development on the USA exports which led to an increase in the value of output derived from the available stock of human resources and materials. Choi (2001) argue that human and knowledge capital were not taken into consideration whereas they are also important factors that affect the pattern of exports and imports.
3.2.2 Dynamic theories of trade

This section discusses dynamic theories of international trade focusing on the relaxation of some strict assumptions of the static theories. Section 3.2.2.1 discusses the Imitation Lag Hypothesis while Section 3.2.2.2 deals with the Product Life Cycle.

3.2.2.1 The Imitation Lag Hypothesis

The Imitation Lag theory of trade was developed by Posner in 1961. It is mainly based on the relaxation of one of the traditional theories’ assumption of identical technology in all nations. In other words the Imitation Lag Hypothesis takes into consideration the fact that technology among different countries also differ greatly in reality. The theory postulates that it takes time for technology to circulate among countries such that achieving identical technology in different countries is a rare or impossible phenomenon (Appleyard et al., 2010).

Suppose there are two nations in the world namely Nation I and Nation II. If a new product emerges in Nation I due to the Nation’s extensive research and innovation, the theory suggests that it will take some time for firms in Nation II to produce the same product. The time it takes for Nation II to start producing the new product from the time of its introduction in Nation I is known as the Imitation Lag. The Imitation Lag period includes the learning period in which firms in Nation II acquire necessary inputs, technology and the know-how of producing the product, installation of required equipment, processing of inputs and the distribution of the product to the market (Swan, 1973).

The theory further makes another adjustment of time known as the demand lag. The demand lag is the time taken by consumers of Nation II to fully accept the new product as a good substitute for existing products from the time of its introduction. The demand Lag theory is directly determined by the level of loyalty of customers to the existing products and the availability of information on the new product. The theory therefore postulates that Nation II continues to import the new product from the time its consumers accept it as a good substitute (demand lag) up to the time its firms start to supply the product to the market (imitation lag) (Appleyard et al., 2010). Any nation can therefore diversify its exports by engaging in continual research, innovation and production of new products. The imitation Lag hypothesis is closer to reality because technology is rarely identical among countries. To add on to that, it takes some time for a newly introduced product to be produced and consumed by other countries other than its initial producer.
3.2.2.2 The Product Life Cycle Theory

The Product Life Cycle (PLC) Theory was developed by Vernon in 1966 and it is based on the Imitation Lag Hypothesis. However, the PLC theory goes a step further than the Imitation Lag theory by relaxing the other assumptions of the traditional theories of trade. The reason behind the development of the PLC theory was the failure of the H-O theory to predict trade patterns of international trade especially for the USA. The theory focuses on the life cycle of a new product and its effects on international trade. The analysis of any new product is divided into three stages namely; the new product stage, the maturing stage and the standardised product stage (Appleyard et al., 2010).

During the new product stage a new product is only produced and consumed within the borders of the country which introduced it. The theory suggests that there will be no international trade involved at this stage. This is based on the assumption that the product could not have been accepted as a substitute by consumers from other countries. This means that total demand of the product will be from domestic consumers only. The new stage product is followed by the maturing stage at which some general features of the product start to show up. Producers start to utilise mass production techniques in the manufacturing of the product and may realise economies of scale as a result of such techniques. During the same stage, foreign demand for the product starts to grow especially from countries with the same level of income as the innovator of the product. On the same stage of the product life cycle, the innovator of the product may start producing the product in foreign countries adding to the production domestically (Ederington and McCalman, 2009).

Depending on the cost associated with the structure and level of producing abroad, the innovator may transfer much of its production even into developed countries leading to export displacement. In other words, an immediate increase in the exports by the innovative nation is followed by a sudden fall of exports in the same country as firms increase their production abroad. The feature of re-location of production among countries proves that labour and capital are immobile internationally as opposed to the H-O trade theory (Appleyard et al., 2010).

When the new product reaches the standardised product stage its features and production processes become well-known. In general terms, the production process is known to the producers and the product is also well-known to the consumers. At this stage production of the product may totally transfer to developing countries. Conclusively, the PLC theory is
more applicable in reality since it suggests dynamic comparative advantage due to the fact that the source of exports changes throughout the life cycle of the product. More so, high diversification of export can be achieved through innovation and staying ahead of other countries. The theory also suggests that high export diversification is directly linked to increases economic growth.

3.2.3 Endogenous growth theory

The endogenous growth model was developed from the works of Harrod (1939), Domar (1946), Frankel (1962), Romer (1986) and Lucas (1988). Unlike the exogenous theory that assumes the economy only experiences long run growth when there is technological improvement, however, the endogenous growth theory explains different growth opportunities in physical capital and knowledge capital. It also assumes that knowledge and physical capital directly lead to the growth of the economy and technological progress. The theory suggests that increased investment in knowledge is associated with higher savings and consequently higher rate of growth of the economy (Dornbusch, Fischer and Startz, 2008).

The theory also assumes constant Marginal Product of Capital (MPK), meaning that every increase in capital is associated with an identical increase in output. In general terms, the production function under the endogenous growth model is assumed to be a straight line. The savings function is also a straight line and savings are always greater than required investment. In other words, capital stock can increase continuously even without technological progress under the endogenous growth theory because of the level of savings which is always increasing and above investment (Dornbusch et al., 2008).

The theory proposes that technological knowledge rather than employment is a factor that grows automatically with capital. This is based on the notion that technology and knowledge are taken as economic capital goods. The model tries to define the determinants of long run growth basing on human capital investment, new technologies and learning-by-doing. Another important factor of the endogenous growth theory is continuous Research and Development (R&D) that can lead to the invention and accumulation of new technological knowledge. New technological knowledge increases the chances of positive knowledge spillovers that can accrue due to the production of new goods (Mayer, 1996).

Lucas (1988) developed a model in which spill-over effects resulted from investment in human capital rather than in physical capital. The model suggested that knowledge depended
mainly on skills that cannot be separated from a worker once acquired and was determined by time spent on education. In other words, the endogenous model proposes that differences in long-term growth are a result of different rates of human capital accumulation, stemming from differences in countries’ time allocation decisions in education. The most important education concept that improves efficiency is learning-by-doing, which allows workers to be engaged. This is determined by the mix of goods a society produces. Hence, the degree of diversification in goods produced within a country affect its overall rate of human capital accumulation and growth (Mayer, 1996).

The model suggests that the country’s initial comparative advantage determines the products it can produce and hence its rate of human capital accumulation. Moreover, the model appreciates the fact that the degree of goods diversification and consequently export diversification has a positive effect on the country’s human capital accumulation. In other words the more a country’s basket of exports is diversified the higher the rate of human capital accumulation, leading to higher productivity and hence increased economic growth.

3.3 Empirical literature

This section analyses the effect of export diversification on economic growth studies in order to shed more light on the relationship between export diversification and economic growth in South Africa. A large body of evidence comes from developed and developing countries. Little was done in South African with this regard. Empirical literature can be categorised in a number of ways. These include categorising by country (developed and developing), categorising by variable (interest rate, GDP) and categorising by type of analysis. The literature review in this section follows the categorisation by country.

3.3.1 Empirical literature from developed countries

Hesse (2008) conducted a research on the role played by exports diversification on economic growth. The study was conducted in Washington, DC and the period under study was from 1961 to 2000. From 99 countries studied, the conclusions were mainly significant to four developing countries namely Chile, Thailand, Uganda and Malaysia. The author argues that export diversification was strong in developed countries as compared to developing countries. In this research, Hesse (2008) used panel data and employed the Ordinary Least Squares (OLS) regression. More so, dynamic panel models of growth were also used rather than conventional cross sectional country growth regressions. Robustness Test, was also conducted to test the sensitivity of data.
Another similar study was conducted by Amurgo-Pacheco and Pierola (2007), the study investigated the differences in export diversification trends between developed countries and developing countries. The author conducted the study in Georgia and the study investigated 126 exporting countries in 5000 product categories. The study found that extensive margin account about 60% of the overall export growth for the developed countries. Suggesting that export diversification in developed countries was the bedrock for economic development.

The study by Amurgo-Pacheco and Pierola (2007) suggested that higher levels of export concentration were detrimental to the growth of GDP per capita especially for developing countries. The author argued that developed countries are characterised by a low index of export concentration hence high economic growth potential. The findings of this study strongly support the view that economies that have diversified their exports baskets in the past years have also experienced higher rates of economic growth.

The study conducted by Hesse (2008) suggested that the pursuit for high levels of export diversification brought about some innovation. However the study proved to be weak because the author did not look at the specific channels through which export diversification can possibly affect economic growth. The results of the study were in line with the Product Life Cycle theory and disagreed with the H-O model predictions. The author used the OLS regression method which is well known for its unrealistic assumptions.

Agosin (2007) identified two channels through which export diversification may affect economic growth. The first being the portfolio effect in which high levels of export diversification reduce export volatility and hence stabilise domestic output. This effect is to a greater extent relevant to the Product Life Cycle theory. The other channel is through dynamic effects that accrue to the economy as a result of diversifying its production into new goods. These dynamic effects come in the form of learning and information technology especially to the country’s labour force. In other words, high level of export diversification was seen as the suggestive factor that could be used to broaden the comparative advantage of the economy.

A more recent study on the effect of export diversification on country growth was also conducted by Kadyrova (2011). The author tested for any positive impact of export diversification on the growth of the economy. The author used panel data from 88 countries that included both developed and developing economies. The study utilised the Generalised Method of Moments (GMM) estimation on panel data for the period from 1962 to 2009.
Furthermore, the author used the Herfindahl Index (HI) to measure export diversification and modified the Solow growth model equation to test the effect of export diversification on GDP.

In contrast to the conclusions of the H-O trade theory, the results of the model specification by the author suggested that economies with lower export concentration had a tendency of growing faster compared to those that are highly concentrated in exports. The author observed that developed countries had export structures that were concentrated on a small number of products and hence faced the high risk of being affected by world price shocks and uncertain demand due to ever changing tastes and technology innovation. In general, the study argued that the risks associated with world price shocks could be curbed by increasing the levels of export diversification. This argument augments the Product Life Cycle theory as argued by Herzer and Nowak-Lehmann (2006) and Petersson (2005). The authors argue that export diversification was a positive stimulus for economic growth. Furthermore, the study also found that other variables such as investment, schooling and population were significant in determining the level of growth of economies. The results from the study can be relied on because the GMM is rarely mis-specified due to the fact that it is a generalised and flexible econometric method that only requires some moment conditions. It can however prove to be very weak for small samples.

In a related study conducted by Brenton et al. (2007), export diversification is widely seen as a positive trade objective in sustaining economic growth. The authors used time series data for more than 60 countries, using the HI as a measure of export diversification and the Linear Regression method was used to analyse the data. In line with Product Life Cycle theory, the authors suggest that diversification of exports makes countries less vulnerable to adverse terms of trade shocks by stabilising export revenues.

Moreover, they argued that it made it easier to channel positive terms of trade shocks into growth, knowledge spill-overs and increasing returns to scale, creating learning opportunities that lead to new forms of comparative advantage. The issue identified was not that exports were generally concentrated, but were concentrated on homogeneous products. Such that, individual exporting countries facing highly inelastic demand will experience adverse terms of trade resulting in negative investment and a fall in consumption.

Similarly, the results of the study were, to a greater extent, consistent with those found by Hesse (2008) and Ferreira (2009) in the sense that export diversification is seen as positively
sustaining economic growth. The authors went on to bring about a crucial dimension of diversifying exports into service provision, while most of empirical evidence on the topic dwell more on diversifying into manufacturing exports. Brenton et al. (2007) suggested that diversifying into services exports was also important and that the tourism sector contributed positively to the economic growth of low income countries like Zambia.

Herzer and Nowak-Lehmann (2006) investigated on export diversification and growth using evidence from Chile for the period from 1962 to 2001. The study employed the Dynamic Ordinary Least Squares (DOLS) method on annual time series data. Furthermore, the study tested the link between export diversification and economic growth using the Cobb-Douglas production function. The authors argued that increases in the level of horizontal export diversification into totally new products could generate positive externalities to the economy as a whole through dynamic learning activities and spill-overs.

The authors suggested that export diversification could positively affect economic growth by reducing dependency on limited commodities exported that could be subject to extreme price and volume fluctuations. This argument was particularly true in the case of commodity-dependent developing countries, where overdependence on the agricultural and mining sectors could lead to declining terms of trade in the long run. The basic reason for this is due to the high degree of price volatility of commodity products (price instability). Following the Product Life Cycle theory, the study discovered that export diversification was essential for positive economic growth through the reduction of export instability. The results of this study were is consistent with those of other authors like Chandra et al. (2007), Petersson (2005), Hesse (2008) and Ferreira (2009). On the same note the authors employed the DOLS procedure that is well known for its unbiased and asymptotically efficient estimates for long-run series even in the presence of endogenous regressors.

Ar-Marhubi (2000) did an empirical investigation on the relationship between export diversification and growth. The study was conducted using a cross-country sample consisting of 91 countries. The author utilised the OLS model to estimate the effect of export diversification, investment, human capital, population growth and openness on economic growth.

Consistent with the Product Life Cycle theory and other empirical work such as Hesse (2008) and Ferreira (2009), the results of the study showed that there was an economically large relationship between export diversification and economic growth. The author went further on
to argue that export diversification affects growth directly and indirectly by stimulating the accumulation of capital especially in developing countries. In agreement to Nicet-Chenaf and Rougier (2008), the study argued that it was detrimental to add distortions to the economy in the light of promoting export diversification. This is mainly because these distortions may run counter to the comparative advantage of the country and have adverse effects on the growth performance and economic efficient of the economy. In other words, the author suggested that the comparative advantage of countries was very important in determining the trade patterns as stated by the H-O trade theory.

3.3.2 Empirical literature from developing countries

Arip, Yee and Karim (2010) researched on the relationship between export diversification and economic growth in Malaysia for the period from 1980 to 2007. The authors employed time series techniques of cointegration (Vector Error Correction Model) and Granger causality tests to examine the long run relationship and dynamic interactions among the variables (export diversification and economic growth). The results of the study showed a unique cointegrating vector among the variables used. On the same note, the authors concluded that export diversification played an important positive role in increasing economic growth. They therefore, suggested that for Malaysia to experience rapid economic growth it was supposed to diversify its exports into manufactured products.

They further suggested that economies could develop greater social and economic cooperation with the rest of the world in order to maintain growth in the long run. The study concluded that high levels of export diversification could help in the stabilisation of Malaysia’s export earnings hence promoting economic growth. In other words policy makers coming up with trade and industry policies were advised to make much emphasis on export diversification. The findings of the study supported the endogenous growth theory and were against the suggestions of the H-O model. It further supported the results of other empirical findings such as Ferreira (2009) and Hesse (2008). The research was however limited to Malaysia, as such its findings may not hold true for other countries.

According to Aditya and Roy (2009), export diversification and export composition were found to be important determinants of economic growth after controlling for some variables such as lagged growth, infrastructure, investment and exports. The authors used cross sectional data from 65 countries, for the period from 1965 to 2005. Instead of using the OLS
model used by many authors, the study used the GMM dynamic panel estimation as well as the commodity concentration index as a measure of export diversification.

The study found a non-linear relationship between export diversification and GDP per capita. Furthermore, the study found that high levels of export diversification led to positive increases in economic growth up to a certain critical level, where the process is reversed such that high levels of export concentration lead to increases in economic growth. The authors concluded that the impact of export diversification was stronger when exports of a country are greater than world’s average export level. The results of the study were, to a greater extent, consistent with those found by Arip et al. (2010), Hesse (2008) and Ferreira (2009). The results of the study were not in consistent with the H-O model.

Chandra, Boccardo and Osorio (2007) did a study on the relationship between export diversification and competitiveness. The period under study was from 1980 to 2004. The authors focused on Kenya, Tanzania, China, Brazil, Mexico, and Argentina among other countries. Furthermore, the study employed the dynamic panel estimates model to analyse the cross sectional data.

In most parts of the study the authors employed the HI which ranges from zero and one as a measure of export diversification. The authors also used manufactured exports share in total exports and the value of export discoveries as measures of export diversification. The results of the study were that there exist a positive relationship between export diversification and economic growth. The results of the study were in consistent with those suggested by Herzer and Nowak-Lehmann (2006) and Petersson (2005).

Similarly, Agosin (2007) in a study entitled “export diversification in emerging countries” concluded that export diversification had a positive effect on the growth of the economy. The study utilised cross country trade data of more than 20 countries but the results focused on China, Mauritius and Finland. The results of the study were not unique to those of other authors such as Hesse (2008), because it suggested that high levels of export diversification led to positive growth of the economy.

Similarly, Ferreira (2009) conducted a study on the expansion and diversification of the export sector and economic growth in Costa Rica using annual data from 1965 to 2006. The study utilised two types of statistical methodologies namely the bounds test for co-integration and the dynamic OLS model to examine the export-led growth hypothesis for Costa Rica.
Using the bounds test for cointegration, the study found that export diversification had no long run effect on economic growth during the period under study. Despite the loss of statistical significance, the author concluded that there was significant causal relationship running from exports to GDP and from imports to exports. Furthermore, the author observed that the country depended much on imports as its inputs hence the conclusion that imports can be an indirect long run channel for economic growth through the provision of intermediate and foreign technology. The results of the study were in contrast with Hesse (2008). The results of the study can be relied on because the author used the cointegration analysis which is well known for its strength in estimating long-run relationships.

Further study by Nicet-Chenaf and Rougier (2008) on FDI diversification and growth for MENA countries found a positive impact of export diversification on economic growth. The study mainly focused on Tunisia, Egypt, Jordan, Morocco, Algeria and Israel. The authors used cross sectional data covering the period from 1995 to 2004.

In line with the Imitation Lag hypothesis and the Product Life Cycle theory, the authors argued that increases in export diversification create an environment that could be favourable for both foreign and domestic investment through the reduction of export instability, technology transfer and increases in productivity levels. Moreover, in agreement with other empirical studies such as Petersson (2005) and Brenton et al. (2007), the study noted that high levels of export diversification were seen to induce endogenous structural changes that promote development within the exporting country. The authors however agreed with Aditya and Roy (2009), and suggested that too much export diversification was detrimental to the growth of the economy because if diversification exceeds optima, exports will end up comprising mainly of low value added commodities. The conclusions from the study could not be relied on due to the use of empirical evidence from MENA countries only.

Cabral and Veiga (2010) investigated on the determinants of export diversification and sophistication in Sub-Saharan Africa. The study was carried on 48 countries and covered the period of 45 years from 1960 to 2005. The study employed the OLS pooled method to analyse disaggregated data for the countries. On the same note the authors used the fixed effect models and instrumental variables to cater for omitted variables and other loopholes associated with the regression method used. More so, the authors used the HI and Theil index as measures of export diversification.
In contrast with the H-O theory, results from cross country comparison suggested that export diversification was associated with long run economic growth and development rates. Furthermore, the study also argues that increases in the levels of export diversification promote high productivity in industries. In support of the conclusions made by Ar-Marhubi (2000), the authors concluded that export diversification was important for export revenues stability, since higher export diversification levels imply a dispersion of risk by a larger number of export sectors. In contrast to the H-O model, the authors further went on to point out that diversification into manufacturing exports consequently led to export sophistication which brings about higher economic growth and good export performance.

3.3.3 Empirical literature from South Africa

In the study on export diversification and specialisation in South Africa, Matthee and Naudé (2007) used cross sectional data obtained from the department of South African revenue services of 19 exporting sub-nationals (magisterial) districts of South Africa for the period 1996 to 2004. The study employed the OLS regression method with economic growth as a dependent variable. Instead of using one measure of export diversification, the authors used four measures of export diversification which included the HI, the absolute index, the Normalised-Hirschmann Index (NHI) and the index that ranks exports in terms of their implied productivity. Results from HI were consistent with the endogenous growth model. On the same note the authors concluded that export diversification was positively related to real GDP per capita. In other words, this was an indication that rich regions exported products that were of better quality. Furthermore, the use of the absolute index, the NHI and the index that ranks exports in terms of their implied productivity yielded results that were also consistent with the HI.

In addition, the study suggested that the positive relationship that exists between export diversification and economic growth could be the possible reason why a country with increasing exports may fail to reduce income inequality among districts. The authors concluded that vertical integration in South Africa was not a significant source of economic growth in the South African context. Horizontal diversification (into manufacturing exports), however, was associated with larger growth (coefficient of the Herfindahl Index was significant at one per cent level). Therefore, Matthee and Naudé (2007) concluded that it was not important to merely diversify exports from primary to secondary products, but the type and diversity of secondary products produced and exported were also essential for growth. In
general the results of the study opposed the predictions of the H-O model though in line with some empirical studies such as those conducted by Matthee and Naudé (2008), Ar-Marhubi (2000), Petersson (2005), and Cabral and Veiga (2010).

Petersson (2005) concluded that exports diversification have continuously assumed greater significance in the growth of the economy. The author looked at export diversification and intra-industry trade in South Africa covering the period from 1990 to 2003 in relation to other SADC countries and utilised the linear regression method. The author divided data into 11 industrial clusters which included primary products, petroleum, forest products, animal products, tropical agriculture products, cereals, capital intensive products, labour intensive products, machinery, chemicals and non-monetary gold.

The study observed that manufacturing exports were relatively diversified during the entire period under study, but were affected by minor short-term fluctuations in macroeconomic variables such as non-monetary gold and crop. Initially, export concentration showed large differences between South Africa’s trading partners, but a trend of convergence was found, especially in manufacturing exports, indicating the rise of a more stable, diversified export composition. The author argued that reduced export concentration led to positive terms of trade and increases in economic growth. In other words, the results of the study were consistent with the endogenous growth model but opposed the H-O model. Furthermore, the results from the study support the findings by Cabral and Veiga (2010), Matthee and Naudé (2007) and Ar-Marhubi (2000).

Matthee and Naudé (2008) suggested that diversifying into manufactured products was very beneficial to developing countries as it brought about a lot of spill-overs such as the introduction of new technology and knowledge. The study was conducted for the period between 1996 and 2004 and used cross sectional data on 19 sectors within the 354 sub-national districts of South Africa. Furthermore, the authors employed the OLS regression to estimate the impact of export diversification on economic growth.

The authors concluded that export diversity and diversification at country level could be important for economic growth. This was drawn from the results that showed that the composition of the export basket as more important than export growth in positively driving economic growth. This was enhanced by the fact that regions with more diversified exports generally experienced higher economic growth rate in South Africa. For example, magisterial districts with less diversified exports having a HI higher than 0.9 experienced below average
annual GDP per capita growth during the period of the study. On the other hand, magisterial districts with less than 0.2 HI contributed well above 33 per cent of South Africa’s economic growth for the period from 1996 to 2004. The results of the study were inconsistent with the predictions of the H-O theory of trade. However, it was in line with the endogenous growth and readings by other authors like Petersson (2005), Arip, et al. (2010), Hesse (2008) and Ferreira (2009).

Naude and Rossouw (2008) researched on the extent and impact of export diversification and specialisation in South Africa for the period from 1962 to 2000. The authors used three methods of measuring export diversification namely; the HI, the NHI index and the absolute deviation of the country’s share of total world exports. The study also employed the Computable General Equilibrium (CGE) model. The authors suggested that South Africa’s export basket was relatively diversified compared to other developing economies but less diversified when compared to its main trading partners such as the USA, Brazil, India and China.

Consistent with the endogenous growth model, the authors concluded that export diversification, whether vertical or horizontal led to real economic growth. The authors attributed these results to increases in export volumes and improvement in the trade balance brought about by high degrees of export diversification. Export diversification was concluded to be associated with higher economic growth. The authors acknowledges the findings of the research done by Petersson (2005), Matthee and Naudé (2008) and Cabral and Veiga (2010).

3.4 Conclusion

In conclusion, both theory and empirical literature generally point out that high levels of export diversification are a favourable condition for positive growth of countries though some theories disagree to this argument. The endogenous growth model argues that there is a positive relationship between export diversification and economic growth. The model suggests that diversifying into manufactured exports reduce export instability and come with a lot of positive externalities such as knowledge and skills. On the contrast, the H-O trade theory argues that countries should specialise in the production and exportation of products in which they have a comparative advantage, based on the relative factor availability in each country. In other words, the H-O theory suggests a negative relationship between export diversification and economic growth. In general, empirical studies have shown that export diversification plays a significant role in the growth of the economy. However, some authors
such as Nicet-Chenaf and Rougier (2008) and Aditya and Roy (2009) argued that too much export diversification may be detrimental to the economy.
CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the methodology employed in the study and is divided into eleven sections. The first section introduces the chapter. Section 4.2 presents the theoretical framework build from the model on exports diversification and economic growth used in the study. Section 4.3 specifies the functional forms and variables used in the model. Section 4.4 defines variables and justifies the inclusion of the variables in the model. Section 4.5 gives the expected results (a priori results). Section 4.6 presents data sources used in the study. Section 4.7 specifies the estimating techniques used in the study. The estimating techniques deals with unit root tests (Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests) and cointegration analysis (vector error correction model (VECM) and the Johansen (1995) techniques). Diagnostic checks discussing heteroscedasticity, residual normality test and serial correlation tests are discussed in Section 4.8. Section 4.9 discusses the impulse response while Section 4.10 presents the value decomposition analysis. Finally, Section 4.11 concludes the chapter.

4.2 Theoretical framework

Traditional theories of trade argued that economic differences among countries are a result of differences in factor endowments, technologies and policy regimes. The theories however failed to explain the reason behind differences in economic activities and growth for countries with similar or the same factor endowments (Matthee and Naude, 2008). This study’s theoretical framework is drawn from the augmented Cobb-Douglas production function which incorporates fixed capital formation, real exports, real imports and human capital as factors that affect economic growth. This is estimated in equation 4.1 presented on the next page (Del Negro and Schorfheide, 2002)
\[ Y_t = (K_t)^\alpha (A_t L_t)^{1-\alpha} \] 
………………………………………………………………………4.1

Where: \( Y = \) real GDP

\( K_t = \) physical capital stock (predetermined at the beginning of period \( t \))

\( L_t = \) labour input

\( A_t = \) technological progress (augmenting technology)

\( 0 < \alpha < 1; \)

\( t = \) time period

4.3 Model specification

The identification of the functional form and the variables used in the estimation of the relationship between export diversification and economic growth is based on both theoretical and empirical literature. In this case, to estimate the relationship between export diversification and economic growth, the present study modifies the model used by Arip et al. (2010). The authors employed a model in which Gross domestic product (GDP) was the dependent variable with the degree of specialisation and diversification, employment and capital expenditure were explanatory variables. The model used by Arip et al. (2010) can be expressed mathematically as in equation 4.2:

\[ GDP = DSD + EMP + CAP \]  
……………………………………………………………………………………………………….. 4.2

Where: \( GDP = \) Gross Domestic Product

\( DSD = \) Degree of specialisation and diversification

\( EMP = \) Employment

\( CAP = \) Capital expenditure

The present study uses GDP as the dependent variable. GDP is explained by the NHI (measure of export diversification), stock of human capital, capital expenditure, real effective exchange rate and trade openness as shown in equation 4.3 on the next page.
\[ LGDP = \beta_0 + \beta_1 NHI + \beta_2 LHUM + \beta_3 LCAP + \beta_4 LREER + \beta_5 LOPEN + \varepsilon \] 

Where \( LGDP \) = logarithm of gross domestic product per capita, \( NHI \) = Normalised-Hirschmann Index, \( LHUM \) = logarithm of human capital formation, \( LCAP \) = logarithm of capital formation, \( LREER \) = logarithm of real effective exchange rate, \( LOPEN \) = logarithm of trade openness, \( \beta_0 = \) intercept and \( \beta_1, \beta_2, \beta_3, \beta_4, \beta_5 = \) coefficients of the independent variables and \( \varepsilon = \) random error.

### 4.4 Definition of variables

LGDP is the logarithm of real Gross Domestic Product. It represents the real domestic output in billion Rands produced in South Africa adjusted for inflation. The data is converted to logarithms. The study uses this variable as a measure of economic growth because it shows how much output South Africa produces in relation to its population.

NHI refers to the NHI, and is a way of measuring the extent of export diversification. The NHI is included in the model because it measures the extent to which South African exports are diversified. Following Naudé and Rossouw (2008), the NHI is calculated as in equation 4.4:

\[
H_{jt} = \frac{\sqrt{\sum_{i=1}^{n} \left( \frac{x_{it}}{X_{jt}} \right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}} \]  

Where: \( H_{jt} \) = normalised-Hirschmann index, where \( x_{it} \) = is the value of exports of industry \( i \) located in country \( j \) and \( X_{jt} \) is the total exports of country \( j \) in a given year \( t \). The number of industries is represented by \( n \). An index value nearer to 1 indicates less diversification while a value closer to 0 signifies a high diversification of exports. The index is converted to logarithms in this study.

LHUM is the logarithm of the stock of human capital. The stock of human capital refers to the skills, competency and experience vested in a country’s labour. Human capital accumulation is believed to be a positive contributor to the quality of the economy’s labour force (Ickes, 1996) hence affecting the productivity and efficiency of the economy. In this study it is measured by government expenditure on tertiary education.
LCAP is the logarithm of capital expenditure. Capital expenditure in this study represents fixed capital formation expressed in billion Rands. This variable is included in the model because the purchasing of physical stock of capital such as machinery impacts directly on the productivity of the economy.

LREER is the logarithm of the real effective exchange rate of the Rand. It is the weighted average of the Rand in relation to the basket of other South Africa’s main trading partners. The weight is determined by comparing the relative trade balances, with regard to the South Africa’s currency, against each other country within the basket. The REER is further adjusted for inflation. The REER is included in the model because it indirectly affects economic growth through the prices of exports and imports.

LOPEN is the logarithm of trade openness. Trade openness shows the extent to which a country is involved in international trade activities with the rest of the world. In this study trade openness is calculated as in equation 4.5:

\[
\text{OPEN} = \frac{(\chi + \gamma)}{\text{GDP}}
\]

Where: OPEN represents trade openness, \(\chi\) is total exports, \(\gamma\) is total imports and GDP is total Gross Domestic Product.

Trade openness is included in the model because it directly affects the amount of trade activities that a country conducts with its trade partners. It also affects economic growth and the number of a goods a country can possibly export and import, thereby determining the degree of export diversification.

\(\varepsilon\) = Error term, which represent the influence of omitted variables in the specification of the model.

4.5 Expected signs

The coefficient of NHI is expected to be positive in this study. This is because high export diversification is expected to have a positive effect on economic growth following the conclusions of most of the empirical literature such as Matadeen (2011), Petersson (2005), Hesse (2008) and Ferreira (2009). Export diversification may be beneficial because of benefits that may accrue to a more export diversified economy in the form of positive externalities and reduced risk of export instability. The coefficient of human capital is
expected to be negative. This follows empirical studies such as Bloom, Canning and Chan (2005) and Aghion et al. (2009). Both studies by Bloom et al. (2005) and Aghion et al. (2009) argue that tertiary education can enhance economic development through technological catch-up which can help economies gain ground on more technologically advanced societies in the sense that graduates are likely to be more aware of and better able to use new technologies. More so, through improved technological catch-up the economy can maximise its potential to achieve higher economic growth in the future. In other words, current investment in tertiary human is expected to have a positive impact on economic growth only in the future.

The coefficient of capital formation is expected to be positive. This is because high capital expenditure means that the economy is able to produce more output thereby increasing economic growth, *ceteris paribus*. The coefficient of real effective exchange rate is expected to be either negative or positive because an increase in the real effective exchange rate of the Rand (depreciation) can affect the economy’s growth in two ways namely the aggregate demand and supply channels. In the aggregate demand channel an increase in the real effective exchange rate enhances the international competitiveness of domestic goods leading to increased net exports and consequently increased GDP. On the other hand the aggregate supply channel suggests that the depreciation of the real exchange rate increases the cost of production and hence reduced GDP (Tarawalie, 2010).

According to Yanikkaya (2002), trade openness was embraced with a strong bias in many economies mainly because of the disastrous failures of import-substitution strategies, especially in the 1980s. Though there is a near consensus about the positive impact of trade openness on economic growth, the positive impact is very complicated and can be very diverse depending on the play of policies. The coefficient of trade openness can therefore be either positive or negative.

### 4.6 Data sources

The study employs South African annual data covering the period from 1980 to 2010. Data on individual exports products breakdown was obtained from searchable database on international trade from the World Trade Organisation (WTO) website (WTO, 2012). In addition, Most of the data which include Real Effective Exchange Rate, human capital formation, capital formation, total exports, total imports and gross domestic product was obtained from the SARB online statistical query publications website (SARB, 2012).
4.7 Estimating techniques

Due to the fact that the study employs time series data covering a period of 30 years, a long run relationship is expected to exist between the variables. The study therefore follows the Johansen (1995) cointegration technique. According to Gujarati (2004: 792), both the dependent and the independent variables must be stationary before any relationship is estimated. In other words the data must be integrated of the same order before estimating the model. This is achieved through the use of the ADF and PP unit roots tests.

4.7.1 Testing for stationarity or unit roots

According to Brooks (2008: 318), stationary and non-stationary data should be treated differently when estimating any economic relationship between variables. This is mainly because the stationarity or non-stationarity of any series can strongly influence its behaviour and properties. Mahadeva and Robinson (2004) define stationary series as those with a constant mean, constant variance and constant auto-covariances for each given lag. Noriega and Ventosa-Santularia (2006) suggest that the use of non-stationary time series may lead to the OLS estimators not converging to the true value of zero indicating the presence of spurious relationship between the dependent and independent variables.

Spurious regression is when regression on the variables yields a very high $R^2$ in excess of 0.9 even if the variables are not related. In general terms, regression of non-stationary series disregard the standard assumption of asymptotic analysis, leading to the F-statistic and t-statistic not following the F-distribution and t-distribution, respectively. Spurious regression can also be seen as flawed estimation leading to the rejection of a true hypothesis or the acceptance of a false hypothesis (Chiarella and Gao, 2002). Phillips (1998) defines spurious regression as a situation in which fitted coefficients are statistically significant even when there is no true meaningful relationship between the regressand the regressor. Phillips (1998) further suggests that the scenario directly results when independent random walks are regressed on each other.

Even if economic theory suggests the existence of a long run relationship between the variables, testing for unit roots remains a necessity before employing any cointegration techniques. Testing for stationarity is done through the testing of a null hypothesis of unit roots ($H_0$: series have unit roots). Series are said to be stationary if they do not contain unit roots or when the null hypothesis is rejected. If series are non-stationary, they can be differenced $d$ times before they become stationary and then are said to be integrated of order
In other words, the order of integration is the number of differencing operations that makes a variable stationary or the number of unit roots present in the data.

### 4.7.1.1 Augmented Dickey-Fuller and Phillips-Perron tests

The ADF test is based on the Dickey-Fuller (DF) test developed by Dickey in 1976 and Fuller in 1979 (Brooks, 2008: 327). The DF tests for unit root using the OLS regression is based on the three equations expressed mathematically as equations 4.6, 4.7 and 4.8.

\[ \Delta \gamma_t = \delta \gamma_{t-1} + \mu_t \]  \hspace{1cm} \text{equation 4.6}

\[ \Delta \gamma_t = \beta_1 + \delta \gamma_{t-1} + \mu_t \]  \hspace{1cm} \text{equation 4.7}

\[ \Delta \gamma_t = \beta_1 + \beta_2 t + \delta \gamma_{t-1} + \mu_t \]  \hspace{1cm} \text{equation 4.8}

Where: \( \gamma_t \) is the time series, \( \Delta \) is the difference operator, \( \beta_1 \) and \( \beta_2 \) are known constants, \( t \) is the trend variable or time and \( \mu_t \) is the pure white noise error term which should satisfy the assumptions of normality, constant variance and independent error terms. Equations 4.6, 4.7 and 4.8 represent random walk. In equation 4.6 \( Y_t \) is a random walk. In equation 4.7 \( Y_t \) is a random walk with drift and in equation 4.8 \( Y_t \) is a random walk with a drift around a stochastic trend. It can be noted that equation 4.6 does not have an intercept. In all the cases the null hypothesis being tested is that \( \delta = 0 \) (there is a unit root) and if the null hypothesis is rejected, \( \gamma_t \) is therefore a stationary time series with zero mean (Gujarati, 2004: 815).

However, the ADF tests differ from DF tests in the sense that the ADF unit root test relaxes the assumption of uncorrelated error term. The ADF is conducted by augmenting equations 4.6, 4.7 and 4.8 by adding the lagged values of a dependent variable. For example, adding lagged values to equation 4.8 directly results in equation 4.9.

\[ \Delta \gamma_t = \beta_1 + \beta_2 t + \delta \gamma_{t-1} + \sum_{i=1}^{\kappa} \alpha_i \Delta \gamma_{t-1} + \varepsilon_t \]  \hspace{1cm} \text{equation 4.9}

Where: \( \varepsilon_t \) is a pure white noise error term, \( \kappa \) is the number of lagged differences, and,

\[ \gamma_{t-n} = \gamma_{t-n} - \gamma_{t-(n-1)} \]  therefore \[ \gamma_{t-2} = \gamma_{t-2} - \gamma_{t-1} \]

\[ \gamma_{t-3} = \gamma_{t-3} - \gamma_{t-2} \]

In most cases the number of lagged difference terms used is usually determined empirically. The ADF type OLS regression results are well known for their strong characteristic of...
modelling autocorrelation in the residuals using autoregressive approximation. In addition, ADF type OLS regression avoids identifying the parameters of the error process. However, the results are usually sensitive to the order of the auto-regression (Wang, 2010).

The Phillips-Perron (PP) test was developed by Phillips and Perron in 1988 as an alternative method for unit root testing (Phillips and Perron, 1988). Though similar to the ADF test, the PP test integrates an automatic correction to the ADF procedure which makes an allowance for auto-correlated residuals by using non-parametric statistical methods. In other words, the PP test corrects for any serial correlation and heteroscedasticity in the errors of the regression by directly modifying the test statistics. The PP test is also superior to the ADF tests because the PP test gives robust estimates when the series have serial correlation, time dependent heteroscedasticity and a structural break (Breitung and Franses, 1998). More so, the PP test ignores any serial correlation in the test regression where the ADF tests use a parametric auto-regression to approximate the Auto Regressive and Moving Average (ARMA) structure of the errors in the test regression. The test regression for the PP tests is as illustrated in equation 4.10.

\[ \Delta \gamma_t = \alpha_1 + \gamma \gamma_{t-1} + \alpha_2 (t - T / 2) + \sum_{i=1}^{m} \phi_i \Delta \gamma_{t-i} + \mu_2t \]  

Where, \( \Delta \gamma_t \) is the first difference operator, \( T \) is the sample size and \( \mu_2t \) is the covariance stationary random error term. \( m \) is the lag length and it is selected using the Newley-West’s suggestions. Under the PP test the null hypothesis that series are I(1) is rejected if the test statistic is more negative than the critical value. The null hypothesis is also tested using t-values with critical values calculated by Mackinnon (1996).

**4.7.1.2 Advantages of the Augmented Dickey-Fuller and Phillips-Perron tests**

The ADF and PP tests are chosen in this study over the simple DF test because the ADF and PP tests can be used even if the series contain serial correlation. The Phillips-Perron test has an advantage over the Dickey-Fuller test because it is capable of showing that the sample moments of any variable converge to random functions. Another advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroscedasticity in the error term. Furthermore, when using the Phillip-Perron tests the user does not have to specify a lag length for the test regression.
4.7.1.3 Weaknesses of the Augmented Dickey-Fuller and Phillips-Perron tests

Unit roots tests such as the ADF and the PP tests are usually criticised for their low power when the process being tested is stationary but with a root close to the non-stationary boundary. For instance in a data generating process with a coefficient of 0.95, assuming that the true data generating process is an AR(1) represented as equation 4.11.

\[ \gamma_t = 0.95\gamma_{t-1} + \mu_t \]

From equation 4.11, the null hypothesis of unit root must be rejected. However, it is argued that the tests are poor to decide whether \( \Phi = 1 \) or \( \Phi = 0.95 \), especially when the sample size is small. The source of the low power of the tests as outlined above comes from the classical hypothesis-testing framework, which suggests that the null hypothesis is never accepted but rejected or not rejected. In other words a failure to reject the null hypothesis does not necessarily mean that it is true, but rather that there could be insufficient information to reject it (Brooks, 2008: 330-331). PP tests are also subjected to serious size distortions and very sensitive to misspecifications (Mahadeva and Robinson, 2004).

4.7.2 Lag selection criteria

To employ the Johansen technique (1995) an indication of the lag order and the deterministic trend assumption of the VAR is required. There are various lag length selection criteria that include the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Criterion (HC) and the Final Prediction Error (FPE) (Zahid and Irum, 2007). Though the SIC is the best for large samples this study used all the information criteria in selecting the most suitable lag length. Furthermore, the study used a maximum of 3 lags during the selection in order to permit for adjustment in the model and accomplishment of well-behaved residuals.

4.7.3 Cointegration analysis and Vector Error Correction Model analysis

After identifying the negative effects of non-stationarity in time series it is then possible to take actions that can transform the data into stationary data. If the time series are non-stationary in levels but are stationary when differenced then the possibility of a linear stationary relationship among the variables is very high (Brooks, 2008: 335). For best estimation the variables must be integrated of the same order. Econometrically, variables that satisfy the above conditions are said to be cointegrated. Maurer (2008) identified
Cointegration as a scenario where two variables have a long-run relationship or equilibrium between them. Theoretically, it is however possible for non-linear relationships to exist between integrated variables. Engle and Granger (1987) suggested that cointegration is when integrated variables share an equilibrium relation that turned out to be either stationary or have a lower degree of integration than the original series. Engle and Granger (1987) also outlined that cointegration signified co-movements among trending variables exploited to test for the presence of equilibrium relationships (Dolado et al., 1999).

Testing for cointegration is important because it acts as a pre-test to avoid spurious regression relationships (Gujarati, 2004: 822). Testing for cointegration can be done through a number of methods which include the Engle-Granger approach which is residual based and the Johansen and Julius (1990) technique which is maximum likelihood estimation based on VAR system. The first step of the Engle-Granger approach involves making the individual variables to be integrated of the same order and then estimating the cointegrating regression using OLS. The second step involves the use of residuals from step one as a variable in the error correction model (Alexander, 1999). The Engle-Granger approach however, has got a lot of loopholes such as the high possibility of the simultaneous equation bias if the causality of the variables runs in both directions. Thereby requiring least one variable to be normalised (Philip, 2001).

Due to the extreme shortcomings of the Engle-Granger approach outline above this study employs the Vector Error Correction Modelling (VECM) by Johansen (1995) technique. In addition the model in this study has more than one variable and hence the possibility of the existence of more than one cointegrating vector making the use of a one variable Engle-Granger approach inappropriate. More so, the VEC modelling also allows for the determination of both long and short run dynamics of the model. On the other hand the Johansen (1995) approach permits for the testing of hypothesis about the equilibrium relationships between the variables. The hypothesis of one or more coefficients may be tested by viewing the hypothesis as a restriction on the matrix (Dolado et al., 1999).

4.7.4 The Johansen (1995) technique based on unrestricted VARS

The Johansen (1995) technique is based on the maximum likelihood framework which is known for its better properties over the Engle-Granger traditional method. It also allows for the empirical determination of the number of stationary relationships, and produces maximum likelihood estimators of the parameters which are always consistent in the presence
of endogenous explanatory variables (Haug and Michelis, 2000). On the same note, the estimators from this technique are governed by asymptotic normal distributions allowing for valid statistical inferences with conventional test statistics (McNown, 2000). The Johansen (1995) technique can be summarised to produce the following steps;

i. **Testing the order of integration**

Testing for the order of integration of the variables used in the model is the first thing to take into consideration under the Johansen technique. The reason for pre-tested the variables is to estimate their order of integration, when all the variables are integrated of the same order, then the data can be plotted to identify the presence of a linear time trend before cointegration test is done. It is important that the variables become integrated of the same order because data that is of different orders of integration is associated with a lot of problems when setting the cointegration relationship.

ii. **Setting the appropriate lag length of the model**

The Johansen approach focuses on selecting the appropriate number of lag values to be included in the model. Brooks (2008: 350) outlines that the Johansen test may be influenced by the lag length used in the model suggesting that the number of lags to be used must be chosen optimally.

iii. **Choosing the appropriate model regarding the deterministic components in the multivariate system.**

The model can take different forms as far as the deterministic components are concerned. The selection of the model form depends on the likelihood ratio tests statistics based on eigenvalues. The normalised cointegrating vectors and speed of adjustment coefficients are analysed.

iv. **Determine the number of cointegrating vectors**

Cointegrating vectors are determined through the use of causality tests on the error correction model, such that a structural model is identified. This if further used to determine whether the estimated model is reasonable enough.
To illustrate how the Johansen technique (1995) is employed, the study assumes a VAR model with more than or equal to two variables that are integrated of order one, with \( n \) lags as presented by equation 4.12 below:

\[
\chi_t = \beta_1 \chi_{t-1} + \beta_2 \chi_{t-2} + \beta_3 \chi_{t-3} + \ldots + \beta_n \chi_{t-n} + \mu_t \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldOTS

To be able to apply the Johansen test, equation 4.12 is transformed into a VECM as in equation 4.13 on the next page.

\[
\Delta \chi_t = \Pi \chi_{t-n} + \Gamma_1 \Delta \chi_{t-1} + \Gamma_2 \Delta \chi_{t-2} + \Gamma_3 \Delta \chi_{t-3} + \ldots + \Gamma_{n-1} \Delta \chi_{t-(n-1)} + \mu_t \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldOTS
\]

Where: \( \Pi = (\sum_{i=1}^{n} \beta_i) - I_g \) and \( \Gamma = (\sum_i \beta_j) - I_g \)

Let \( \chi_t \) be a \( p \) dimensional column vector of I(1) variables, such that \( \Pi \) and \( \Gamma_i \) are \( p \times p \) matrices of coefficients and \( \mu_t \) represent the deterministic part of the model. \( \Pi \) can be interpreted as the long run coefficient matrix on which the Johansen test focuses on. Testing for cointegration is therefore calculated taking into account the rank of the \( \Pi \) matrix through its eigenvalues using the test statistics taken from the rank-restricted product moment matrices (Hjalmarsson and Osterholm, 2007). The rank of the matrix is the same as the number of its characteristic roots (eigenvalues) that are not equal to zero. If a cointegration relationship exists between the variables under consideration then the rank of \( \Pi \) is not significantly different from zero (Brooks, 2008: 350-351). There are usually two tests statistics for cointegration under the Johansen technique as shown in equations 4.14 and 4.15:

\[
\hat{\lambda}_{\text{trace}}(r) = -T \sum_{i=r+1}^{g} \ln \left( 1 - \hat{\lambda}_i \right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldOTS
\]

\[
\hat{\lambda}_{\text{max}}(r, r+1) = -T \ln \left( 1 - \hat{\lambda}_{r+1} \right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldOTS
\]

In both cases \( T \) represents the size and is the number of cointegrating vectors under the null hypothesis and \( \hat{\lambda}_i \) is the estimated value for the \( i^{th} \) ordered eigenvalue from the \( \Pi \) matrix. A significantly different from zero eigenvalue shows the presence of a corresponding cointegration vector, since each eigenvalue is associated with each cointegrating vector. In each case, the null hypothesis is rejected if the test statistic is greater than the critical value.
\( \lambda_{\text{trace}} \) represents a joint test where \( H_0 \) is that the number of cointegrating vectors is lower than or equal to \( r \) and the alternative hypothesis that there are more than \( r \) cointegrating vectors.

\( \gamma_{\text{max}} \) tests the null hypothesis that the number of cointegrating vectors is \( r \) against the alternative hypothesis that cointegrating vectors is \( r + 1 \).

In general, the Johansen (1995) technique exploits the fact that the data will be integrated of the same order by looking for a vector that maximises the correlation between variables included in the model (Gonzalo and Lee, 1998).

### 4.7.5 Error correction Model

Cointegrated variables must be represented in an error correction representation and an error correction term (ECT) must be incorporated into the model (Chen et al., 2009). To capture the effect of the information lost during differencing, a vector error correction model (VECM) is formulated to reintroduce the lost information. Deviations from the equilibrium in the error correction model illustrate short run dynamics in the model. It is very essential to formulate the ECM because it is the most appropriate model in measuring the rectification from disequilibrium of the preceding period (Hauser, 2001). In an ECM, the short-term dynamics of the variables in the system are influenced by the deviation from equilibrium as shown in equation 4.16.

\[
\Delta y_t = \beta_1 \Delta x_t + \beta_2 (y_{t-1} - \gamma_{at-1}) + \mu_t \tag{4.16}
\]

The term \( y_{t-1} - \gamma_{at-1} \) represents the error correction term. The coefficient of one implied on \( xt-1 \) in equation 4.16 means that there is a proportional long term relationship between \( y \) and \( x \). The interpretation of the error correction model is as follows: \( y \) is expected to adjust with \( t-1 \) and \( t \) as a result of changes in the values of the explanatory variables \( x \) between \( t-1 \) and \( t \), and also partly to correct for any disequilibrium that existed during the previous period. The error correction term appears without any lag implying that \( y \) changes between \( t-1 \) and \( t \) in response to a disequilibrium at time \( t \). The term \( \beta_1 \) defines the short run relationship between variations in \( x \) and changes in \( y \) and \( \gamma \) shows the long run relationship between \( x \) and \( y \). \( \beta_2 \) represents the speed of adjustment and it strictly measures the proportion of the last period’s equilibrium error being corrected.
The ECM has advantages such as the fact that it is a convenient model to measure the correction from disequilibrium of the variable from the previous period and this has an excellent economic implication. To add on to that, ECMs are designed in terms of first differences which usually eliminate trends from the variables involved thereby doing away with the problem of spurious regressions. Another advantage of ECMs is that they can easily fit into the general-to-specific approach to econometric modelling.

4.8 Diagnostic checks

According to Gujarati (2004:507), diagnostic tests are a necessity in any model estimation because they act as instruments in determining the adequacy and efficiency of the model form used. Diagnostic checks are also used to validate the parameter estimation outcomes from the estimated model. In other words, diagnostic tests check the stochastic properties such as heteroscedasticity, residual autocorrelation and normality of the estimated model.

4.8.1 Heteroscedasticity

One of the assumptions of OLS is that the variance of all errors must be constant and the same for all observation. This is commonly known as the assumption of homoscedasticity. Disturbance terms with variance which is not the same are said to be heteroscedastic (Brooks, 2008: 132). In other words, heteroscedasticity occurs when the variance of errors are different between observations. Heteroscedasticity renders the usual standard errors of the estimated parameters to be biased and inconsistent. The presence of heteroscedasticity has serious negative implications such as unnecessarily large confidence levels that may lead to inaccurate F and t-tests results (Andren, 2007: 91-92). This study employs the White test to detect heteroscedasticity because it does not rely on normality assumption and it is not complicated to employ. It is also based on whether there is any systematic relation between the squared residuals and the independent variables.

4.8.2 Residual normality test

One of the assumptions of the Classical Linear Regression is that residuals must be normally distributed with constant variance and zero mean. In general terms, the assumption of normality suggests that all variables captured by the error term do not systematically affect the mean value of the dependent variable. Normality tests are done to check for excess kurtosis and skewness (Gujarati, 2004: 66-68). The Jarque-Bera (JB) test of normality is employed in this study and it is an asymptotic test based on OLS residuals. The JB test tests
the null hypothesis that the distribution of the series is symmetric. The null hypothesis of normality is rejected if the residuals from the model are either significantly skewed or leptokurtic (or both).

### 4.8.3 Serial Correlation Langrage Multiplier (LM) tests

The Classical Linear Regression also assumes that there exist no autocorrelation among the disturbance terms. The assumption of no serial correlation can be represented algebraically as equation 4.17:

$$E(\mu_i, \mu_j) = 0 \quad i \neq j$$

Equation 4.17

In other terms, the assumption of no serial correlation can be interpreted to mean that the error term of any observation must not be influenced by any other disturbance term from other observations. Like heteroscedasticity, the presence of serial autocorrelation does not make the estimators to be biased; however, it makes the estimators to be inefficient due to absence of the minimum variance (Gujarati, 2004: 452). The Durbin-Watson statistic is used in this study to test for the presence of first order serial correlation in the residuals.

### 4.9 Impulse response analysis

According to Lu and Xin (2010) impulse responses help in tracing out the responsiveness of the dependent variable in the model to fluctuations in each explanatory variable. A unit shock is applied to the error for each variable separately such that an $x$ variable or a total of $x^2$ impulse responses can be generated. Application of the impulse analysis can be done to VECM and provided that the system is stable, the shock should gradually die away (Lutkepohl, 2005). In this study the generalised impulse approach analysis is employed.

### 4.10 Variance decomposition analysis

Variance decompositions are performed after impulse response analysis is done to ascertain more information on the link between export diversification and economic growth. Variance decomposition analysis is a different method for examining model dynamics, which gives the proportion of the movements in the dependent variables that result from their own shocks in relation to shocks from other variables. The analysis is formed on the basis that a shock in any variable will directly affect the variable itself and spread to all other variables in the system due to the dynamic structure of the model. In general terms variance decomposition
analysis determines how much any step-ahead error variance of a given variance is explained by innovations to each explanatory variable (Brooks, 2008: 300-301).

4.11 Conclusion

The purpose of this chapter was to formulate the model based on both empirical and economic theory with economic growth being the dependent variable. The main explanatory variable of the model is the level of export diversification measured by the NHI. Other explanatory variables include trade openness, capital expenditure, human capital and real effective exchange rate. Tests for stationarity are performed using the ADF and PP tests to ensure that the data is stationary. Cointegration analysis is done through the use of the VECM and the Johansen (1995) technique. A number of diagnostic test such as the heteroscedasticity test, serial correlation tests and residual normality test are employed to validate the parameter estimation of the model. Impulse response and variance decomposition analysis are also employed by the study to determine the relationship among variables included in the model.
CHAPTER FIVE
PRESENTATION AND ANALYSIS OF EMPIRICAL FINDINGS

5.1 Introduction

This chapter presents and interprets empirical findings on the role played by export diversification on economic growth. The Chapter is divided into 8 sections. Section 5.2 presents unit root test results for the stationarity tests. Section 5.3 presents and discusses the cointegration test results. Section 5.4 discusses the long run relationship between the variables under consideration. Section 5.5 presents the diagnostic checks results. This is followed by impulse response and the variance decomposition analysis in Sections 5.6 and 5.7 respectively. Section 5.8 concludes the chapter.

5.2 Unit root test results

The Johansen (1995) procedure can only be done correctly if testing for unit root is taken as the preliminary stage. It is necessary to determine whether the series are stationary or not, before applying the Johansen test. In this study, two forms of testing for stationarity are employed. The first one is the informal graphical representations which gives a rough idea of the data’s structural breaks and stationarity. Results from the graphical analysis are presented in Figure 5.1 and 5.2. Figure 5.1 present data in levels while Figure 5.2 shows data in first difference. The results from the ADF and PP tests are shown in Table 5.1 and Table 5.2, respectively.

Figure 5.1 indicates that gross domestic product (GDP), normalised-hirschmann index (NHI), real effective exchange rate (REER), trade openness (OPEN), capital formation (CAP) and human capital formation (HUM) all have a trending behaviour. All the variables increase in general except for REER which shows a declining trend. Furthermore, the series in Figure 5.1 are non-stationary. In other words the series are non-stationary in levels as illustrated by the graphs in Figure 5.1. Figure 5.2 shows that the data is fluctuating around zero mean implying that it became stationary after differencing. This suggests that the variables are likely to be integrated of order one. Stationary time series are a necessity so as to avoid spurious relationships. The ADF and PP tests are also used to strengthen the findings of the graphical representations as results from the graphical representations cannot be relied on alone as it is an informal way of testing for stationarity. Undifferenced variables graphs are presented in Figure 5.1 on the next page.
Figure 5.1: Plot of Undifferenced variables

Source: Own Graphs made with Results from the unit root tests.
Plot of differenced variables graphs are presented in Figure 5.2 below.

**Figure 5.2: Plot of differenced variables**

*Source: Own Graphs made with Results from the unit root tests.*

When testing for unit roots using the ADF and the PP test, the null hypothesis is that the series have a unit root. If the test statistic is greater than the critical values at all levels of
significance, the null hypothesis of unit root is not rejected at that level of significance, implying that the series is non-stationary (Brooks, 2008: 334&335). Using the ADF test as shown in Table 5.1, all the series in levels for intercept, trend and intercept and when both the intercept and trend are omitted is non-stationary except for REER which is stationary at ten per cent significance level for the intercept.

Results from the ADF and PP tests are shown in Table 5.1 and Table 5.2 respectively.

**Table 5.1: Augmented Dickey-Fuller tests**

<table>
<thead>
<tr>
<th>Order of integration</th>
<th>Variable</th>
<th>Intercept</th>
<th>Trend</th>
<th>and</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>LGDP</td>
<td>1.535</td>
<td>-1.691</td>
<td></td>
<td>2.651</td>
</tr>
<tr>
<td>1st difference</td>
<td>DGDP</td>
<td>-3.216**</td>
<td>-4.043**</td>
<td>-1.797*</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>NHI</td>
<td>-1.672</td>
<td>-2.132</td>
<td></td>
<td>-1.514</td>
</tr>
<tr>
<td>1st difference</td>
<td>DNHI</td>
<td>-6.522***</td>
<td>-6.588***</td>
<td>-6.231***</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>LCAP</td>
<td>-0.713</td>
<td>-2.507</td>
<td></td>
<td>0.545</td>
</tr>
<tr>
<td>1st difference</td>
<td>DCAP</td>
<td>-3.286**</td>
<td>-4.184**</td>
<td>-3.080***</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>LHUM</td>
<td>-0.932</td>
<td>-1.866</td>
<td></td>
<td>2.729</td>
</tr>
<tr>
<td>1st difference</td>
<td>DHUM</td>
<td>-3.061**</td>
<td>-3.225*</td>
<td>-4.642***</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>LREER</td>
<td>-2.793*</td>
<td>-3.045</td>
<td></td>
<td>-0.494</td>
</tr>
<tr>
<td>1st difference</td>
<td>DREER</td>
<td>-4.250***</td>
<td>-4.255**</td>
<td>-4.292***</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>LOPEN</td>
<td>-0.336</td>
<td>-3.128</td>
<td></td>
<td>-2.679</td>
</tr>
<tr>
<td>1st Difference</td>
<td>DOPEN</td>
<td>-3.203**</td>
<td>-4.481***</td>
<td>-2.145**</td>
<td></td>
</tr>
<tr>
<td>1 per cent</td>
<td>Critical values</td>
<td>-3.689</td>
<td>-4.310</td>
<td>-2.650</td>
<td></td>
</tr>
<tr>
<td>5 per cent</td>
<td></td>
<td>-2.972</td>
<td>-3.574</td>
<td></td>
<td>-1.953</td>
</tr>
<tr>
<td>10 per cent</td>
<td></td>
<td>-2.625</td>
<td>-3.221</td>
<td></td>
<td>-1.610</td>
</tr>
</tbody>
</table>

Notes

*** represents stationarity at 1 per cent of significance, ** represents stationarity at 5 per cent of significance and * represents stationarity at 10 per cent of significance, L represents Logarithms of variables and D represents that the variable has been differenced.

*Source: Own Table made with Results from the ADF tests.*

When the data is differenced once, the test rejects the null hypothesis of unit roots because all test statistics are more negative and smaller than the critical values implying that all the series become stationary. NHI is stationary at one per cent significance level for the intercept, intercept and trend and when none is present. CAP and HUM are only stationary at one per
cent significance level when neither the intercept nor the trend is present. The test statistic for OPEN is less than the one per cent critical value when both the trend and intercept are present in the series. REER is stationary at one per cent level of significance for the intercept and when neither the intercept nor the trend is present. The test statistic of GDP and CAP are less than the critical values at one per cent significance level for the intercept and trend and intercept. At the same level of significance for the intercept and trend and intercept HUM and REER are also stationary respectively. GDP is stationary at ten per cent significance level when both the trend and the intercept are absent and HUM is also stationary for the trend and intercept.

Table 5.2 presents the results of the PP test and is similar to the ADF because it tests the series for the intercept, trend and intercept and none. For series in levels the PP test shows that all the variables are non-stationary when the intercept is present. When the intercept is present GDP, REER, CAP and HUM are non-stationary at levels while NHI and OPEN are stationary at five per cent significance level. When there is no trend and intercept all the variables except for OPEN which is stationary at five per cent significance level are non-stationary. When the data is first differenced the data is stationary at one per cent significance level on the intercept except for CAP and HUM which is stationary at five per cent significance level. For the trend and intercept at first difference GDP, NHI, REER and OPEN are stationary at one per cent level of significance while CAP and HUM test statistics are less than the ten per cent critical value. When neither the trend nor the intercept is present, all variables are stationary at five per cent significance level except for HUM which is stationary at ten per cent significance level. In general, both methods of testing for stationarity utilised in the study prove that data is non-stationary when in levels but become stationary after being differenced once. This implies that the data is integrated of the same order I(1). Table 5.2 is presented on the next page.
Table 5.2: Phillip-Perron tests

<table>
<thead>
<tr>
<th>Order of integration</th>
<th>variable</th>
<th>Intercept</th>
<th>Trend and intercept</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>LGDP</td>
<td>1.442</td>
<td>-0.980</td>
<td>4.653</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; difference</td>
<td>DGDP</td>
<td>-4.071***</td>
<td>-4.835***</td>
<td>-2.767***</td>
</tr>
<tr>
<td>Level</td>
<td>NHI</td>
<td>-2.227</td>
<td>-4.298**</td>
<td>-1.373</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; difference</td>
<td>DNHI</td>
<td>-11.530***</td>
<td>-11.527***</td>
<td>-11.274***</td>
</tr>
<tr>
<td>Level</td>
<td>LCAP</td>
<td>0.434</td>
<td>-1.192</td>
<td>1.337</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; difference</td>
<td>DCAP</td>
<td>-2.969**</td>
<td>-3.493*</td>
<td>-2.943***</td>
</tr>
<tr>
<td>Level</td>
<td>LHUM</td>
<td>-0.354</td>
<td>-1.288</td>
<td>7.253</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; difference</td>
<td>DHUM</td>
<td>-3.260**</td>
<td>-3.252*</td>
<td>-1.856*</td>
</tr>
<tr>
<td>Level</td>
<td>LREER</td>
<td>-2.221</td>
<td>-2.560</td>
<td>-0.366</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; difference</td>
<td>DREER</td>
<td>-4.727***</td>
<td>-4.737***</td>
<td>-4.779***</td>
</tr>
<tr>
<td>Level</td>
<td>LOPEN</td>
<td>-0.029</td>
<td>-3.622**</td>
<td>-2.457**</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Difference</td>
<td>DOPEN</td>
<td>-5.815***</td>
<td>-5.680***</td>
<td>-4.558***</td>
</tr>
<tr>
<td>1 per cent</td>
<td>Critical values</td>
<td>-3.670</td>
<td>-4.297</td>
<td>-2.644</td>
</tr>
<tr>
<td>5 per cent</td>
<td></td>
<td>-2.964</td>
<td>-3.568</td>
<td>-1.952</td>
</tr>
<tr>
<td>10 per cent</td>
<td></td>
<td>-2.621</td>
<td>-3.218</td>
<td>-1.610</td>
</tr>
</tbody>
</table>

Notes

*** represents stationarity at 1 per cent of significance, ** represents stationarity at 5 per cent of significance and * represents stationarity at 10 per cent of significance, L represents Logarithms of variables and D represents that the variable has been differenced.

Source: Own Table made with Results from the PP tests.

5.3 Cointegration tests

After establishing that all the variables are integrated of the same order, the study goes on to test for cointegration in order to ascertain whether there exist any long-term relationship between the variables under consideration. Cointegration tests not only determine the long-run relationship but also allows for the integration of short-run dynamics among variables in a framework. However, two conditions are essential for variables to be cointegrated. That is the linear combinations of the variables from the regression of the non-stationary variables in levels must be stationary and that the variables must be integrated of the same order.

The Johansen (1995) maximum likelihood approach is utilised in testing for cointegration. A multi-variable model is associated with some problems such as the possibility of the
existence of more than one cointegrating equations among the variables in the model making the process of cointegration testing an intimidating one. The solution of too much cointegrating relationships within a model is the adoption of a simplified model with a small number of variables, though it may suffer from misspecification due to omitted variables. This study however adopts the other solution in which a pair-wise correlation matrix is used to control the variable selection process. Table 5.3 represents the exact results of the pair-wise correlation of variables included in the model.

**Table 5.3: Pair-wise correlation results**

<table>
<thead>
<tr>
<th></th>
<th>GDP</th>
<th>NHI</th>
<th>CAP</th>
<th>HUM</th>
<th>REER</th>
<th>OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>1.000</td>
<td>-0.304</td>
<td>0.545</td>
<td>-0.413</td>
<td>-0.021</td>
<td>0.513</td>
</tr>
<tr>
<td>NHI</td>
<td>-0.303</td>
<td>1.000</td>
<td>-0.375</td>
<td>0.034</td>
<td>-0.282</td>
<td>0.285</td>
</tr>
<tr>
<td>CAP</td>
<td>0.545</td>
<td>-0.375</td>
<td>1.000</td>
<td>-0.551</td>
<td>0.333</td>
<td>0.371</td>
</tr>
<tr>
<td>HUM</td>
<td>-0.413</td>
<td>0.034</td>
<td>-0.551</td>
<td>1.000</td>
<td>0.200</td>
<td>-0.283</td>
</tr>
<tr>
<td>REER</td>
<td>-0.021</td>
<td>-0.282</td>
<td>0.333</td>
<td>0.200</td>
<td>1.000</td>
<td>-0.326</td>
</tr>
<tr>
<td>OPEN</td>
<td>0.513</td>
<td>0.285</td>
<td>0.371</td>
<td>-0.283</td>
<td>-0.326</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*Source: Own Table made with Results from the pair-wise correlation tests.*

From the pair-wise correlation results shown in Table 5.3, it can be deduced that CAP is highly correlated to GDP. In line with economic theory that high levels of investment in productive machinery and equipment leads to positive GDP growth, CAP is positively correlated to GDP. Another positively correlated variable to GDP is OPEN and confirms theoretical underpinnings because as the economy becomes more open especially when it is experiencing positive net exports, GDP increases. The economy can also grow as a result of its increased ability to import more raw and input materials to be used in the production of other goods thereby adding positively to its GDP. REER has a negative association with GDP suggesting that increases in REER (depreciation of the Rand) negatively affects GDP which is consistent with theoretical underpinnings. HUM is also negatively correlated to GDP mainly because investment in human capital may reduce current production but have a positive increase in GDP for the future generations. NHI is negatively related to GDP in support of theoretical underpinnings such as the H-O theory, which suggests that a country can only increase its GDP by specialising in the production and exportation of the product in which it has a comparative advantage.
An essential prerequisite in conducting the Johansen (1995) cointegration tests and estimation of any VAR system is the selection of an optimal lag length. In this study, the optimal lag length was made by examining the lag structure in an unrestricted VAR originally specified with three lags and using VAR lag order selection criteria. The optimum lag length is very important in testing for cointegration and estimating VAR systems so as to avoid spurious regression. For instance, if there are \( n \) number of variables with \( k \) lag length, it is necessary to estimate \( n(nk+1) \) coefficients. The choice of the lag length is also important because the lag length determines the power of rejecting the hypothesis through \( k \). If \( k \) is too large, degrees of freedom maybe wasted and if it is too small, important lag dependences maybe omitted from the VAR. Lag order selection criterion is presented in Table 5.4 below.

### Table 5.4: Lag Order Selection Criteria

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>106.1874</td>
<td>NA</td>
<td>3.14e-11</td>
<td>-7.156242</td>
<td>-6.870770</td>
<td>-7.068971</td>
</tr>
<tr>
<td>1</td>
<td>281.8630</td>
<td>263.5134</td>
<td>1.56e-15</td>
<td>-17.13307</td>
<td>-15.13476*</td>
<td>-16.52217</td>
</tr>
<tr>
<td>2</td>
<td>338.1612</td>
<td>60.31952*</td>
<td>5.43e-16</td>
<td>-18.58294</td>
<td>-14.87180</td>
<td>-17.44841</td>
</tr>
<tr>
<td>3</td>
<td>398.5212</td>
<td>38.80283</td>
<td>3.55e-16*</td>
<td>-20.32294*</td>
<td>-14.89897</td>
<td>-18.66478*</td>
</tr>
</tbody>
</table>

Notes
*Indicates lag order selection by the criterion

LR: sequential modified LR test statistic (each test at 5 per cent level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Own Table made with Results from the lag order selection criteria tests.

Results presented in Table 5.4 shows that sequential modified LR test statistic and the Schwarz information criterion selected 2 lags and 1 lag respectively, while the other information criterion selected 3 lags. Consequently, the cointegration and VAR models test are conducted under the assumption of intercept and no trend in the series.

Table 5.5 shows the trace based Johansen cointegration test results. The null hypothesis of the trace test is that the number of cointegrating equations is less than or equal to the number of cointegrating vectors. If the test statistic is greater than the critical values of the trace tests,
then the null hypothesis is rejected and the null hypothesis is not rejected if the test statistic is less than the critical value. Johansen cointegration test results are presented in Table 5.5 below.

**Table 5.5: Cointegration Rank Test (Trace)**

<table>
<thead>
<tr>
<th>Hypothesised No of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical value</th>
<th>Prob**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.879012</td>
<td>174.7334</td>
<td>95.75366</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1*</td>
<td>0.772498</td>
<td>115.5956</td>
<td>69.81889</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2*</td>
<td>0.728854</td>
<td>74.13899</td>
<td>47.85613</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 3*</td>
<td>0.665194</td>
<td>37.59623</td>
<td>29.79707</td>
<td>0.0052</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.207222</td>
<td>6.958543</td>
<td>15.49471</td>
<td>0.5825</td>
</tr>
<tr>
<td>At most 5</td>
<td>0.016175</td>
<td>0.456611</td>
<td>3.841466</td>
<td>0.4992</td>
</tr>
</tbody>
</table>

Notes

Trace test indicates 4 cointegrating eqns at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

*Source: Own Table made with Results from the cointegration rank tests.*

From table 5.5, the trace test shows that there are at least four cointegrating equations at five per cent level of significance. The null hypothesis of no cointegrating equations is rejected because the trace statistic of 174.73 is greater than the five per cent critical value of 95.75. On the same note, the null hypothesis that there are at most three cointegrating vectors is rejected since the test statistic of approximately 37.59 is greater than the five per cent critical value of 29.79. The test fails to reject the null hypothesis that there are at most four cointegrating vectors since the test statistic of approximately 6.95 is less than the five per cent critical value of 15.49. It can therefore be concluded that the trace statistics specified four cointegrating relationship at five per cent significance level.

The cointegration test based on the maximum eigenvalue is presented in Table 5.6 on the next page. The null hypothesis of the maximum eigenvalue based test is that the number of the cointegrating equations is \( r \) and is tested against the alternative hypothesis of that the number of cointegration equations is \( r + 1 \). If the test statistic is greater than the critical value, the null hypothesis is rejected.
Table 5.6: Cointegration Rank Test (Maximum Eigenvalue)

<table>
<thead>
<tr>
<th>Hypothesised No of CE(s)</th>
<th>Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.879012</td>
<td>59.13780</td>
<td>40.07757</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1*</td>
<td>0.772498</td>
<td>41.45665</td>
<td>33.87687</td>
<td>0.0062</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.728854</td>
<td>27.58434</td>
<td>36.54276</td>
<td>0.4527</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.665194</td>
<td>21.13162</td>
<td>30.63769</td>
<td>0.3017</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.207222</td>
<td>6.501.931</td>
<td>14.26460</td>
<td>0.5497</td>
</tr>
<tr>
<td>At most 5</td>
<td>0.016175</td>
<td>0.456611</td>
<td>3.841466</td>
<td>0.4992</td>
</tr>
</tbody>
</table>

Notes

Max-eigenvalue test indicates 1 cointegrating eqns at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Own Table made with Results from the cointegration rank tests.

From Table 5.6 it can be deduced that the maximum eigenvalue test suggest that there is at least one cointegrating vectors at five per cent significance level. The test fails to accept the null hypothesis of no cointegrating equation at five per cent significance level because the test statistic value of approximately 59.14 is greater than the five per cent critical value of 40.08. The test also fails to reject the null hypothesis that there is at most one cointegrating vectors since the test statistic of approximately 41.46 is greater than the five per cent critical value of approximately 33.88. In other words the maximum eigen statistics specified one cointegrating relationship at five per cent significance level.

Both test presented in Table 5.5 and Table 5.6 indicate that the null hypothesis of none cointegration vector is rejected. In this regard, only one cointegration relationship is going to be taken into consideration in this study. Figure 5.3 on the next pag diagrammatically illustrate the cointegrating vector which represents the deviations of the endogenous variable from its long run equilibrium. It also presents the cointegration relationship for the period from 1980 to 2010. The deviations of GDP from the long run equilibrium of GDP are stationary and hence can be used for the estimation of the error correction model.
5.4 Vector Error Correction Model (VECM)

Since one cointegration vector exists among the variables in the model as shown in Section 5.3 the VECM can therefore be used to analyse the long run and short run effects of the variables on the dependent variable. The VECM is specified basing on the results of the cointegration tests and its results are shown in Table 5.7 and Table 5.8 below.

Table 5.7: Results of the long run cointegration equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-10.35165</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>GDP(-)</td>
<td>1.000000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NHI(-)</td>
<td>0.462022</td>
<td>0.11557</td>
<td>3.99790</td>
</tr>
<tr>
<td>REER(-)</td>
<td>0.543505</td>
<td>0.09686</td>
<td>5.61137</td>
</tr>
<tr>
<td>OPEN(-)</td>
<td>0.058409</td>
<td>0.22618</td>
<td>0.25825</td>
</tr>
<tr>
<td>HUM(-)</td>
<td>-0.195425</td>
<td>0.08014</td>
<td>-2.43849</td>
</tr>
<tr>
<td>CAP(-)</td>
<td>-0.311734</td>
<td>0.08966</td>
<td>-3.47681</td>
</tr>
</tbody>
</table>

Source: Own Table made with Results from the long run cointegration equation tests.
The long run effect of export diversification and other factors that affect export diversification and trade can be illustrated as in Equation 5.1

\[ \text{GDP} = -10.352 + 0.462NHI - 0.195HUM - 0.311CAP + 0.544REER + 0.058OPEN \ldots 5.1 \]

From Equation 5.1 it can be deduced that HUM and CAP have a negative long run relationship with GDP. The results suggest that unit increases in HUM and CAP lead to a decline in GDP by approximately 0.195 and 0.311, respectively. The negative relationship between CAP and HUM is against the theoretical underpinnings which suggest that increases in both capital and human capital increases GDP. However, increases in HUM can start to affect GDP positively in the future when the educated and skilled labour force start to produce goods while reducing current GDP.

Both NHI and OPEN have positive relationships with GDP in the long run. The results in Table 5.7 suggest that a unit increase in NHI increases GDP by approximately 46.20 per cent. The positive relationship between NHI and GDP is consistent with theoretical suggestions which argue that increased export diversification also increases GDP. On the same note, a unit increase in OPEN also causes increases in GDP of about 0.058.

According to economic theory, openness can either have a negative or a positive relationship with GDP depending on whether the trade has got relatively more exports to imports or vice-versa. REER has a positive coefficient in equation 5.1, meaning that an increase in the real effective exchange rate (depreciation) causes an increase in GDP. The long run view of this study, a unit percentage decrease in the value of the Rand causes approximately 58.41 per cent increase in GDP.

In general terms, REER has a negative relationship with GDP. The negative relationship between REER and GDP is in line with theoretical underpinnings. This is evident in the economic theory suggests that an increase in REER (depreciation) is associated with declining terms of trade consequently reducing balance of trade due to the fact that imports become dearer and exports prices decrease after the depreciation. Table 5.8 on the next page presents error correction results.
Table 5.8: Error correction results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>0.084387</td>
<td>0.15637</td>
<td>0.53966</td>
</tr>
<tr>
<td>NHI</td>
<td>-3.041284</td>
<td>0.77943</td>
<td>-3.90192</td>
</tr>
<tr>
<td>REER</td>
<td>-0.361619</td>
<td>0.47613</td>
<td>-0.75950</td>
</tr>
<tr>
<td>OPEN</td>
<td>1.074700</td>
<td>0.25073</td>
<td>4.28622</td>
</tr>
<tr>
<td>HUM</td>
<td>-0.258141</td>
<td>0.55550</td>
<td>-0.46470</td>
</tr>
<tr>
<td>CAP</td>
<td>0.399790</td>
<td>0.32489</td>
<td>1.23053</td>
</tr>
</tbody>
</table>

Source: Own Table made with Results from the error correction tests.

The coefficients of the error correction terms indicate the speed of adjustment of the variables. The coefficient of GDP is approximately 0.084 implying that the speed of adjustment is around 8.4 per cent. In other words, of the variation from the equilibrium for GDP, only 8.4 per cent is corrected annually. The correction happens during the time when the variable is moving towards equilibrium. This means that there is slow speed of adjustment of GDP which may reflect little pressure on the variable in restoring to the equilibrium in the long run due to any disturbances. The speed of adjustment is however not statistically significant with a t-value of around 0.5397. The slow speed of adjustment of GDP maybe interpreted as that there are other variables other than the ones specified in the model that affects GDP such as interest rates, monetary policy, fiscal policy and demographic factors.

NHI, REER and HUM have negative coefficients meaning that these variables converge to their long run equilibria. OPEN and CAP have coefficients that are positive, suggesting that any disequilibrium in the variables continue to grow. The t-statistics of all the variables except for OPEN which is 4.286 are statistically insignificant because they are less than two.

The impact of export diversification on GDP was also estimated using the OLS model. The estimation results are shown in Table 5.9 on the next page.
Table 5.9: Modeling fiscal policy and unemployment in South Africa using OLS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHI</td>
<td>0.118</td>
<td>0.129</td>
<td>2.914</td>
<td>0.361</td>
</tr>
<tr>
<td>OPEN</td>
<td>-1.292</td>
<td>0.159</td>
<td>-8.146</td>
<td>0.407</td>
</tr>
<tr>
<td>REER</td>
<td>-0.457</td>
<td>0.205</td>
<td>-2.233</td>
<td>0.004</td>
</tr>
<tr>
<td>HUM</td>
<td>0.412</td>
<td>0.063</td>
<td>6.492</td>
<td>0.034</td>
</tr>
<tr>
<td>CAP</td>
<td>0.883</td>
<td>0.086</td>
<td>10.274</td>
<td>0.462</td>
</tr>
</tbody>
</table>

Notes

R-squared: 0.829
Dependent Variable: GDP
Adjusted R-squared: 0.803
Durbin-Watson stat: 2.78

Source: Own Table made with Results from the OLS tests.

Results in Table 5.9 show that NHI positively influences GDP in South Africa. NHI has a positive coefficient of 0.118 which indicate that a percentage increase in NHI causes an approximately 11.8 per cent increase in GDP. NHI has a significant t-statistic of 2.914. This relationship is in line with the long run cointegration relationship and theoretical underpinnings which also suggest a positive relationship. In contrast with the long run cointegration relationship, OLS suggests a negative relationship between OPEN and GDP. In other words a unit increase in OPEN leads to an approximately 1.29 decrease in GDP. However, the relationship is insignificant with a t-statistic of 0.407.

A unit percentage increase in REER leads to an approximately 45.7 per cent decrease in GDP suggesting a negative relationship which is consistent with theoretical underpinnings. The relationship is also significant as shown by an absolute t-statistic of 2.233. Both CAP and HUM have a positive relationship with GDP. A unit increase in CAP and HUM lead to approximately 0.412 and 0.883 increase in GDP, respectively. Both the relationships are significant as they have t-statistics of 6.492 for HUM and 10.274 for CAP.

Data used in the study is robust as indicated by the adjusted R-squared of 0.803. The R-squared which measures the overall fitness of the model has a high value above 50 per cent of approximately 82.9 per cent indicating that the model is satisfactory. The Durbin-Watson (DW) value of 2.78 implies that the model does not suffer from serial correlation, meaning
that there is no auto correlation. A comparison of actual and fitted residuals are presented in Figure 5.4 below.

**Figure 5.4: Actual versus Fitted residuals**

![Graph showing actual versus fitted residuals](image)

*Source: Own Graph made with Results from the actual versus fitted residuals tests.*

In order to observe the fitness of the model the actual versus fitted residuals are presented in the form of a graph. This is depicted in Figure 5.4. Although there is still a considerable margin of error, Figure 5.4 shows that the model fits the data in a fairly sensible way. The scaled residuals show that there is white noise. In other words, the test generally confirms the adequacy of the restricted error correction specification.

### 5.5 Diagnostic checks

Diagnostic checks are also very important in the model because they validate the parameter evaluation of the outcomes achieved by the model. This is mainly because any existence of a problem in the residuals from the estimated model automatically translates into the inefficiency of the model leading to the estimated parameters being biased. The VAR model was subjected to diagnostic checks. The fitness of the model was tested in three main ways. Firstly, serial correlation was tested using the langrage multiplier (LM) test, followed by the
Jarque-Bera for normality test and finally the White test for heteroscedasticity. Diagnostic checks results are shown in Table 5.10 below.

**Table 5.10: Diagnostics checks results**

<table>
<thead>
<tr>
<th>Test</th>
<th>Null hypothesis</th>
<th>t-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Langrange Multiplier (LM)</td>
<td>No serial correlation</td>
<td>9.263</td>
<td>0.613</td>
</tr>
<tr>
<td>Jarque- Bera (JB)</td>
<td>There is a normal distribution</td>
<td>0.525</td>
<td>0.769</td>
</tr>
<tr>
<td>White (CH-sq)</td>
<td>No conditional heteroskedasticity</td>
<td>566.07</td>
<td>0.268</td>
</tr>
</tbody>
</table>

*Source: Own Table made with Results from the diagnostic checks tests.*

From Table 5.10 it can be seen that the test for serial correlation has a statistic of 9.263 with a probability of 0.613. The LM statistic of 9.263 implies that the null hypothesis of no serial correlation cannot be rejected. In other words, the model does not suffer from the problem of serial correlation. Serial correlation arise when a variable has relationships with itself in a manner that the value of such a variable in the given time period carry over into the future period. The results in Table 5.10 show a Jarque-Bera statistic of 0.525 with a probability of 0.769. Since the probability is above 0.05 the null hypothesis of normal distribution is not rejected.

Heteroscedasticity is tested using the White test with no cross terms. The existence of heteroscedasticity implies that the model has some misspecifications making it weak in estimating results. In this case the model does not suffer from misspecifications because the null hypothesis of no conditional heteroscedasticity is not rejected. This is because the test produced a CH-sq of 566.07 at a probability of 0.268. It can therefore, be concluded that the model can be relied on in drawing conclusions from the results estimated by the model.

**5.6 Impulse response analysis**

Results of the impulse analysis performed on the VECM regression are presented graphically in Figure 5.5 below. The impulse response functions are used to show the time path of the dependent variables in the model, to shocks from all the explanatory variables. Shocks in a stable model must eventually die away or decline to zero while an unstable model produces volatile shocks.

Only impulse responses for GDP in relation to other variables are analysed in this study. This is because the study deals with the impact of export diversification and other export related
variables on GDP. The impulse graphs shown in Figure 5.5 illustrate the dynamic response of GDP to a one period standard deviation shock to the innovations in the model. Furthermore, the impulse response functions also show the frequency and the directions of the response to each of the shocks in the ten year period from 1980 to 1990. Shocks to all the variables under consideration are significant though they eventually die away with time. In other words most of the impulse response functions have confirmed to the results of the short run relationship analysis conducted previously.

A one period deviation shock to NHI gradually appreciates GDP to approximately one per cent up to period seven after which the impact gradually dies away. On the other hand a one period standard deviation shock in OPEN marginally depreciates GDP by one per cent throughout the period of ten years. The same level of the shock to REER appreciates GDP to approximately one per cent and its impact quickly dies away in period five. A one period deviation shock to HUM gradually depreciates GDP by approximately one per cent to period five when it starts to appreciate GDP to at least one per cent throughout the period. A shock to CAP makes GDP to appreciate by around two per cent throughout the period. Results of the NHI, REER and CAP indicate a positive relationship between GDP where an increase in the variables cause one per cent, one per cent and two per cent respectively, while increases in HUM and OPEN each reduces GDP by one per cent. Figure 5.5 on the next page presents Impulse response analysis for GDP.
Figure 5.5: Impulse response analysis for GDP

Source: Own graphs made with Results from the impulse response tests.
5.7 Variance decomposition analysis

Variance decompositions analysis provides a measure of the contribution of each type of shock to the forecast error variance. In other terms, variance decomposition analysis helps in determining the importance of shocks to each of the independent variables. Variance decomposition results are presented in Table 5.11 below.

Table 5.11: Variance decomposition analysis results

<table>
<thead>
<tr>
<th>Period</th>
<th>S.E</th>
<th>GDP</th>
<th>NHI</th>
<th>OPEN</th>
<th>REER</th>
<th>HUM</th>
<th>CAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.023460</td>
<td>100.0000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>2</td>
<td>0.043023</td>
<td>94.25686</td>
<td>0.076237</td>
<td>0.073779</td>
<td>3.004733</td>
<td>2.361852</td>
<td>0.226446</td>
</tr>
<tr>
<td>3</td>
<td>0.063699</td>
<td>93.90938</td>
<td>1.006932</td>
<td>0.051787</td>
<td>2.055477</td>
<td>2.435103</td>
<td>0.541323</td>
</tr>
<tr>
<td>4</td>
<td>0.075597</td>
<td>93.45303</td>
<td>1.052764</td>
<td>0.754618</td>
<td>2.068747</td>
<td>1.729144</td>
<td>0.941692</td>
</tr>
<tr>
<td>5</td>
<td>0.086448</td>
<td>93.74911</td>
<td>1.321246</td>
<td>0.579390</td>
<td>2.261698</td>
<td>1.359850</td>
<td>0.728702</td>
</tr>
<tr>
<td>6</td>
<td>0.094852</td>
<td>93.45160</td>
<td>1.170442</td>
<td>0.602419</td>
<td>2.695886</td>
<td>1.286109</td>
<td>0.793544</td>
</tr>
<tr>
<td>7</td>
<td>0.104221</td>
<td>93.50324</td>
<td>1.379132</td>
<td>0.509438</td>
<td>2.808924</td>
<td>1.072836</td>
<td>0.726434</td>
</tr>
<tr>
<td>8</td>
<td>0.112571</td>
<td>92.74632</td>
<td>1.528279</td>
<td>0.624018</td>
<td>2.996068</td>
<td>1.087523</td>
<td>1.017788</td>
</tr>
<tr>
<td>9</td>
<td>0.120661</td>
<td>92.56284</td>
<td>1.725494</td>
<td>0.544092</td>
<td>3.194459</td>
<td>0.953088</td>
<td>1.020029</td>
</tr>
<tr>
<td>10</td>
<td>0.126609</td>
<td>91.90781</td>
<td>1.793174</td>
<td>0.684064</td>
<td>3.384799</td>
<td>1.029106</td>
<td>1.201048</td>
</tr>
</tbody>
</table>

Source: Own Table made with Results from the variance decomposition tests.

Due to the fact that the study only concentrates on the movements of GDP that result from the shocks to itself or any other independent variable used in the study. It also reports only the variance decomposition in GDP and analyse the relative importance of each of the independent variables in influencing its movements. The study reports the variance decompositions for a period of ten years. Such a period is chosen so as to fully observe the impact of the independent variables on GDP in a relatively longer time.

In period one all the variance in GDP is explained by its own shocks as shown in Table 5.11, where GDP itself explains 100 per cent of its own variation. In period five GDP explains about 94 per cent of its own variations while the independent variables only explain about six
per cent of the GDP variations. Of the six per cent which is not explained by GDP itself, NHI explains one per cent while REER explains approximately two per cent, with OPEN, CAP and HUM each explaining about one per cent of GDP variations. After a period of ten years, GDP continues to explain the greater share of its variations. It explains approximately 92 per cent with eight per cent being explained by other variables in the model. The effect of NHI increases by one per cent, while OPEN continues to explain one per cent of GDP variation. REER’s influence increases to three per cent and HUM and CAP continue to contribute one per cent of GDP variations. The results in Table 5.11 are in consistence with the impulse response analysis results because all variable affect GDP in the short run.

5.8 Conclusion

The Chapter examined the role played by export diversification and its impact on GDP in South Africa. Firstly, an analysis of the time series property of unit roots tests was performed using the informal graphical representations and formal ADF and PP tests. Both the informal and formal methods of unit roots testing reveal that most of the series are non-stationary when they are in their levels. However, all the variables become stationary after being differenced once meaning that they are integrated of the same order.

The Johansen cointegration tests employed in the study show that there is at least one cointegration between GDP and, export diversification and other independent variables specified in the model. The existence of cointegration between the variables led to the estimation of the VECM which provided long run and short run parameter estimates. The results of the long run cointegration equation suggest that export diversification positively influence GDP, therefore we reject the null hypothesis that increases in export diversification levels does not lead to increases economic growth in the South Africa. All the explanatory variables proved to be statistically significant in explaining GDP. Diagnostic checks, impulse response and variance decomposition were also presented. Diagnostic checks reveal that the model was suitable for the estimation of the relationship under consideration. Furthermore, no serial correlation and misspecification was found in the model, making the results of the model valid and reliable.
CHAPTER SIX
CONCLUSIONS, POLICY RECOMMENDATIONS AND LIMITATIONS

6.1 Summary of the study and conclusions

Chapter One of this study outlined the main objective of the study so as to determine the existence of any possible relationship between export diversification and economic growth. Chapter Two provided an outline of trade regime changes that South Africa went through after which an overview of GDP, export diversification and possible variables that affect export diversification trends were outlined. South Africa can be seen as a country which changed from high trade protectionism to embrace trade liberalisation in the early 1990s. This has seen the country expanding its trade activities with other countries. During the period before apartheid export were more concentrated than after trade liberalisation. More so, the trend overview of South Africa revealed that export concentration indices movements were associated with opposite movements in the growth of the country’s economy meaning that export diversification influences GDP positively in South Africa.

Chapter Three analysed both theoretical and empirical literature. Theoretical literature reviewed in the study includes the H-O model, the Imitation Lag Hypothesis, the Product Life Cycle and the Endogenous growth model. Of the theories reviewed only the H-O model concludes that countries must concentrate on the exportation of products in which that country has a comparative advantage as suggested by its factor endowments abundance and the factor intensity of the products produced. All the other theories suggest that export diversification was important for positive growth of countries. Empirical literature on the relationship between export diversification reveals that export diversification plays an important role in the growth of the economy. However, some authors such as as Nicet-Chenaf and Rougier (2008) and Aditya and Roy (2009) argue that too much export diversification may negatively affect the economy. The methodology of the study was discussed in Chapter Four with the results analysed and interpreted in Chapter Five.

The data used in this study was analysed using the methodology outlined in Chapter Four. The data was first tested for stationarity using the ADF and PP tests. Stationarity tests reveal that all variables were stationary in their first difference. Cointegration and vector error correction modelling was also done. Three lags were used in the cointegration analysis and both the trace and eigenvalue cointegration test reflected that there was at least one cointegrating equation at five per cent significance level. All the explanatory variables proved
to be statistically significant in explaining GDP. The pair-wise correlation matrix was also used to determine the exact relationship between the four variables involved in this study.

Diagnostic tests, impulse response and variance decomposition analysis were also carried out and the tests reveal that the GDP model used in the study is quite suitable in capturing the influence of the explanatory variables in South Africa. The long run equation constructed from vector error correction modelling shows that GDP is positively related to export diversification, real effective exchange rate, and trade openness. However, it is negatively related to human capital and capital investment. The relationships estimated in the study are consistent with theoretical underpinning because the diagnostic checks and variance decomposition analysis suggest that the model is stable. This chapter provides a detailed summary, policy recommendations and limitations of the study.

6.2 Policy Implications and Recommendations

A number of policy implications can be deduced from the results and conclusions of this study. Based on the results of this study, the South African government can be advised to continue implementing trade liberalisation policies. The presence of a significant long run relationship between export diversification and economic growth implies that increased diversification in exports contributes to economic growth of the economy. In other words, the South African government can embark on a policy in which it can subsidise small to medium scale firms that engage in the innovation and production of new products. The support to such firms will increase future possibilities of a diversified export basket for the country.

Furthermore, the South African government should also take into consideration that trade openness also contributes the growth of the economy. Hence, policy makers may be advised to also give positive attention to potential exporters and importers. In other words, the government can engage in export subsidisation and create policies such as reducing import tariffs and duties to create a more free trade environment. The country can also enhance trade openness by being involved in economic integration through active participation in trade blocks. However, this must be done with caution due to the fact that increased trade openness and globalisation makes the economy to be more vulnerable to global shocks such as financial crisis and credit crunches occurring it the trade partners. The South African policy makers can also utilise the empirical findings of this study in influencing the level of growth in the country. Though the model used in the study did not consider all other factors that
affect the growth of the economy such as political factors, monetary policy, fiscal policy and demographic factors.

Trade openness was also found to have a positive relationship with GDP in the long run cointegration equation. Since trade openness consist of both exports and imports as a fraction of GDP, South Africa can influence trade openness through either exporting or importing of productive raw materials to be used in production of other products. This can be achieved by maintaining a favourable exchange rate of the South African currency against major currencies such as the American dollar, the British Pound and the Botswana Pula.

6.3. Limitations of the study and areas of further research

The use of a simplified model is a major limitation to this study. Due to unavailability of data, not all actual variables as suggested by theory could be included in the model for example instead of using economic growth as the dependent variable, a GDP was used as a proxy for economic growth in the model. On the same note, instead of using human capital in the model as suggested by economic theory, government expenditure on tertiary education was used. Furthermore, the study suffered from limited and inconsistent secondary data. Data such as those for exports goods classes was not readily available in the local currency (Rands) and therefore had to be converted from US dollars, making the data subject to mistakes and inconsistency in results. However, the limitations did not lead to loss of statistical significance since the results are supported by both theoretical and empirical literature. Future studies may focus on the extent to which export diversification can continue to be a source of economic growth in South Africa.
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### APPENDIX ONE

Table A1: Data used in the research (natural logarithms)

<table>
<thead>
<tr>
<th>obs</th>
<th>LOG_GDP</th>
<th>NHI</th>
<th>LOG_OPEN</th>
<th>LOG_REER</th>
<th>LOG_HUM</th>
<th>LOG_CAP</th>
</tr>
</thead>
<tbody>
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<td>1983</td>
<td>13.7787</td>
<td>-1.368</td>
<td>-1.58247</td>
<td>5.048124</td>
<td>8.584478</td>
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<td>4.907125</td>
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<tr>
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<td>Value 3</td>
<td>Value 4</td>
<td>Value 5</td>
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<td>2005</td>
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<td>12.03677</td>
<td>12.7994</td>
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*Source: Own Table made with statistical data available from SARB and WTO (2012).*