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THE CONTRIBUTION OF THE MOTOR INDUSTRY TO THE SOUTH AFRICAN ECONOMY

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I, the undersigned, **Khaya Tyatya,** student number **200508100,** do hereby declare that this dissertation is my original work with the exception of quotations and references whose sources are acknowledged and that it has not been submitted, and will not be presented at another University for similar or any other degree award.

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Signature

03 APRIL 2012

Date

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IN LUMINE TUO VIDE BIMUS LUMEN

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Dedication

This work is dedicated to my nephews Achume and Liyema and my new born son Olonathando to serve as inspiration for the future ahead.

List of Acronyms

ADF: Augmented Dickey Fuller

BJ: Bera- Jarque

CAR: Centre for Automotive Research

CBU: Completely Built Unit

CEE: Central and Eastern Europe

CEX: Consumer Expenditure Survey

CGE: Computable General Equilibrium

CKD: Completely Knocked- Down

BEA: Bureau of Economic Research

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

DF: Dickey Fuller

DFA: Duty Free Allowance

DS: Dynamo System

DTI: Department of Trade and Industry

ELG: Export Led Growth

EP: Export Promotion

ERPT: Exchange Rate Pass Through

EU: European Union

UK: United Kingdom

FDI: Foreign Direct Investment

FTA: Free Trade Agreement

GEAR: Growth, Employment And Redistribution

HCV: Heavy Commercial Vehicles

HTS: Harmonized Tariff Schedule

IIT: Intra-Industry Trade

IPAP: Industrial Policy and Action Plan

IRCC: Import Rebate Credit Certificate

IS: Import Substitution

LCV: Light Commercial Vehicles

LM: Lagrange Multiplier

MIDP: Motor Industry Development Programme

MVP: Motor Vehicle and Parts Industry

NAAMSA: National Association of Automobile Manufacturers of South Africa

NAFTA: North American Free Trade Agreement

NEER: Nominal Effective Exchange Rate

OECD: Organisation for Economic Co-operation and Development

OEM: Original Equipment Manufacturers

OLS: Ordinary Least Squares

PAA: Productive Asset Allowance

REMI: Regional Economic Models

RGDP: Real Gross Domestic Product

RGT: Response Group Trendline

RMVO: Real Motor Vehicle Output

SACU: South African Customs Union

SADC: South African Development Community

SARB: South African Reserve Bank

SOE: State Owned Enterprises

SMME: Small, Medium and Micro Enterprises

SSA: Sub-Saharan Africa

STATSSA: Statistics South Africa

TFP: Total Factor Productivity

TNC: Trans-National Corporation

VAR: Vector Autoregression

VECM: Vector Error Correction Model

WTO: World Trade Organisation

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The automobile industry in South Africa consists of the vehicle production sector and the components sector. The vehicle manufacturing sector includes Original Equipment Manufacturers (OEM) or vehicle assemblers. Four OEM`s are based in the Eastern Cape namely Volkswagen, Daimler Chrysler, Ford Motor Company and General Motors with rest spread across Gauteng (Nissan & BMW) and Kwa-Zulu Natal (Toyota). A number of component suppliers support these OEM`s. About 40% of South Africa's vehicle output comes from the Eastern Cape maintaining the country's position as an automotive competitor in Africa and the world (Department of Trade and Industry, 2009).

The motor industry is critically important for the South African economy in terms of its contribution to the country's GDP (ASTDT, 2004). The motor industry's contribution was 7.2 percent of the country's GDP in 2008 making it one of the largest contributors to GDP over the past few years (NAAMSA), 2009). The motor industry's share of GDP has varied over the years as it registered a 7.2 percent share in 2005, 5.7 percent in 2006, 6.7 percent in 2007. The motor industry's varying contribution to GDP has implications on the competitiveness of the industry, its ability to attract investment and create employment on a continuous basis which can set the industry to becoming a reliable contributor to the country's economic growth.

The South African automobile industry exports passenger cars and commercial vehicles to countries around the world. The sector's exports, as a percentage of total South African exports, have increased more than threefold from the 4, 1 % in 1995 to 13 %, and 7 % in 2007 (Stats, SA 2008). Exports have a positive effect on securing jobs and in some cases providing employment for additional workers as has been the case by a number of OEM`s (BMW, VW and Daimler Chrysler) who have won new exports contracts from their parent companies. Employment improved in both the OEM`s and the component sector in that employment in the vehicle assembly increased from 32 751 in December 2001 to 38 623 in April 2007 whilst employment increased by 31.3 percent in the components sector over the same period (Barnes & Morris, 2008). Significant investments in best practice assets and state of the art technology have taken place, mainly to accommodate export contracts for vehicles and automotive components. Capital Investments in the vehicle industry increased from R 847 million in 1995 to R3.5 billion in 2005 (Black, 2007). Structural changes such as technology transfer and human capital development have taken place in the South Africa's automotive industry over the past decade as a result of increased investment.

In 1995 the government introduced the Motor Industry Development Programme (MIDP). Under this programme trade liberalization was encouraged and integration into the global economy was established (Black, 2007). The MIDP programme had specific objectives, namely, to achieve international and domestic competitiveness, create employment and contribute to economic growth (Franse, 2006). To this end, the industry was able to provide high quality and affordable vehicles and components to the domestic and international market and in turn provide sustainable employment through increased production. In order to achieve these objectives government provided support for this industry. The support included; minimal protection for assembly, some export support and investment assistance. Tariffs and import duties were reduced. Government phased down protection to 40% on light motor vehicles and to 25% of heavy vehicles by 2002. The MIDP also provided incentives for vehicle producers to expand exports. Import duties on components and vehicles were offset by import rebate credits derived from the export of vehicles and components (Black &Bhanisi, 2006). The introduction of the motor industry development programme led to increased competitiveness and this impacted positively on the industry as more jobs and investment opportunities were created. The MIDP was received positively by the OEM`s and components sector as it meant firms had to upgrade and modernize their facilities. Investments in the industry improved leading to positive spillover effects such as technology transfer, human capital development, learning processes in organizational development and access to export market. Firms (OEM) also experienced an increase in financial performance, capital expenditure and productivity development (Franse, 2006).

1.2 Statement of the problem

The motor industry is a key growth sector in the South African economy. However, the contribution of the motor industry to economic growth has not been consistent. There has been variations to the growth over the last few years and this had an impact on South Africa`s growth. Whereas the government has provided support with the introduction of the Motor

Industry Development Programme (MIDP), and jobs were created during the inception of the MIDP, overall employment has declined. The motor industry continued to shed jobs over the years. This has led to a number of stakeholders proclaiming that the assistance provided by government has yielded little or no return.

1.3 Objective of the study

The objective of the study is to determine the role of the motor industry in the economic growth of the country.

Sub-Objectives

- To determine the performance of the motor industry and its contribution to economic growth
- Make recommendations for improving performance and contribution of the industry to economic growth.

1.4 Significance of the study

The motor industry, has the potential to contribute positively towards economic growth and economic development. The performance of the motor industry therefore becomes critical. The study aims to highlight the contribution of the motor industry to economic growth in South Africa. The rationale for the study is to contribute to empirical evidence already available by highlighting the importance of the industry to South Africa's growth prospects. By ascertaining the industries contribution government can put in place programs that will stimulate growth for the economy.

1.5 Hypothesis

The null hypothesis to be tested is that the motor industry has positive impact on South Africa`s Gross Domestic Product (GDP).

1.6 Outline of the study

This dissertation is divided into six chapters. Chapter one presents the introduction, statement of the problem, objectives, significance and the hypothesis of the study. Chapter two provides a review of both the empirical and theoretical literature, Chapter three provides an overview of developments and trends in the motor industry. Chapter four presents the methodology to be used in the estimation of the model, Chapter five presents the empirical findings. Chapter six provides a summary of the findings, conclusions and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to explore the various theories of economic growth. Any meaningful contribution by any sector is based on its ability to contribute to economic growth and to create employment (Todaro, 1997). The neoclassical (Solow) growth theory, new (endogenous) growth theory, the recent neoclassical theory of counterrevolution and the structural change theory are discussed in this chapter. These theories are important in that they provide the determinants and fundamental dynamics of economic growth. The chapter is divided into three sections. The first section deals with the various theories of economic growth, the second section deals with the empirical literature on economic growth and the last section provides the concluding remarks.

2.2. Theoretical Literature

This section is aimed at investigating the determinants of economic growth. Traditional theories of economic growth namely, neoclassical (Solow) growth theory and the endogenous growth theory, the neoclassical theory of counterrevolution (market fundamentalism) and the structural change theories are discussed, a general assessment of theoretical literature is also provided.

2.2.1 Neo-Classical (Solow) Growth Theory

The neoclassical growth theory was developed by Robert Solow (1956) and Trevor Swan (1956). The neo-classical growth theory assumes capital accumulation (capital stock), population growth (increase in quantity and quality of labour) and technological progress (technology) are the primary sources of growth. This theory outlines how a steady economic growth rate will be achieved with the varying contributions of labour, capital and technology. The theory starts with a simplified assumption, that there is no technological progress in the economy, that is, output is a function of the capital-labour ratio and is expressed as follows,

$$Y= f\,(K) \qquad \text{.............2.1}$$

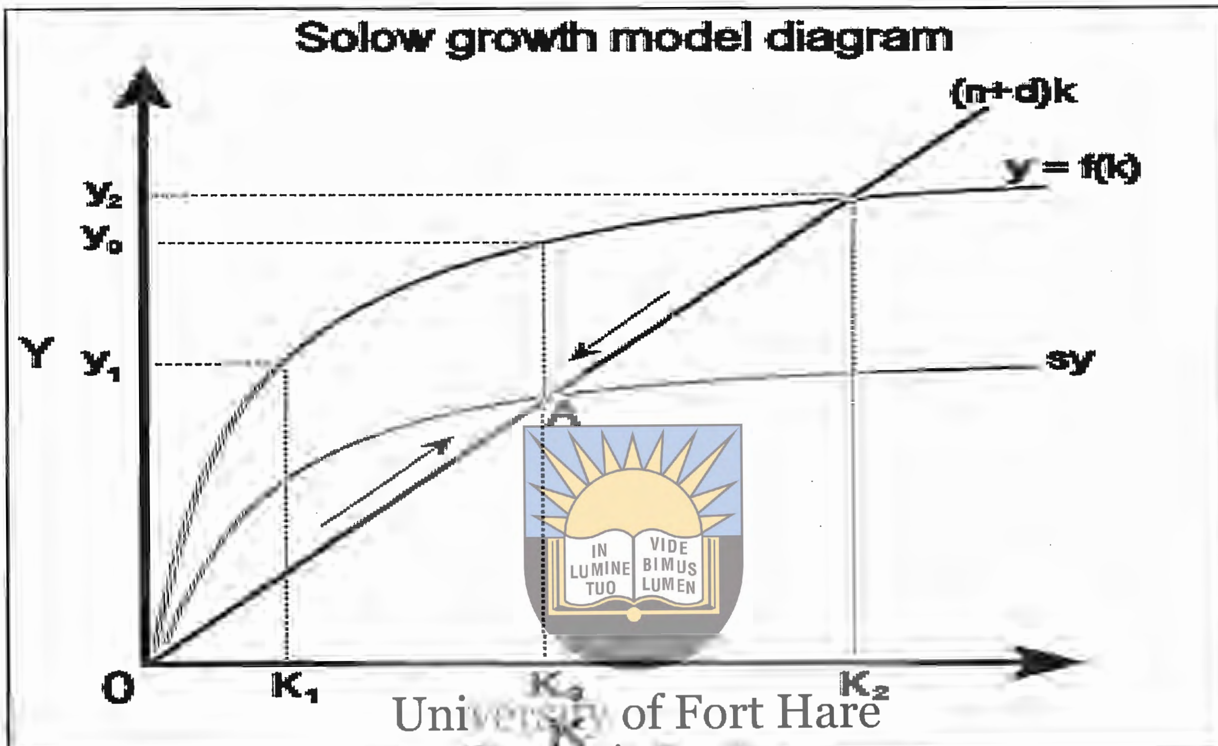
Where:

Y = output per head

K = capital per head

The Solow growth model is illustrated in figure 2.1 below.

Figure 2.1: Solow Growth Model.



Source: Thirwall (2002:137)

In figure 2.1 above Y represents output per head, K represents the capital per head and the production function represented by Y = f (K). As the capital rises, output rises but output rises less at higher levels of capital than at low levels. The production function will therefore increase steadily at lower levels of capital but will increase at a decreasing rate at higher levels of capital. This implies that the economy will reach a long run level of output and capital called the steady state equilibrium. The steady state equilibrium for the economy is the combination of per capita GDP (output per worker) and per capita capital (capital stock per worker) where these economic variables are no longer changing, $\Delta y = 0$ and $\Delta k = 0$.

The steady state equilibrium is shown by point A where output per worker is constant. The economy stops growing because of the diminishing marginal product of capital. Each additional machine add to production but adds less than the previous machine. At the steady state equilibrium savings (sy) is equal to required investment (n+d) k. This is because the investment required to maintain or replace worn out equipment is equal to the savings generated by the economy. At low levels of physical capital accumulation, a high marginal productivity of capital creates an incentive to invest, thus raising the capital-labour ratio and labour productivity. Falling marginal product of capital ensures both a rise in the capital-output ratio, and a declining incentive to invest, until a point is reached at which the full savings (and hence investment) generated by the economy are employed in order to supply new labour hours entering the workforce with the same capital intensity as existing previous labour hours available for production (Fidderke & Simkins, 2006).

The only way for the economy to grow or move from the steady state equilibrium is for the economy to raise its savings level and maintain a lower labour force growth rate. This can only happen if savings have risen relative to investment requirement and therefore more is saved than required to maintain capital per head constant. This higher savings rate implies that there will be an incentive to invest therefore increasing the capital–labour ratio and labour productivity. A high population (labour force) growth rate leads to a decline in labour productivity (Thirwall, 2002). A lower growth rate of the labour force allows the use of investment for the purposes of capital deepening rather than capital widening, and again the consequence is a rising capital-labour ratio and higher labour productivity. Both changes in the savings rate and changes in the growth rate of the labour force result in a temporary change in the growth rate of output as the economy moves towards a new steady state defined by the new savings rate and labour force growth rate. In steady state the natural growth rate of the economy would again prevail (Fidderke & Simkins, 2006). With constant-returns-to-scale production savings only increases the growth rate of output in the short run but does not affect the long run growth rate of output. The implication here is that a higher savings rate initially increases output or growth but the economy will reach a new steady state equilibrium in the long-run.

The Solow growth model predicts that countries with equal savings rates and population rates will eventually converge to equal incomes (absolute convergence). Poor countries are poor because they have less capital but if they save at the same rate as rich countries and have access to the same technology they will eventually catch up (Thirwall, 2002). If countries have different savings rates then they will reach different levels of income in the steady state but if their rates of technological progress and population growth are the same their steady state will be the same. South Africa`s savings rate dropped 22 percent in 1982 to around 13.2 percent in 2005 whilst South Africa`s labour force growth rate has been steadily increasing during the same period (Romm, 2003). The lack of sustained growth in the economy is as a result of a low savings culture in South Africa which constrains the required investment (Fidderke & Simkins, 2006). Furthermore, the low savings rate inhibits capital towards the motor industry. This in turn puts limits to labour productivity, job creation and ultimately output.

The only way for the economy to grow or move from the steady state is through technological progress. The reason why the economy requires this exogenous variable is because technology augments all factors of production. This means that technology increases the productivity of both capital and labour. Technology enhances performance of available capital and labour works at much more faster and efficient rate. The technology parameter is augmented in front of all other factors in the production function as it reflects total factor productivity and is expressed as follows,

$$Y= AF (K, L) \quad \text{..............2.2}$$

Where: Y= output

A= technological progress/total factor productivity

K= capital

L= labour

Equation 2.2 illustrates economic growth as a function of capital and labour, augmented with technology parameter which expresses total factor productivity. The above equation became known as the Solow residual as indicates total factor productivity as it measures all the changes in production that cannot be accounted for by changes in input factors namely, capital and labour. The Solow model of exogenous technological growth does help explain the role that technology plays in the productivity of both capital and labour. Technology plays a central role in driving growth in the motor industry all over the world. Technological progress in the motor industry involves scientific and technological research (R&D) which results in new and modern (advanced) products. These new and modern products results in an efficient capital stock and a higher rate of productivity by workers (human capital) therefore achieving economies of scale. Economies of scale are important as firms are able to produce cars at lower costs resulting in increases in output and ultimately economic growth. Investment in new and modern technology helps the motor industry become more efficient and achieve higher levels of contribution to economic growth. Investments in new export facilities to improve export performance by vehicle manufactures is evidence of this.

Technology also has an important impact on human capital development of the labour force as it equips them with the necessary skills to operate modern technology (Franse, 2006).

2.2.2 Limitations of the Neo-Classical Growth Model

The neo-classical growth model assumes economies reach long run steady state equilibrium and the only way for the economy to grow is through technological progress. It however leaves the determinants or sources of this exogenous variable unexplained. This has led to dissatisfaction among scholars with the traditional growth theory. The model assumes that in the absence of shocks or technological change all economies will converge to zero growth. Rising per capita incomes are only a temporary phenomenon resulting from a change in technology. Any increase in per capita income that cannot be attributed labour or capital is ascribed to what is known as the Solow residual. Empirical studies by Solow showed that roughly 50 percent of historical growth in industrialised nations is attributed to the residual (Fidderke & Simkins, 2006). However, it is impossible to analyse the determinants of technological advances because it is completely independent (exogenous) of the decisions of economic agents. Another weakness of the Solow growth model is that it fails to explain large differentials in residuals across different countries. The notion that poor countries will eventually catch with developed countries if technological progress is the same is flawed if there is no explanation on the determinants of this technological advances (Fidderke & Simkins, 2006). In view of the of the weaknesses of the Solow growth model, the New growth theory (endogenous) emerged. The endogenous growth theory is discussed in the next sub section.

2.2.3 New Growth Theory (Endogenous)

The endogenous growth theory was developed by Romer (1986) and Lucas (1988). The endogenous growth model outlines how human capital development and research & development (R&D) contribute to long run economic growth. The endogenous growth model is based on two approaches namely, the Romer (1986, 1990) and Lucas (1988) models. The theory assumes that there are positive externalities associated with human capital formation (for example education and training) and research and development that prevent marginal product from declining (Thirwall, 2002). The theory begins with the assumption that there is constant returns in production.

The endogenous growth theory is a straight forward extension of the Solow growth model, expressed as follows,

$$Y = AK \ldots\ldots\ldots\ldots 2.3$$

Where Y = output

A = total factor productivity (technology)

K = capital

Equation 2.3 shows that output is proportional to capital. Total factor productivity represents the marginal product of capital which is constant. The endogenous growth theory relaxes the assumption of decreasing marginal product of capital and endogenises (internal) technological progress, the production function therefore exhibits constant marginal product of capital. To prevent marginal product of capital declining, Lucas (1988) proposed that the concept of capital be broadened to include human capital. The concept of human capital is explained as outlined by Lucas (1988) is explained in the next subsection.

2.2.3.1 The Lucas Endogenous Growth Model

The Lucas (1986) approach of endogenous growth introduces the concept of human capital as opposed to physical labour in the production function. Human capital refers to the knowledge accumulation or skills gained by workers through learning by doing. The Lucas (1986) model outlines that the final growth rate of the economy will be determined by the rate of growth of human capital creation. The Lucas (1986) model of endogenous growth is expressed as follows;

$$Y = AF\,(K^{\alpha}, H^{1-\alpha}) \ldots\ldots\ldots\ldots\ldots\ldots 2.4$$

Where: Y = output

A = total factor productivity

K = capital

H= human capital

α and $1-\alpha$ = output elasticities of the factor inputs. (α and $1-\alpha=1$).

Equation 2.4 above illustrates the human capital component of the production function. With capital non-declining and human capital exhibiting positive externalities such as education and training the economy will reach long run economic growth. Economic agents including firms and consumers invest in human capital through knowledge accumulation. All inputs of the production function can thus be accumulated. The accumulation of capital generates new knowledge about production in the economy as a whole. Growth is then generated by assuming that the incentive to invest in human capital is non-decreasing in human capital. The Lucas model of endogenous growth postulates a production function of human capital which is constant returns to scale in human capital but with the possibility of increasing returns to scale. Hence the marginal product of human capital which determines the incentive to invest in knowledge accumulation is constant (Ickes, 1996). The Lucas model assumes human capital relates to skills and experience gained by the labour force. Investment in human capital has a positive impact on the growth process (Bassanini and Scarpetta, 2002). The second approach to endogenous growth by Romer (1986, 19990) is discussed in the next subsection.

2.2.3.1 The Romer Model of Endogenous Growth

The second aspect of the new endogenous growth theory is linked to research and development (R&D). Technological progress in the form of new ideas is a way that the economy escapes diminishing returns in the long-run. Expenditure on research and development (R&D) is considered as an investment in knowledge that translates into new technologies as well as more efficient ways of using existing resources of physical and human capital. Romer (1986) focuses on R&D as primary to knowledge accumulation. The model adds R&D to the traditional production function. This is expressed as follows;

$$Y = A(R)\, f(R_i, K_i, L_i) \text{............} 2.5$$

Where: Y = output

A = total factor productivity

K_i = capital

L_i = labour

R_i = stock of results from expenditure on R&D in firm i and where spill over from private research efforts lead to improvements in public stock of knowledge

Equation 2.5 above illustrates an augmented production function that includes R&D. In this model output is not only a function of capital and labour but also R&D efforts by firms. However internal economies do not accrue to the firm engaged R&D due to spillover effects. Economies of scale are external to firm as technology will move across to other firms leading to an improvement in public knowledge. According to the Romer (1986) model of endogenous growth technological progress has characteristics of a public good, that is, non-rivalry and partially-excludable. The creation of new knowledge by one firm is assumed to have a positive external effect on the production possibility of other firms because knowledge cannot be perfectly patented or kept secret. With spill-over effects knowledge production is an inadvertent side-product of all production and investment activity, and would thus take place whether firms wish to undertake it or not, as long as they are engaged in their standard productive activity (Fidderke & Simkins, 2006). The marginal cost of using new knowledge is assumed to be zero or close to zero. The low cost of using existing knowledge is also assumed to lower the cost of producing new knowledge, thus causing dynamic scale economies in knowledge accumulation.

The effect of knowledge spill-over is to ensure that the efficiency of the labour input at the social level improves. The consequence of this is that the production function shows increasing returns to scale at the social level (because of constant social returns to capital). Once social returns to scale in capital are constant, it immediately follows that the marginal product of capital also becomes constant. Consequently, the incentive to invest does not change with a rising capital labour ratio, since the marginal product of capital and hence the profit rate is constant. The source of the non-declining incentive to invest in Romer-1986 models arises due to knowledge spill-over's, which ensure anon-declining marginal product of capital (Fidderke & Simkins, 2006). To illustrate how a firm can internalise economies if scale, Romer (1990) developed a new production function as illustrated below.

The production function is augmented to endogenize technological progress (Romer, 1990)

$$Y = f(K, L, H, A) \ldots\ldots\ldots\ldots 2.6$$

Where: Y= output

K = capital

L = labour

H = human capital

A = stock of knowledge about technological progress

The above equation includes human capital in the production function and technology is no longer exogenous. This is because technology occurs as a result of R&D. In conducting R&D human capital and knowledge of capital stock are used which make technology endogenous to the firm. In conducting R&D the firm obtains increasing economies of scale due to the non-declining nature of capital stock and human capital. Long run growth depends on the human capital devoted to research and on the effectiveness of the human capital engaged in the research.

In the case of R&D, there seems to be stronger consensus that R&D may have a persistent effect on growth, that is, higher R&D expenditure would, *ceteris paribus*, be associated with higher growth rates. To the end, overall expenditure on R&D as a share of GDP has risen since the 1980s in most countries mainly as a result of increases in R&D activity in the business sector. The endogenous growth theory emphasizes that the long-run rate of growth is not explained by population growth as in the Solow model but rather by knowledge accumulation (Foss, 1998). Romer (1986) and Lucas (1988) argue that technological progress is an effect of targeted research and development (Nedomlelova, 2007). Research and Development results in improvement in technological progress which in turn attracts more investment leading to increased productivity.

Technological progress in the motor industry has been largely driven by increased investment. The transfer of technology in the motor industry occurs as a result of increased investment in R&D and spillover effects such as superior product design, skills transfer and human capital development (Hartzenburg & Muradzikwa, 2002). The investment in R&D has led to the local motor industry producing world class quality cars which are exported through world class export facilities. Clearly, the endogenous growth model provides a policy implication that private investment has to be supported by government subsidy. Since private investors cannot internalize knowledge spillovers, private marginal returns to investment will be lower than the social marginal return, such that private investors will under-invest physical capital from a social perspective.

The motor industry puts emphasis on human capital development with a number of programmes to train and educate its labour force. Volkswagen (SA) and Daimler Chrysler (AG) which both have plants in the Eastern Cape regularly send a selected number of employees to their parent companies in Germany for educational and training programmes. The skills and expertise that they acquire enhances the productivity and output of both the company and the employees themselves. Emphasis on human capital development becomes very important. The motor industry development programme (MIDP) is an incentive based subsidy programme from the South African government to encourage investment and exports in the motor industry. According to Kwagga (2007) and Black (2001) the MIDP has been very successful in attracting foreign direct investment and boosting the level of exports. The incentives offered under the MIDP help local OEM`s focus capital expenditure on R&D activities as opposed to high tariffs and duties which they would otherwise be paying for. Technological progress in the motor industry is needed if the industry is to become a reliable contributor to the economic growth of the country. The MIDP as an economic policy programme is an attempt by government to stimulate the motor industry to achieve higher levels of growth, productivity and cost competitiveness.

2.2.4 Limitations of the Endogenous Growth Model

The relaxation of the assumption of decreasing marginal product of capital and changing the shape of the production function such that it exhibits constant marginal product of capital violates economic principles. The changed assumption implies that a firm with twice as much machinery will produce twice as much output. If doubling capital doubles output, then doubling all factors including labour will more than double output, this suggests increasing returns to scale. The implication here is that larger and larger firms become more efficient and there would eventually be one firm dominating the entire economy, this possibility of this occurring are minimal and therefore increasing returns to scale to all factors is are ruled out (Thirwall, 2002).The assumption that a non-declining marginal product of capital occurs as a result of knowledge spill-over is difficult to support. This is because the knowledge spillover's may be difficult to internalize but it takes time for the knowledge to move across to other sectors/regions/countries. The public good characteristic of technology on which the theory relies on is therefore questionable. Another weakness of the model is the approach of technological progress. Even though the growth theory has shown that technology has an explicit origin (investment in capital stock) it still remains unexplained as an internal activity on the part of economic agents. Technology continues to 'just happen' as it is a by-product of intentional activity directed not at technological change itself, but at a quite different productive activity. The expectation is of a reward not from technological change *per se*, but from the act of investment in physical capital (Fidderke & Simkins, 2006). With the emergence and popularity of the endogenous growth theory in the 1980s , a new and different school of thought called the neoclassical theory of counterrevolution also emerged. This theory is discussed in the next subsection.

2.2.5 Neoclassical Theory of Counterrevolution

The neoclassical theory that emerged in the 1980s was based on two approaches, namely the neoclassical theory of counterrevolution and neoclassical theory of international trade. However the focus will be on the neoclassical theory of counterrevolution (market fundamentalism) which focused on economic growth rather than international trade. The market fundamentalism approach is discussed below.

2.2.5.1 Market Fundamentalism

The neoclassical theory of counterrevolution became popular in the 1980s when conservative governments in the US, UK and Germany came into power (Todaro, 1997). In developed countries the counterrevolution favoured supply side macroeconomic policies and privatization of public corporations. In developing countries the theory called for free markets and dismantling of public ownership and government regulation in economic activities. The central argument of the neoclassical counterrevolution is that underdevelopment or lack of economic growth is caused by poor resource allocation and too much state intervention. Neoclassical economists argue that by permitting free markets, privatizing state-owned enterprises, promoting free trade and export expansion economic growth will occur (Todaro, 1997). South Africa has adopted a prudent macroeconomic policy which encompasses free markets, moved towards trade liberalization and promoting free trade by eliminating or reducing trade barriers. The country privatized state owned enterprise and adopted an export promotion policy (GEAR). The economic growth experienced in South Africa from early 2000 until the financial crisis is attributed to these economic policies(Fidderke & Simkins, 2006).

The motor industry has benefited immensely from South Africa`s industrial economic policy programme, MIDP. The MIDP is a move by government towards free trade as it reduced import duties and tariffs for local firms. This allowed the local firms to achieve economies of scale and achieve competitiveness in the international economy. The policy of promoting exports in the country has also benefited the motor industry which has increased its exports levels. The structural change theory which emerged in the 1950s is discussed in the next subsection

2.2.5 Structural Change Theory

The structural change theory recognizes that physical as well as human capital is a necessity for growth. The theory acknowledges that savings and investment are necessary for growth but are not sufficient. The structuralist theorists focus on transforming the domestic economic structures from being heavily dependent on traditional or primary exports to a more industrialized and diverse manufacturing economy (Franse, 2006). The structural-change theory focuses on the 'mechanisms" by which underdeveloped economies transform their economies from heavy emphasis on traditional subsistence agriculture to manufacturing. The structural changes start on the economic subsystem and propagate to other aspects affecting enterprises, nations, economic and political blocks, the global ecosystem, integration and diversification (Doningo & Tonella, 2002). The structural changes involve changes in economic variables such as the transformation of production; changes in consumer demand; international trade; utilization of resources and changes in socioeconomic factors. Structural change theorists emphasize the shift from agricultural to industrial production, the steady accumulation of physical and human capital, and the change in consumer demands to more diverse manufactured goods(Franse, 2006). The central argument in this theory is that developing economies are transformed over time to permit new industries to replace agriculture as the engine of economic growth. A simple structural change model for growth was illustrated Lewis (1954). In the Lewis (1954) model it is assumed that the traditional agriculture has surplus labour with zero marginal product which is transferred without any loss in output to the more urban and industrialized sector. The speed with which the output expansion (due to transfer of labour) occurs is determined by the rate of industrial investment and capital accumulation in the modern sector. This process of modern-sector self-sustaining growth and employment is assumed to continue until all surplus rural labour is absorbed into the new industrial sector.

Empirical structural-change analysts emphasize both domestic and international constraints to development. The domestic ones include economic constraints such as the countries endowment of resources and the physical and population size as well as institutional constraints on development such as government policies and objectives. International constraints include access to external capital, technology and international trade. The structuralist view puts less faith in free markets as a driver of dynamic competitiveness and more faith in the ability of governments to mount interventions effectively. The South African government has identified a number of sectors including manufacturing as a source of economic growth. The motor industry has been identified as a "key growth sector" by government and various initiatives have been put in place to achieve this growth. The South African economy has moved towards an industrialized production, the MIDP as an economic policy programme is evidence of this (Franse, 2006).

2.2.6 Assessment of theoretical literature

A number of growth theories are reviewed, however the traditional neoclassical and endogenous growth theories become relevant for the study. The neoclassical and endogenous growth theories use a production function based approach in identifying factors that contribute to economic growth. The neoclassical growth theory assumes that capital and labour are the fundamental determinants of economic growth. However, the theory predicts that an economy will reach a steady state equilibrium due to the diminishing marginal product of capital and technology (exogenous). The weakness of the neoclassical theory is that it fails to explain the determinants of this exogenous variable. The prediction of absolute convergence where developing countries with the same access to technology as developed countries will catch is another weakness. It would be very hard for developing countries to catch if technological determinants are not known. Technology is important for the growth and development of the motor industry. However according to the neoclassical growth theory, there is no explanation of what determines this technology even though motor industry companies engage in R&D activities to develop technology. Due to these weaknesses, the endogenous growth theory becomes more relevant (Fidderke & Simkins, 2006).

The endogenous growth model becomes relevant because it endogenises technological progress. The theory outlines that positive externalities such as human capital development and R&D prevent marginal product from declining. Technological progresses, unlike the neoclassical theory is attributed to these positive externalities. Human capital development through knowledge accumulation and skills development contributes positively to growth in output. The South African motor industry has put emphasis on knowledge accumulation and skills development through education and training programmes for its employees. A stated earlier, Volkswagen and Daimler Chrysler in the Eastern Cape regularly send a selected number of employees to parent companies in Europe for human capital development purposes. Human capital development through the above mentioned programmes result in non-declining marginal product of labour and the possibility of increasing returns to scale in production. The endogenous growth theory also attributes technological progress to R&D activities. Companies that engage in R&D cannot isolate benefits to themselves but to society at large due to spillover effects. Spillover effects have resulted in an increase the transfer of technology in the motor industry. If companies cannot enjoy individual benefits of R&D, there is a need for government to incentivise companies who are involved in R&D. The introduction of the MIDP is a move to incentivise vehicle manufactures. Human capital development is also enhanced when companies are engaged in R&D as the employees gain expertise through learning by doing. The endogenous growth becomes relevant because it attributes long run economic growth to positive externalities which are gained through activities such as human capital and R&D. The South African motor industry engages in such activities and therefore the contribution of the motor industry to economic growth is expected to be positive (Fidderke & Simkins, 2006).

A production function based endogenous growth model will be used as the theoretical model. However, before attempting to estimate the theoretical model a review of empirical literature may indicate the variables which have been empirically found to have an impact on economic growth. A review of empirical studies on the contribution of the motor industry to economic growth is discussed in the next section.

2.3 Empirical Literature

Empirical literature on the contribution of the motor industry to economic growth is very extensive. However there are few empirical studies that investigate how the motor industry affects economic growth in South Africa. Most of empirical literature done in South Africa focuses at micro-level or specifically the impact of the MIDP on the growth of motor industry. A review of South African empirical literature, however still needs to be done as it might indicate which variables can be used in the empirical estimation. Empirical literature from outside South Africa does investigate the impact of the motor industry on economic growth. A review of empirical literature from outside South Africa is discussed first, followed by empirical literature from South Africa and a general assessment of empirical literature.

2.3.1 Empirical Literature: An International Perspective

The empirical literature which focuses on the contribution of motor industry output to economic growth includes amongst others, Dixon and Rimmer (2004), Santini and Poyer (2004). Dixon and Rimmer (2004), studied the contribution of the Motor and Vehicle Parts Industry (MVP) to the Australian economy. Rather than measuring the contribution in terms of resources used, the study looked at the potential contribution of an industry in terms of the effect on economic welfare of improved performance. Using a dynamic computable general equilibrium (CGE) model the study measured the potential contribution of the MVP to the Australian economy. A number of key assumptions about the labour market, government expenditure and MVP contributions were made in the CGE model. Regression results suggested that if productivity increased it would lead to 0.17 percent increase in GDP and 0.05 increase in employment, 0.24 increase in household consumption, 0.25 percent in average real wage rate.

Santini and Poyer (2004) studied the relationship between motor vehicle output (MVO) and GDP in the USA. The study covered the period 1968-2007 using time series data compiled from the Bureau of Economic Research (BEA).The initial results provide some evidence of a bi-directional causality between RGDP and RMVO. This preliminary statistical analysis of the dynamic relationship between RMVO and RGDP clearly indicated a statistically significant directional causality from RGDP to RMVO, whereas the causal link from RMVO to RGDP was statistically weaker, but it could not be discounted.

The Centre for Automotive Research (CAR) (2010) looked at the contribution of the automotive industry to the economy of the United States. The study estimated the motor industry`s contribution to employment and economic growth. Estimates of the indirect and induced employment associated with direct employment at parts suppliers, assemblers, and dealerships were produced using a dynamic, inter-industry model developed by Regional Economic Models (REMI). The REMI model is designed for industry- and region-specific impact analysis. The CAR team used a 51 region and 161 industry sector model developed by REMI to capture the effects of all fifty states and the whole U.S. economy. The results show that OEM employed 313 000 employees, 1 067 000 intermediate jobs, 1 765 000 spin-offs jobs associated with automotive industry thus providing 3 145 313 jobs for the whole U.S. economy contributing 1.7 percent of total employment. Components suppliers employed around 685 000 employees and total employment (including intermediate jobs) total employment was 3 286 322. Total employment in the automotive industry including car dealerships totaled 7 960 391 and contributed around 4, 5 percent to the GDP of the U.S.

A Report by Jukubiak, Kolesar, Izvorski and Kurekova (2008) commissioned by the Commission on Growth and Development looked at the recent developments and impact on growth of the Slovak Automotive Industry. The report analysed recent automotive investments in the Slovak Republic and analyzes how these developments have affected growth in productivity and output. The study attributed the recent increase of FDI in Slovakia automotive industry to a number of factors. These include a change in government policy towards a more liberalized and open economy. This led to increased investment from OEM`s as the government provided an incentive for them to invest. The Slovak Republic also had one of the lowest unit labour costs in the whole Central and Eastern Europe (CEE) region and trade union activity had been very minimal. Slovakia granted foreign firms subsidy packages and tax exemptions giving them an incentive to export vehicles and automotive parts. The Slovak republic financial services system also contributed by increased borrowing as a result reduced costs. The Slovakian automotive industry contributes close to a third of national GDP and also contributes to 10 percent of manufacturing employment. The impact of the automotive industry on the Slovak economy has been substantial, helping boost growth in output, exports, and employment.

Holweg, Davies and Podpolny (2009) studied the competitive status of the United Kingdom (UK) automotive industry using a survey. A quantitative industry analysis shows that growth, productivity, contribution to GDP and R&D in the UK automotive have declined over the period 1995-2006. A qualitative industry analysis with the aid of in-depth interviews with industry leaders was conducted. The sample size of the survey was 15 industry leaders and a 5 point Likert scale was used to analyze the respective responses. The majority of industry leaders felt that structural weaknesses (skills shortage) have contributed to the decline of the UK automotive industry. Strengths like labour market flexibility and quality of R&D resources were also identified. Labour market flexibility was considered to be moderately less flexible than BRIC (Brazil, Russia, India and China) and Central and Eastern Europe

(CEE) countries whilst R&D quality was considered to be more moderate than BRIC and CEE countries respectively. Labour costs and environmental regulation made the UK less competitive than other EU countries BRIC and CEE countries.

Ito (2002) investigated the productivity differentials between foreign owned and local firms in the Thailand automotive industry. Firm (plant) establishment-level data is used in the estimation of plant level productivity of both foreign and local firms. The study employed a conditional quintile analysis for the years 1996 and 1998. The advantage of using the quantile regression technique is that it takes into account any possible bias due to non-normality and unobserved heterogeneity among plants. Two measures of productivity were used namely; value added per hour by production workers (VA) and total factor productivity (TFP). Comparing the simple mean of various productivity measures of foreign and local plants, it was found that foreign plants had significantly higher labour productivity and capital–labor ratios. Capital productivity were significantly higher for foreign than local plants in the assembly industry. However, it was significantly lower for foreign plants in the bodies and trailers and the parts industries. The relative TFP level was significantly higher for foreign plants in the bodies and trailers and the parts industries had a higher capital–labor ratio than local plants, the high capital intensity probably has not yet led to productivity improvements.

Foreign Direct Investment (FDI) is also an important contributor to economic growth and thus the impact of FDI on motor industry growth is reviewed. Haiss, Mahlberg and Molling (2009) studied the impact of FDI on exports and GDP growth in the Central and Eastern Europe (CEE) automotive industry. Panel data analysis covering the period 1995-2007 was used. The panel data covered five respective CEE countries, namely Poland, Slovakia, Slovenia, Czech Republic and Hungary. These respective countries were selected in the study as they had gone through political and economic changes over the studied period. A production function based approach with GDP being the dependent variable and automotive FDI, automotive employment, capital stock, education and automotive production rates as independent variables was used in regression analysis. The results of the regression analysis suggest that all independent variables were positively related to GDP growth (per capita).

Buckley, Clegg, Zheng, Siler and Giorgioni (2007) studied the impact FDI on the productivity of the Chinese Automotive Industry. Panel data analysis for the period the 1995-1999 was used. A production function approach with labour productivity as the dependant variable in order to determine output per work was used. Independent variables include capital intensity (CI), firm size (FS), labour quality (LQ), foreign investment (FI) and innovation (IN). The results of regression analysis of the study suggest that CI, FS, FI had positive effects on labour productivity whilst LQ and IN had negative but insignificant results. The study thus concludes that inward FDI contributes positively to labour productivity.

Pradhan and Singh (2009) studied the impact of outward FDI (OFDI) and knowledge flows on the Indian automotive industry. A quantitative analysis of the influence of OFDI activities on in house domestic R&D performance on the Indian automotive industry for the period 1988-2008 was done. The study utilized unbalanced panel data sets covering a sample size of 436 automotive firms. The Tobit-ML estimation technique was employed with R&D intensity as the dependant variable whilst firm size, distance, exports, ODFI, liberalization, product specialization, technology, inward FDI and profit margins are the independent variables. The empirical findings supported the view that the OFDI is an important determinant of R&D performance in the Indian automotive industry even though auto component manufacturers have a lower R&D intensity than vehicle manufacturers.

Richet and Ruet (2008) did an automotive industry comparison of India and China. The study found a widespread contrasts and complexities between the two countries automotive industries. The Chinese automotive industry was under state control where foreign companies are in partnerships with State Owned Enterprises (SOE) whilst in India production is realized by private industrial groups. Growth in the size of the Chinese automotive industry multiplied by four in one decade largely as a result of joining the World Trade Organization (WTO) which promotes trade liberalization. FDI into China contributed to the growth of the industry as it had brought money, technology, knowhow and development networks. Compared to other Asian countries Indian car production and exports are at low but emphasis is now put on export and companies like TATA have been successful abroad. FDI into India was a bit more qualitative than quantitative as it brought quality production processes and managerial learning. The focus for both countries is global domination albeit through different strategies of state control (China) and private production and innovation (India) through joint ventures.

Ravenhill (2005) studied the impact of FDI into the Korean Automobile industry. The study examined the factors driving FDI into the industry and the subsequent impact on car makers and auto parts suppliers. The buying of local car makers (Daewoo and Samsung Motors) by foreign firms (GM and Renault) respectively contributed to capital injection and flow into the local industry. The takeover also contributed to improved technology transfer and research and development in the domestic market and integration into the global network. Investment into the auto parts industry had been lagging behind but increased in recent years as many foreign firms had injected money through joint ventures. Research and development had been largely conducted in parent company's headquarters abroad and not much technology transfer occurred. There are however constraints in encouraging investment into the industry like labour market flexibility and trade union militancy thus had a significant impact on employment creation.

Wang (2010) studied the role of inter-industry linkages on FDI and productivity growth in the Canadian automotive industry. A period of 25 years from 1973-1997 was covered in the regression analysis. An OLS based Total Factor Productivity (TFP) estimation technique was employed. Automotive industry productivity was used as the dependent variable with FDI (horizontal), FDI (upstream), FDI (downstream), R&D, import share and export share are used as independent variables. The study differentiates between the types of FDI through weighted averages of both the FDI (upstream-inputs purchased) and FDI (downstream-output sold). The regression results suggested that upstream FDI had a negative impact on productivity growth in the vehicle industry (- 4.61) but downward stream FDI (inward) had a positive effect on the bus, body and trailer industry (+5.69 %).

Exports contribute to the GDP of a country and the impact of motor industry exports to economic growth is reviewed. Abedini and Peridi (2009) studied the Iranian car market in the global context by looking mainly at its export potential. Time series data for the period 1997-2006 is used. A modern gravity model as derived from new theoretical developments was used in the regression analysis. GDP, car production, justice and law, distance, common language and sectoral import tariffs were augmented into the gravity model as explanatory variables with exports being the dependant variable. A number of dummy variables were included to capture product groups, prices, business cycles and the openness of a country. The regression results suggested that GDP, car production, law and common language all had a positive effect on the car exports with GDP being the most significant. Distance and import tariffs have a negative effect on exports potential exports as expected. Compared to other automotive exporting nations Iran had a one of the lowest or negative fixed effects (-1.75).

Iranian exports were therefore far below than expected or potential exports creating possibility of increased motor exports.

The rate if exchange between countries determines the terms of trade and therefore the impact of the exchange rate on a country`s trade levels is important. Turkan and Ates (2008) studied the exchange rate pass through effect (ERPT) on US motor vehicle products and auto parts import prices. Using import unit values of 79 motor vehicle products and 245 auto-parts, which are classified by the 10-digit level of Harmonized Tariff Schedule (HTS), the study examines the pass-through of exchange rate changes from 5 different trading partners covering the period 1998 to 2006. The empirical results suggested that the US's import pass-through in auto-industry was incomplete across both motor vehicle products and auto-parts. The results however did indicate that auto-part products had a relatively higher pass-through effect than motor vehicle products.

Williamson (2000) studied exchange rate exposure and competition using the automobile industry in the US and Japan. The study examined the effects of real exchange changes on multinational firms and incorporates the effect of intra-industry competition on the relation between exchange rates and firm value. Real exchanges were observed monthly, specifically on the fifteenth day of each month to counter the effects of macroeconomic announcements. The sample was comprised of monthly return index of each firm on its home security market covering the period 1973-1995. An OLS estimation equation is used in regression analysis with the aid of a seemingly unrelated regression (SUR) to capture the cross-sectional dependence in residuals. The empirical results suggested that a time varying exposure existed across countries for multinational firms and global competitors. The currency exposure was function of foreign sales, cost structure of foreign competition and degree of competition. The appreciation of a currency had a negative impact on the firms and foreign production was a measure to counter foreign exchange exposure.

The growth and contribution of the motor industry also depends on the industrial and trade policies a country adopts. Sanidas and Jayanthakumaran (2006) studied the impact of trade liberalization on the Australian Passenger Motor Vehicle Industry (PMV). Time series data analysis for the period 1968-2002 was used to measure the impact of trade liberalization on imports, exports, internal demand for cars and labour productivity. The regression results suggested that liberalization had improved trade volume, imports, exports and productivity but had however reduced the internal demand for cars. Trade liberalization had improved productivity and exports and policy makers should encourage export-promotion programmes to ensure the survival of the PMV industry.

Decena (1999) studied the impact of trade liberalization on the Philippines automotive industry. The study examined the automotive industry`s behavior towards transition a regulated to a liberalized system with the elimination of two main policies, local content requirements and foreign exchange requirements. Data from the passenger car sector for the period 1986 to 2004 was used, this period is important as it signaled a shift to trade liberalization. The Dynamo Systems (DS) approach was used to capture how changes in policies will affect the industry variables like production, imports, exports, costs of production and employment and thus the DS approach facilitated the simulation process. The simulation results suggested that the passenger car sector would exhibit growth if no changes were made to the present policies but elimination of local content programs would increase average car prices, decrease employment and the production rate. The DS results also suggested that elimination of foreign exchange requirements would increase investment and thus lowering of local content requirements as opposed to complete elimination would be a better alternative.

Wang (2004) analyzed the impact of policy reforms and foreign direct investment (FDI) in the Chinese automotive industry. Since 1978 the country had moved to a more liberalized market economy but still had restrictive policies such tariffs, screening of foreign firms and foreign equity limits. The results of the study suggested that the open market policies the country has pursued over the years had increased FDI into the Chinese automotive sector and contribution to economic growth. There were three main patterns for foreign investment in China: equity joint ventures (EJV), co-operative joint ventures (CJV) and wholly foreign-owned ventures (WFO). The EJV is the main pattern of foreign investment with Europe accounting for the biggest share of geographical origin of investment. Between 1981 and 1998 the net foreign capital injected to the Chinese automotive industry was only about $4.54 billion, equivalent to 22 per cent of the total investment in the FDI projects. The study concluded that in order to attract more FDI, the Chinese government had to reduce trade and non-trade barriers. Liberalization of trade and investment, and deregulation of industrial policy however were necessary but not sufficient conditions for the sustainable development, growth and progress of the automotive industry. The success of the automobile industry depends also on the extent to which China will transform into a market economy and its integration into the world economy.

Labour forms an integral part to economic growth, the contribution of employment to the growth of the motor is therefore reviewed. Nunnenkamp (2005) looked the Germany automobile industry and Central Europe (CE) integration into the international division of labour. The study showed that the economic transformation of CE led to competitive pressures for the German automobile industry and ultimately having negative repercussion for the labour market. The outsourcing of certain production had led to pressure on wages and employment opportunities. The relocation of assembly lines and the outsourcing of parts production to Central Europe have led to a decrease in the value added by the Germany automobile industry.

Interest rates affect the level of investment into the motor industry and also affect consumer spending on motor cars. Doyle (1997) studied the impact of interest rates and taxes on new car prices in the Unites States. Using micro-level data and the cross-sectional variation tax code the study determine whether interest rate deductions are able to pass through new car prices. For data analysis purposes, the Consumer Expenditure Survey (CEX) which generates 12 months of information (November 1987 to October 1988) was used. The data set included 5000 observations generated from 85 different sampling areas. The empirical results suggested that sales tax rate and after tax real interest rate negatively influence the price of a new car and slightly reduce the probability of buying a new car.

2.3.2 Empirical Literature from South Africa

Empirical literature from South Africa, as mentioned earlier, is limited. The few studies that investigated the performance of the motor industry include Meyn (2004), Sichei, Erero and Gebreselassie (2005) amongst others. Meyn (2004) studied the export performance of the South African Automotive Industry. The study investigated whether the EU-SA Free Trade Agreement (FTA) had any significant impact on the export performance of the SA automotive components industry. Personal interviews consisting of standardized questionnaires were used. A total of 25 automotive components companies were included in the sample all of which were based in Gauteng with the exception of two companies which were based in Port Elizabeth and Durban respectively. The majority (13) of the surveyed companies are domestically owned and produced only for the local market. However even though SA was the main selling market for the companies, the EU provided indirect market as they sold their products through OEM`s. The surveyed companies hardly faced any hindrance when entering the EU market. The majority of surveyed company's exports had increased over the last five years and rate the likelihood of future export increases as positive. Seventeen companies knew of the EU-SA FTA but only six (6) of the surveyed companies knew about the possible effects on business performance. The study concluded that the EU-SA FTA will have minimal impact on automotive components suppliers as they export through OEM`s and would continue to focus on the domestic economy.

Sichei, Erero and Gebreselassie (2005) studied the relationship between exports of transport equipments and machinery and export potential of South African exporters. An augmented gravity model of South Africa`s exports of motor vehicle parts and accessories to 76 countries for the period 1994-2003 was used. The regression results suggested that it takes about 16 months for the exporters to adjust or take the export opportunity of a one year export contract. Importing country income and GDP (SA) had a positive effect on motor vehicle exports in both the long and short-run. However importing country population and crude oil prices had a negative impact on exports. The study concluded that South Africa's actual exports are well below the "optimistic" potential exports but above the "pessimistic" potential exports.

Hartzenburg and Muradzikwa (2002) employed a case study into the transfer of technology in the South African automotive industry. A qualitative and quantitative assessment for the period 1990-1998 was used . The results of the study suggested that transfer of technology in the motor industry occurred as a result of increased investment through spillover effects such R&D, superior product design, skills transfer and human capital development.

The domestic motor industry is structured in such a way that Original Equipment Manufacturers (OEM) are clustered with components manufacturers, the impact of this clustering is therefore assessed. Nel and Makuwaza (2001) studied the impact of clustering on improving manufacturing and economic growth using a case study from the Eastern Cape automotive industry. A total of 27 firms were involved in the survey. It was found that clustering as a policy strategy did not help in improving profits, exports and employment of vehicle manufacturers it however reduces logistical and transactional costs between the firms in the cluster. There was however an improvement in employment, exports and profits in the components sector largely due to co-operation in areas such as training of workers, product development and lending of machinery.

Lorentzen (2007) studied the dynamics of industry and innovation in the South African Automotive Industry. The study analysed the relationship between human capital in host countries and international capital inflows. A case study of Daimler Chrysler SA (DCSA) which is based in the Eastern Cape was done. The case study is based on interviews with DCSA, component suppliers, education and training providers, a business association, and a provincial development agency. The case study found that the integration into global supply chains can have a profoundly positive impact, through education and training, on local human resources. With the production and export of new C-Class model DCSA had to upgrade its human resources. A series of recruitment drives were launched to train its workforce and an skills intervention programme amounting to R500 million increased the workforce by around 1000 employees. A number of employees were also sent to the Germany (Bremen) plant for highly specialized training. The analysis also demonstrated that once DCSA had committed to integrating the East London plant in its global supply chain, it set about upgrading local human resources in a major way. The investment by DCSA in human capital development bodes well for province as the workforce will contribute to regional and ultimately to provincial economic development.

Damoense and Jordaan (2007) studied the impact of Intra-Industry Trade (IIT) on the growth of the South African automotive industry. A G-L index, which is the most widely used measure of the intensity of IIT employs . This index calculates the share of IIT as the part of balanced trade that represents the overlap between exports and imports of total trade between countries for a given industry. Using an OLS modelling technique with fixed effects the study utilizes market size, per capita GDP, FDI and geographical distance as dependant variables. Disaggregated data from the automobile industry at the 6-digit level was used. This is important to determine whether IIT can be defined as horizontally differentiated(by variety) or vertically differentiated (by quality). The results of the regression analysis suggested that ITT is horizontally differentiated in the motor industry and vertically differentiated in the components industry. The study concluded by finding that market size, per capita GDP, FDI and geographical distance positively influence Intra-Industry Trade and contributed to the growth of the motor industry. The empirical literature reviewed suggests that there are a number of factors that influence the contribution of the motor industry to economic growth.

2.3.3 Assessment of Empirical Literature

The empirical literature on the contribution of the motor industry to economic growth is limited, especially in South Africa. Empirical literature contribution of the motor industry to economic growth done outside South Africa, however, is vast. The empirical literature from outside South Africa does indicate which motor industry variables or factors effect economic growth. Table 2.1 below provides a summary of the empirical literature and a guide for selecting variables to be tested in the empirical analysis. Studies by Haiss et al., (2009), Buckley et al., (2007), Dixon and Rimmer (2004) and Sichei et al., (2005) amongst others provide guidance on the theoretical and empirical framework to follow. The studies mentioned above are form different countries, use different techniques but the variables used in their respective empirical models are similar. The variables that have been empirically found to have a positive relationship with economic growth (GDP) include FDI, employment, exports, productivity, household consumption and income, technology, innovation and R&D in the motor industry. These variables are found to be positively related to GDP amongst all empirical studies reviewed. However variables which are empirically found to have a negative impact on GDP are interest rate, exchange rate, tariffs and the cost structure of the motor industry. Empirical literature on the contribution of the motor industry economic growth in South Africa does not provide an empirical framework that can be adopted as most studies use qualitative analysis. Due to the limited empirical literature in South Africa, the study will adopt empirical model based on studies by Haiss et al (2009) and Buckley et al (2007). Haiss et al., (2009) and Buckley et al., (2007) employed a production function approach in estimating the contribution of the motor industry to economic growth.

Table 2.1: Summary of selected empirical literature on the motor industry

Study	Country	Methodology	Variables
Haiss et al (200)	Central and Eastern Europe (CEE)	Pooled Ordinary Least Squares (OLS)	GDP,FDI, productivity employment, capital stock, education.

Buckley et al (2007)	China	Ordinary Least Squares (OLS)	FDI, capital intensity, firm size, labour quality, innovation.
Dixon and Rimmer (2004)	Australia	Computer Generated Equilibrium (CGE)	GDP, household consumption, wage rate, employment, exports.
Sichei et al (2005)	South Africa	Dynamo System (CGE)	GDP, exports, oil price, income.
Jukubiak et al (2008)	Slovakia	Survey	GDP, employment, exports.
Holweg et al (2009)	UK	Survey	GDP, employment, productivity, R&D, capital investment.
Pradhan and Singh (2009)	India	Tobit Model	R&D, outward FDI, inward FDI, exports, technology, profit margins, firm size.
Abedini and Peridi (2009)	Iran	Fixed Effects Model (FEM)	GDP, productivity, tariffs, exports.
Williamson (2000)	US and Japan	Ordinary Least Squares (OLS)	Exchange rate, costs structure, exports, competition.
Sanidas and Jayanthakumaran	Australia	Auto Regressive Distribution Lag (ARDL)	Exports, imports, demand for cars, labour productivity.

Source: Authors computation from various empirical studies

2.4 Concluding Remarks

The main purpose of this chapter was to review theoretical and empirical literature. The chapter also sought to investigate which factors determine or are fundamental dynamics to economic growth. A review of theoretical literature suggested that the neoclassical and endogenous growth theories are both relevant for the study. However, due to the weaknesses of the neoclassical growth theory, the endogenous growth theory was chosen as the relevant theoretical framework. This is because the endogenous focuses on human capital development and R&D as primary sources of long run growth. This is particularly important for the motor industry as motor vehicle manufactures engage in human capital and R&D activities such as skills development programmes and education and training. In conducting R&D, human capital and knowledge of capital stock are used which make technology endogenous to the firm. Due to knowledge spillovers the benefits of the endogenising technology are spread to society at large, resulting in self-sustaining economic growth and development.

Even though empirical literature in South Africa is limited, empirical literature suggests that FDI, employment and exports contribute positively to economic growth while exchange rate and interest rate contribute negatively. An empirical model based on the empirical studies by Haiss et al (2009) and Buckley et al (2007) as mentioned earlier is formulated. Therefore, the empirical model suggested for the study will be based on a production function based approach and will include GDP, FDI, employment, exports, exchange rate and interest rate.
The next chapter provides an overview of the developments and trends in the South African motor industry.

CHAPTER 3

OVERVIEW OF DEVELOPMENTS AND TRENDS IN THE MOTOR INDUSTRY IN SOUTH AFRICA

3. 1 Introduction

This chapter reviews developments and trends in the motor industry for the period 1994-2008. The review highlights changes in the contribution of the motor industry to economic growth of the country for the 1994-2008 periods. The chapter is divided into three sections. The first section provides a historical background of the motor industry, the second section provides a detailed analysis of the various industry variables and the last section is the concluding remarks.

3.2 Overview of the Motor Industry

Historically the growth and development of the South African motor industry has been shaped by policy programmes introduced by the government. The policy programmes to be reviewed in this section include local content programmes which consisted of six phases (1960-1994) and the MIDP which was introduced in 1995 and runs up to 2012. In this section a brief historical overview is provided, followed by a review of both policy programmes.

3.2.1 Historical Overview

The South African Automotive Industry has always been a critical sector for the country. Founded in 1924 with establishment of vehicle assembly plants by Ford and General Motors in Port Elizabeth, the industry grew rapidly and by 1950 the motor car assembly industry had developed as a major branch of the secondary industry in South Africa. However, the rapid expansion of the industry brought with it a sharp increase in imports, and this was at partially responsible for a renewed balance of payments crisis in 1958 (Duncan, 1992). In 1958 government appointed the Viljoen Commission to investigate how the motor industry can reduce the inflow of imports into the motor industry. The Viljoen Commission (1958) recommended that the South motor industry introduce a local content programme so that manufacturing is undertaken locally and to reduce imports (Dix, 1995). The recommendation was taken and investigated by the Board of Trade and Industry (BTI) which released its report in 1960. The BTI report recommended that a components industry be created to broaden industrial base and save foreign exchange through reduction in imports (Julius &Lumby, 1998).

Between 1950 and 1980 vehicle sales increased ten fold reaching 453 451 units due to an expanded production base and local content requirements. The industry had attracted investment to the region of R450 million whilst employing some 38 000 people in assembly and around 34 000 in components sector (Duncan, 1992). Growth stagnated during the 1980s as the economy entered a phase of slow expansion with contribution of the sector to GDP being - 9.3 percent (Dix, 1995). This was mainly due to disinvestment by a number of OEM`s (Ford, General Motors) as a result of growing political instability and international isolation (Duncan, 1992). By 1989 vehicle sales had stagnated to 350 000 units with employment reaching 37000 and 73000 in the vehicle assembly and components respectively. Local content programmes from phase I to VI are discussed in the next subsection.

3.2.2 Local content programmes (Phase I-VI)

The South African Automotive Industry developed under high levels of protection with series of local content programs which were implemented to protect the local industry from imports (Dix, 1995). The implementation of this programme was based on the findings of the Viljoen Commission (1958) and the Board of Trade and Industry report of 1960. The targets for Phases I to V are outlined in Table 3.1 below.

Table 3.1: Local content requirements and time periods in SA Automotive Industry

PHASE	TIME PERIOD	START TARGET	END TARGET
I	1961-June 1964	15 %	40 %
II	July 1964-Dec 1969	45 %	55 % "usual"
III	Jan 1971-Dec 1976	52 % "nett"	66 %
IV	Jan 1977-Dec 1979		66%
V	Jan 1980- Mar1989		66%
VI	April 1989- 1995	-	-

Source: Board of Trade and Industry Report N° 2627 (1988: 4)

From its inception in 1961 until March 1989, under Phases I to V of the local content programme, content protection on motor cars was calculated on the basis of the vehicle's mass, in terms of which a certain percentage of the final mass of motor cars produced by a motor manufacturer in South Africa had to be produced using local components. Phase I was implemented in 1961 and ran until June 1964. During this phase, it was stipulated that the target level of local content by mass was to be increased from 15 per cent to 40 per cent. This meant that the from the final mass of the vehicle, a minimum target 15 percent would be sourced locally. The target of Phase II, which ran from 1 July 1964 to the end of 1969, was to increase local content of manufactured vehicles from 45 per cent to 55 per cent local content by mass on 31 December 1969. Manufactures were only allowed to import components if there was sufficient proof that it could not be sourced from local manufacturers. Under this phase, content requirements were no longer based on "usual" local content (as had been the case for the previous two phases), but rather on "nett" local content. Under Phase II, "usual" local content required that the last manufacturing process of components had to take place in South Africa, in order for them to qualify as local content, and a finishing target of 55 per cent "usual" local content equated to 50 per cent "nett" local content. The "nett" local content requirement implied that components had to be manufactured locally from locally produced materials in order to count as local content (Dix, 1995).

Phase IV commenced on 1 January 1977 and was intended to last until 1978. The end of Phase IV was subsequently extended to December 1979. This phase was intended as a period in which manufacturers could consolidate their position following the stringent conditions imposed on them by Phase III. During this phase, the production of vehicles with a local content exceeding 71 per cent was encouraged by means of excise rebates. Phase V was introduced in 1 January 1980 and lasted until 1 March 1989. Under Phase V, the minimum local content target remained at 66 per cent. However, unlike previous phases, there was no fixed timetable for the achievement of local content targets, as the Board of Trade and Industry maintained that increased levels of local content should be achieved on a voluntary basis, and should be encouraged by means of rebates on indirect taxation (Dix, 1995). Phase VI was introduced in 1989 and involved a radical change in the calculation of local content based on value rather than mass. Phase VI encouraged local vehicle assemblers to increase local content from an industry average of estimated at 55 percent at the inception of the programme to 75 percent (including exports) by 1997. This meant exports by OEM could be counted as local content.

Phases I to V may be regarded as successful in that employment in the motor industry and related industries has increased since the inception of the local content programme in 1961. Employment decreased under Phase V due to the slowdown in the country`s growth rather than the Phase itself. Between 1967 and 1975, the average annual real growth in the motor and components industries was 10,3 per cent in comparison to 4,6 per cent growth in total Gross Domestic Product (GDP) for the period in question, indicating that the contribution of the motor and components industries to the GDP increased at a rapid rate over the period 1967 to 1975, this trend continued until 1981 (Duncan, 1992). However, despite these relative successes the local content a number of failures. The motor industry relied heavily on imports and this impacted negatively on the country`s current account deficit. The emphasis on using local content resulted in an increased cost structure as the capital intensive technology used had to be imported and therefore vehicle manufactures charged higher prices on motor cars. Another area in which the local content programme was not successful at rationalisation in the motor industry. The motor vehicle industry produced too many models and variants which limited the possibility of economies of scale. The local content programmes, specifically, Phase VI came under heavy criticism and in 1992 the Motor Industry Task Group (MITG) was appointed to re-examine the programme and future development of the motor industry (Lamprecht, 2006). The recommendations of the MITG led to the formulation of the Motor Industry Development Programme (MIDP), which will be discussed in more detail in next section.

3.2.3 Motor Industry Development Programme (MIDP)

The Motor Industry Development Programme (MIDP) was introduced in September 1995 with the aim of the development of an internationally more competitive and growing South African Automotive Industry (DTI, 2004). With the introduction of the MIDP, local content requirements were abolished entrenching the principle of export complementation and phasing down of tariffs. The policy programme was developed in the context of the country`s political and economic liberalization and the major structural shift in government policy and trade regime. The MIDP shifted the automotive industry from being highly protected and inwardly focused to be fully integrated into the global strategies of parent companies (Lamprecht, 2006). The major objectives of the MIDP were to:

- provide high quality and affordable vehicles and components to the domestic and international markets;
- provide sustainable employment through increased production;
- make a greater contribution to the economic growth of the country by increasing production and achieving an improved sectoral trade balance (DTI, 2004).

These national objectives were to be achieved by :

- encouraging a phased integration into the global automotive industry;
- increasing the volume and scale of production by the expansion of exports and gradual rationalization of models produced domestically;
- encouraging the modernization and upgrading of the automotive industry in order to promote higher productivity and facilitate the global integration process (DTI, 2004).

The major policy instruments to achieve these objectives have been :

- a gradual reduction in tariff protection so as to expose the industry to greater international competition;
- the encouragement of higher volumes and a greater degree of specialization by allowing exporting firms to earn rebates of automotive import duties;
- the introduction of a range of incentives which are designed to upgrade the capacity of the industry in all spheres (DTI, 2004).

In essence the aim of the MIDP was to encourage the domestic OEM`s to specialize in one or two high volume models, obtain economies of scale benefits to export competitively and import the models not assembled domestic market at low to duty free levels (Lamprecht, 2006). This approach would also assist the components suppliers to achieve higher volumes in the domestic market to become economically viable. Participation in the MIDP is contingent to fulfilling a number of requirements and compliance. OEM and vehicle components manufacturers which export have to register with the Department of Trade and Industry (DTI) and comply with the Customs and Excise Act which is administered by the South African Revenue Service (SARS). The technical parameters of how the MIDP would operate are illustrated in Table 3.2 below

Table 3.2: Technical parameters of the MIDP (1995-2012)

				Value of Export Performance			
Year	CBU Duty %	CKD DUTY %	DFA %	CBU %	Components %	Qualifying PGM Value %	PAA %
1995	65	49	27	100	100	100	
1996	61	46	27	100	100	100	
1997	58	43	27	100	100	100	
1998	54	40	27	100	100	100	
1999	51	37.5	27	100	100	90	
2000	47	35	27	100	100	80	20
2001	44	32.5	27	100	100	60	20
2002	40	30	27	100	100	50	20
2003	38	29	27	94	94	40	20
2004	36	28	27	90	90	40	20
2005	34	27	27	86	86	40	20
2006	32	26	27	82	82	40	20
2007	30	25	27	78	78	40	20
2008	29	24	27	74	74	40	
2009	28	23	27	70	70	40	
2010	27	22	27	70	70	40	
2011	26	21	27	70	70	40	
2012	25	20	27	70	70	40	

Source: Department of Trade and Industry Motor Industry Development Report (2004: 16)

As part of the previous local content programmes the domestic vehicle manufacturer gave rise to an excise duty. This excise duty liability would then be reduced by increasing local content and exporting. Under the MIDP, which is a customs duty driven system, a duty liability arises on the importation of Completely Built-Units (CBU) and automotive components. The OEM`s have a duty liability on the components it imports and the imported content of components sourced domestically. The duty liability (tariffs) on CBU decreased from 65 percent in 1995 to 32 percent in 2006 and tariffs on Completely Knocked- Down (CKD) components decreased from 49 percent to 26 percent over the same period (See column 2 & 3 in Table 3.2 above). The duty liability would be reduced to 25 percent on CBU and 20 percent on CKD by 2012 . This was in line with the General Agreements on

Trade and Tariffs (GATT) and World Trade Organisation (WTO) regulations, albeit at faster rate. The decrease in import tariffs was initiated to allow inflow of imports, reducing the cost structure of the domestic industry thereby making the industry more competitive internationally. Vehicle manufactures are effectively paying lesser for components imports thereby reducing the prices of vehicle produced domestically. To promote domestic manufacturing and reduce duty liability OEM`s receives a first cut rebate called a Duty Free Allowance (DFA) which is calculated a 27 percent of the wholesale prices of domestically manufactured and sold vehicles (See column 3 in Table 3.2). The assembly of CKD components is regarded as a pre-requisite to access the DFA (Lamprecht, 2006). The DFA therefore increases the effective rate of protection for vehicles produced for the domestic market. This is also an attempt to make vehicle more affordable to South African consumers.

Exporters of vehicle, components and automotive tooling earn credits based export performance. The export performance is calculated as the net export selling price, normally free on board value less all imported content on the product to be exported. The monetary value of the local content of components can be used to offset the duty liability through the Import Rebate Credit Certificates (IRCC). The basic idea behind the import-export facilitation scheme (IRCC) was that OEMs could earn sufficient foreign exchange by exporting, in order to offset foreign exchange purchased for the payment of imported components. The IRCC have to be audited and submitted to the DTI within one year for claiming purposes. One Rand of IRCC is earned for every one Rand of local value added. To promote more exports the value of the IRCC would be reduced from 94 percent in 2003 to 70 percent by 2012 (See column 4 & 5 in Table 3.2) . The purpose of the rebate is to create an improvement in global competitiveness of the motor vehicle and component manufacturing industry (Franse, 2006).

Initially the MIDP was successful at meeting some of its objectives as international competition and exports had been increased. However, as years passed by there was growing sentiments among stakeholders that the MIDP had to be reviewed as it was not meeting all of its initial objectives (Kwagga, 2007). Investment had also increased as more OEM`s set up plants but domestic production and subsequently employment were not improving. As part of government's efforts to assess and ensure the success of the MIDP, a number of reviews were conducted. The first review published in 1999 recommended that the MIDP be extended from 2002 to 2007 with further gradual reduction of tariffs reduction in import duties on light motor vehicles and original equipment components and the introduction of a production rationalisation Productive Asset Allowance (PAA) to those manufacturers who have invested in productive assets for the assembly of light vehicles and the manufacture of automotive components in accordance with a set of qualifying criteria (Lamprecht, 2006)). A 20 % non-tradable duty credit (See column 6 in Table 3.2) on qualifying investment in productive assets was to be calculated, spreading over five years. This applied to CBU imports which will sustain the range of products offered to the consumer but not necessarily produced domestically. A further review was conducted in 2002 to provide clarity on policy until 2012. The brief was to maintain the basic architecture of the MIDP. Tariffs were set to decline to 25% and 20% for built up vehicles and components respectively and there few other minor adjustments (Black &Bhanishi, 2006). These included an international trade duty facility, export facilitation scheme, abolishing local content requirements and an additional DFA for vehicles below ex-factory selling price of R 40000 (Kwagga, 2007). The MIDP contributed to the growth and development of the South African motor industry. The performance of the motor industry from the inception of MIDP is explored in the next section.

3.3. Developments and Trends in the South African Automobile Industry

Relative to its market size of over 450 000 vehicles produced per annum, South Africa has a strong automotive industry (Franse, 2006). The industry continues to attract foreign direct investment and has become competitive in the global automotive industry. Exports have gradually increased which has resulted in an reduced current account deficit.

3.3.1 Structure of the South African Automobile Industry

The South African automotive industry represents 80 percent of Africa`s vehicle output and around 0.73 percent of total global vehicle output (ASTDT, 2004). Currently there are eight leading world vehicle manufacturers which operate in South Africa namely BMW, Daimler Chrysler, Fiat, Ford, General Motors, Nissan, Toyota, and Volkswagen (NAAMSA, 2010). These OEM`s are supported by a large number of first tier and second tier components manufacturers (ASTDT, 2004). All OEM`s have become partly or wholly owned subsidiaries of world leading motor manufacturers. This has contributed to increased foreign direct investment in the local industry. Local OEM`s are now fully integrated into international markets through these transnational companies (Franse, 2006).The assemblers in South Africa have rapidly fallen into line with their developed country parent company operations, resulting in the rapid reorientation of their global presence and their own position within global value chains. This has had enormous implications for the domestic automotive component firms as facilitated by important trade policy changes (Barnes & Morris, 2008). The ownership structure of South African automotive industry is illustrated in Table 3.3 below.

Table 3.3: Changing ownership structure of SA automobile manufacturers

South African Assembler	Ownership 1990	Ownership 1998	Ownership 2007
Toyota	100% Local	72% Local 28% Toyota	75%Toyota 25% Local
Volkswagen	100% Volkswagen AG	100% Volkswagen AG	100% Volkswagen AG
BMW	100% BMW AG	100% BMW AG	100% BMW AG
Ford	100% Local	55% Local 45%GM	100% Ford
DaimlerChrysler	50% Daimler 50% Local	100% Daimler AG	100% Daimler AG
General Motors	100% Local	51% Local 49% GM	100% GM
Nissan	87% Local 13% Nissan	63%Nissan 37% Local	91% Nissan 9% Mitsui

Source: Barnes and Morris (2008, 12)

The ownership structure of the South African automotive industry has rapidly changed over the last 20 years (See Table 3.3 above). The changes occurred as a result of the changing political and economic landscape of South Africa. The political instability and economic sanctions (isolation) resulted in some vehicle manufacturers such General Motors and Ford to disinvest in South Africa. These companies were then listed and bought by South African companies such as Anglo-American (Ford) and Delta Motor Corporation in the case of General Motors. This scenario changed over the years and these corporations were fully owned by parent (foreign) companies by 2008. Parent companies have gradually taken over ownership and aligned domestic subsidiaries with their global strategies, integrating them into the global network (Barnes & Morris, 2008). The German manufactures strategy has been different and as such BMW, Volkswagen and Daimler Chrysler ownership structure has not changed over the same period. The Japanese manufacturers (Toyota and Nissan) have continued to invest in their local operations and by 2008 both manufacturers had the majority equity in their South African subsidiary corporations.

3.3.2 Market Share in the automobile industry

The South African automotive industry, as elsewhere in the world is strongly controlled and governed by the OEM`s (Lamprecht, 2006). The South African automotive industry is intensely contested by the eight OEM and thus competitive advantage and rapid production becomes important (DTI, 2004). The domestic market has expanded rapidly and the production of cars had reached 500 000 by 2006 with sales reaching over 700 000 in the same year (NAAMSA, 2011). Before 1994 15 consumer brands were available in the country compared to 48 consumer brands available in the country by 2005 (Lamprecht, 2006). Market share South African automotive is illustrated in Table 3.4 below.

Table 3.4: Market share in the South African automotive industry

Assembler	Market Share (1999)	Market Share (2004)	% change 1994-2004
Toyota	23.6	23.6	-
Volkswagen	22.6	23.5	0.9
Daimler Chrysler	9.9	10.1	0.2
General Motors	11	9.6	-1.4
Ford	13.3	9.7	-3.6
BMW	8.4	7.0	-1.4
Nissan	9	4.9	-4.1
Others	-	11.5	11.5

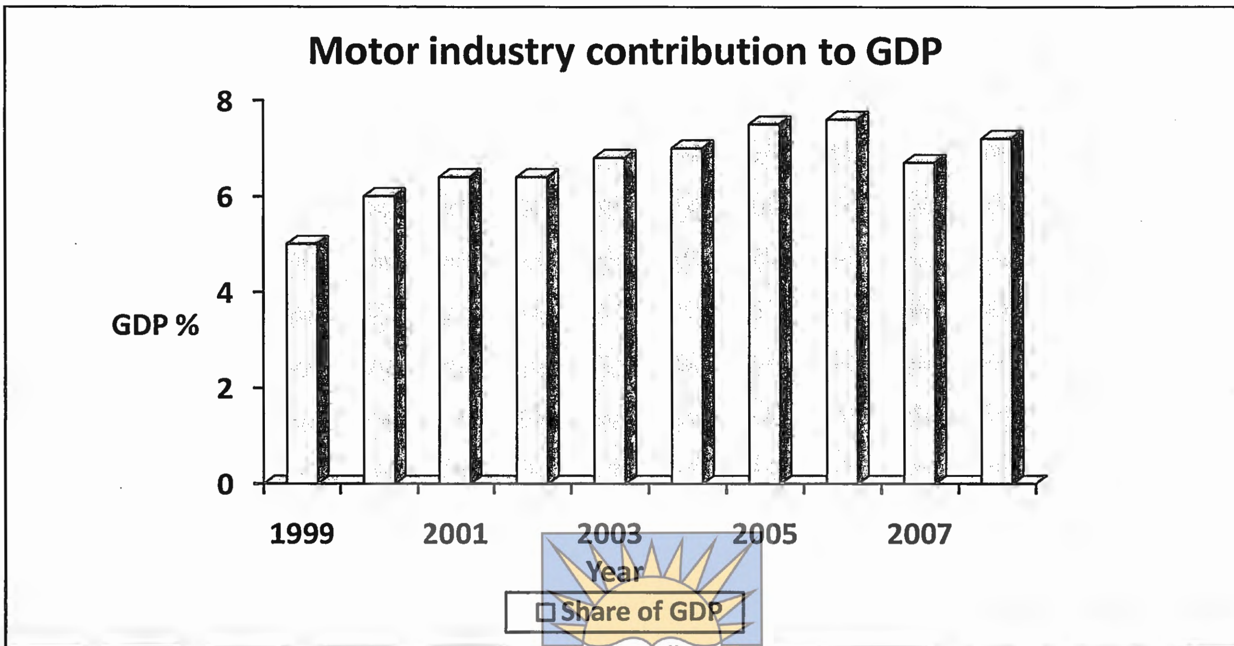
Source: Franse (2006, 54).

South Africa`s motor vehicle stock is concentrated in Gauteng and comprises of 38 percent followed by Western Cape with 17 percent and Kwa Zulu- Natal with 13.8 percent and the rest of the provinces with less than 10 percent (Lamprecht, 2006). The light motor vehicle segment of the industry is where the battle for market share is mostly concentrated. Toyota and Volkswagen are the leaders in terms of automotive industry market share. Toyota produced new entry (start-up) vehicles such as Toyota Tazz (discontinued) and Toyota Corolla, whilst Volkswagen has maintained its dominance with the VW Golf and recently the VW Polo (Franse, 2006). The two light vehicle manufacturers account for almost 50 percent of the domestic market but since 1999 their dominance has remained relatively stable (See Table 3.4 above). Toyota`s market share remained at 23.6 percent between 1999 and 2004 whilst Volkswagen its market share from 22.6 to 23.5 over the same period. Daimler Chrysler gained around 0.2 percent (points) of market share whilst other manufacturers have lost a sizeable percentage in market share between 1999 and 2004, Ford (-3.6%), GM (-1.4%), Nissan (-4.1%) and BMW (-1.4%) (Franse, 2006). This could be attributed to the new entrants into the domestic market such Fiat and Peugeot (France), Tata (India) and Cherry (China) which accounted for 11.5 percent by 2004).

3.3.3 Automobile contribution to GDP

The South African automobile sector contributes roughly 10 percent to manufacturing GDP whilst employing over a 100 000 employees (Franse, 2006). The contribution to GDP has increased over the years from approximately 5 percent in 1999 to around 6.8 percent by 2003 (see Figure 3.1 below). The contribution has varied over the years The automobile share of GDP increased to 7.6 percent in 2006, this was the largest contribution by the industry. The SA automobile industry was well on its way to achieving its goal of being a dominant contributor to the local and global economy. There was however a marginal decrease in 2007 when domestic production declined leading to a fall employment and ultimately its share of GDP, the decline in domestic production, sales and exports also contributed the reduced percentage share of GDP (NAAMSA, 2009). An increase in domestic production and exports coupled with a weaker rand contributed to an increase in GDP contribution of the motor industry to around 7.2 percent of GDP in 2008 (NAAMSA, 2010). The contribution of the motor industry to GDP over the period 1999 to 2008 is shown in Figure 3.1 below.

Figure 3.1: Motor industry Contribution to GDP 1999-2008

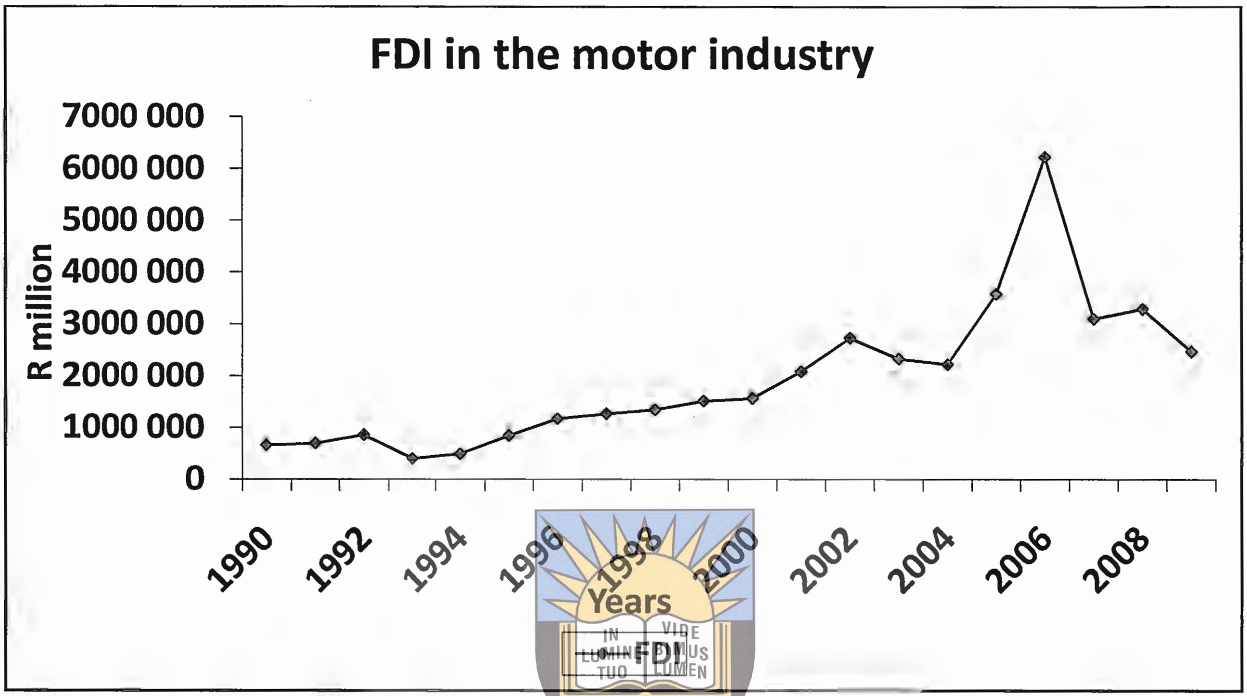


Source: National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

3.3.4 Foreign Direct Investment in the automobile industry

Foreign direct investment (FDI) has long been recognized as a major source of technology and know-how for developing countries and can be a potent factor in promoting growth (Lamprecht, 2006). It is the ability of FDI to transfer not only production know-how, but also managerial skills that distinguishes it from all other forms of investment; including portfolio capital and aid (Franse, 2006). Since mid-1990, the automotive industry has been one of the most successful recipients of FDI inflows in all of South Africa's manufacturing industries, especially through increased foreign ownership of local OEMs by multinational firms. Local OEMs are now largely integrated into the global production networks of auto multinational firms (Damoense & Jordaan, 2007). The motivation of parent companies to add plants in developing economies is to increase competitiveness in their global operations. The incentives(import-export complementation, productive asset allowance and tariffs) offered under the MIDP provide protection to multinational firms which in turn inject FDI into the industry and contribute to the export expansion and growth of the local industry (Black, 2001). The increase in investment in the motor industry is largely attributed to the introduction of the MIDP in 1995 (Kwagga, 2007). Trends in motor industry FDI for the period 1990-2008 are shown in Figure 3.2 below.

Figure 3.2: Trends in motor industry investment (FDI) from 1990-2008



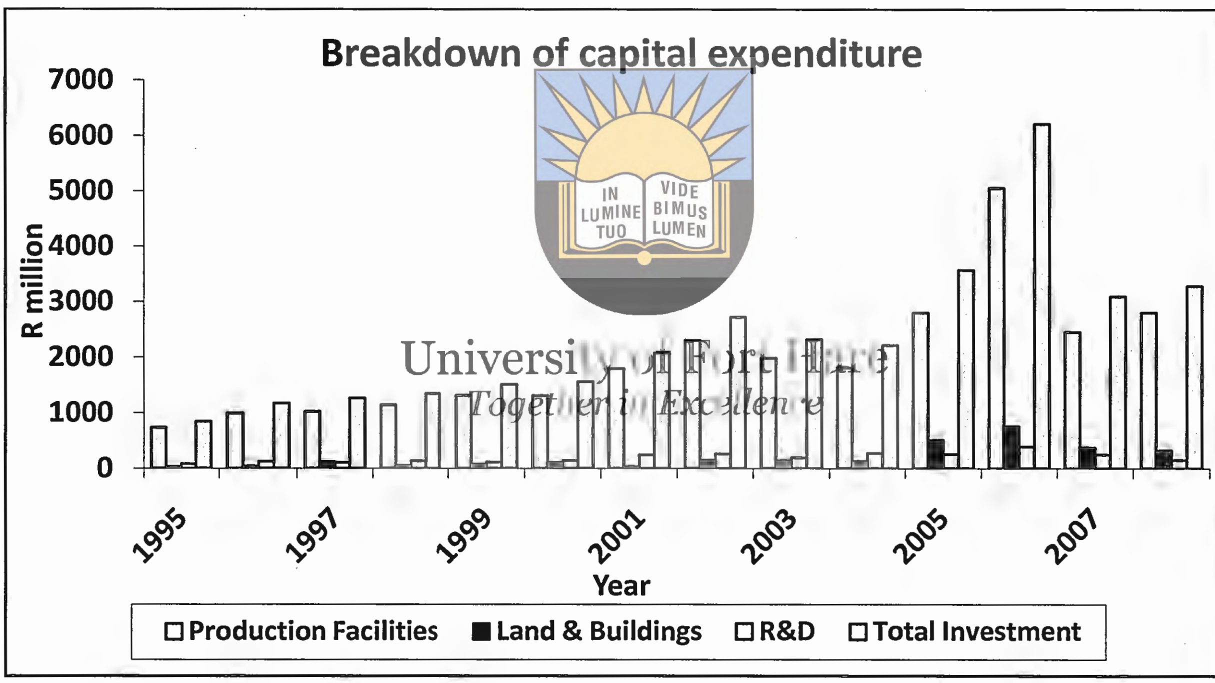
Source: National Association of Automobile Manufacturers Annual Report (2006), National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

Prior to the introduction of the MIDP FDI in the motor industry had been low. This was mainly because of the inward oriented local content programmes (Phase I-IV) which inhibited trade liberalization. A key indicator of the impact of the liberalization of the trade regime is the impact on investment. Investment stood at R660 million in 1990 and decreased to its lowest level of R400 million in 1993 under Phase IV of the local content programme before increasing to R492 million in 1994 (See figure 3.2 above). Between 1990-1994 investment growth decreased by 25 percent as uncertainty about the trade and investment policies the new government would follow. Investment increased to R1171 million 1996 after the introduction of the MIDP and stood at R2078 million by 2001. There was growing consensus that the MIDP in created incentives for investment during the MIDP mid-term review in 2001. Investment had tripled to R6214 million by 2006 largely as a result of increased production capacity and sustained economic growth in the country. Between 1996 and 2008, growth in sector investment stood at an incredible 180 percent (Kwagga, 2007). There was subsequent decline in 2008 with investment being R3290 million in 2008 due to a decrease in production and subsequent sales and as a result of a slowdown in economic growth (NAAMSA, 2009).

3.3.6.1 Breakdown of total capital expenditure

The South African automotive industry is the second largest recipient of foreign investment of any sector since 1994, indicating the extent to which the MIDP has leveraged investment and access to export market (DTI, 2004). Investment into infrastructure and production capacity has risen directly as a result of opportunities offered by the MIDP.

Figure 3.3: Breakdown of total capital expenditure (investment) from 1995-2008



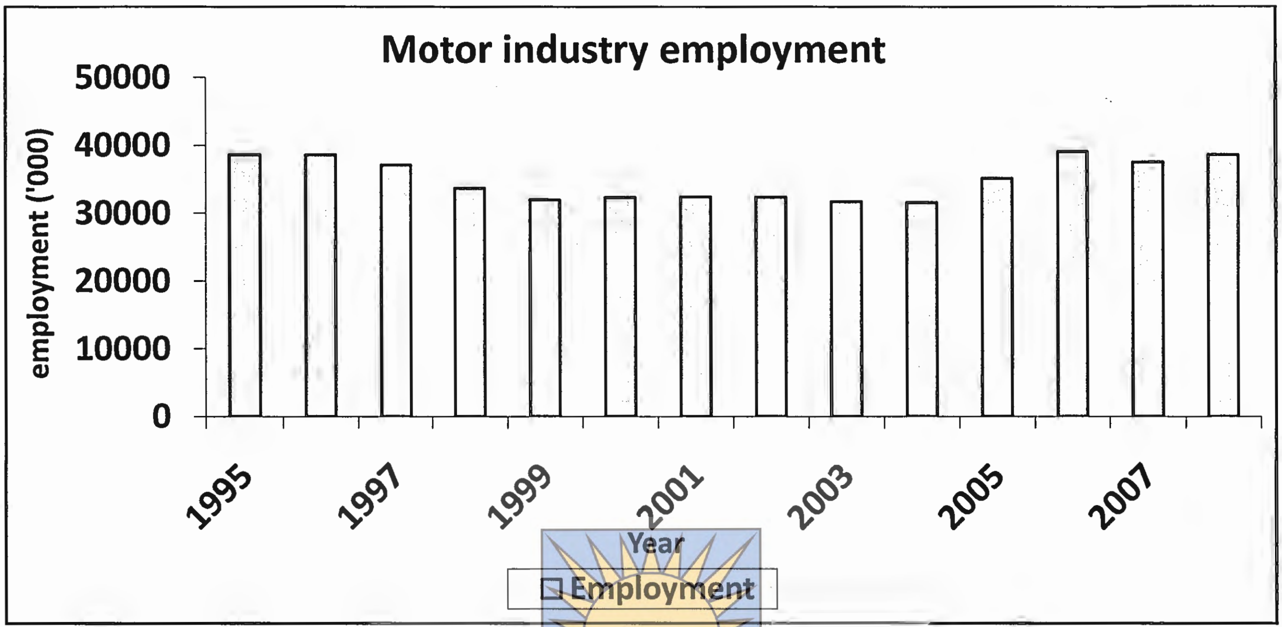
Source: National Association of Automobile Manufacturers Annual Report (2006), National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

Figure 3.3, above illustrates the breakdown of capital expenditure by the various vehicle manufacturers (OEM). Since 1995 the biggest recipient of capital expenditure by OEM`s has production facilities. Production facilities encompass the actual products (brands), local content requirements and export investment and production facilities. Investment into this portion of operations increased by a staggering 85 percent between 1995 and 2006 and accounted for nearly 90 percent of all capital expenditure by 2008. This is mainly because vehicle manufacturers utilized the investment incentives offered by the government in terms of local content requirements and the gradual reduction in trade barriers to allow the manufacturers export opportunities. Therefore manufacturers used the capital expenditure in providing exporting and production facilities. Investment in land and buildings has varied since the introduction of the MIDP, it stood at R35 million in 1995 and gradually increasing to around R110 million by 2000. Expenditure in land and buildings decreased to R33 million in 2001 an indication that vehicle manufacturers had access to reliable facilities. This was mainly because South Africa had the necessary infrastructure to cater for their operations and therefore more money was utilised in facilities and research and development. South Africa has the ability to build more plants quicker and at a lower cost (DTI, 2004). However, even though capital expenditure has increased, the annual percentage increases in research and development. The South African automotive industry remains a technology importer and the motor industry`s greatest benefits emanate from technology transfers enhancing capacity, quality and standards.

3.3.5 Employment in the automobile industry

The automotive industry has a high multiplier effect and direct linkages with a large number of support services and SMEs. Employment ratios vary from country to country but generally, for every worker involved in the manufacturing of a motor vehicle, at least two or more are employed in used vehicle sales, servicing and repair(DTI, 2004).The contribution of any industry to economic growth cannot be measured without taking into account employment creation (Fidderke & Simkins, 2006). The contribution of the motor industry to employment creation has not been consistent. Some stakeholders claim it has not been successful in creating employment but rather stabilized jobs whilst others have claimed that it has created jobs mainly through the introduction of the MIDP (Flatters, 2005). Trade Unions claim that the motor industry has not been successful in creating job opportunities even with large government support. Employers, however, argue that the original objectives of the MIDP were to stabilise jobs and the motor industry has in fact met these objectives. Global evidence shows that the automotive sector, more specifically the motor manufacturing sector may not necessarily create direct employment (Kwagga, 2007). One of the main objectives of the MIDP was to improve international competitiveness and it was realized, however , that it would be difficult to create employment in the automotive sector but emphasis should rather be placed on stabilizing or maintaining the prevailing rate of employment (Lamprecht, 2006). A compromise was therefore reached between government and the industry after the first MIDP review, employment should rather be stabilized. Motor Industry employment from 1995-2008 is illustrated in Figure 3.4 below.

Figure 3.4: Motor Assembly Employment:1995-2008



Source: National Association of Automobile Manufacturers Annual Report (2006), National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

Figure 3.4 above shows that since the introduction of the MIDP in 1995 employment growth has been fairly stable. Between 1995 and 1997 employment had been relatively stable with 38600 employees in the assembly sector in 1996. Employment decreased from 37100 in 1997 to only 32300 employees by the year 2000. This amounted to a 12 percent decrease in overall assembly employment and is attributed to the decline in production and vehicle sales over the same period (DTI, 2004)). The decline in productivity occurred because vehicle manufactures opted to produce low volumes models in the domestic market by utilizing imported components (Black, 2001). Most OEM`s also had spare capacity due to automation and therefore could increase production without increasing employment levels. The emerging market crisis the international financial market instability in 1997 led to the interest hikes, which impacted negatively on domestic sales. The drive towards higher production and new manufacturing techniques resulted in many full-time jobs being converted to subcontracting, out-sourcing, in-sourcing and part-time (temporary and causal) jobs (Lamprecht, 2006). High levels of employment relative to the number of vehicles produced meant that the existing employment levels could only be maintained through increased production (Lamprecht, 2006). Between the years 2000-2004, employment remained relatively stable, employment started to increase in 2004 mainly as a result of improvement in production and sales mainly through exports (DTI, 2004)). The South African automotive industry has become an important global exporter of vehicles and the increase in exports has led to a number of jobs being created. The increased focus on exports, capital and skills-intensive manufacturing has lead to a rise in demand for skilled labour (DTI, 2004). Raising domestic skills levels and generating employment through more labour-intensive assembly practices is associated with tangible long-term economic and social benefits. As a result of export growth, mainly through Completely Built-Units (CBU), increased production, increased sales and economies of scale, the motor assembly industry employed nearly 40000 employees by 2006 and this was equivalent to the employment levels at the beginning of the MIDP (Lamprecht, 2006). Production and productivity gains have also been realized by the OEM`s and this had positive output growth resulting in marginal losses in employment. Employment in the motor assembly industry therefore has not improved over the years but rather remained stable.

3.3.6 Exports and Imports in the motor industry

Exports are one of the main drivers of growth in the automotive sector (Kwagga, 2007). The South African automotive industry enjoys significant advantages compared to many other exporting countries. The South African automotive industry has flexibility in producing short-runs; its abundance of raw materials and low energy costs combined with the expertise, its advanced technology and good business relationships of parent companies ensures that the automotive industry increasingly adds value to the global strategies of parent companies (DTI, 2004). Most developing nations build mass-produced cars targeted for targeted markets. In contrast, South Africa sells to various niche markets, which protects the industry from cyclical fluctuations that affect exporters who exposed to single markets. Given this flexibility, South Africa has a unique advantage when it comes to low volumes, as is the case with lower volume vehicle and niche markets (Lamprecht, 2006).

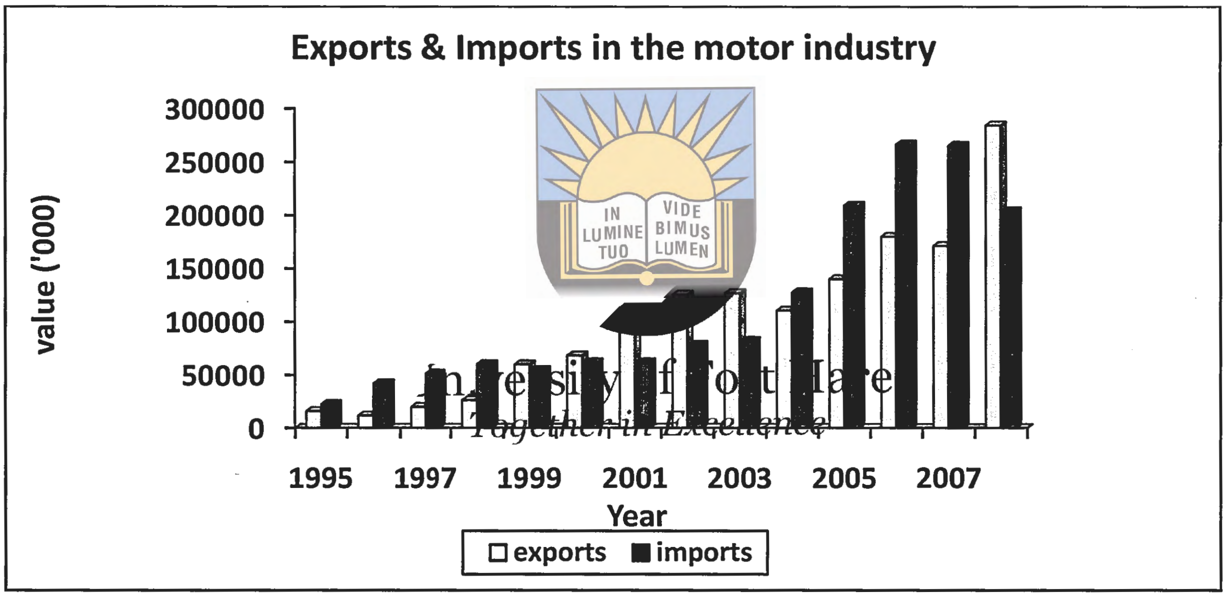
A good domestic market is a powerful support basis for a successful export progamme. The automotive industry in general is reliant on economies of scale in order to export products as part of a global value chain, hence the majority of SA exporting firms is currently partly or wholly foreign owned. A principal reason for the shift in ownership relates to the manner in which exporting contracts are secured, as well as the need to access global design capabilities. SA OEM`s are seen as a supply source into the global supply network. The process design is done in SA while the product design is done overseas. Improved process capabilities are seen as a pre-condition for continued supply into the automotive industry

Products made in SA need to be manufactured according to global design developed by a leading multinational company, usually the parent company. A variety of challenges such as improving quality, increasing efficiency, managing costs, reducing scrap, decreasing downtime and boosting capacity need to be addressed.(DTI, 2004)

Whilst some other automotive variables have been inconsistent, exports sales have continued to increase over the years. The main driver of growth in exports over the years is considered to be the introduction of the MIDP. Before trade liberalization, the motor industry`s objectives were more inward oriented and thus concentrated on protecting the industry from imports. With the introduction of the MIDP, OEM`s were encouraged and even incentivized to increase their ratio of export sales. However since 1995 imports have grown at a much faster rate than exports mainly as a result of reduction of import tariffs. The problem was that vehicle manufacturers initially adopted a strategy of generating import credits by exporting components, especially those that required only light investments. This allowed them to continue to introduce new, low volume models into the domestic market utilizing imported components. This strategy offered an "easy" route to achieve duty neutrality, certainly much easier than increasing local content in low volume, locally assembled vehicles. But this strategy also left vehicle producers in a vulnerable position. By failing to increase vehicle volumes through exporting, unit production costs would remain high and vehicle manufacturers would become progressively less able to compete as tariff reductions continued (Black, 2001).

From 1995-1999 imports have increased at a much faster rate than exports. Imports increased from 22 305 in 1995 to 59951 in 1998 (see Figure 3.5 below). The lowering of tariffs gave component manufacturers the flexibility and the opportunity to source uneconomical, locally produced parts from foreign firms (Black, 2001).Exports however increased at a much slower rate from 15762 in 1995 to 25898 over the same period. The smaller increase is attributed to the fact that most vehicle manufacturers had not put in place clear exporting programmes. Between 1999 and 2003 exports grew faster than imports as production and sales become buoyant thus contributing significantly to economic growth. The importance of economies of scale meant that the increased competitive temperature placed some pressure on firms to increase production as a way of reducing unit costs (Lamprecht, 2006). The reduction in import tariffs although providing foreign firms access to the domestic market, has also given local producers a chance to concentrate on exports rather than being protectionist. One of the objectives of the MIDP was to reduce tariffs and duties on certain automotive products over a prescribed period. As more and more tariffs and duties were reduced it allowed an inflow in imports/components into the automotive industry. The result is that imports have continued to increase at a much faster rate than exports since 2004, with imports increasing from 127389 in 2004 to 265095 in 2007 whilst exports increased from 110507 to 171238 over the same period. The volume of motor industry exports and imports between 1995-2008 is shown below.

Figure 3.5: Vehicle Exports and Imports 1995-2008 (units)



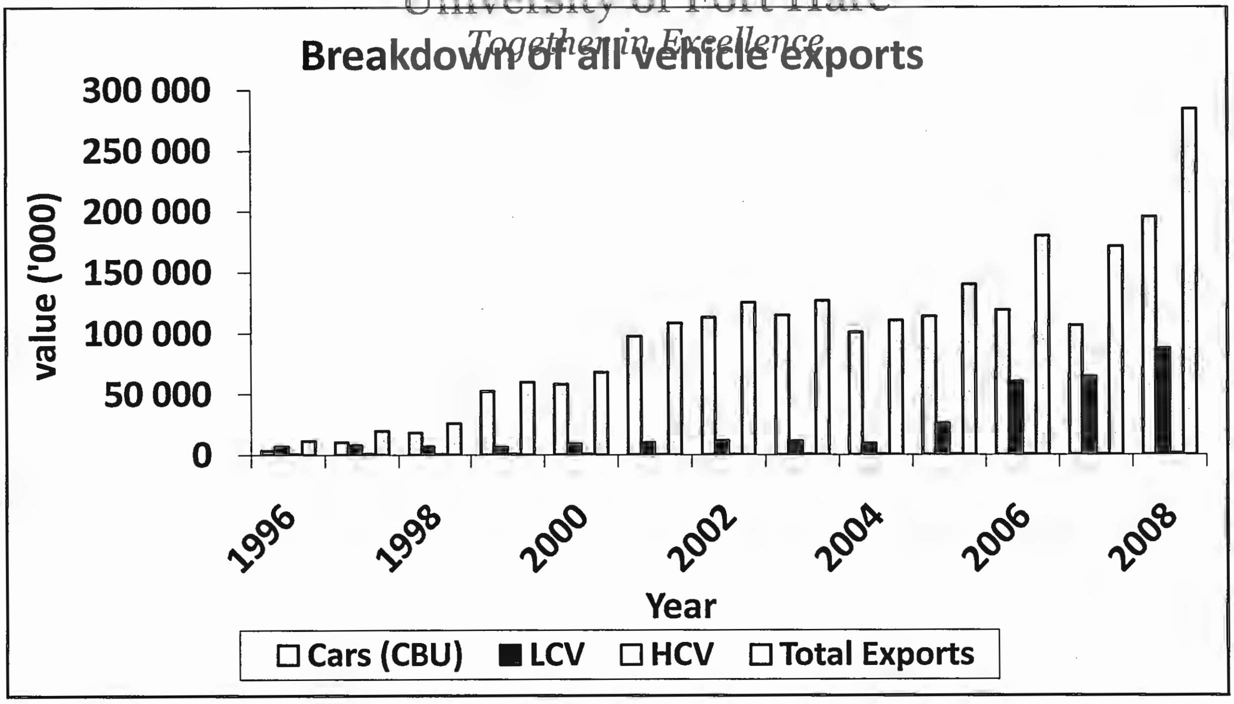
Source: National Association of Automobile Manufacturers Annual Report (2006), National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

3.3.6.1 Breakdown of all vehicle exports

Exports from the South African automotive industry comprise of completely build-up units (CBU), light commercial vehicles (LCV) and heavy commercial vehicles (HCV). Light commercials contributed the most to total exports by South African vehicle manufacturers, contributing over 60 % (see figure 3.6 below). Since then there has been a gradual decline in light commercials and especially heavy commercials. The majority of motor exports have been CBU with an average increase of 92 percent between 1996 and 1999, from 3 743 units to 52 347 units over the period. In 2003 CBU exports from SA comprised 90, 7% passenger cars, 8, 9% light commercial vehicles and 0,4% medium and heavy commercial vehicles. The average value of all CBUs exported from South Africa increased from R137 000 to R153 000 (Franse, 2007). Passenger car exports have increased by 1, 7% to114 909 units from 113 025 units in 2002. BMW, DaimlerChrysler, Volkswagen and Toyota SA exported 98, 4% of the passenger cars (DTI, 2004).

Light commercial vehicle exports declined from 11 699 units in 2002 to 11 283 units in 2003. Total exports declined from 126 661 in 2003 to 110 507 in 2004, mainly as certain models reached their end-of-life cycle and subsequent phasing in of new models. The strong Rand also had negative impact on total exports. Between 2004 and 2008 passenger car exports (CBU) increased by an average 48 percent, but they still comprised of the biggest share of total exports by 2008 at 69 percent. Light commercials more than doubled since 2004, increasing by 89 percent over the same period from 9 360 in 2004 to 87 314 in 2008 (Lamprecht, 2006). A breakdown of all vehicle exports form 1995-2008 is illustrated in figure 3.6 below.

Figure 3.6: Breakdown of vehicle manufacturing exports 1995-2008



Source: National Association of Automobile Manufacturers Annual Report (2006), National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

3.3.6.2 Destination of all vehicle exports

South Africa as part of South Africa Customs Union (SACU) has developed important ties with countries of the North American Free Trade Agreement (NAFTA) through the Africa Growth Opportunity Act (AGOA), established in January 2001 and also has significant trade links with the South African Development Community (SADC) and countries of the European Union (EU) (Damoense and Jordaan, 2007). South Africa exports a substantial amount of automotive products(both CBUs and CKDs) to member countries of the EU and NAFTA trade blocs. Between 1995 and 1997 the SADC region was the biggest recipient of South African exports, constituting an average of 55 percent of all vehicle exports.

Destination of all vehicle exports from1995-2005 is illustrated in Table 3.5 below.

Table 3.5: Destination of vehicle exports by value: 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total export value(R Billion)	R0,80	R0,70	R1,4	R1.8	R4.8	R7,0	R10,8	R16,3	R18,6	R17,0	R21,4
Country/Region	%	%	%	%	%	%	%	%	%	%	%
Japan	-	-	-	-	-	11	13	18	35	32	35
USA	-	-	-	-	-	7	18	23	20	14	4
UK	1	3	2	15	13	9	18	17	16	24	20
Australia	4	11	19	15	10	12	10	11	15	19	24
Germany	-	-	5	25	57	37	19	12	3	1	-
Other	95	86	74	45	20	24	22	19	11	10	-
EU	-	3,7	7,2	41,2	69,9	52,8	37,6	29,9	19,5	24,5	23,6
NAFTA	-	-	-	-	1,0	7,3	17,9	22,6	19,5	13,9	3,7
SADC	44,0	64,3	46,3	27,0	11,3	11,9	9,2	10,2	5,6	3,9	4,2

Source: Department of Trade and Industry Motor Industry Report (2004), National Association of Automobile Manufacturers Annual Report (2006)

Trade has however shifted to the demanding markets such the EU which has increased its motor vehicle imports from South Africa from around 4 percent in 1997 to around 24 percent in 2005. The German manufacturers (BMW, Daimler-Chrysler and VW) have been the biggest exporters to the EU as they have unveiled export programmes through the MIDP. BMW exports the 3 series vehicles to Japan, Australia and USA (left hand drive), contributing to a substantial increase in vehicle exports to these respective countries. VW exports the Polo series to the EU and also exports the new Golf 5 series to parts of the Asia Pacific. Daimler-Chrysler (Mercedes-Benz) exports the C-Class model to the USA. Toyota and Nissan are the only other companies that focus substantially on the exports even though the majority of their exports are for the African market.

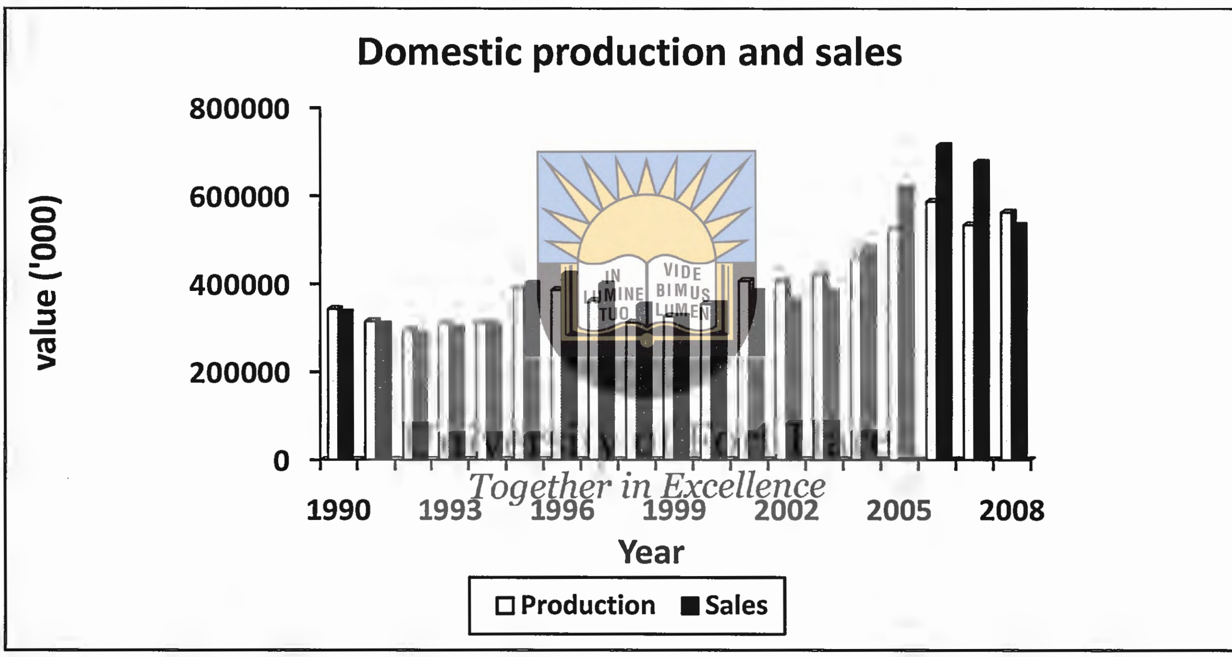
3.3.7 Domestic Production and Sales

South Africa is establishing itself as an international player in the production of motor vehicles and automotive components and this demands sophisticated logistics systems and high standards along the supply chain as an integral part of world trading. Skilled personnel is a critical element in promoting global competitiveness and while SA remains behind the leading countries in terms of productivity, improvements in domestic productivity efficiencies so far have come mainly as a result of higher specialization and economies of scale benefits via volume increases in exports, as well as increased levels of automation. The SA industry has relatively low levels of automation and a complex product range of comparatively low volumes in global terms. R[illegible] normally are required to do some of the most sensitive work in SA whilst welding tasks are labour intensive due to relatively low labour costs. This, however, contributes to SA's comparative advantages such as flexibility, diverse range of products produced, price competitiveness of small series products and quick changing of the configuration of tooling and processes according to need (DTI, 2004).

Investment is considered as a driving factor in the growth of the motor industry, however it was able to drive growth through increased production levels. One of the objectives of the MIDP was to increase domestic production. Policy makers assumed that increased production lowered average costs through the realization of economies of scale and subsequently contribute towards competitiveness of the industry. Demand for factor inputs were expected to increase and as a result, more people would be employed and sourcing of local components was expected to rise (Kwagga, 2007). However, domestic production initially decreased after the introduction of the MIDP. Domestic production (per unit) decreased from 389 476 in 1995 to 312 055 in 1998 but started to increase again in 1999 reaching 354 364 by 2000 (See figure 3.7 below).

The percentage decrease in domestic production between1995-2000 was negative 9 percent. Sales also showed a decline after the introduction of the MIDP reaching 325 775 units in 1999 its lowest level since 1996. The decline in domestic production and sales is attributed to an increase in costs of production. Trade liberalization opened the market for inflow of imports which pushed vehicle prices up resulting in a decline in sales units. The emerging markets crisis and the international financial market instability in 1997 led to higher interest rates in South Africa and therefore impacting negatively on the domestic market (Lamprecht, 2006). Domestic production of vehicle and sales from 1990-2008 is illustrated in figure 3.7 below.

Figure 3.7: Domestic Production and Sales 1990-2008



Source: National Association of Automobile Manufacturers Annual Report (2006), National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

A review of the MIDP recommended that tariffs, duties and other forms of protection be reduced even further (See Table 3.2). This allowed domestic vehicle manufacturers to source components on certain products from abroad at a cheaper price thus reducing input costs and ultimately leading to increased global competitiveness. Falling interest rates and innovative financial packages gave impetus to a rise in production and vehicle sales. Between 2001 and 2004 production increased from 406 779 in 2001 to 455 702 in 2004. Sales also tracked and surpassed production with annual sales increasing from 382 259 in 2001 to 481 520 over the same period (NAAMSA, 2006). A slight decline in both vehicle production and sales in 2002 occurred as a result of the slowdown in the global economy. Since 2004 production and sales have continued to be buoyant reflecting the positive macroeconomic fundamentals coupled with new consumer and business sentiment in the South African economy. The year

2006 represented the biggest annual vehicle sales in history, recording over 700 000 vehicles. The period between 2001 and 2006 represented the biggest growth in vehicle sales figures with percentage unit sales increasing by an incredible 86 percent. The country had experienced its longest economic growth phase over the same period and thus the consumer demand for vehicles increased. The boom in the vehicle sales was a move towards what policy makers and stakeholders in the industry predicted and aimed for, the industry was on its way to meeting the goal of producing 1 000 000 vehicles. However this objective was not met as vehicle production and subsequently sales declined in 2007 and 2008. This was caused by a relatively strong Rand which impacted on exports sales and decrease in demand due to high oil prices which impacted on per unit costs (Takaendesa, 2006).

To achieve the high levels of domestic production in the motor industry and achieve international competitiveness, labour productivity in the South African automotive industry has to be amongst the best in the world. Labour productivity is critically important in the South African automotive industry because of the low levels of automation. Table 3.6 below illustrates labour productivity in the South African automotive industry.

Table 3.6: Labour Productivity in the South African motor industry.

Year	Units Produced	Employees	Units per employee
1995	389476	38600	10.09
1996	386310	38600	10.00
1997	362104	37100	9.76
1998	312055	33700	9.26
1999	326 065	32000	10.19
2000	354364	32300	10.97
2001	406779	32389	12.56
2002	405071	32370	12.51
2003	421965	31700	13.31
2004	455702	31548	14.44
2005	525271	35137	14.94
2006	587719	39079	15.03
2007	534490	37529	14.24
2008	562966	38623	14.57

National Association of Automobile Manufacturers Quarterly Review of Business Conditions (2009)

Historically labour productivity had been very low in the automotive industry but has improved since 1995. Surveys conducted by the International Motor Vehicle Programme between 1994 and 1996 showed that the average South African assembly plant compared poorly with assembly plants in other countries. The main reasons for this are ascribed to relatively low levels of automation and the complexity of most assembly plants, which produce a range of models in relatively low volumes (Black, 2001). Over the years labour productivity in the vehicle manufacturing industry improved becoming on par with other global competitors. Productivity in the South African automotive industry increased and between 1995 and 2004 production of vehicle per employee increased from 10 units to around 14.4 units. The improvements in labour productivity occurred as a result of economies of scale. BMW has decided to specialize in the 3-Series model to achieve economies of scale and to discontinue local production of the 5- and 7-Series, which are now being imported. Volkswagen of South Africa has also reduced the number of vehicle platforms from five to three with the discontinuation of the production of the Audi and the T3 bus. The full Audi range is now being imported as well as the T5 bus, the newer version of the T3 bus. Daimler-Chrysler also only produces the C-Series of the Mercedes Benz models, with the E-Class and S-Class being imported (Franse, 2006)

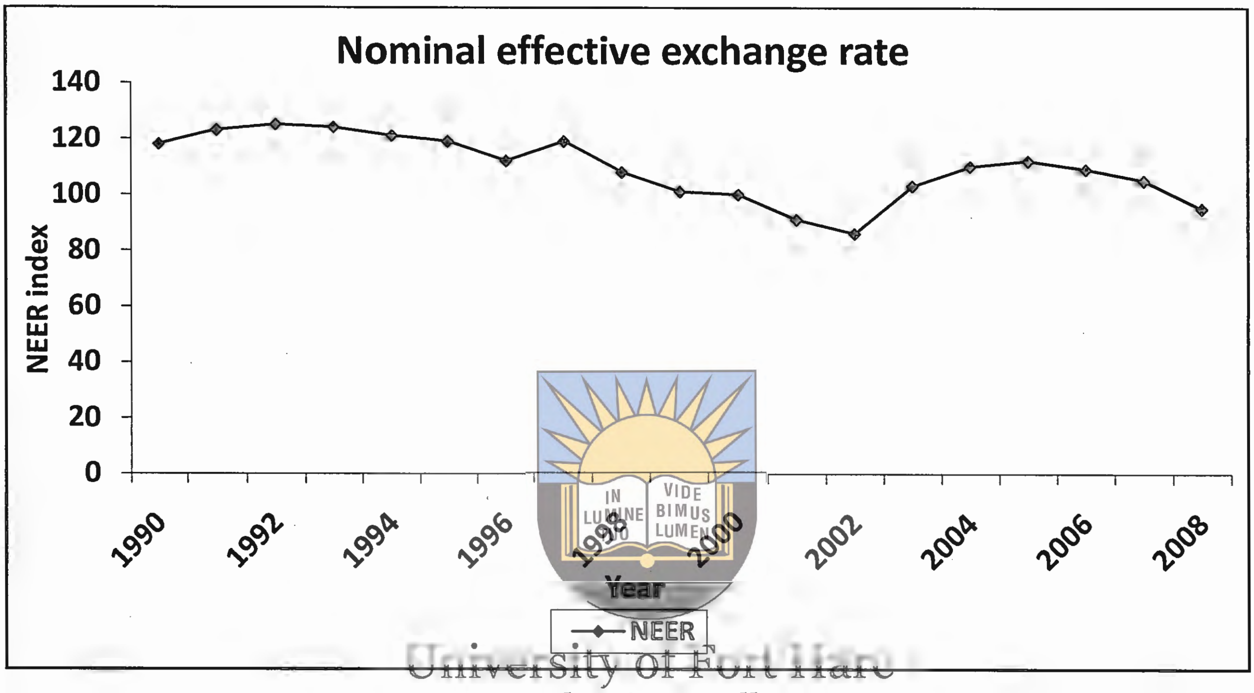
With the increase in domestic production and export growth, the South African motor industry improve in quality performance (Lamprecht, 2006). South Africa is establishing itself as an international player in the production of motor vehicles and automotive components and this demands sophisticated logistics systems and high standards along the supply chain as an integral part of world trading. Quality performance levels in the South African motor industry improved as the BMW South African plant achieved a global quality award in 2002, which demonstrates high class quality in vehicle manufacturing. Productivity growth and quality improvements have been crucial in the face of dynamic transformations in the world automotive industry and South Africa's increased exposure to international competition. The assembly plants in SA have demonstrated that it is possible to use a higher labour content to achieve world-class build quality in a short space of time. Even for highly sophisticated models, automated production may not be a requirement for high build quality. South Africa is successfully highlighting the advantages of flexible production lines that use more human workers for lower volume production instead of automating with robots, without compromising quality. In this regard the domestic industry has the ability to quickly adapt to comparatively short production runs of the niche market derivatives(DTI, 2004)

3.3.8 Exchange rate

Exchange rate is merely the price of one currency in terms of another (Takaendesa, 2006). In other words, it is the rate at which currencies are exchanged, for example the units of rand needed to buy a unit of a dollar or the reverse. There are a various measures of foreign exchange rate which are used in the foreign exchange market. These include the nominal exchange rate, real exchange rate, bilateral and multilateral (effective) exchange rates. The focus of the study will be on the multilateral- nominal effective exchange rate. The nominal effective exchange rate (NEER) or trade weighted nominal exchange rate of a currency is a weighted average of its exchange rate against other currencies. The weights used are usually the proportion of a country's trade with another country. An increase in value of the currency in terms of another is called an appreciation and a decrease in value is called a depreciation of the currency.

Up until 1979, the South African exchange rate was essentially fixed, as it was pegged either to the US dollar or to the pound sterling. South Africa moved to a dual exchange rate system in 1979, which was discarded temporarily in 1983 for two years and ultimately in 1995 when the country adopted a unified and freely floating exchange rate system. Prior to the introduction of the free floating exchange rate system in 1995, the Reserve Bank maintained a direct influence on the exchange rate through active intervention in both the spot and forward markets. This was done in order to keep the Rand stable and to the currency against excessive inflow of foreign currency. During the late 1980s and the beginning of the 1990s the Rand was relatively stable mainly due to the intervention by the Reserve Bank in the exchange rate market. The imposition of government sanctions and the international isolation of the country meant the authorities were unable to prevent a nominal effective depreciation of the rand of almost 19 per cent between January 1993 and the end of July 1994 (Takaendesa, 2006). The transition into democracy in 1994 brought stability and exchange rate reform. A unified and free floating exchange rate was introduced and the nominal effective exchange rate appreciated marginally from 112.00 in 1996 to 119.00 in 1997 (See Figure 3.8 below). However, due to the Asian financial crisis and the decline of gold the nominal exchange rate depreciated from 1997, ultimately reaching a low of R6.35 against the dollar in 1999 and continued to decline. The attacks on America in 2001 further caused uncertainty in emerging markets and the nominal effective rate declined from 91.00 to 86.00. The Rand appreciated in 2002 due mainly to renewed investor sentiments about emerging markets specifically South Africa. The Nominal effective exchange rate of South Africa from 1990-2008 is illustrated in figure 3.8 below.

Figure 3.8 Nominal effective exchange rate (NEER) of South Africa 1990-2008



Source: South African Reserve Bank (2009a)

The nominal effective exchange rate continued to appreciate reaching 110.00 in 2004 to 112.00 in 2005 as capital inflows intensified and global commodity prices increased. The nominal exchange rate declined from 106.00 to 95 between the years 2006 and 2008. This is attributed to lower interest rates, lower prices for key domestic exports and slowdown in global economic growth.

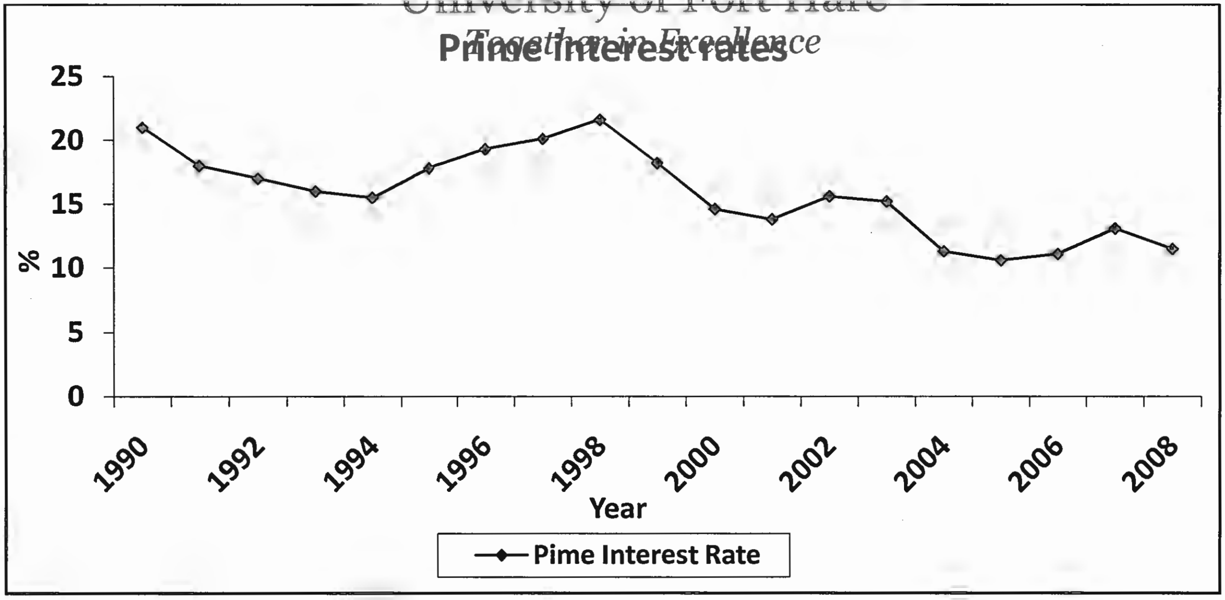
3.3.9 Interest rate

Interest rates refer to the cost of borrowing (Ayanwale, 2007). The prime and the repo rate system is used in South Africa. The South African Reserve Bank which is responsible for monetary policy uses the repo rate system to influence money supply in the economy. The Reserve Bank through this system determines the optimal level of interest rates for the country.

Interest rates also determine the flow of FDI to the host country. An increase in FDI contributes to the economic growth of a country (Ayanwale, 2007). The most important aspect is that higher interest rates create a wider spread between the domestic interest rate and the world interest rate. A lower real interest rate, particularly in the context of political risk and instability, has the effect of reducing the flow of FDI in any potential investment location (Obsfeld, 1986). Interest rates in South Africa have been robustly managed by the Reserve Bank from the start of the decade, and therefore investors are finding it attractive to invest in the country.

Historically interest rates in South Africa have been very high reaching double digits in the late 1980`s. This period was characterized by the use of the monetary aggregate (money supply) targeting system. Due to the instability of the country, economically and politically, this system became ineffective as the Reserve Bank found it hard to control monetary aggregates and ultimately interest rates. This system was subsequently replaced by the repo rate system in the early nineties which made it easier for the Reserve Bank to control interest rates . The prime interest rate in South Africa from 1990-2008 is illustrated in figure 3.9 below.

Figure 3.9 Prime interest rates in South Africa 1990-2008



Source: South African Reserve Bank (2009b)

The prime interest rates stood at 21 percent at the beginning of 1990 and steadily declined, reaching its lowest level of 15.5 percent in 1994. Due to the Asian financial crisis in 1997 the Reserve Bank increased interest rates to 20.1 percent to protect the domestic economy (Lamprecht, 2006). The Reserve Bank adopted an inflation targeting policy in 2000 which used interest rates as a tool to reduce inflation in the domestic economy. The new policy was successful in managing interest rates reaching 13.8 percent by the year 2001. However due to the Rand crash in 2002 interest rates increased to 15.6 percent . Since then the Reserve Bank was able to manage interest rates reaching its lowest level of 10.6 percent in 2005. This was the lowest level since 1990 and this is attributed to the high economic growth in the country during the period 2003-2006. Since then interest have steadily increased, initially reaching 13.5 in 2007 but declined to 11.5 in 2008. This was as a result of the slowdown in global economic growth in 2007 and the global financial crisis in 2008.

3.4 Concluding Remarks

The motor industry is a key industrial sector for the South African economy. The overview above illustrates the importance of the industry to the country`s growth. Historically, the contribution of the motor industry to the country`s growth has been important as government initiated a number of policy programmes to enhance the performance of the sector. Phase I to IV of the local content programs were initiated to help produce an industrial base such that manufacturing take place locally and reduce imports. However the local contents programs were too restrictive on imported components and high tariffs were set to protect the industry. Despite the government's intentions the local content programs were detrimental to the success of the industry as performance of the motor industry decreased under the policy programs. Investments had decreased, exports growth was virtually non-existent and contribution to GDP was low.

The motor industry has over the years moved away from local content programmes which were inward looking to a modern outward oriented programme, the MIDP. Over the years tariffs and duties have been reduced as a policy incentive to drive global competitiveness, attract foreign investment and improve exports. The contribution (percentage share) of the motor industry to the GDP of this country has increased substantially since the introduction of the MIDP. Investment and exports have more than doubled since 1995 mainly because of the incentives offered by the MIDP. Global (parent) companies have increased their equity stakes in the domestic market as they want to take advantage of the investment incentives, maintain market share, achieve economies of scale and align domestic firms into the global market. A number of domestic OEM`s have won contracts to produce high quality vehicles for export to the international market. Investment, exports and international competitiveness represent the success of the MIDP as a policy programme. Employment has increased to the levels that were there when the programme was introduced therefore achieving the objective of maintain rather than creating employment. Vehicle sales have also more than doubled making the South African motor industry one of the most competitive in the world. The domestic OEM`s have now rationalized, producing high (quality) volumes for the domestic and international market. Having done an overview of developments and trends in the motor industry, next chapter presents the methodology to employed in the estimation of model.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the methodology employed in the investigation of the impact of the motor industry on economic growth and employment in South Africa. The empirical model and the relevant data issues are presented. The first part of the chapter specifies the model and how estimation of the model was applied. This is followed by specifying the data that was used, the definition of variables and expected results. The last part of the chapter looks at various tests for the model including stationarity, cointegration error correction and diagnostic testing.

4.2 Model Specification

The model used in this study is based on the methodology by Buckley et al (2007) and Haiss et al (2009) as discussed in Chapter 2. Buckley et al (2007) and Haiss et al (2009) looked at the relationship between motor industry FDI, labour, exports and economic growth. The theoretical framework which underpins the methodology is based on the endogenous growth model as discussed in Chapter 2 which assumes that labour, human capital, physical capital as well as technology progress, are primary sources of growth. An augmented production function in deriving the empirical model is employed. The endogenous production function model investigates the relationship between labour (L), human capital (H), physical capital (K), technology (T) and economic growth, with the GDP shown as a function of L, H, K and A. The model begins by deriving the normal production function as expressed as follows;

$$Y = f(L, H, K, T) \ldots\ldots\ldots\ldots (4.1)$$

Where:

Y = Output

L = Labour force

K=Capital Accumulation

Following the augmented production function model of Buckley et al (2007) and Haiss et al (2009) the empirical model is modified to include a number of other variables expressed as follows;

$$GDP_s = FDI_m, L_m, X_m, E, I \ldots\ldots\ldots\ldots \quad (4.2)$$

Where:

GDP_s = Gross Domestic Product (manufacturing sector),

FDI_m = Capital inflow (FDI) into the motor industry,

L_m = Labour employed in the motor industry,

X_m = Motor Vehicle Exports

E = Exchange Rate

I = Interest Rate

The empirical model is expressed in the following functional form:

$$GDP_{st} = \beta o + \beta_1 FDI_{mt} + \beta_2 L_{mt} + \beta_3 X_{mt} + \beta_4 E_t + \beta_5 I_t + \mu_t \ldots\ldots\ldots\ldots\ldots \quad (4.3)$$

Where:

βo, β_1, β_2, β_3, β_4, β_5 are the coefficients of the variables to be estimated, FDI_{mt}, L_{mt}, X_{mt}, E_t, I_t whilst μ_t is the stochastic error term.

t = Time

The empirical model was estimated with the econometric software Eviews, version 7.

4.3 Definition of Variables and Data Sources

A number of variables were included in the regression equation which estimates the contribution of the motor industry to economic growth in South Africa. These include the following;

Gross Domestic Product (GDP) of a country is the market value of all final goods and services produced within the country in a given period of time. Since the motor industry is a subsector in the manufacturing sector, GDP for the manufacturing industry was used as a proxy of motor industry GDP. Quarterly time series data for GDP (current market prices) from the first quarter of 1994 to the fourth quarter of 2008 was used in the estimation and was sourced from the Department of Trade and Industry (DTI) Economic Database.

Foreign Direct Investment is the inflow into the countries borders of foreign capital. The study specifically looked at inflow of capital into the motor manufacturing industry. The foreign capital is mostly used for capital expenditure purposes of expansion, machinery and equipment. Quarterly data on capital expenditure from the first quarter of 1994 to the last quarter of 2008 was used. Quarterly time series data on capital expenditure was sourced from the National Association of Automobile Manufacturers of South Africa (NAAMSA) quarterly review of business conditions.

Labour is the number of people who are employed in the motor manufacturing (assembly) industry in South Africa. The study focused on the assembly only and therefore did not include components and retail employment. Quarterly employment data from first quarter of 1994 to the fourth quarter of 2008 was used. Quarterly time series labour force data was sourced from the National Association of Automobile Manufacturers of South Africa (NAAMSA) quarterly review of business conditions.

Motor vehicle exports refer to the number of vehicles which have been produced by the Original Equipment Manufactures (OEM) which are sold to the international or overseas market. A number of OEM`s produce specifically for the international and local market whilst others concentrate on the local market. Quarterly time series data of the number of vehicles exported was sourced the Response Group Trendline (RGT) which provides data on the motor industry and other institutions like NAAMSA.

Exchange rate refers to the currency of the country, specifically South Africa, in this case the Rand. Quarterly time series data on the nominal effective exchange rate of South Africa from 1994 to 2008 was used. Quarterly data on the nominal exchange rate was sourced from the South African Reserve Bank (SARB).

Interest rate is the interest that is charged on borrowing and/or loans. The prime lending rate that is charged by the South African Banks was used as it is directly charged on loans and investments. Quarterly time series data on the prime interest rate in South Africa was used. The quarterly data was sourced from the South African Reserve Bank (SARB).

4.4 Expected Relationships

In estimating a regression equation, all economic variables are expected to conform to economic theory. This research follows on literature reviewed in chapter 2 and estimates a relationship that conforms to economic theory. The coefficient β_1 is expected to have a positive impact on GDP. When investment (motor industry) increases it increases capital expenditure leading to an increase in output (GDP)

The coefficient ($\beta_2>0$) is expected to have a positive relationship with GDP. Labour (human capital) contributes positively to the output of the industry and ultimately GDP growth. As the number of people who are employed in the motor industry increase, GDP is also expected to increase.

The coefficient β_3 is expected to be greater than zero ($\beta_3>0$). Motor industry exports (foreign sales) are expected to increase foreign earnings (currency) meaning more money will be coming into the country. This raises firms output (profits) thus contributing positively to GDP.

The coefficient β_4 is expected to have both negative($\beta_4<0$) and or positive($\beta_4>0$) impact on GDP. A strong currency or an appreciating Rand is expected to reduce motor vehicle exports as local firms will be earning less of foreign currency. This reduces domestic production and sales as there is no profit earned by exporting and could lead to potential job losses. A weaker Rand is expected to increase the demand for exports, boosting production sales and ultimately contribution of the industry to economic growth. In this case the exchange rate may have a positive impact on GDP.

The coefficient β_5 is expected to have a negative impact on GDP($\beta_5<0$). High interest rates do not attract foreign direct investment into the motor industry. A high interest rate therefore reduces capital expenditure, deters employment opportunities and has a negative impact on GDP growth.

4.5 Estimation Techniques

There are several techniques available for parameter estimation, ranging from classical regression methods to cointegration based techniques. The former is based on the assumption that all the variables to be included in a regression are stationary. However, most time series data are not stationary in their levels such that estimations based on this technique will be meaningless (spurious). Differencing the variables to mechanically turn them stationary has been a preferred approach to deal with this problem, but it throws away useful long run information that may be in the data. These problems led to the emergence of new generation models based on cointegration and error correction modelling (Brooks, 2002: 400). There are also several cointegration based methods but the majority of them suffer from numerous problems when applied to multivariate models. These include not being able to test for cointegration when there are multiple cointegrating relationships and sample problems amongst others. The technique in this category that has emerged as the most powerful and popular is the Johansen technique, which is the technique employed in this study.

The Johansen (1991, 1995) technique has become an essential tool in the estimation of models that involve time series data. This approach is preferred as it captures the underlying time series properties of the data and is a systems equation test that provides estimates of all cointegrating relationships that may exist within a vector of nonstationary variables or a mixture of stationary and nonstationary variables (Harris, 1995: 80).The Johansen technique has several advantages over other cointegration based techniques, which will be discussed in the following sub-sections. The Johansen technique is preferred in this study as it allows for the estimation of a dynamic error correction specification, which provides estimates of both the short and the long run dynamics in the empirical model. A number of steps are required in estimating the Johansen technique and these include, to determine the stationarity of the variables in the empirical model, the next step is performing cointegration tests in order to identify any long run relationships between the variables, a short run vector error correction model is then estimated on condition of finding cointegration in the previous step and finally, residual diagnostics tests form the last step. Impulse response and variance decomposition is be performed when the variables pass the necessary diagnostics tests.

4.5.1Testing for stationarity/unit root

A series is referred to as (weakly or covariance) stationary if its mean and variance are constant over time and "the value of the covariance between the two time periods depends only on the distance or lag between the two time periods, not on the time at which the covariance is calculated" (Gujarati, 2003:797). A series that is not stationary is referred to as nonstationary. In addition, a series is said to be integrated and is denoted as I (d), where d is the order of integration. The order of integration refers to the number of unit roots in the series, or the number of differencing operations it takes to make a variable stationary.

In the classical regression model, the focus is on the relationship between stationary variables, but most of the variables usually follow a nonstationary path. Variables that have a linear relationship (non-stationary) can produce misleading results as they might show trends. Stationarity refers to testing and making sure that the series are integrated of the same order. Gujarati (2003: 806) shows that if the dependent variable is a function of a nonstationary process, the regression will produce spurious results (a nonsense regression). In other words, the dependent variable will follow the trend of its explanatory variables. In such a case, the results will be meaningless. In fact, it is likely that significant t-ratios and a high R^2 will be obtained even though the trending variables are completely unrelated. Consequently, unit root or stationarity tests should be done on all the variables before proceeding with the tests for cointegration and estimation of parameters. There are a number of stationarity tests applied in econometric modelling, these include the Dickey-Fuller, Augmented Dickey-Fuller, Kwiatkowski-Phillips-Schmidt-Shin and the Phillips-Perron tests. However this study adopts the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) which have several advantages over others which will be discussed in the next subsection.

4.5.1.1 Dickey-Fuller

The Dickey Fuller involves estimating one (or more) of the equations below using OLS in order to obtain the estimated value of γ and the associated standard error. It also involves comparing the t-statistics with the appropriate value reported in the DF tables which allows the researcher to determine whether to accept or reject the null hypothesis $\gamma = 0$, which means there is unit root against the alternative hypothesis, there is not unit root $\gamma < 0$.

The DF test considers three different regression equations that can be used to test for the presence of unit root. This means three models can be estimated for each variable and these are; without a constant and a trend, with a constant and no trend and with both a trend and a constant. These equations are presented by the equations below.

The equation with no constant and no trend is represented by;

$\Delta y_t = \delta y_{t-1} + \mu_t$..(4.4)

The equation with a constant and no trend is represented

$\Delta y_t = \beta_1 + \delta y_{t-1} + \mu_t$..(4.5)

The equation with both a trend and a constant is given by;

$\Delta y_t = \beta_1 + \beta_{2t} + \delta y_{t-1} + \mu_t$..(4.6)

The difference between the three regressions concerns the presence of a deterministic element where t is the trend. However Eviews 7 does not provide the third equation (4.6) for the Dickey Fuller test. The parameter of interest in all regression equations is γ, if $\gamma = 0$, the y_t sequence has unit root. The methodology to get of estimation and getting critical values for t-statistics is the same regardless of which of the three forms of the equation is estimated. The error term in the Dickey Fuller test should satisfy the assumptions of normality, constant error variance and independent(uncorrelated) error terms. If the error terms are not independent in the equations above, results based on the DF test will be biased. The weakness of the DF test is that it does not take account of possible autocorrelation in the error and to cater for this the ADF test may be used. The Dickey-Fuller test, as with other unit root tests, has its own weaknesses.

Even if the test seems to give a precise answer on stationarity or nonstationarity, this is not the case. The test is weak in its ability to detect a false null hypothesis. Brooks (2002: 381) and Gujarati (2003: 819) show that unit root tests have low power if the process is stationary but with a root close to the nonstationary boundary. This lack of power means that the Dickey-Fuller test fails to detect stationarity when the series follows a stationary process (Thomas, 1997: 410). This could occur either because the null hypothesis was correct or because there is insufficient information in the sample to enable rejection.

There are several ways of solving this problem, including increasing the sample size and using a stationarity test among others. The former solution could be limited by data unavailability, while the latter could be a good alternative without changing the sample size.

4.5.1.2 Augmented Dickey Fuller test

The ADF test is a stricter version of the DF test. The ADF test estimates three models for each of the variable as shown below;

The equation with no constant and no trend is represented by;

$\Delta y_t = \gamma\, y_{t-1} \sum_{i=2}^{p} \beta i \Delta y_{t-1+1} + \mu_t$...(4.7)

The equation with a constant and no trend is represented

$$\Delta y_t = a_0 + \gamma\, y_{t-1} + \sum_{i=2}^{p} \beta i \Delta y_{t-1+1} + \mu_t \qquad (4.8)$$

The equation with both a trend and a constant is given by;

$$\Delta y_t = a_0 + \gamma\, y_{t-1}\, a_2 \sum_{i=2}^{p} \beta i\, \Delta y_{t-1+1} + \mu_t \qquad (4.9)$$

In these models;

$$= \gamma - (1 - \sum_{i=1}^{p} \alpha i)$$

and

$$\beta = - \sum_{i=1}^{p} ai$$

The ADF test corrects for high-order serial correlation by adding a lagged differenced term on the right-hand side in the DF equations. The null ($\gamma = 0$) and alternative hypothesis for the ADF test is the same as the DF test. In both [illegible] calculated statistic is less (in absolute terms) than the MacKinnon (1991, 1996) values, which are used by the E-views 7 software, the null hypothesis is accepted and will therefore mean that there is a unit root in the series. In other words, it means the time series is not stationary. The opposite is true when the calculated statistic is greater than the MacKinnon critical values. However, in this ADF equation the coefficient of interest is γ, if $\gamma = 0$, the equation is entirely in first difference form and so has no unit root. If the coefficients of a difference equation sum up to 1, at least one characteristic root has unity. On the equations, if $\sum ai = 1$, $\gamma = 0$ and the system has a unit root.

4.5.2 Cointegration and Error Correction

In order to proceed to this stage, all the series of interest should be integrated of the same order, preferably I (1). The reason for this is that if the series display level stationarity, or are I (0), standard regression and statistical inference could be carried out, since there would be no problem of spurious regressions. On the other hand, if they are integrated of different orders the norm used is to difference all the variables included in regressions. The remaining cases of both I(1) or both I(2) variables is the case of interest here, because an estimation of regressions based on first differenced variables could result in committing a ‘sin’ of misspecification and loss of long run information embodied in the data. It is however, not necessary for all the variables in the model to have the same order of integration, especially if theory a priori suggests that such variables should be included. Thus, a combination of I (0), I (1) and I (2) can be tested for cointegration. (Harris, 1995: 80)

Cointegration has practical economic implications. Most time series data are nonstationary individually, but move together over time, that is, there are some influences in the series (for example, market forces), which imply that the two series are bound by some relationship in the long-run. A cointegrating relationship may also be seen as a long term or equilibrium phenomenon, since it is possible that cointegrating variables may deviate from the relationship in the short run, but their association would return in the long-run. This concept is particularly important in this study where there is a need to identify and distinguish those variables that have a long term relationship with the economic growth (GDP).

There are several ways of testing for cointegration. These can be divided into two broad categories, the residual based such as the Granger test (Engle and Granger, 1987) and those based on the maximum likelihood estimation of the VAR such as the Johansen and Juselius(1990) technique. The Engle-Granger test uses a two-step procedure. Firstly the residual error is tested for stationarity. Where variables X and Y might individually be non-stationary but if the estimate of their residual error is stationary, X and Y are said to be cointegrated. The Granger test seeks to determine whether the residual has an equilibrium relationship or is stationary. Therefore this implies that X and Y form a long run relationship and the regression is not spurious. Engle and Granger (1987) showed that any cointegrated series has an error correction representation, implying that the residual error of the estimation in the first step is stationary; the error correction model therefore can be estimated. Secondly, the error correction model is estimated, which represents the short run dynamics of the model. Thus, this two-step procedure covers both the long run equilibrium and the short- run adjustment process. The residual-based cointegration tests are inefficient and can lead to contradictory results, especially when there are more than two I (1) variables under consideration. The Engle –Granger cointegration test suffers from numerous problems, such as the usual finite sample problem of a lack of power in unit root and cointegration tests, inability to perform any hypothesis tests about the actual cointegrating relationships and their inability to detect more than one cointegrating relationship (Brooks, 200: 392)

In light of the highlighted problems with the residual based cointegration tests, the study shall employ the maximum likelihood based test in determining cointegration. The purpose of this cointegration test is to determine whether the variables in our growth model are cointegrated or not. The Johansen methodology can be described as follows,

Assume a vector: X_t = [LGDP, LFDI, LEMPL, LEXP, LEXCHR, LINTR] and assume the vector is in VAR representation of the form;

$X_t = z + \sum_{i=1}^{p} \prod i \; X_{t-1} + \mu_t$ ....(4.10)

where z is a (n x 1) vector of deterministic variables, ε is a (n x 1) vector of white noise error terms and $\prod i$ is a (n x n) matrix of coefficients. In order touse the Johansen test, the VAR (4.10) above needs to be turned into a VECM; specification (Brooks, 2002: 403), which may be specified as;

$\Delta X_t = z + \sum_{i=1}^{p} Bi \; X_{t-1} + \mu_t$ ....(4.11)

Where Xt is a vector of I (1) variables defined above, Δ Xt are all I (0)variables, Δ indicates the first difference operator, Bi is a (n x n) coefficientmatrix and ∏is a (n x n) matrix whose rank determines the number of cointegrating relationships. The Johansen's cointegration test is to estimate the rank of the∏ matrix (r) from an unrestricted VAR and to test whether to reject the restrictions implied by the reduced rank of ∏. If ∏is of full rank (r = n), it suggest that variables are level stationary and if it is of zero rank (r = 0), no cointegration exists among the variables. On the other hand, if ∏is of reduced rank (r<n),then there exists (n x r) matrices α and β such that;

$\prod = \alpha\beta'$ ....(4.12)

where α represents the speed of adjustment matrix, indicating the speed with which the system responds to last period's deviations from the equilibrium relationship and β is a matrix of long run coefficients(Brooks, 2002: 404).

However before one attempts to rank the cointegrating relationship two steps need to be followed. An optimal lag length (k) needs to selected and the choice of the deterministic assumption that the Johansen test requires. The reason for the selection of the lag length is because the Johansen test can be affected by the lag length of the Vector Error Correction Model (VECM). A number of information criteria are used in the selection of the optimal lag length, these includes; the sequential modified likelihood ratio(LR), Akaike information criterion (AIC), Final prediction error (FPE) Schwarz, information criterion (SC) and the

Hannan-Quinn information criterion (HQ). These information criteria usually centre around one lag length but if they are conflicting than the AIC and SC are considered the best predictors because of the prediction power.

The second issue is the choice of the deterministic assumption that the Johansen test requires in testing for cointegration. Various types of VAR scan be estimated based on five deterministic trend assumptions, for example, with or without a constant and trend in cointegrating term and with or without a constant in the VAR equations. E-views 7 specifically provides the following deterministic trend assumptions: Case1assumes no deterministic trend in the data and no intercept or trend in the VAR and in the cointegrating equation (CE); Case 2 assumes no deterministic trend in the data, but an intercept in the CE and no intercept in VAR; Case 3 assumes a linear deterministic trend in the data and an intercept in CE and test VAR; Case 4 allows for a linear deterministic trend in data, intercept and trend in CE and no trend in VAR; and Case 5 allows for a quadratic deterministic trend in data, intercept and trend in CE and linear trend in VAR. As a guide, E-views 7 provides the use of Case 2 if none of the visual plots of the series and unit root tests show the presence of a trend in the series, Case 3 if the series have stochastic trends, Case 4 if some of the series are trend stationary, while Cases 1 and 5 are rarely used in practice.

Once the appropriate VAR order (k) and the deterministic trend assumption have been identified, the rank of the ∏matrix can then be tested. The Johansen and Juselius (1990)has two variants of the reduced rank test for determining the cointegration space. The two variants are maximum eigenvalue (λ-max) and the trace statistics (λ-trace) and the superior Johansen and Juselius cointegration test is employ. In interpreting the results if the null hypothesis of no cointegrating vector can be rejected, it indicates that there is a long run relationship among the variables in the model.

The Johansen and Juselius tests are represented by the following equations;

$\lambda_{-max}(r, r+1) = -T \sum_{i=r=1}^{n} In\,(1-\lambda_i)$..(4.13)

$\lambda_{-trace}(r) = -T\sum_{i=r=1}^{n} In\,(1-\lambda_i)$ ....(4.14)

Where: r is the number of cointegrating vectors, λ_i is the estimated values of the characteristics root (also called eigenvalues) and the T is the number of usable observations. The larger is λ_i, the more large and negative will be the test statistic. Therefore if the eigenvalue is non-zero, then $\ln(1\lambda_i)<0 \forall i>1$. That is, for it to have a rank of 1, the largest for it to have a rank of 1, the largest eigenvalue must be significantly non-zero, while other eigenvalues will not be significantly different from zero.

The trace statistic sequentially tests the null hypothesis that the number of cointegrating relations is r against the alternative of k cointegrating relations, where k is the number of endogenous variables. The maximum eigenvalue conducts separate tests on each eigenvalue and has as its null hypothesis that there are r cointegrating vectors against an alternative of r+1 (Brooks, 2002: 405). Both these tests compare the eigenvalue and trace statistic values to critical values. For both tests, if the test statistic is greater than the critical values, the null hypothesis that there are r cointegrating vectors is rejected in favour of the corresponding alternative hypothesis.

However, the trace and maximum eigenvalue statistics may yield conflicting results. To deal with this problem, Johansen and Juselius (1990) recommend the examination of the estimated cointegrating vector and basing one's choice on the interpretability of the cointegrating relations. Alternatively, Luintel and Khan (1999: 392) show that the trace testis more robust than the maximum eigenvalue statistic in testing for cointegration. The two approaches would be considered in this study when faced with such a problem.

Once the cointegrating vectors have been identified then a Vector Error Correction Model may be estimated. A VECM is merely a restricted VAR designed for use with nonstationary series that have been found to be cointegrated. The specified cointegrating relation in the VECM restricts the long run behavior of the endogenous variables to converge to their cointegrating relationships, while allowing for short run adjustment dynamics. Once estimation is complete, the residuals from the VECM must be checked for normality, heteroskedasticity and autocorrelation, which are discussed in the next sub-section.

4.5.3 Diagnostics Check

Any econometric estimation technique whether OLS or VAR is not considered robust and valid unless diagnostics tests are done. Diagnostics checks test the validity and usefulness of the estimated model. Diagnostic checks test the stochastic properties of the model, such as residual autocorrelation, heteroskedasticity and normality, among others.

4.5.3.1 Autocorrelation LM Test

The Lagrange Multiplier (LM) test used in this study is a multivariate test statistic for residual serial correlation up to the specified lag order. Harris (1995: 82) argues that the lag order for this test should be the same as that of the corresponding VAR. The test statistic for the chosen lag order (m) is computed by running an auxiliary regression of the residuals ($t\mu$) on the original right-hand explanatory variables and the lagged residuals ($m\ t-\mu$).Johansen (1995) presents the formula of the LM statistic and provides detail on this test. The LM statistic tests the null hypothesis of no serial correlation against an alternative of autocorrelated residuals.

4.5.3.2 White heteroskedasticity test

This test is an extension of White's (1980) test to systems of equations, it tests the null hypothesis that the errors are both homoskedastic (no heteroskedacity problem) and independent of the regressors and that there is no problem of misspecification. The test regression is run by regressing each cross product of the residuals on the cross products of the regressors and testing the joint significance of the regression. The failure of any one or more of the conditions just mentioned above could lead to a significant test statistic. Thus, under the null of no heteroskedacity and no misspecification, the test statistic should not be significant.

4.5.3.3 Residual normality test

One of the most commonly applied tests for normality is the Bera-Jarque (BJ) test. The residual normality test used in this study is the multivariate extension of the Jarque-Bera test which compares the third and fourth moments of the residuals to those from the normal distribution (Brooks, 2002: 180).The joint test is based on the null hypothesis that residuals are normally distributed. A significant Jarque-Bera statistic, therefore, points to non-normality in the residuals. However, the absence of normality in the residuals may not render cointegration tests invalid.

4.5.4 Impulse response and variance decomposition

The reaction of the dependant variable (GDP) to shocks to each of the other variables is of great importance in VAR estimation. This is because it shows how these transmitted shocks affect GDP and how long it takes GDP to recover from such shocks to the system.

4.5.4.1 Impulse response

Impulse response analysis traces out the responsiveness of the dependent variable in the VAR to shocks to each of the other variables. It shows the sign, magnitude and persistence of shocks to GDP (in our context). A shock to a variable in a VAR not only directly affects that variable, but is also transmitted to all other endogenous variables in the system through the dynamic structure of the VAR. For each variable from the equations separately, a unit or one-time shock is applied to the forecast error and the effects upon the VAR system over time are observed. The impulse response analysis is applied on the VECM and, provided that the system is stable, the shock should gradually die away (Brooks, 2002: 341).

4.5.4.2 Variance Decomposition

Variance decomposition measures the proportion of forecast error variance in a variable that is explained by innovations (impulses) in itself and the other variables. Variance decompositions performed on the VECM may provide some information on the relative importance of shocks to the growth model. Variance decompositions give the proportion of the movements in the dependent variables that are due to their 'own' shocks (innovations), versus shocks to the other variables (Brooks, 2002: 342).

4.6 Concluding Remarks

This chapter presented the methodology used in building an empirical model. Having identified empirical studies by Haiss et al (2009) and Buckley et al (2007) which looked at the relationship between the motor industry and economic growth, an empirical model was built based on the endogenous production function approach. This growth model included the dependant variable Gross Domestic Product, and a number of modified independent variables including Foreign Direct Investment, employment, exports, exchange rate and interest rate.

The Dickey -Fuller and Augmented Dickey – Fuller were chosen to test for stationarity whilst the Johansen technique was chosen to test for cointegration and error correction. To test for the validity and robustness of the model diagnostics residual checks are done and to determine the impact, magnitude and proportion of shocks to the growth model impulse response and variance decomposition checks are done. Having outlined the research methodology in this chapter, the next chapter presents the empirical findings.

CHAPTER FIVE

PRESENTATION OF EMPIRICAL RESULTS

5.1 Introduction

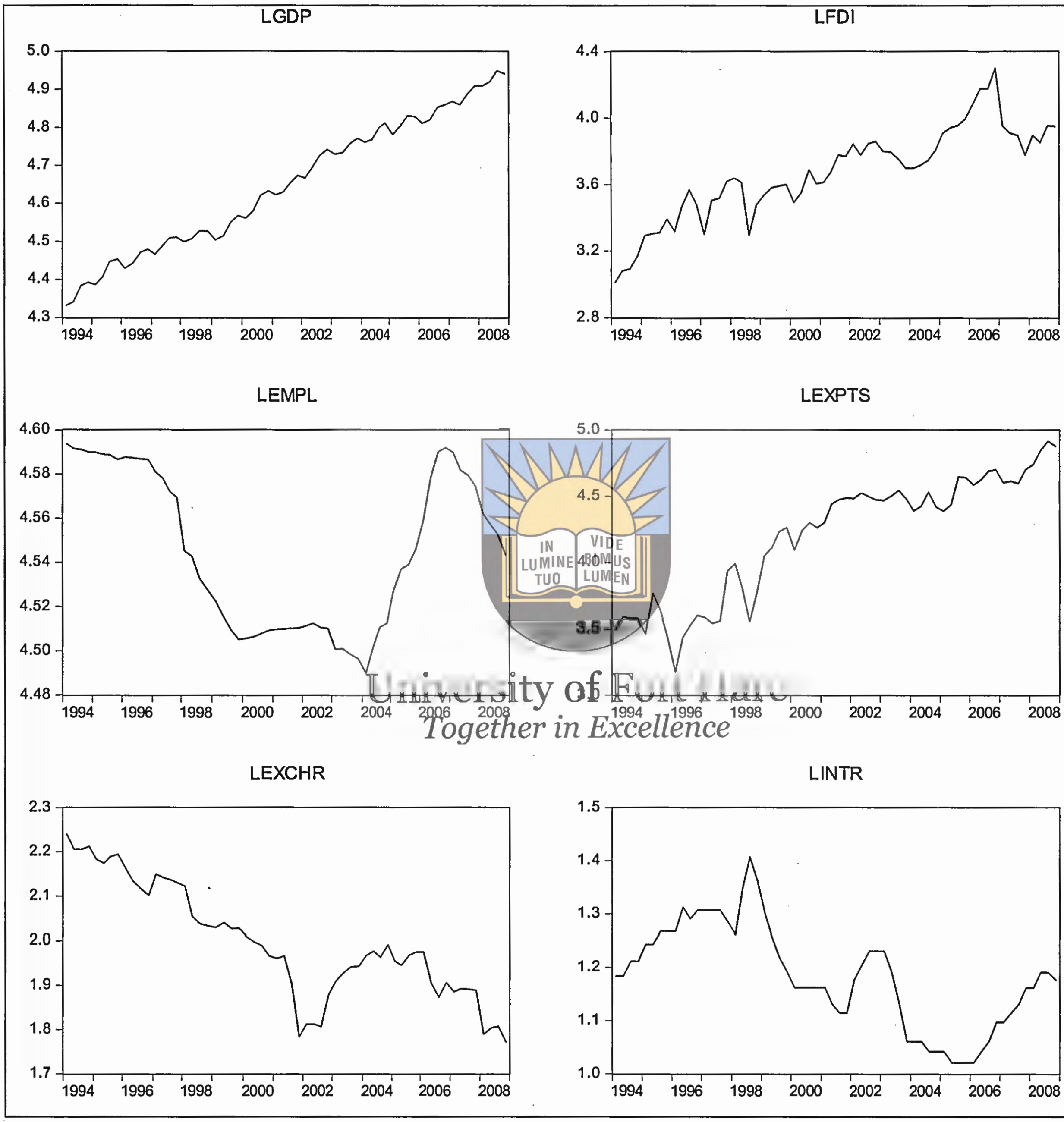
The production function based approach to economic growth was considered to be the relevant analytical framework for the chapter. The chapter applies the relevant analytical or methodological framework and reports the findings. This chapter provides an overview of the estimated results and relevant findings by providing an analysis of the empirical findings. This chapter is divided into five sections namely; stationarity and unit root tests, cointegration tests, the long run relationship and short run parameters, diagnostics checks and impulse response as well as variance decomposition.

5.2 Stationarity/unit root test

This is the first step required by Johansen estimation technique. In this study, one informal test for stationarity and two formal tests are employed. One of the most popular informal tests for stationarity is the graphical analysis of the data. A visual plot of the series is usually the first step in the analysis of any time series before pursuing any formal tests. This preliminary examination of the data is important as it allows the detection of any data capturing errors, and structural breaks and gives an idea of the trends and stationarity of the data set. As stated in the previous chapter the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests are applied. Figure 5.1 and 5.2 below show plots of all variables used in the model in their logarithm and first differences form against time.

The first impression from the visual plot in figure 5.1 is that all variables are non-stationary in logarithm form. The first two variables LGDP, LFDI and LEXPTS seem to be trending upwards albeit with fluctuations. The last two variables LEXCHR and LINTR seem to be trending downwards albeit with fluctuations whilst LEMPL initially trends downwards but then starts to trend upwards. All variables in figure 5.1 have a time variant mean and variance suggesting that they are not stationary in their levels.

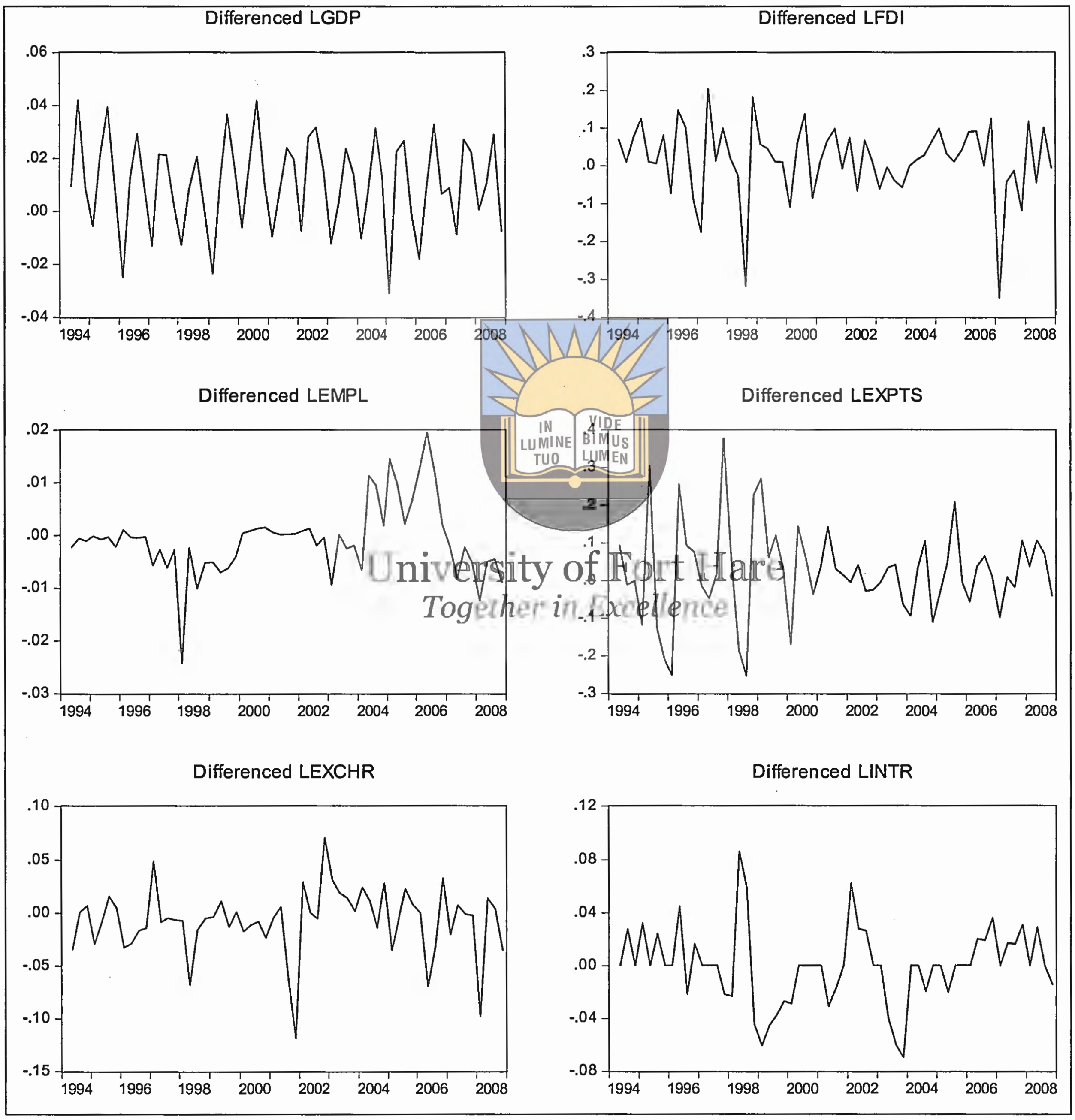
Figure5.1: Plots of all variables in logarithm form 1994q1-2008q4



Source: Authors own computation on E-views 7

The first impression from the visual plot in figure 5.2 is that some variables follow the stationarity after first differencing. The variables DLGDP, DLFDI and DLEXPTS could be stationary as they seem to be hovering around their means. The other three variables DLEMPL, DLEXCHR, DLINTR also show the stationarity process as they seem to be hovering around their means but their variances are clearly not constant over time. However, the problem with the visual inspection technique is that it is subjective as no conclusion can be made about the stationarity status of the variables. Therefore based on the analysis above some kind of formal hypothesis testing procedure is required.

Figure 5.2: Plots of all variables after first differencing 1994q1-2008q4



Source: Authors own computation on E-views 7

The two formal hypothesis tests employed in the study are the Dickey-Fuller and the Augmented Dickey-Fuller as mentioned in Chapter 4. The null hypothesis to be tested for both the DF and ADF tests is that there is unit root. The null hypothesis of a unit root is rejected in favour of the stationary alternative in each case if the test statistic is bigger (in absolute terms) than the Mackinnon (1996) value. Therefore, a rejection of the null hypothesis means that the series do not have a unit root. Both the DF and ADF tests were carried out under different deterministic trend assumptions. The DF test was carried out with a constant and no trend, constant and a trend only (Eviews 7 does not provide for no constant and no trend assumption). The ADF test was however carried out using all deterministic trend assumptions including no constant and no trend. The DF and ADF results are presented in Table 5.1 below

Table 5.1: Unit root/ stationarity tests

Stationarity test						
	Dickey Fuller		**Augmented Dickey Fuller**			**Order of Integration**
Variable	With Constant & No Trend	With Constant & Trend	With Constant & No Trend	With Constant & Trend	No Constant & No Trend	
LGDP	0.60370	-2.6504	-0.24055	-2.7233	2.5763	1 (0)
DLGDP	-2.9354*	-2.7620	-2.9562**	-2.9258	-1.3389	1 (1)
LFDI	-0.5880	-2.9581	-2.2950	-3.5812**	1.0498	1 (0)
DLFDI	-8.3567*	-9.0302*	-8.9418*	-8.9729*	-8.7804*	1 (1)
LEMPL	-0.0272	-1.5271	-0.2395	-1.9195	-1.2184	1 (0)
DLEMPL	-7.6121*	-7.7871*	-7.6057*	-7.6714*	-7.4732*	1 (1)
LEXP	0.441817	-2.277146	-0.47708	-2.255438	1.83216	1 (0)
DLEXP	-7.0262*	-7.4765*	-7.7548*	-7.6819*	-7.3356*	1 (1)
LEXCHR	0.3623	-1.9325	-1.1124	-2.0156	-1.9999	1 (0)
DEXCHR	-5.8897*	-6.7161*	-6.9585*	-6.8859*	-6.6754*	1 (1)
LINTR	-1.7885	-2.886	-1.7696	-2.6577	-0.1901	1 (0)
DINTR	-4.9005*	-4.8984*	-4.8582*	-4.813*	-4.9015	1 (1)
Critical values at 1%	-2.6076	-3.751	-3.55502	-4.133838	-2.6077	
Critical values at 5%	-1.9468	-3.174	-2.91552	-3.493692	-1.9469	

Source: Authors own computation on E-views 7

In table 5.1 above *indicates critical value at 1 percent level, **indicates critical value at 5 percent level. L represents Logarithms of the variables and D represents the variable has been differenced.

Table 5.1 shows that all of the variables have unit root in levels as the value of the t-statistics is smaller than the Mackinnon values in all deterministic trend assumptions. However LFDI (constant and trend) moves closer to the stationary boundary as it follows the stationarity process under the ADF test. FDI (constant and trend) has a t-statistic value of -3.5812 which is bigger than the Mackinnon value of -3.493692, significant at 5 percent level. When the test is applied to first differences of the series, all variables become stationary suggesting that they are all I(1). This is because the t-statistic for all variables is bigger than the Mackinnon value. The null hypothesis of unit root is therefore rejected and the alternative of no unit root in the series is accepted. The unit root test using constant and no trend assumption shows the most robust results for both tests.

LGDP is non-stationary in levels as the ADF t-statistic of -0.24055 is smaller than the 1 percent Mackinnon value of -3.55502. However, the ADF t-statistic value of -2.9562 becomes bigger than the 5 percent Mackinnon value of -2.91552 and the null hypothesis of unit root is rejected. The results for LGDP are more robust under the deterministic trend assumption of constant and no trend for both tests. LFDI was also found to be non-stationary in levels but becomes stationary after first differencing for both the DF and ADF under all deterministic trend assumptions. This is because the ADF and DF t-statistic values of -8.9418 and -8.3576 are bigger than the 1 percent Mackinnon values of -3.55502 and -2.6076 respectively. LEMPL possesses unit root in levels but becomes stationary after first differencing because the ADF t-statistic value of -7.6057 is bigger than the 1 percent Mackinnon value of 3.55502. LEXPTS, LEXCHR and LINTR are all found to non-stationary in levels but become stationary after first differencing. This is because their ADF t-statistic values of -7.7548, -6.9585 and -4.8582 are bigger than the 1 percent Mackinnon value of 3.5502 and the null hypothesis of unit is rejected in favour of the alternative hypothesis. The variables are all integrated of the order I(1) and are ready for cointegration tests which is discussed in the next section.

5.3 Cointegration

Cointegration analysis was conducted using the Johansen procedure to determine whether there is a long run equilibrium relationship between GDP and its determinants. The procedure involved specifying the optimal leg length and choosing of the deterministic assumption that the Johansen test requires. Table 5.2 below shows the lag length criteria obtained from the unrestricted VAR. The information criterion approach produces conflicting results as LR, FPE and AIC selects 5 lags whilst the SC and HQ both select 2 lags. An optimal lag length is required to produce uncorrelated and homoskedastic residuals. To reach a conclusion on the conflicting results all lags selected were considered and a lag length with robust diagnostics used. Lag 2 produced spurious estimates whilst Lag 5 had too many cointegrating equations which would make interpretation difficult. Lag 4 was therefore chosen as the optimal lag for the data set. The Johansen cointegration test is therefore conducted under the assumption of no trend but a constant in the series and 4 lags for the VAR.

Table 5.2: Lag Length information criterion

Lag	LR	FPE	AIC	SC	HQ
0	N/A	5.80e-14	-13.4510	-13.2321	-13.3663
1	606.9328	6.98e-19	-24.7864	-23.2535*	-24.1936*
2	48.5970	8.52e-19	-24.6344	-21.78764	-23.5335
3	71.4362	4.90e-19	-25.3096	-21.1490	-23.7007
4	33.4890	7.66e-19	-25.1168	-21.6423	-22.9981
5	57.6657*	4.08e-19*	-26.2105*	-19.4220	-23.5853

Source: Authors own computation using E-views 7

*indicates lag order selection criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwartz information criterion

HQ: Hannan-Quinn information criterion

The results of the Johansen cointegration technique are reported in table 5.3 below.

Table 5.3: Johansen cointegration rank test results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.764403	168.4060	95.75366	0.0000
At most 1 *	0.533849	88.89615	69.81889	0.0007
At most 2	0.301728	46.91766	47.85613	0.0611
At most 3	0.243488	27.16460	29.79707	0.0977
At most 4	0.176749	11.81755	15.49471	0.1659
At most 5	0.020164	1.120375	3.841466	0.2898

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.764403	79.50988	40.07757	0.0000
At most 1 *	0.533849	41.97848	33.87687	0.0044
At most 2	0.301728	19.75307	27.58434	0.3585
At most 3	0.243488	15.34705	21.13162	0.2653
At most 4	0.176749	10.69717	14.26460	0.1701
At most 5	0.020164	1.120375	3.841466	0.2898

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

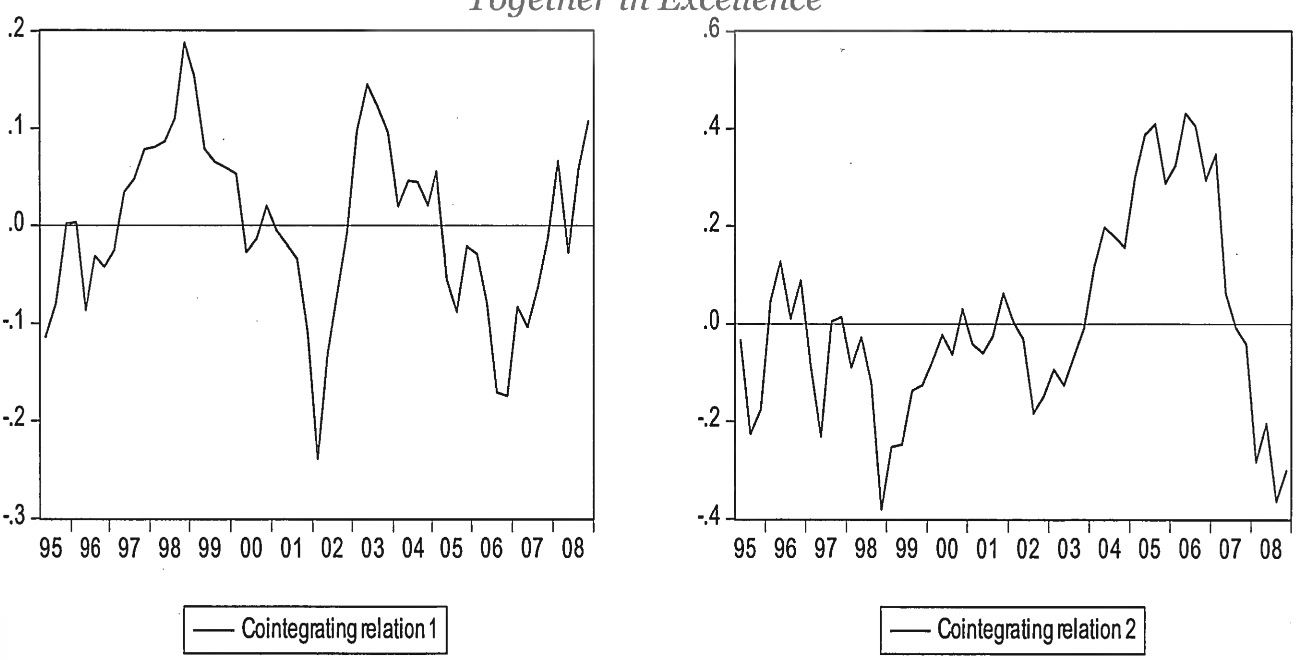
* denotes rejection of the hypothesis at the 0.05 level

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

Source: Authors own computation using E-views 7

The top part of the table (5.3) represents the Trace test whilst the bottom part represents the Maximum Eigenvalue test. The Trace test shows that the null hypothesis of no cointegrating vector is rejected since the tests statistics of 168.4060 is greater than the 5 percent critical value of approximately 95.75366. The null hypothesis that there is at most 1 cointegrating vector is also since its test of 88.89615 statistics is larger than the critical 5 percent value of approximately 69.81889. However at null hypothesis that there is at most 2 cointegrating vectors cannot be rejected as the test statistics of 46.91766 is smaller than the 5 percent critical value of approximately 47.85613. The Maximum Eigenvalue test results are similar to that of the Trace tests as it rejects the null hypothesis of no cointegration at most 1 but fails to reject the null hypothesis that there is at most two cointegrating vector. The Trace and Maximum Eigenvalue tests both suggest there are two cointegrating relationship within the empirical model. The two cointegrating relationships within the model are graphically shown below. The graphs in figure 5.3 below show that the cointegrated residuals exhibit stationarity over the long run. What remains therefore is the need to identify which vectors constitute the true or most significant cointegrating relationship.

Figure 5.3: Johansen cointegrating relationships



Source: Authors own computation using E-views 7

Having identified the optimal lag length and a long run relationship between the variables, an error correction model which shows both long and short run parameters is discussed in the next section.

5.4 Error correction and the long run relationship

The error correction model estimates the speed at which a dependent variable Y returns to equilibrium after a change in independent variable X. If variables have a long run relationship (cointegrated) there may still be a short-run deviation in their behaviour, thus there is disequilibrium in the system. The Vector Error Correction Model (VECM) is therefore used to correct the disequilibrium or tie down the short run relationship to its long run behaviour. If the gap between the long run and short run rates is large relative to the long run relationship, the error correction model must be applied.

The number of cointegrating relationships obtained in the previous step, the number of lags and the deterministic trend assumption used in the cointegration test are all used to specify a VECM. This VECM allows for the differentiation between the long and short run parameters for the empirical model. However, before the interpretation of the results from the VECM, the true two cointegrating relationships that have been suggested in the last section have to be identified. This section therefore looks at the variables constituting the cointegrating equations. Table 5.4 below shows the estimates of the VECM.

Table 5.4: The long run relationship

Sample (adjusted): 1995Q2 2008Q4
Included observations: 55 after adjustments
Standard errors in ( ) & t-statistics in [ ]

CointegratingEq:	CointEq1	CointEq2
GDP(-1)	1.000000	0.000000
FDI(-1)	0.000000	1.000000
EMPL(-1)	-2.196026	-1.497860
	(0.36940)	(0.37176)
	[-5.94481]	[-4.02909]
EXP01(-1)	0.082370	-0.658477
	(0.09355)	(0.09415)
	[0.88049]	[-6.99409]
EXCHR(-1)	1.261725	0.342999
	(0.25760)	(0.25925)

	[4.89792]	[1.32304]
INTR(-1)	1.294343	-1.977515
	(0.30016)	(0.30208)
	[4.31216]	[-6.54636]
C	0.930621	7.537265

Error Correction:	D(GDP)	D(FDI)	D(EMPL)	D(EXP01)	D(EXCHR)	D(INTR)
CointEq1	-0.093987	0.053153	0.002760	-0.171045	0.104438	-0.281570
	(0.03475)	(0.40030)	(0.02011)	(0.44559)	(0.13898)	(0.07065)
	[-2.70498]	[0.13278]	[0.13724]	[-0.38386]	[0.75146]	[-3.98517]
CointEq2	-0.105492	-0.235609	0.007396	-0.262049	-0.074902	0.260183
	(0.02874)	(0.33115)	(0.01664)	(0.36861)	(0.11497)	(0.05845)
	[-3.67012]	[-0.71149]	[0.44459]	[-0.71090]	[-0.65148]	[4.45148]

Source: Authors own computation using E-v[illegible]

The VECM results clearly show evidence of presence of error correction. A comparison of the coefficients of the error correction terms shows that interest rate (INTR in cointEqua1) has the most significant coefficient and is the most significant with a t-value of -3.985 and has the correct and negative sign. GDP also has a negative coefficient and a t-value of -2.704 and thus also possess error correction. The other variables either have a positive sign or are insignificant. However variables with the negative sign still constitute the long run relationship despite being insignificant.

In the second cointegrating equation GDP has the most significant coefficient, t-value and has the correct negative sign. Some variables do contain the error term but are insignificant. This suggests that interest rate and GDP constitute the true cointegrating relationship in the first and second cointegrating vectors. The long run relationship in the model is therefore explained by INTR and GDP. The error correction term measures the speed of the adjustment in returning the disequilibrium in the model to its equilibrium. The error correction term therefore suggest that any disequilibrium in the growth model will be corrected every quarter. Having identified the variables constituting the long run relationship, short run parameter estimates are presented in Table 5.5 below.

Table 5.5: Modelling GDP with ECM 1994q1 to 2008q4

Independent Variables	Coefficient	T-statistic
Constant	0.028587	4.74272*
FDI(-1)	0.058384	2.64346*
Employment(-3)	0.949962	2.08168*
Exports(-4)	0.270284	1.67158**
Exchange Rate (-1)	-0.13590[illegible]	-2.06891*
Interest Rate(-4)	-0.216837	-2.99688*
$ECT_t(-1)$	-0.513282	-3.19334*
Diagnostics $R^2 = 0.864433$ SE = 0.008800 F- Statistic = 6.8669448 AR (LM) = 11.24335 [0.7942] White Test = 223.8386 [0.9491] Normality = = 8.4335 [0.5923]		

Source: Authors own computation using E-views 7

In Table 5.5 *represents significance at 1 percent level, **significance at 10 percent level

In specifying an empirical model for the motor industry in South Africa, several variables are of key interest to the study. These include motor industry foreign direct investment (FDI), labour (EMPL) and exports (EXPTS). From the VECM regression estimates all were expected to have a positive impact on GDP in the manufacturing sector. Foreign Direct Investment (FDI) is an important driver of growth in the motor industry. Large amounts of foreign capital are injected into the motor industry, mostly for capital expenditure and operations. It is therefore expected that this variable of interest will contribute positively to economic growth. The reported sign of the coefficient is consistent with the expected sign. The coefficient value for FDI lagged once is 0.05 which is also significant as the t-statistics for this coefficient is 2.64346. A percentage increase in FDI lagged once will result in a 5 percent increase in GDP in the manufacturing sector. This result corroborates theoretical predictions that FDI (capital expenditure) contributes positively to FDI. These findings conform to empirical literature by Haiss et al (2009), Buckley et (2007) and Wang (2010) that found that motor industry FDI contributed positively to economic growth.

As expected, motor industry employment has a positive sign and a very high coefficient value of 0.94.This coefficient value is highly significant as the t-statistics for this coefficient is 2.083168 at 1 percent significance interval. In this model a percentage increase in motor industry employment lagged three times leads to a 0.94 increase in GDP in the manufacturing sector. The coefficient suggests that motor industry employment in the biggest contributor to growth in the manufacturing sector. These findings are also in line with the theoretical predictions that employment (labour) contributes positively to GDP. The relevant empirical literature is by Loretzen (2007) which found that human capital positively to economic growth .

Exports are also important for the growth of the motor industry. The sign of the coefficient is also consistent with the expected sign. The coefficient for motor industry exports lagged four times is 0.27 which is significant at 10 percent level as the t-statistics for this coefficient is 1.67158. A percentage increase in exports lagged four times leads to 27 percent increase in GDP in the manufacturing sector. Studies by Abedini and Peridi (2009) and Meyn (2004) all found that exports contribute positively to GDP. These results therefore conform to all relevant empirical literature.

Exchange rate (nominal) measures the domestic currency, in this case the Rand, of a country. An appreciation in exchange rate indicates an appreciation of the Rand thereby resulting in a decrease in exports and ultimately GDP and the opposite is expected to occur if the Rand depreciates. Thus, a negative sign is therefore expected for the coefficient of the nominal exchange rate. The coefficient of exchange lagged once is -0.13 and is significant at 1 percent with a t-value of -2.06891. A percentage increase in the nominal effective exchange rate (NEER) lagged once leads to a 13 percent decline to GDP in the manufacturing sector during the period under review. The sign and coefficient of the exchange rate are consistent with relevant empirical literature. Allayanis (1997) and Turkey and Aces (2008) also found that an appreciation of the currency affects economic growth negatively.

Interest rate refers is the cost of borrowing or lending. The South African Reserve Bank charges a repo rate to commercial banks on their borrowing. These banks then charge a prime rate on consumers which is generally higher than the repo rate. Interest rates are expected to have a negative relationship with economic growth. The coefficient of interest rate lagged four times is -0.21 and is significant at 1 percent level with a t-value of -2.9968. This means that a 1 percent increase in prime interest rate lagged four times results in a 21 percent decrease in GDP in the manufacturing sector. These results conforms to empirical studies by Doyle (1997) which found that higher interest rates contribute negatively GDP.

The error correction term has a negative sign which is the correct or appropriate sign. The expected sign is negative as the error correction term helps in returning the disequilibrium in the model to its equilibrium level. The value of the coefficient is -0.51 and is highly significant as the t-statistics for this coefficient is -3.19334 at 1 percent confidence interval. The coefficient suggests that the error correction term helps in returning GDP to its equilibrium at a reasonable speed. The estimated coefficients explained were subjected to diagnostics test which are discussed in the next section.

5.5 Diagnostics Tests

Diagnostic checks are crucial in this analysis because if there is a problem in the residuals from the estimation of the model, it is an indication that the model is not efficient, such that parameter estimates from such a model may be biased. Results for the diagnostics tests are presented in Table 5.5 above.

The estimated model exhibits robust results. The expected signs and values of the coefficients do conform to economic theory. The R^2 measures the goodness of fit test or the degree of confidence we can attribute our coefficients. All the coefficients in the model are reliable estimates as indicated by the high R^2. The model has an R^2 of 0.86 which explains the percentage variation in the dependant variable as a result of the independent variable

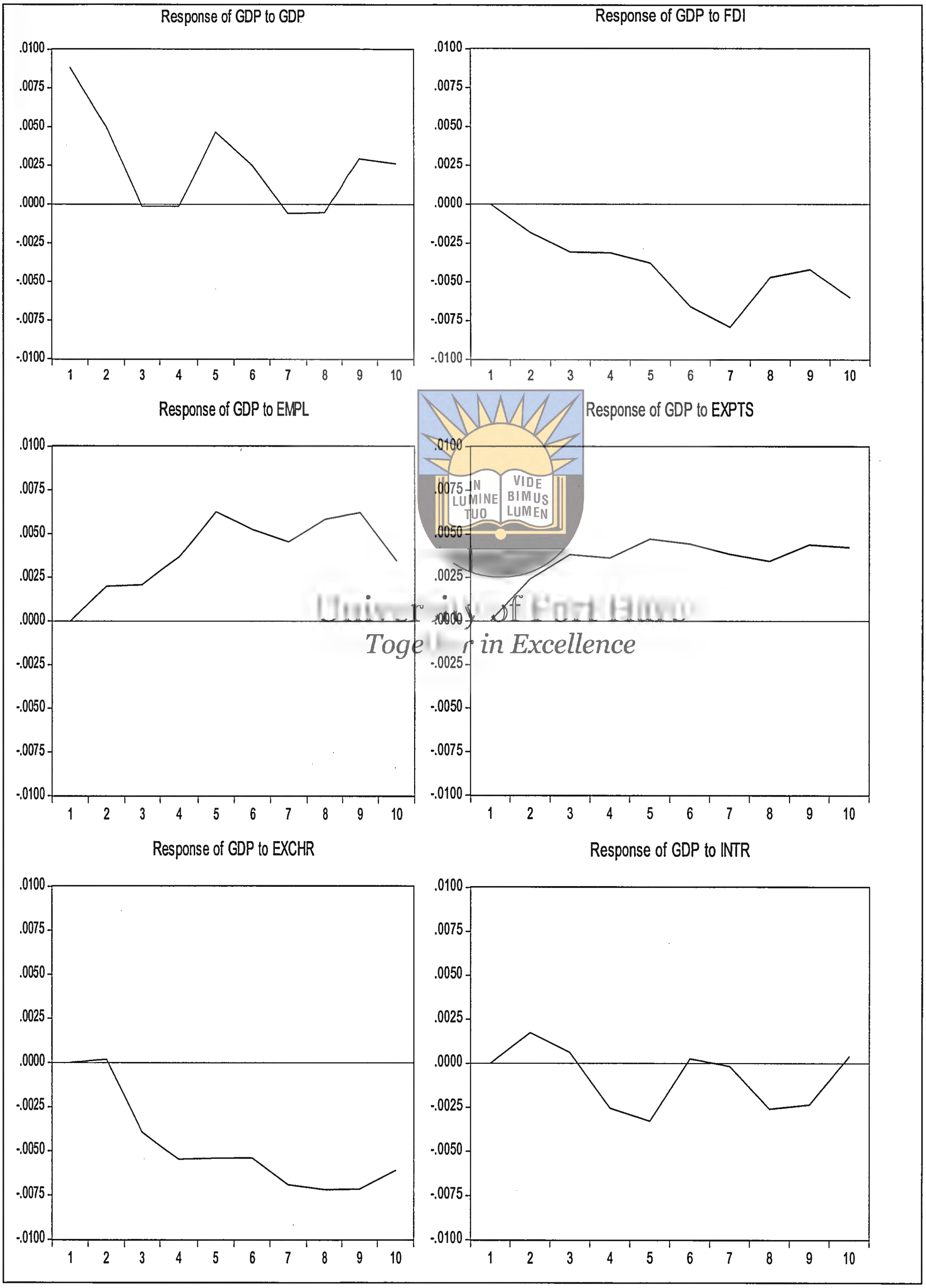
The model is a robust one due to a number of factors, namely the F-statistic and the low standard error. The model passes the F-test with a value of 6.8669448 which means all the independent variables are jointly significant in explaining changes in the dependent variable, GDP. A model with a low standard error is also highly credible and the standard error of this model is 0.008800. The lower the standard error the more credible the estimates

The empirical model was subjected to rigorous diagnostics tests. The growth model was tested for normality, serial (auto) correlation, heteroskedasticity. Diagnostic tests carried out on the data reveal that the model is reasonably well specified. All of the diagnostic tests support the statistical appropriateness of the equation. The LM test which tests for serial correlation has a t-statistic of 11.24335 and a p-value of 0.7942 indicating that the null hypothesis of no serial correlation is accepted as the t-statistic is not significant. The White test which tests for heteroskedasticity has a p-value of 0.9491 with a t-statistic of 223.8386 which is not significant. The null hypothesis of no heteroskedasticity in the residuals is therefore accepted. The residuals are normally distributed as the t-statistic of 8.4335 has a p-value of 0.5923, indicating that the null hypothesis of normality is accepted as the t-statistic is not significant. The next section involves tests for impulse response and variance decomposition.

5.6 Impulse response and Variance decomposition

Sometimes VECM estimations do not show the wealth of information of the dynamic effects on the short run parameter estimates. This can be overcome by the impulse response and variance decomposition tests. Impulse response analysis traces out the responsiveness of the dependent variable in the VAR to shocks to each of the other variables in the system. Variance decomposition analysis on the hand provides a means of determining the relative importance of shocks in explaining variations in the variable of interest. Table 5.6 below presents the impulse response results.

Table 5.6 Impulse response of the variables in the growth model

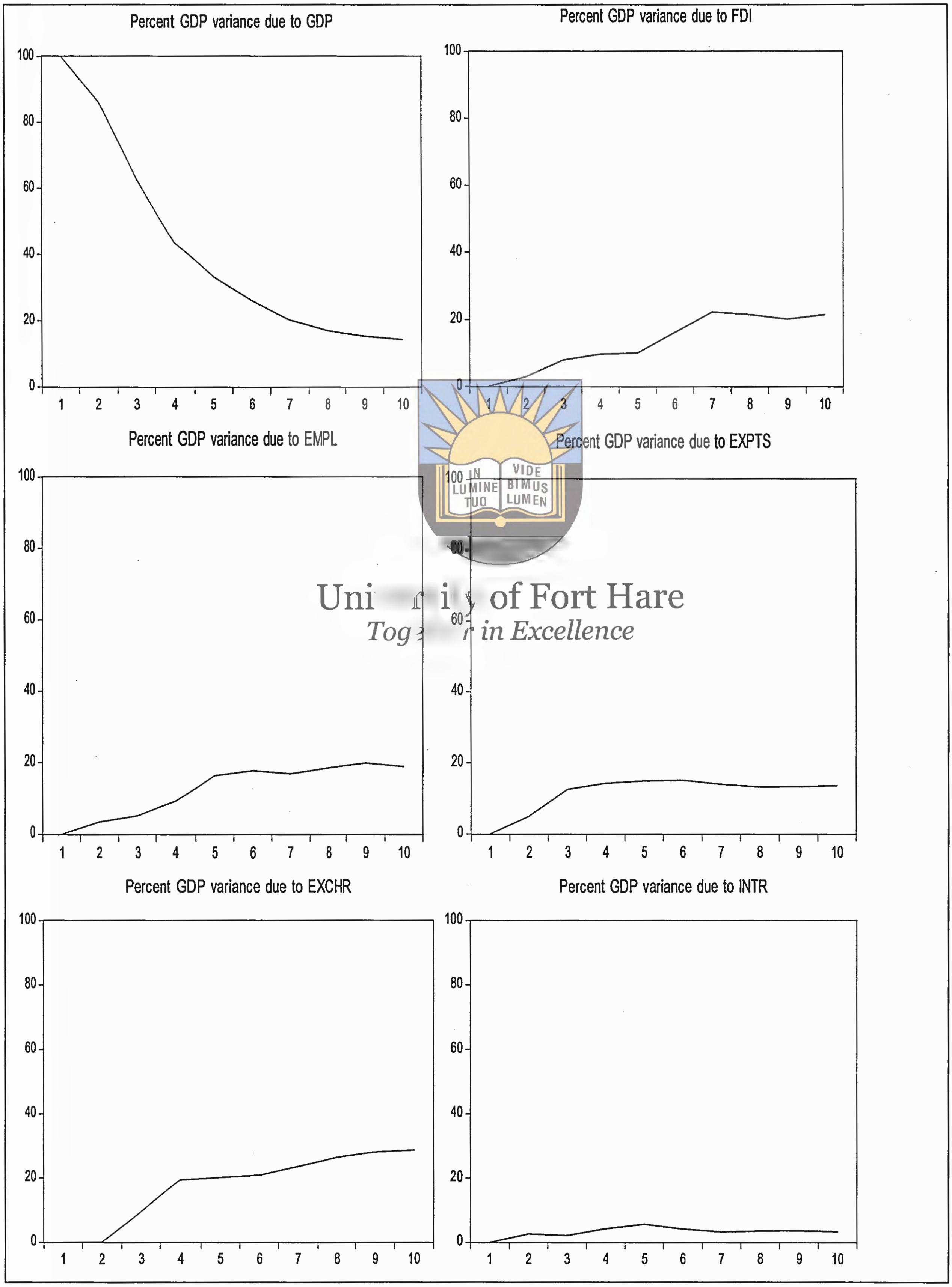


Source: Authors own computation using E-views 7

These impulse response functions show the dynamic response of the GDP to a one-period standard deviation shock to the innovations of the system and also indicate the directions and persistence of the response to each of the shocks over a 10 quarter (2.5years) period. For the most part, the impulse response functions have the expected pattern and confirm the results from the short run relationship. The first graph shows the response of the independent variable to deviations by itself. This simply means that the effect or responsiveness of GDP to changes in GDP. GDP had remained stable despite fluctuations over the 10 quarter (2.5 years) short run period. The impact of shocks to the dependant variable is not different from the reported short run effects. A one time period standard deviation shock to FDI marginally depreciates GDP up to the seventh quarter but then starts to appreciate thereafter but eventually dies off. The effect of FDI to GDP is minimal over the short run which explains the low coefficient. A one time standard deviation shock to employment marginally appreciates up until the fifth quarter, decreases in the seventh but then appreciates in 8 quarter, suggesting that the impact of FDI on GDP occurs over a longer period of time. The overall impact of employment to GDP is positive which is similar to VECM short run estimates. A one time standard deviation shock to exports appreciates GDP by more than 4 percent, and continues to appreciate until the last quarter (10). A one standard deviation shock to the nominal effective exchange rate marginally decreases GDP and this transmission continues up until the last quarter. Interest rate is shown to have a stable impact on GDP, implying that a one period standard deviation shock will be managed, possibly by monetary authorities. Among all the analyzed variables only employment, export and exchange rate are shown to have a persistent and significant impact on GDP over the 10 quarter period, the rest are shown to have only a minimal impact.

Table 5.7 below provides an analysis on the movement of GDP following shocks to itself or its determinants. In the context of this study, variance decomposition therefore provides a way of determining the relative importance of shocks to each of the variables that help in explaining variations in GDP. The lag information criteria selected 4 lags but the study allows for 10 lags in order to determine the impact of shocks over time. For the 4 quarter ahead forecast error variance, the dependent variable (GDP) itself explains about 40 percent of its variations whilst the rest of the variables explain the remaining 60 percent. Of the remaining 60 percent explained by other variables, 10 percent is explained by FDI, 10 percent by employment, 15 percent by exports, 20 percent by the exchange rate and the remaining 5 percent by interest rate.

Table 5.7 Variance decomposition of the variables in the growth model



Source: Authors own computation using E-views 7

However after the 8th quarter the dependant variable only explains roughly around 17 percent of its variation whilst the independent variables explain about 83 percent. This suggest that the only a small proportion of variation in the dependant variable is explained by itself over time and its variations is attributed to its independent variables.

5.7 Concluding remarks

The chapter sought to provide empirical results on the contribution of the motor industry to South Africa`s economic growth. This chapter analyzed the relationship between GDP and the motor industry and the dynamic adjustment of GDP following shocks to the industry variables. The chapter started by analyzing the time series properties of the data employing both informal and formal tests for stationarity. The variables were found to be integrated of the same order (1). Johansen cointegration tests provided evidence that there is cointegration between the GDP and the motor industry variables. Evidence of cointegration allowed the estimation of VECMs, which simultaneously provided the parameter estimates for both the long and short run relationships. The variables that have a significant long run relationship with GDP are interest rate (INTR).

The speed of adjustment coefficient measures the speed of adjustment in GDP following a shock in the system. This study indicates that about 51 % of the variation in GDP from its equilibrium level is corrected every quarter. The short run dynamics are consistent with literature showing the Foreign Direct Investment, Exports, Employment have a positive impact on GDP while Exchange rate and Interest rate both have a negative impact. The impulse response showed that employment; export and exchange rate have persistent on GDP whilst variance decomposition showed that about 60 percentage of variation in GDP was as a result of the independent variables. The study therefore corroborates with the theoretical and empirical framework by showing that Foreign Direct Investment, Exports, Employment contribute positively to GDP. The summary of the main findings, conclusion and recommendations are presented in next chapter.

CHAPTER SIX

SUMMARY OF THE MAIN FINDINGS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter draws conclusions and policy recommendations from the empirical findings presented in the Chapter 5. The objective of the study was to determine the role of the motor industry in the economic growth of South Africa and the impact of foreign direct investment and employment on GDP. The study also sought to determine the role of exports, exchange rate and interest rates in contributing to growth in the motor industry.

In order to establish the contribution of the motor industry to economic growth in the country, a growth model was estimated. In chapter 2, an analysis of theoretical literature was presented and the endogenous growth theory was chosen as the relevant theoretical framework. The endogenous growth theory shows that human and physical capital as well as technology are primary sources of economic growth. An endogenous production function based approach was adopted as the relevant empirical framework. A review of the empirical literature showed that foreign direct investment, employment and exports contribute positively to economic growth whilst interest rates and exchange rates had a negative effect on economic growth.

An extensive review of the contribution of the motor industry to the South African economy was presented in chapter 3. The review outlined how the motor industry developed over the years to become a reliable contributor to the economic growth of South Africa as a result of policy programmes by government. The growth in the contribution of the motor industry over the last 20 years is attributed to the introduction of the Motor Industry Development Programme (MIDP). Under the MIDP, foreign direct investment and exports have increased whilst employment remained stable. The exchange rate has remained stable and the interest rate have decreased over the same period.

In chapter 4 the study outlined the research methodology to used in the study. A production function based approach adopted from Haiss et al (2009) and Buckley (2007) was employed. The empirical model was specified with GDP in the manufacturing sector as a dependent variable and FDI, employment, exports, exchange rate and interest rate as dependent variables. The study used time series data spanning the first quarter of 1994 to the fourth quarter of 2008. The data used to estimate the empirical model was sourced from NAAMSA, DTI, STATSSA and SARB respectively. The variables were checked for unit root using Dickey- Fuller and Augmented Dickey-Fuller tests. In order to determine both the long and short run relationship between GDP and the independent variables, the Johansen cointegration and error correction methodology was preferred because of its several advantages over other alternative techniques. To determine the validity and reliability of the empirical model, diagnostic tests for normality, serial correlation and heteroskedasticity were applied. Impulse response and variance decomposition tests were employed to determine the reaction of the dependent variable to shocks from each of the other variables.

Chapter 5 of the study presented the empirical findings. After subjecting the variables to stationarity tests, all variables showed evidence of unit root in levels. However, the variables were found to be stationary after first differencing. Johansen cointegration tests provided evidence that there are two cointegrating vectors. Evidence of cointegration allowed the estimation of VECMs, which simultaneously provided the parameter estimates for both the long run and short run relationships. GDP and interest rate were found to constitute the long run relationship in the growth model. After identifying the long run relationship, short run parameter estimates were reported.

The results of the empirical model suggest that foreign direct investment (FDI) contributes positively to economic growth and therefore are important to motor industry`s growth prospects. The results show that a percentage increase in foreign direct investment lagged once leads to a 5 percent increase in GDP in the manufacturing sector. This finding is supported by empirical literature from Haiss et al (2009) and Buckley (2007). Employment was also found to have a positive relationship with GDP. A percentage increase in employment lagged three times leads to a 94 percent increase in manufacturing GDP, empirical literature by Loretzen (2007) supports this finding. Exports were also found to have a positive relationship with economic growth. The study found that a percentage increase in exports lagged four times results in a 27 percent increase manufacturing GDP. The findings are supported with empirical literature by Abedini and Perini (2009) and Meyn (2004) which found that exports contribute positively to GDP. The nominal effective exchange rate (NEER) was found to have a negative impact on GDP. A percentage increase in the NEER lagged once leads to a 13 percent decrease in GDP in the manufacturing sector. Empirical literature by Allayanis (1997) and Turkey and Aces (2008) support this finding. Interest rates (prime) were also found to have a negative impact on GDP. A percentage increase in interest rate lagged four times leads to a 21 percent decrease in manufacturing GDP. This finding is also supported with empirical literature by Doyle (1997).

Diagnostics checks showed that the residuals of the variables are normally distributed, have no serial correlation and are not heteroskedatic. The empirical model also has a high R-squared and a low standard error indicating goodness of fit test or the degree of confidence we can attribute our coefficients. The impulse response analysis showed that employment, exports and the NEER have a persistent impact on GDP whilst variance decomposition showed that the variation in GDP was largely as a result of its independent variables. Another parameter of interest in VECM`s is the speed of adjustment coefficient which measures the speed of adjustment of GDP following a shock in the system. The estimated coefficient of the error correction term is 0.51. This indicates that about 51 per cent of the variation in GDP from its equilibrium level is corrected within a quarter. The coefficient suggests that the error correction term helps in returning GDP to its equilibrium at a reasonable speed.

6.2 Policy Implications of the study

The findings of this study suggest that foreign direct investment, employment and exports are the major drivers of growth in the motor industry. The South African motor industry and the economy as a whole depend largely on foreign direct investment, employment and exports to achieve growth. In order for the motor industry to continue to be sustainable and for the county to achieve long-term growth, foreign direct investment has to be attracted.

In attracting foreign direct investment into the motor industry, the South African government has to create conditions that are conducive for foreign investors. Since 1995 FDI into the South African motor industry has quadrupled and is now amongst the highest in the world (NAAMSA, 2006). This is largely driven by trade liberalization policies (opening up of economy) such as tariff reduction and policy programmes like the MIDP. South Africa`s trade liberalization policies should be strengthened as it has reaped enormous benefits for the motor industry. The trade liberalization policy should work in conformity with the MIDP programme in reducing tariffs. Since 1995 tariffs have gradually decreased from 65 percent on Completely Built (CBU) units and 49 percent on Completely-Knocked Down (CKD) units to around 26 and 21 percent by 2011. This has led to an increase in foreign direct investment as vehicle assemblers are effectively paying less to import components. In order to keep the motor industry competitive tariffs need to be reduced in accordance with World Trade Organization levels in order to be competitive globally. The EU, NAFTA and other economic trade blocks offer lower levels of tariff for the automotive sector making them more competitive. The MIDP runs until 2012 and it is not clear what policy programme the government will implement beyond 2012.

The level of FDI into South Africa motor industry is also influenced by the education and skills levels of the labour force. The South African government need to equip prospective employee's with the necessary skills and formal education as this has an impact on the job creation. The automotive industry is a technologically advanced industry and therefore foreign investors need suitably qualified and skilled personnel to operate machines and equipment.

The Industrial Policy Action Plan (IPAP) seeks to attract foreign direct investment levels exceeding R20 billion in next four years. In order for the motor industry to attract future foreign direct investment there must be more incentives provided such as subsidy packages and tax exemptions for foreign firms. This could have a significant impact on the growth of motor industry and employment creation as the IPAP policy seeks to create more 160 000 jobs in the next ten years.

Motor industry employment has not increased over the last 17 years but rather stabilized. Employment initially increased after the introduction of the MIDP but have declined to levels that were there before the introduction of the MIDP. This is due to the highly capital intensive (automation) nature of the motor assembly industry. However domestic OEM`s and parent companies should be encouraged to conduct research & development (R&D) locally in order to improve local skills, expertise and employment opportunities. This could be done by providing the necessary technological machinery and equipment and if these are not readily available then parent companies should be incentivized to come and invest in South Africa . A number first tier and second tier components manufacturers are also foreign owned companies. These companies should also be actively encouraged to set up and conduct R&D in the country in order to create more employment opportunities and qualify for rebates through the Import Rebate Credit Certificates (IRCC).

Exports also have a positive impact on motor industry growth and therefore an export oriented programme is desirable. South Africa produces high quality vehicles at competitive prices as a result of economies of scale which are exported around the world. The New Growth path policy document encourages export led growth in the South African economy and therefore motor industry export programmes are essential for this growth. A number of

OEM`s have won contracts to export a range of models to the world over thus government has to encourage and incentivise other domestic OEM`s who produce only for the domestic market to engage in export promotion programmes. The Productive Asset Allowance (PAA) which incentivises firms which invest in new property, plant and equipment should be reviewed as it has the potential to grow export volumes. It should however not only be concentrated on new assets only and it should also include the components sector which has largely been neglected.

The foreign exchange rate movements have an impact on the domestic motor industry. A stronger or appreciating Rand makes imports less expensive and exports more expensive. When imports are cheaper it has negative consequences for local value added and when exports are more expensive it results in less competitiveness as less foreign income will be earned. The New Growth Path advocates for a competitive exchange rate in order to drive growth in the manufacturing sector. Therefore a more stable currency is required to achieve domestic and international competitiveness. The automotive industry stakeholders should actively engage the monetary authorities to [illegible] the Rand against over-valuation as this results in less production and competitiveness for the export market.

Interest rates (prime) movements also have a significant impact on the motor industry. Interest rates affect consumer demand and spending on motor vehicles. A higher interest rates limits consumer spending on domestic motor vehicles due to high interest consumers have on their mortgage payments, thus slowing domestic sales. A higher real interest rate attracts FDI and thus the impact of higher inflation is also important. Monetary authorities should therefore try to keep lending rates at reasonable level such that consumer demand for vehicles does not decline and at the same time be able to maintain the prevailing rate of inflation which could also affect car prices.

6.3 Limitations of the study

Using quarterly times series data for the motor industry posed serious challenges as some variables are provided on an annual basis. This led to omission of some variables and using of proxies to capture the effect of certain variables. The risk involved in finding proxies is that they may not correctly represent the actual variables, resulting in inconsistent results. However, these problems seem not to have significantly affected the findings presented in this study as they support the theoretical and empirical predictions.

6.4 Areas for further research

The study investigated the contribution of the motor (assembly) industry to the South African economy. However, the components sector of the automotive industry was not included in the study and therefore there is need to examine its contribution to the South African economy.

REFERENCES

Abedini, J. (2008). "*The Emergence of Iran in the World Car Industry: An Estimation of its Export Potential*". Available online at http://gsme.sharif.edu/~econsem/abstract2.pdf. (Accessed 17 February 2011).

Allayanis, G. (1997). "*The Time-Variation of the Exchange-Rate Exposure: An Industry Analysis*". Available online at http://faculty.darden.virginia.edu/allayannisy/expotv.pdf. (Accessed 20 March 2011).

Automotive Sector Technology Development Trends. (2004). "*Automotive Sector*" Available on line at http://www.capegateway.org.za/text/2004/11/technology-developmentstrends.pdf (Accessed 21 June 2010).

Bassanini, A., & Scarpetta, S. (2002). "*Growth, technological change and ICT diffusion: Evidence form OECD countries*". Oxford Review of Economic Policy, 18 (3): 324-344.

Barnes, J., & Morris, M. (2008). "*Staying alive in the global automotive industry: What can developing economies learn from South Africa about linking into global automotive value chains*". European Journal of Developmental Research, 20 (1): 31–55.

Black, A. (2001). "*Globalisation and restructuring in the South African Automotive Industry*". Journal of International Development, 13 (6): 779-796.

Black, A., & Bhanishi, S. (2006). "*Globalisation, imports and local content in the South African Automotive Industry*". Paper presented at a TIPS conference in 2006. Available online at http://www.eref.uqu.edu.sa/files/globalisation_imports_and_localcontent.pdf (Accessed 20 May 2010)

Black, A. (2007). "*Policy and industry structure in the South African automotive sector: From import substitution to extreme export orientation*", Journal of Development Perspectives.3 (1).

Board of Trade and Industry. (1988). "*Investigation into the Industry Manufacturing Passenger Cars and Light Commercial Vehicles, Report No. 2627*". Pretoria, Government Printer.

Brooks, C. (2002). "*Introductory Econometrics for Finance*". Cambridge University Press: Cambridge.

Buckley, J.P., Clegg, J., Zheng, P., Siler, P.A., & Giorgioni, G. (2007). "*The Impact of Foreign Direct Investment on the Productivity of China's Automotive Industry*". Management International Reviews, 47 (5): 707-724.

Centre for Automotive Research. (2010). "*The contribution of the automotive industry to all economies and all the fifty states and the United States of America*". Available online at http://www.cargroup.org/pdf/association_paper.pdf. (Accessed 20 February 2011).

Department of Trade and Industry Economic Database. (2009). "*Gross Domestic Product*". Available online at: http://www.dti.gov.za/econdb/gdp/default.asp (Accessed on 22 June 2010).

Department of Trade and Industry. (2004). "*Current Developments in the Automotive Industry*". Available online at http://www.dti.gov.za/publications/automotiveindustry.pdf (Accessed 22 June 2010).

Damoense, M.Y., & Jordaan, A.C. (2007). "*Intra-industry trade: a methodology to test the automobile industry in South Africa*". South African Journal of Economic and Management Sciences, 10 (1): 130-144.

Decena, M.J.P.S. (1999). "*A System Dynamics Study on the Liberalization Plans of the Philippine Automotive Industry*". Available online at http://www.systemdynamics.org/pdf. (Accesses 20 September 2010).

Dix, K. A. (1995). "*The Motor Car Assembly/Manufacturing Industry in South Africa: Phases I to V*". South African Journal of Economic History, 10 (1): 21-38.

Dixon, P.B., & Rimmer, M.T. (2004). "*Measuring contributions to the Australian economy: Benefits of a fast growing motor vehicle and parts industry*" Available online at http://www3.interscience.wiley.com/journal/123284469/ (Accessed on 20 May 2010).

Doningo, C., & Tonella, G. (2000). "*Towards a theory of structural change*". Available online at http://www.ideas.repec.org/a/eee/streco/v11y2000i1-2p209-225.html. (Accessed 23 May 2010).

Duncan, D. (1992). "*Foreign and local investment in the South African motor industry 1924-92". South African Journal of Economic History*, 7 (2): 53-81.

Dunning, J.H. (1973). "*The Determinants of International Production". Oxford Economic Papers*, 25(3): 289-336.

Engle, R.F., & Granger, C.W.J. (1987). "*Co-integration and error correction:Representation, estimation and testing"*. Econometrica, 55: 251-76.

Fidderke, J. W., & Simkins, C. (2006). "*Economic Growth in South Africa since the late nineteenth Century*". Available online at www.commerce.uct.ac.za/economics/staff/jfedderke/.../ross.pdf. *(Accessed 1 March 2011).*

Fidderke, J. W., & Romm, A.T. (2004). "*Growth impact and determinants of Foreign Direct Investment into South Africa*". Available online at http://www.commerce.uct.ac.za/documents/2006/fdi-10.pdf. (Accessed 12 September 2010).

Flatters, F. (2006). "*Is the MIDP a model of selective industrial policies*" Available online at http://www.tips.org.za/node/1070 (Accessed on 22 June 2010).

Foss, N.J. (1998). '*The New Growth Theory: Some Intellectual Growth Accounting*". Journal of Economic Methodology, 5 (2): 223-246.

Franse, A. (2006). "*The response of an Original Equipment Manufacturer to the Motor Industry Development Programme*". A case study. Rhodes University. Available online at http://www.eprints.ru.ac.za/303/1/Franse_MBA_2006.pdf. (Accessed 24 May 2010.).

Gujarati, D. N. (2003). "*Basic Econometrics*".([illegible] edition). McGraw-Hill Inc: New York.

Haiss, P., Mahlberg, B., & Molling, M. (2009). "*The Automotive Industry in Central and Eastern Europe – Engine of Grow or Free Rider*?" Business and Economics Conference (OBEC), Oxford University, U.K. Available online at http://www.gcbe.us/Peter%20Haiss,%20Bernhard%20Mahlberg,%20Mike%20Molling.doc (Accessed 31 March 2011).

Harris, R. (1995). "*Using Cointegration Analysis in Econometric Modelling*". Prentice Hall: London.

Hartzenburg, T., & Muradzikwa, S. (2002). "*Transfer of technology for successful integration into the global economy: A case study for the South African Automotive Industry*" Available online at http://www.unctad.org/en/docs//iteipc20036_en.pdf (Accessed 24 May 2010).

Holweg, M., Davies, P., & Podpolny, D. (2009). "*The Competitive Status of the UK Automotive Industry*". Available online at http://www-innovation.jbs.cam.ac.uk/publication/downloads/holweg.pdf (Accessed on 29 August 2010).

Ito, K. (2002). "*Are Foreign Multinationals More Efficient? Plant Productivity in the Thai-Automobile Industry*". Working Paper Series 2002-19. Available online at http://www.iscead.or.jp/7publication/workingpp/wp2002/2002-19.pdf. (Accessed 27 November 2011) .

Jakubiak M., Kolesar P., Izvorski I., & Kurekova L. (2008). "*The Automotive Industry of the Slovak Republic: Recent Developments and Impact on Growth*". Commission on Growth and Development, Working Paper No.29. Available online at http://www.growthcommission.org/storage/cgdev/.../gcwp029web.pdf (Accessed 29 September 2011).

Ickes, B.W. (1996). "*Endogenous Growth Models*". Available online at http://www.econ.la.psu.edu/~bickes/endogrow.pdf (Accesses 12 September 2010).

Johansen, S. (1991). "*Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models*". Econometrica, 59:1551–1580.

Johansen, S. (1995). "*Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*". Oxford University Press: Oxford.

Johansen, S., & Juselius, K. (1990). "*The Full Information Maximum Likelihood Procedure for inference on Cointegration – with applications to the demand for money*". Oxford Bulletin of Economics and Statistics, 52: 169-210.

Julius, A.B., & Lumby, A.B. (1998). *"Phases I, II & III of the local content programme in the South African motor car manufacturing industry 1961-1976"*. South African Journal of Economic History, 13(1):17-35.

Kwagga, M. (2007). "*Sustaining automotive industry growth in South Africa: A review of the first five years of Motor Industry Development Programme*". South African Journal of Economic History, 22 (1): 51-73

Lamprecht, N. (2006). "*An analysis of the Motor Industry Development Programme (MIDP) as a promotional tool for the South African Automotive Industry in the Global Automotive Environment*". Available online at http://www.uir.unisa.ac.za/handle/10500/2378. (Accessed 20 Feb 2011).

Lewis, W.A. (1954). "*Economic Development with unlimited supply of labour*". The Manchester School, 22 (2): 131-91.

Lorentzen, M. (200). "*Dynamics of Industry [illegible]ovation: Organisations, Networks and Systems*". Industry and Innovation, 14 (1): 1-3

Lucas, R. (1988). "*On the Mechanics of Economic Development*". Journal of Monetary Economics, 22: 3-42.

Luintel, K. B., & Khan, M. (1999). "*A Quantitative Reassessment of the Finance–Growth Nexus: Evidence from a Multivariate VAR. Journal of Development Economics*". 60: 381–405.

Mackinnon, J. G. (1991). "*Critical Values for Cointegration Tests*. In: Engle, R. F. and Granger, C. W. J. (1987). Long-run Economic Relationships. Oxford University Press: Oxford.

Mackinnon, J. G. (1996). "*Numerical Distribution Functions for Unit Root and Cointegration Tests*". Journal of Applied Econometrics, 11: 601-618.

Meyn, M. (2004). "*The Export Performance of the South African Automotive Industry: A New stimuli by the EU-SA Free Trade Agreement*". Institute for World Economics and International Management Working Paper No. 89.

Morrisset, P. (2000). *Foreign Direct Investment to Africa: Policies also Matter. Transnational Corporation*, 9: 107–125.

National Association of Automobile Manufacturers (NAAMSA). (2006). "*NAAMSA Annual Report 2005/2006*". Available online at http://www.naamsa.co.za/papers/20060124. (Accessed 17 June 2011).

National Association of Automobile Manufacturers (NAAMSA). (2009). "*Quarterly Review of Business Conditions*". Available online at http://www.naamsa.co.za/papers/20091stQuarter. (Accessed on 20 June 2011).

National Association of Automobile Manufacturers (NAAMSA). (2010). "*Quarterly Review of Business Conditions*". Available online at http://www.naamsa.co.za/papers/20101stQuarter. (Accessed on 29 June 2011).

National Association of Automobile Manufacturers (NAAMSA). (2011). "*Quarterly Review of Business Conditions*". Available online at http://www.naamsa.co.za/papers/20111stQuarter (Accessed on 20 August 2011)

Nedomlelova, I. (2007). "*Theories of Economic Growth and Regional Disparities*". University of Liberec. Available online at http://www.alnus.kin.tul.cz/~vyzkum/wd/download/2008/f03.pdf. (Accessed 26 May 2010).

Nel, H., & Makuwaza, G.C. (2001). "*Clustering as a policy strategy for improving manufacturing performance and economic growth in South Africa: A case study of the motor industry in the Eastern Cape.* Available online http://www.essa.org.za/download/papers/04.pdf. (Accessed 30 May 2010).

Nunnenkamp, P. (2005). "*Relocation, Offshoring and Labour Market Repercussions: The Case of the German Automobile Industry in Central Europe*". Available online at http://www.econstor.eu/bitstream/10419/3910/1/Nu-LARGE_AutomobileIndustry.pdf (Accessed 5 July 2010).

Obsfeld, M. (1986). "*The Consequences of Stabilization and Liberalization* in *Economic Adjustment and Exchange Rates in Developing Countries.* University of Chicago Press: Chicago.

Pravin, J.P., & Singh, N. (2009). "*Outward FDI and Knowledge Flows: A Study of the Indian Automotive Sector*". International Journal of Institutions and Economies, 1 (1):156-187.

Ragamasamy, L. (2009). "*Exports and Economic Growth: A case for South Africa*". Journal of International Development, 21: 603-617.

Ravenhill, J. (2005). "*FDI in the Korean Auto Industry*". Les Études de l'Ifri 3. Available online at http://www.ifri.org/files/Economie/Etude_3_Ravenhill.pdf. (Accessed 20 September 2010).

Richet, X., & Ruet, J. (2008). "*The Chinese and Indian Automobile Industry in Perspective: Technology Appropriation, Catching-up and Development*". World Transition Economy Research, 15:447-465.

Romm, A.Y. (2003). "*The relationship between savings and growth in South Africa: an empirical study*". TIPS/DPRU Forum 2003. Available online at http://www.tips.org.za/files/688.pdf. (Accessed 26 July 2011).

Romer, P. (1986). "*Increasing Returns and Long-run Growth*". *Journal of Political Economy*, 94: 1002-37.

Romer, P. (1990). "*Endogenous Technological Change*". *Journal of Political Economy*, 98 (5): 71-102.

Santini, D.J., & Poyer D.A. (2004). "*Motor Vehicle Output and GDP*". Working Paper. Available online at http://www.transportation.anl.gov/pdfs/TA/657.pdf. (Accessed 09 July 2010).

Sanidas, E., & Jayanthakumaran, K (2006). "*Trade liberalization and lagged reactions of trade flows, productivity and internal demand: an application to the Australian PMV industry*". Journal of Asia Pacific Economy, 13 (1): 26-49.

South African Reserve Bank (SARBa). 2009. "*Historical Macroeconomic Time series Information*". Available online at http://www.resbank.co.za/ Research/Statistics/ Pages/OnlineDownloadFacility.aspx (Accessed 22 June 2011).

South African Reserve Bank (SARBb). 2009. "*Historical Macroeconomic Time series Information*". Available online at http://www.resbank.co.za/Research/Statistics/Pages/ OnlineDownloadFacility.aspx (Accessed 26 June 2011).

Sichei, M., Erero, J.L., & Gebreselassie, T. (2005). "*An Augmented Gravity Model of South Africa`s Exports of Transport Equipments and Machineries*". Trade and Uneven Development: Opportunities and Challenges Annual Forum. Available online at http://www.tips.org.za/files/770.pdf. (Accessed on 27 August 2010).

Solow, R. (1956). "*A contribution to the Theory of Economic Growth*". Quarterly Journal of Economics, 70 (1): 65-94.

Swan , T.W. (1956). "*Economic growth and capital accumulation". Economic Record* 32 (63): 334–361.

Thirwall, A.P. (2002). "*Growth and Development with special reference to Developing Countries*". 7th Edition. Palgrave Macmillan, London.

Thomas, R. L. (1997). "*Modern Econometrics: An Introduction*". Addison-Wesley: London.

Todaro, P. (1997). "*Economic Development*". 5th Edition. Longman, New York University.

Turkan, K. & Ates, A. (2008). "*An Examination of Exchange Rate Pass-Through to U.S. Motor Vehicle Products and Auto-Parts Import Prices*". Global Economy Journal, 9 (1): 3.

Ukpolo, V. (1998). "*Exports and Economic Growth in South Africa: Evidence from Cointegration and Granger Causality Tests*". The African Economic & Business Review, 1 (1).

Valodia, I. (1999). "*Trade Policy, productivity and learning: evidence in South Africa*". Development Southern Africa,16 (3): 531-546.

Wang, H. (2004). "*Policy Reforms and Foreign Direct Investment: The Case of the Chinese Automobile Industry*". Journal of Economics and Business, 5 (1): 287 –314.

Wang, Y. (2010). '*FDI and productivity growth: the role of inter-industry linkages*". Canadian Journal of Economics, 43 (4):1243-1272.

White, H. (1980). "*A Heteroskedasticity-Consistent Covariance Matrix and A Direct Test for Heteroskedasticity*". Econometrica, 48: 817-838.

Williamson, R. (2000). "*Exchange rate exposure and competition: evidence from the automotive industry*". Journal of Financial Economics 59: 441- 475.

APPENDIX 1

Data used in regression analysis

Year	GDP	FDI(Rm)	Employment	Exports	Interest rate	exchange rate
1994 q1	21 418	1 020	39 250	3 148	15.25	173.61
1994 q2	21 893	1 200	39 049	3 896	15.25	160.36
1994 q3	24 125	1 230	38 998	3 799	16.25	160.62
1994 q4	24 632	1 470	38 900	3 796	16.25	163.11
1995 q1	24 312	1 960	38 887	2 895	17.5	152.41
1995 q2	25 513	2 010	38 817	5 839	17.5	149.16
1995 q3	27 939	2 040	38 791	4 352	18.5	154.63
1995 q4	28 415	2 460	38 600	2 678	18.5	156.4
1996 q1	26 830	2 082	38 695	1 502	18.5	144.98
1996 q2	27 627	2 928	38 666	2 705	20.5	135.66
1996 q3	29 557	3 701	38 624	3 351	19.5	130.47
1996 q4	30 111	3 000	38 690	3 995	20.25	126.26
1997 q1	29 218	2 000	38 102	3 810	20.25	141.14
1997 q2	30 703	3 200	37 865	3 473	20.25	138.39
1997 q3	32 240	3 300	37 335	3 614	20.25	136.86
1997 q4	32 443	4 150	37 100	8 612	19.25	134.75
1998 q1	31 505	4 350	35 090	9 831	18.25	132.43
1998 q2	32 105	4 100	34 900	6 426	22.25	113.05
1998 q3	33 666	1 970	34 101	3 591	25.5	108.98
1998 q4	33 621	3 000	33 700	6 050	23	107.72
1999 q1	31 851	3 420	33 306	11 266	20	106.76
1999 q2	32 691	3 800	32 775	12 973	18	109.48
1999 q3	35 577	3 900	32 308	17 093	16.5	106.14
1999 q4	36 916	3 990	32 000	18 384	15.5	106.32
2000 q1	36 399	3 110	32 029	12 453	14.5	102.09
2000 q2	37 973	3 570	32 090	17 332	14.5	99.37
2000 q3	41 834	4 900	32 187	19 924	14.5	97.53
2000 q4	42 900	4 030	32 300	18 322	14.5	92.35
2001 q1	41 958	4 110	32 344	19 962	14.5	91.21
2001 q2	42 673	4 780	32 356	27 707	13.5	92.35
2001 q3	45 104	6 000	32 370	29 782	13	79.75
2001 q4	47 172	5 890	32 389	30 842	13	60.64
2002 q1	46 359	6 990	32 450	30 506	15	64.82
2002 q2	49 464	6 000	32 546	33 565	16	64.83

2002 q3	53 218	7 010	32 401	31 495	17	64
2002 q4	55 179	7 250	32 370	29 748	17	75.33
2003 q1	53 663	6 300	31681	29 402	17	80.97
2003 q2	54 103	6 240	31 687	31 817	15.5	84.51
2003 q3	57 143	5 700	31 502	35 060	13.5	87.24
2003 q4	59 008	5 000	31363	30 382	11.5	87.53
2004 q1	57 610	5 000	30 894	24 506	11.5	92.49
2004 q2	58 555	5 200	31 708	26 608	11.5	94.74
2004 q3	62 947	5 550	32 413	33 877	11	91.71
2004 q4	64 855	6 450	32 548	26 262	11	97.74
2005 q1	60 397	8 120	33 658	24 442	11	90.09
2005 q2	63 624	8 760	34 431	27 381	10.5	87.99
2005 q3	67 660	9 000	34 604	44 290	10.5	92.61
2005 q4	67 420	9 880	35 137	43 799	10.5	94.22
2006 q1	64 694	12 150	36 184	38 541	10.5	94.17
2006 q2	66 100	15 000	37 848	42 110	11	80.22
2006 q3	71 311	15 000	38 903	48 949	11.5	74.5
2006 q4	72 397	20 000	39 079	50 259	12.5	80.31
2007 q1	73 873	8 960	38 [illegible]	[illegible] 146	12.5	76.61
2007 q2	72 396	8 120	38 173	41 072	13	77.84
2007 q3	77 069	7 880	37 974	39 507	13.5	77.63
2007 q4	81 100	6 000	37 529	50 512	14.5	77.18
2008 q1	81 202	7 880	36 475	55 122	14.5	61.51
2008 q2	83 155	7 120	36 059	70 489	15.5	63.5
2008 q3	88 900	9 000	35 686	82 916	15.5	64.05
2008 q4	87 366	8 900	34 963	75 684	15	59.04