The Relationship between Exports and Economic Growth:

An Empirical Case Study of the South African Automobile Industry

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Acronyms and Abbreviations

ADF test – Augmented Dickey-Fuller test

AIEC- Automobile Export Council

CBU – Completely Built-UP

CKD- Completely Knocked-Down

IRCC- Import Duty Rebate Credit Certificates

MIDP- Motor Industry Programme

MNC- Multinational Corporation

OEM- Original Equipment Manufacturer

PAA – Productive Asset Allowance

PP- Phillips Perron test

VAR- Vector Auto Regression

VECM- Vector Error Correction Model

Abstract

The dissertation investigates the relationship between automobile exports and economic growth in South Africa. Given the amount of investment and government assistance that has gone into assisting and developing the South African automobile industry via the Motor Industry Development Programme, this study examines whether the increase in automobile exports has impacted on economic growth. A demand-side model of the Export-Led Growth hypothesis is estimated in order to analyse the magnitude of the impact of automobile exports on growth. The results of the VECM and Dynamic Granger Causality test reveal that vehicle exports have a long-run positive impact on economic growth and that a uni-directional causal relationship is found to run from vehicle exports to economic growth. Even though vehicle exports are found to have a relatively significant impact on economic growth, domestic demand factors are concluded as being the key contributor of economic growth in South Africa.

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Chapter 1

Introduction and the Research Study

1) Background

In the current international trade literature, there has been a great deal of emphasis on export promotion. Many countries have shifted from inward-oriented policies towards outward-oriented trade policies and, thus, adopted export promotion. This focus on export promotion and expansion of exports in developing countries has been viewed as a possible instrument for both job creation and poverty reduction. The nexus of this argument is based on the view that exports are essential for economic growth and are in fact regarded as the engine of economic growth. In support of this view and referred to in Medina-Smith (2001: 2), countries such as : Hong Kong (China), Taiwan Province of China, Singapore and the Republic of Korea (i.e. the Four Tigers) have successfully achieved and sustained growth since the 1960s due to their free-market and outward-oriented approach to trade.

A successful automotive industry is viewed as an emblem of economic success. In developing countries, a successful automotive industry is often regarded as a sign of a mastery of modern and even advanced technologies. According to Jan and Hsiao (2004: 1145), many developing countries "...nurture the automotive industry as a path to technological and economic development ..." This is because the automobile industry is regarded and being both capital-and technologically- intensive. In addition, an expanding automobile industry has effects on related industries such as: being a massive employer due to its large output levels, promoting both knowledge and technology development and the development of the component industry. The study will also examine whether or not South Africa should rather concentrate more increasing its automobile exports in order to obtain higher levels of economic growth.

Lorentzen et al. (2004: 11) point out that the "...Gauteng area around Pretoria and Johannesburg is both the largest market and has the largest concentration of OECMs (BMW, Ford, Nissan, Fiat) and component firms. " The Eastern Cape is also an important automobile area in South Africa, since it contains the three major OECMs, namely: DaimlerChrysler in East London, VW in Port Elizabeth, and Delta Motor Corporation in Uitenhage. In Kwa-Zulu Natal, automobile production is dominated by the Toyota plant. Black and Mitchell (2002:1) indicate that the "...first South African car assembly plants were established in the late 1920s and protected by high tariffs. " The South African

automobile industry, like many automobile industries in developing countries, developed as a purely assembly industry with the main objective being to service the needs of the domestic market. The protective policies, however, isolated the South African assembly plants from the global production networks of the parent companies. The South African assembly plants only exported completely knocked down (CKD) packs.

During the 1980s, the South African automobile industry experienced difficulties as many foreign companies exited the country due to the international campaign against the apartheid. The imposition of sanctions resulted in the disinvestment by the both General Motors and Ford (the two largest North American OEMs). The Motor Industry Development Programme (MIPD) was introduced in September 1995. Department of Trade and Industry (2004: 16) explains that the Motor Industry Development Programme (MIPD) "...involves a gradual but progressive reduction in assistance...." The MIPD has deviated from the previous protective policies as it has stipulated that as no local content requirements are set. AIEC (2008:11) explains that the main objective if the MIDP is to "... rapidly increase the international competitiveness of the domestic automotive industry and facilitate the increased exports of completely built-up (CBU) vehicles and automotive components." The main aim of the MIDP programme was to reshape the future direction of the South African automotive industry as well as that of the associated industries. In order to achieve the above objective the MIDP has gradually reduced tariff protection. This has been in order to expose the South African automobile industry to greater international competition. The MIDP has put programmes in place to allow exporting firms to earn rebates on automotive import duties. This has been an attempt to encourage and enable domestic automobile firms to produce higher volumes. AIEC (2008:11) points out that the MIDP was established was to "to entrench the outward orientation of the industry, thereby restructuring it to achieve global competitiveness..." In addition, the MIDP was introduced in order to maintain both the employment and output contributions of the automotive industry to the South African economy.

1.2) Statement of the Study

The study examines commodity dependency with regards to the automobile industry in South Africa. This is because substantial assistance has been given to the automobile industry in South Africa via the Motor Industry Development Programme. In addition, the export of automobiles has been regarded as a key factor in economic growth. The auto sector has been regarded as one of the success stories for South African industry and industrial policy. This success is based mainly on the recent growth of both assembled

vehicle and component exports and the substantial foreign investment has been recently undertaken or announced. The success of the South African automobile industry has, thus, attracted a great deal of attention.

Given the amount of investment and government assistance that has gone into assisting and developing the South African automobile industry, it is necessary to examine whether the increase in automobile exports has influenced growth. In addition, what needs to be determined is how much value (if any) has the export of South African automobiles added to economic growth. If the automobile industry has added very little value to economic growth, then what needs to be investigated is whether South Africa would obtain sustained economic growth if it reduced its dependence on automobile exports through increased export diversification into other commodities.

1.3) Objectives of the Study

The general objective of this study is to examine whether or not automobile exports influenced economic growth in South Africa for the time period 1995Q1-2011Q2. The specific objectives of this dissertation are:

1. To estimate the contribution of automobile exports to economic growth in South Africa.
2. To test the causal relationship between automobile exports and economic growth.
3. To make conclusions and policy recommendations based on the empirical findings.

1.4) Hypotheses to be Tested

The Hypotheses to be tested are as follows:

1. Automobile exports do not contribute to economic growth in South Africa.
2. There is no causation between automobile exports and economic growth in South Africa

1.5) Justification of the Study

The development of the automotive industry is important because it is able to influence the development and competitiveness of other related industries via external economies of scale. Hsiao (2004:1146) explains that "...the automotive industry can drive the development of related industries, particularly the mechanical and electronics industries." The automotive industry is also a massive employer. At the end of 2010, employment in the South African automobile assembly industry amounted to approximately 29 000

individuals. (AIEC, 2010:63) Since the automobile industry consists of large scale operations, it requires a large number of workers in order to produce the given amount of automobile output. As a result, a great deal of attention has been placed on the automobile industry in South Africa. There has been a large amount of investment and government policy intervention aimed at increasing automobile exports. However, it is uncertain as to whether or not increasing automobile exports ultimately contributes to South Africa's economic growth. Therefore, it is necessary to question as to what value (if any) automobile exports contribute to economic growth in South Africa. The results of this study would be extremely important because if it is found that little value is added by automobile exports, then government policy should be redirected. It is also necessary to examine whether the alternative of export diversification would add more value to economic growth than the growth in automobile exports. The results of this analysis are expected to be relevant to South African policy makers, economists, and interest groups because promoting economic growth through automobile export expansion can contribute to poverty reduction and job creation. The results obtained in this study will be meaningful to South Africa and all developing countries as the study will suggest some key determinants of economic growth.

1.6) Organization of the Study

This study is divided into six chapters. The current chapter introduces the problem to be investigated and focuses primarily on the background of the intended research. It reveals the significance of the South African automobile industry as well as the possible relationship between automobile exports and economic growth. In addition, this chapter indicates the movement from import-substitution to export promotion in the South African automobile industry. Following this introductory chapter, Chapter 2 details the policies implemented in the South African automobile industry in order to expand automobile exports. Chapter 3 reviews the theoretical and empirical literature review regarding the relationship between exports and economic growth. Chapter 4 presents the analytical framework for examining the impact of automobile exports on economic growth. Chapter 5 will analyze and interpret the results obtained. Chapter 6 will discuss the conclusions and recommendations deduced from the results.

Chapter 2

An Overview of the South African Automobile Industry

2.1) Introduction

The development of the South African automobile industry has relied heavily on trade protection and substantial government assistance. It was only after trade liberalization was adopted in South Africa, that the South African automobile industry implemented a more outward-oriented trade policy approach by means of the Motor Industry Development Programme (MIDP). South Africa, like many other developing countries, has focused on establishing a productive automobile industry. The automobile industry has been regarded as a path to both technological and economic development (Jan and Hsiao, 2004: 1145). This is largely because the automobile industry is characterized by being both relatively capital and technologically intensive. Furthermore, the automobile industry has positive effects on related industries (i.e. especially the component industry) via external economies of scale. The automotive industry is also a massive skill-intensive employer. This is due to its large scale operations that require the employment of a large number of workers in order to produce the substantial production of output that is required for the industry to survive and develop. The scale of the automobile production levels, allows the industry to export most of its output and in this way, economic growth is obtained. However, some countries have made the mistake on possibly focusing too heavily on the automobile industry. This is mainly because some automobile industries have been too small in scale to obtain economies of scale and have produced and exported vehicles at high average costs of production. It can, therefore, be questioned whether the focus on the South African automobile industry has contributed to economic growth.

This chapter will briefly examine South Africa's dependence on automobile exports and trade policy in South Africa. Furthermore, the structure of the South African automobile industry will be discussed. Focus will be placed on the change in trade policy in the South African automobile industry from import substitution, the different phases of the local content programme to the Motor Industry Development Programme (MIDP). This chapter will also examine South Africa's automobile export performance. In addition, a comparison will be made between South Africa's automobile exports and the automobile exports in other developed and developing countries.

2.2) The Structure of the South African Automobile Firms

The South African automobile firms are geographically situated in Gauteng (Nissan SA, BMW SA), the Eastern Cape (VW SA, Delta, Daimler Chrysler) and Kwa-Zulu Natal (Toyota).The American-based automobile firms (i.e. Ford and General Motors) were the first to establish assembly plants in South Africa. They were followed by the introduction of assembly plants by both the German-based automobile firms (i.e. BMW, Volkswagen and Daimler Chrysler) and the Japanese-based automobile firms (i.e. Toyota and Nissan). The South African automobile assembly plants were established in order to satisfy the domestic demand for automobiles. As a result, the South African automobile firms produced vehicles mainly for the domestic market and placed little attention on the export of vehicles.

The South African automobile industry has faced numerous challenges. Unlike other automobile manufacturers in other parts of the world, the majority of the South African automobile firms experienced a period in which the parent companies disinvested in their South African operations. This occurred during the 1980s due to the political pressures and the international campaign against apartheid. The first automobile manufacturers to disinvest in their South African operations were the American-based firms (i.e. Ford and General Motors). They were shortly followed by the disinvestment by the Japanese-based firms. In the 1990s, both the American-based and Japanese-based automobile manufacturers reinvested in their South African operations. Although these automobile manufacturers have reinvested in South Africa and have since obtained equity stakes in their South African operations, the American-based firms (i.e. Ford and General Motors) have been less willing to source vehicles from South Africa. This is especially with regard to sourcing vehicle exports from South Africa on a significant scale. The main reason for this is because these firms have faced surplus capacity as they have established numerous assembly plants in other parts of the world (Black, 2001:20). The German-based assembly plants (BMW, VW and Daimler Chrysler) were the only automobile firms to continue their operations in South Africa despite the uncertainty and political climate in South Africa during the 1980s. This has made it easier for them continue and improve their operations in South Africa and obtain a large market share.

Table 2.2.1: Changing Ownership Structure of South African based OEMs

South African Assembler	Ownership: 1990	Ownership: 1998	Ownership: 2009	Ownership: 1990-2009
Toyota	100% local (JSE listed)	Local: 72%(JSE listed) Toyota (Japan): 28%	Toyota: 75% Wesco (South Africa): 25%	SA to MNC dominated Joint Venture
Volkswagen	Volkswagen AG : 100%	Volkswagen AG : 100%	Volkswagen AG : 100%	MNC
BMW	BMW AG: 100%	BMW AG: 100%	BMW AG: 100%	MNC
Daimler Chrysler	DaimlerChrysler (Mercedes Benz): 50%; Local 50%	DaimlerChrysler (Mercedes Benz): 100%	Daimler: 100%	MNC
Ford	100% local (Anglo American)	AngloAmerican:45% Ford: 45% Employee trust 10%	Ford : 100%	SA to MNC
Nissan	87% local Nissan Diesel: 4% Mitsui & Co. (Japan) : 9%	Sankorp (local) : 37% Nissan: 50% Nissan Diesel 4%, Mitsui : 9%	General Motors : 100%	SA to MNC
General Motors	100% local (management)	Local managers : **51%**, General Motors: 49%	General Motors: 100%	SA to MNC

Source: Barnes and Meadows (2008)

A distinguishing feature of the South African automobile industry is its ownership structure. Seven of the eight OEM's (Original Equipment Manufacturer) are now wholly foreign owned multinational. Table 2.2.1 above, taken from Barnes and Meadows (2008), reveals the change in ownership of the South African based automobile firms. Most of the automobile assembly firms in South Africa (with the exception of BMW, DaimlerChrysler and Volkswagen) were domestically owned in 1990. This was mainly due to many of the firms disinvesting in their South African operations in the 1980s. By 2009, Toyota is the only automobile firm that is partly domestically owned. This is even though the domestic ownership is only 25% in 2009. As it is evident from Table 2.2.1, Ford, Nissan and General Motors have all increased their stake in their South African automobile assembly plants. In 1990, Daimler Chrysler was the only German-based firm that was partly domestically owned. However, unlike the other automobile firms (i.e. General Motors, Nissan and Ford) that decreased their domestic ownership between 1990 and 2009, Daimler Chrysler was totally owned by the parent company by 1998 (Black, 2001:19).

The implication is that key decisions about the South African automobile industry are made abroad by the respective parent companies. Hence, it is highly likely that the agenda of decision makers of the parent companies may differ from those in South Africa. However, despite key decisions being made aboard, the movement towards a greater degree of foreign-ownership has allowed the South African automobile industry to become more integrated with the global production and export networks of their parent company. This has facilitated an increase in both investment and automobile exports.

The Delta Motor Corporation (formerly General Motors) faced greater difficulties with regard to its vehicle exports. This is mainly because Delta struggled to establish a significant stake in the South African automobile market. Delta (formerly General Motors) re-entered the South African automobile industry in 1996. Compared to the other automobile firms in South Africa, Delta was characterised by a relatively small CKD assembly plant. Delta attempted to increase its market share by implementing an export programme. However, Delta's amount of local content, production levels and vehicle exports remain relatively small and insignificant compared to the other OEMs in South Africa (Black, 2001:19). Although Delta has struggled to increase its market share and scale of production, it is not the only automobile firm to have experienced difficulties in the South Africa market. The Japanese-based firms (Nissan and Toyota) have also been characterised by low levels of investment. Furthermore, they continue to operate under licence agreements that only permit them to export to certain markets. For example, Toyota South Africa has been permitted to export vehicles to very limited consumption markets in Southern and Eastern Asia. The Toyota subsidiary in South Africa mainly exports vehicles to African countries. This has placed substantial constraints on their scale of production and export performance (Hall and Robbins, 2006: 7).

The automobile industry is a scale-intensive sector and is characterised by economies of scale. As a result, automobile firms are required to produce a large volume of vehicles in order to reduce average costs of production. The South African automobile firms face large domestic constraints, such as: domestic sales and foreign demand for automobiles. If the South African automobile firms only produced vehicles for the domestic market, they would not be able to obtain the large production volume necessary to reduce average costs of production. The South African automobile firms would only be able to produce a very small scale of output of vehicles at high average costs of production. These low levels of output would be detrimental to the survival of the automobile industry in South Africa. Therefore, the only way that the South African automobile firms are able to increase their production and reduce their average costs of production is by exporting their output of

vehicles. As a result, many of the South Africa automobile firms have actively engaged in export programmes in order to facilitate and promote increased vehicle exports. Lorentzen et al. (2004: 9) explain that "VW, BMW and Daimler (later DaimlerChrysler) were the first to respond by injecting significant capital into their South African operations for the production of a limited range of vehicles..." The bulk of these vehicles were destined for the export market. The South African automobile firms that have shown the most significant increase with regards to export expansion have been BMW, Volkswagen, Daimler Chrysler and Toyota (Meyn, 2004:16). The German-based firms (i.e. BMW, VW and Daimler Chrysler) have established large export contracts as their production is mainly for the overseas export market. The Japanese based firms (i.e. Nissan, Mazda and Mitsubishi) have also established large export contracts. The main destination of the exports for these Japanese and German based firms is the European market. Toyota differs in its export strategy as it mainly exports to the African market. This is according to the strategy of its parent company.

2.3) Trade Policy in the South African Automobile Industry

The development of the South African automobile industry has relied heavily on both protection and substantial government protection. Trade policy with regard to the South African automobile industry can be divided into three phases. These include: import substitution (Phase I-V), Phase VI and the Motor Industry Development Programme (MIDP). Each of these stages and trade strategies has made an impact on the establishment, development and focus of the automobile industry in South Africa. In the past decade, the South African automobile industry has experienced dramatic increases in exports and foreign investment. As a result, the South African automobile industry has been regarded as a success story in South African industrial policy (Flatters, 2002: 1). However, there have been various concerns raised regarded both the future of the automotive industry and its continual dependence on government assistance. This section will focus on the various phases of protection and the Motor Industry Development Programme (MIDP).

2.3.1) Import Substitution

The South African automobile industry was first assisted in the 1920s. This initial phase of this assistance lasted until 1961 and mainly included simple import substitution policy which favoured the simple assembly for the domestic market (Department of Trade and Industry, 2004: 16). The South African automobile industry was established in the 1920s.

Like many other developing countries, the South African automobile industry was highly protected (Black and Bhanisi, 2007: 133). Import substitution was adopted in the South African automobile industry and was characterised by high import tariffs being placed on automobile and component imports. In this way, import substitution assisted in the development and protection of the South African automotive industry. The high tariffs also attracted a large number of foreign-owned companies wishing to invest in and ultimately set up assembly plants in South Africa. As a result, many foreign firms established assembly plants in South Africa.

The South African automobile industry was not only characterised by its protection via import substitution, but also by the substantial government assistance that was granted to the industry. Import substitution was viewed as a way in which imports of components and vehicles could be reduced and the balance of payments constraints could be eased. In this way, it was envisaged that import substitution, together with government assistance, would give rise to a competitive automobile industry that would be able to produce large volumes of automobile output at low average costs of production. It was envisaged that the only way that the South African automobile industry would be able to obtain economies of scale was through import substitution.

In the early years of the development of the South African automobile industry, focus was placed on domestic automobile sales and production. Very little attention was placed on automobile exports. The main focus of the protection in the South African automobile industry was to establish simple automobile assembly plants that would be able to satisfy the needs of the domestic market. Hence, the South African automobile industry was developed around the assembly of completely knocked-down kits (CKD). Although these CKD assembly plants were relatively small financial assets, they were regarded as crucial strategic assets from the view of the automobile firms (Sturgeon and Florida, 2000:26). From the view point of the South Africa automobile industry, these CKD assembly plants were regarded as important development assets. This was because they allowed the South African automobile to develop and to acquire some of the technology and skills necessary to produce and possibly export automobiles. It can be argued that without these CKD assembly plants, South Africa would have never been able to develop an automobile industry and obtain some of the skills, knowledge and technology necessary to produce and export automobiles. However, by not placing very little (or even any) focus on automobile exports, the South African automobile industry became isolated from the parent companies' global production network. The other major challenge that the South African automobile industry faced was an increasing shortage of foreign exchange. Large

amounts of imported components were required in order to produce vehicles domestically. Vehicles assembled in South Africa only contained approximately 20 percent local content (Flatters, 2002:3). The large amount of imported components needed to produce automobiles placed greater pressure to the shortage of foreign exchange.

2.3.2) Phases I-VI

From the 1920s to 1961, trade protection only consisted of high import tariffs being placed on the automobile assembly plants. The local content programme in the South African automobile industry was introduced in 1961 (Damoense and Simon, 2004: 252). The local content programme was adopted in conjunction with import substitution and continued government assistance plans. Although the local content programme was still inward-oriented, it differed from the former phase of protection in that it focused on the imposition of high tariffs and the degree of local content contained in automobile production and exports. Thus, all automobiles and components produced in South Africa were required to contain a certain percentage of domestically produced content. The local content programme served as an additional mechanism to protect and develop automobile production and exports. It was envisaged that the local content requirement would force the foreign-owned firms to utilise more domestically produced components in the production of automobiles. This would assist in easing the balance of payments constraints. In addition, it would allow the domestic automotive component industry to obtain the skills and technology necessary to produce quality components.

Phases I-V of the local content programme were based entirely on the weight of automobile exports. Thus, exported vehicles were required to contain a certain weight of local content. According to Damoense and Simon (2004:253), these local content levels ranged from "....a low 15 per cent in 1961 to 66 per cent in 1980..." By 1980, exported vehicles were required to contain a local content requirement of 66% (based on weight). This local content requirement did not have to be met by every individual vehicle, but rather across a model range. This meant that it was possible that individual vehicle exports could differ across a model range with regards to their local content. It was, however, mandatory that the entire range met the stipulated local content requirement. If the automobile assemblers were not able to meet the local content requirements, high tariffs would be placed on import components. The local content requirements, thus, provided a way in which the automobile firms could reduce their costs on automobile production and exports. However, the local content programme was criticized as being

ineffective as it was regarded as facilitating the proliferation of automobile models being produced at low levels of output.

Table 2.3.2.1: Number of Assemblers and Models Produced

Phase of Local Content Programme	No. of Assemblers	No. of Models
Phase I (1961)	8	24
Phase II (1970)	16	43
Phase III (1976)	13	39
Phase V (1987)	7	30

Source: Black and Mitchell (2004)

Table 2.3.2.1 above indicates the effect of the local content programme on the number of assemblers and models in the South African automobile industry. At the beginning of Phase I, the South African automobile industry consisted of only 8 assemblers producing 24 models of vehicles. However in Phase II, as the local content requirement increased, the number of assemblers and number of models produced had almost doubled. Even though, the number of assemblers and models produced decreased slightly in Phase III, it was still relatively larger than the number present in Phase I. According to Black and Bhanisi (2006:6), by "...late 1986, there were seven assemblers producing 20 basic model variants for a market of 172 000 passenger cars." Instead of increasing the production of automobile in the South African automobile industry, the local content programme gave rise to a variety of models being produced. The problem was that these models were not being produced at high enough volumes to obtain economies of scale.

The South African automobile industry was characterised by numerous models of vehicles being produced at low levels of output and high average costs of production. The high domestic demand for a variety of vehicle models made it necessary for the South African automobile industry to produce a number of vehicle models. However, the South African assembly plants lacked the technology, scale of production and automation to produce numerous vehicle models at a large output levels. Even though, the main objective of the local content programme was to increase the production levels and reduce the cost of production in the automobile industry, it did not really achieve this because the South African assembly plants produced a number of vehicle models at relatively low levels of output and high average costs.

Trade protection was regarded as having failed in the automobile industry. The adoption of import substitution was also viewed as having a negative effect on the South African

automobile industry. Even though import substitution assisted the South African automobile industry's development and reduced vehicle and component imports, it was not successful with regards to giving rise to an automobile industry with a large scale of production. Import substitution and the local content programme resulted in increased competition amongst the automobile firms to produce a variety of models (Black and Mitchell, 2002:2). This was in order to satisfy the increased domestic demand for different models of vehicles. The South African automobile industry developed into an industry that produced a variety of different models at relatively low levels of production for each model. As a result, the automobile assembly plants were unable to obtain economies of scale. This was because the different vehicle models were produced on a low scale and at high average costs. Import Substitution and the local content programme gave rise to an automobile industry that was highly inefficient and uncompetitive.

Trade protection in the automobile industry was not only criticized on the low scale of production. Import substitution and local content programme also contributed to the isolation of the South African automobile industry (Black and Bhanisi, 2007: 133). The South African automobile industry was also disadvantaged by its relatively small domestic market, low scale of production and the lengthy shipping distance to the major international markets (i.e. especially the European markets). The political and economic uncertainty caused by apartheid was also detrimental to the growth and survival of the South Africa automobile industry. During the uncertainty and unrest of the 1980s, domestic demand for automobiles stagnated (Meyn, 2004:8). Despite the negative effects of trade protection and economic uncertainty on the South African automobile industry, the government continued to adopt import substitution and the local content programme. This was even though it had been argued that import substitution had failed in the South African automobile industry, as well as industries in other developing (i.e. Latin America, Asia and Africa) and developed countries (i.e. Australia, New Zealand and Japan). The government was determined to establish an autonomous national vehicle and component industry, regardless of the consequences of a protective trade policy. Due to South Africa's isolation during apartheid, the government viewed the establishment and development of a national automobile industry as being essential for economic growth and industrialization. This was mainly because of South Africa's increased isolation. By the 1990s, the South African automobile industry had become an industry which displayed slow growth, high average costs, low productivity and a large number different models being produced at low levels of output.

Phase VI was introduced in 1989 and signalled a partial shift in trade policy from import substitution to export promotion (Flatters, 2002: 3). Although Phase VI did contain a local content programme, it differed from the previous phases as local content was based on the value of exported vehicles; instead of being based on weight. Furthermore, Phase VI focused on promoting automobile exports in order to obtain economic growth. The main success of Phase VI was that there was a rapid increase in exports (approximately 28 percent per annum). However, the South African automobile industry was still relatively protected and was viewed as not having the ability to reduce the net automotive trade deficit and the foreign exchange usage by the automobile industry (Damoense and Simon, 2004:254). Another issue with Phase VI was that it was implemented during a period of political and economic instability and uncertainty.

2.3.3) The Motor Industry Development Programme (MIDP)

The perceived failure of the import substitution and previous trade protection adopted in the automobile industry necessitated the adoption of more outward- oriented trade policy. In addition, it was crucial that the South African automobile industry underwent major structural changes so that it would be able to obtain economies of scale and increase automobile exports. The South African automobile industry experienced has experienced a shift from import substitution to export promotion. Although this shift towards export promotion was initiated under Phase VI, the presence of local content requirements under Phase VI meant that the shift towards export promotion was only a partial shift. It was necessary that the automobile industry adopted a further shift towards export promotion. (Flatters, 2002: 4). Furthermore, the government assistance granted to the South African automobile industry would be more focused on facilitating the development of the industry and the promotion of exports. Barchiesi (2000:10) indicates that "...the transition away from import substitution was paralleled by the need to overcome the international isolation inherited by the apartheid regime..." The South African automobile industry's survival depended on trade liberalization. The industry needed to be less isolated and reintegrate into the international markets. In addition, the South African automobile industry needed to become more competitive in order to develop and become more efficient. Since the South African automobile industry consisted of a proliferation of models being produced at a small scale of production, it was necessary to rationalize of the number of different models produced As a result of domestic market constraints, the only way in which growth in the South African automobile industry could be achieved was through a significant increase in automobile exports. The South African government recognised the importance and

potential of the South African automobile industry and implemented policies to encourage and improve automobile exports and competitiveness. This was a difficult task as the South African automobile industry had to grow in a less protected trade environment.

The Motor Industry Development Programme (MIDP) was introduced in September 1995. The MIDP was viewed as an extension of Phase VI. However, MIDP differed from the previous phases of protection (including Phase VI) in that it advocated an environment in which there were no local content requirements. One of the key objectives of the Motor Industry Development Programme (MIDP) was to develop an automotive industry that would be internationally competitive (Department of Trade and Industry, 2003: 10). In addition, the MIDP was introduced in order to facilitate and promote the production vehicles that would be of a high quality and affordable to both the domestic and international markets. It was also envisaged that the MIDP would assist in increasing the automobile production and exports levels through its various incentives. In this way, the South African automobile industry would be able to obtain economies of scale. Furthermore, it would allow an increase in employment in the automobile industry and cause economic growth. One of the main objectives of the Motor Industry Development Programme (MIDP) was to restructure the automobile industry in such a way that it would be able to make a greater contribution to economic growth in South Africa and improve the automobile trade balance.

The Motor Industry Development Programme (MIDP) aimed to meet various national objectives (Department of Trade and Industry, 2003: 10). These objectives included encouraging a phased integration into the global automotive industry. This was accomplished by the reduction in import tariffs; the elimination of the local content programme and other incentives incorporated in the MIDP. In this way, the MIDP created an environment in which South Africa automobile exports could enter and compete in the global automobile networks and markets. The MIDP also sought to meet the national goals by facilitating the growth in both the scale and volume of automobile production and exports. One of the key objectives of the MIDP was to rationalize the number of models produced by the automobile firms. It facilitated a restructuring of the South African automobile industry in which fewer models would be produced. However, greater volumes of a small number of models would be produced. In this way, the automobile firms would be able to achieve economies of scale. Automobile output not sold domestically would be destined for the export market. In fact, the domestic market provided a way in which production could be increased. This is because the domestic automobile market is too small to purchase the large volume of automobiles produced locally. Surplus output of

automobiles could, thus, be exported. Therefore, automobile production could be increased to satisfy both the domestic and international markets and in this way, economies of scale could be obtained. The restructuring of the automobile industry also involved a process of upgrading and modernisation of the South African automobile industry (Department of Trade and Industry, 2003: 10).This was in order to promote higher productivity in the South African automobile industry and also to facilitate the global integration process. The international markets demanded automobile exports to be of a higher quality. It was therefore necessary that automobiles destined for the export markets were of a higher quality. In order to improve quality of production, it was necessary that the assembly plants and the automobiles produced contained higher levels of technology and were in line with international standards.

The Motor Industry Development Programme (MIDP) was characterised by various policy instruments designed to meet the national objective. One of the main policy instruments used in the MIDP was the gradual and continuous reduction in tariff protection (Department of Trade and Industry, 2003: 10). This allowed the South African automobile industry to become more exposed to the global automobile market and work towards building up greater international competitiveness. The MIDP has also included a variety of incentives in order to facilitate and encourage greater specialization and growth in automobile exports. Flatters (2005: 2) indicates that prior to the MIDP, the automobile industry "...was protected by tariffs in excess of 100 percent and burdensome local content requirements." As a result, the South African automobile industry produced a wide range of models at a very low level of production. The high protective trade policy implemented before the MIDP had resulted in an automobile industry that was inefficient. If the import tariffs and trade protection had been eliminated altogether, the South African automobile industry could not have competed in the domestic and international markets. For this reason, tariff barriers were gradually reduced under the MIDP.

The main features of the MIDP are: a tariff phase-down programme, additional government assistance, duty-free allowances and the small vehicle incentive scheme. The MIDP was more geared to export promotion than any of the previous trade protection policies. Under the MIDP, an increase in exports has been regarded as having the ability to obtain economic growth and sustainable economic growth. However, this is viewed as only being achieved with sufficient government assistance. The MIDP policy is regarded as being in line with the movement towards trade liberalization in South Africa and has been viewed as being successful in the South African automobile industry. The MIDP provides various incentives that are intended to rationalise the automobile production into

a smaller range of products (Flatters and Netshitomboni,2006:4). Economies of scale can only be achieved if the South African automobile firms specialised in fewer models of automobiles and expanded their production of these automobiles. In this way, these ranges could be exported. The domestic demand for other models automobile models would be satisfied via importing.

Unlike the previous trade protection policies adopted in the South African automobile industry, the MIDP eliminates all local content requirements (Flatters, 2002: 5). This is the main feature that distinguished the MIDP from all of the previous trade protection schemes and is more in line with export promotion. In addition, the MIDP has attempted to meet national objectives by gradually reducing tariff protection placed on both automobiles and components. As a result of the reduction in import tariffs, the South African automobile industry exposed to greater international competition and is able to possibly become more competitive in the global automobile market.

Table 2.3.3.1: MIDP Tariff Rates (%) on Vehicles and Components

	1995	1997	1999	2001	2003	2005	2007	2009
Cars	65	58	51	44	38	34	30	28
Parts	49	43	38	33	29	27	25	23

Source :(Flatters and Netshitomboni, 2006:4)

Table 2.3.3.1 above shows that from 1995, the tariff rates on both imported vehicles and components have gradually declined. The tariff rates on imported vehicles have declined at a faster rate than those on imported components. This signals the change from import substitution towards export promotion. However, in 2004, South Africa's average tariff rates for all categories of imports were 7.9 percent (Flatters and Netshitomboni, 2006:4). Hence, the average tariff rates of South Africa in 2004 were less than a quarter of the tariff rates imposed on vehicles. The tariff rates reflected above are still higher than the tariffs reflected in South Africa's general tariff schedule.

Table 2.3.3.2 below shows the import tariff rates for light vehicles and medium and heavy vehicles from 1995 to 2011. With reference to the above table, the tariffs on both light vehicles and medium and heavy vehicles have been reduced. However, the tariff imposed on medium and heavy vehicles has stayed the same since 2000. The main reason for this was that MIDP has placed a greater emphasis on the promotion of light commercial vehicles. In addition to reducing tariffs, the MIDP also introduced a small vehicle incentive

(SVI) which operated as a subsidy and promoted the production of smaller and relatively less expensive vehicles mainly for export purposes. According to Barnes and Meadows (2008:27), the small vehicle allowance (SVI) "...operated via a duty drawback mechanism linked to the value of the motor vehicle." Although the SVI was removed in 2007, the South African automobile industry has focused mainly on the production and export of light vehicles (i.e. passenger vehicles and light commercial vehicles).

Table 2.3.3.2: Tariff Rates (%) on Light Commercial Vehicles and Medium and Heavy Vehicles

Effective Date	Light Vehicle Segment	Medium and Heavy Vehicle
	CBU's	CBUs
1995	65%	40%
1996	61%	37.5%
1997	57.5%	35%
1998	54%	30%
1999	50.5%	25%
2000	47%	20%
2001**	43.5%	20%
2002	40%	20%
2003	38%	20%
2004	36%	20%
2005	34%	20%
2006	32%	20%
2007**	30%	20%
2008	29%	20%
2009	28%	20%
2010	27%	20%
2011	26%	20%

Source: Naamsa (2007) ** denotes the years in which the MIDP was extended.

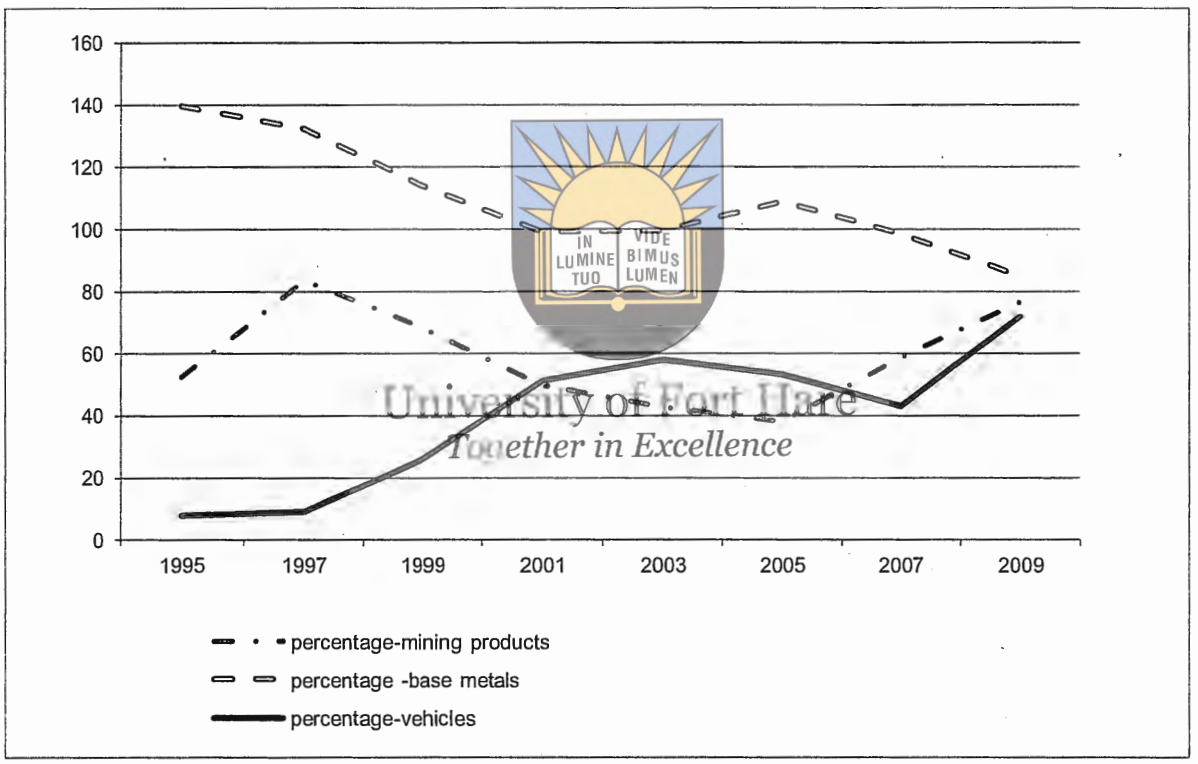
The MIDP also included an import-export complementation scheme (IEC) that would allow the OEMs to earn sufficient foreign exchange by exporting vehicles and components (Damoense and Simon, 2004:255). Import-export complementation was used in an attempt to offset foreign exchange utilised in importing components necessary for automobile production. The import duty rebate credit certificates (IRCCs) were issued by the Department of Trade and Industry. The IRCCs are based on the value of automobile exports. The automobile firms are able to earn import credits that allow them to reduce the dutiable value of imported component or vehicles in proportion to the value of their vehicle exports. The IRCC scheme allows an automobile firm that exports vehicles with local content valued at R 100 million to import automotive components valued at R 100 million duty free. In this way, the import-export complementation scheme allows the automobile firms to earn import duty credits by increasing automobile exports. The MIDP, therefore, allows the South African automobile firms to qualify for duty drawbacks on imported components and receive IRCCs in proportion to their automobile exports (Flatters and Netshitomboni, 2006:4).

The above scheme provided the South African automobile firms with a means in which they could reduce their costs of production. This is the case especially since these costs of production relied heavily on imported components. In addition, it provided an incentive for the South African automobile firms to increase their exports. The more the South African automobile firms are able to increase their exports, the more they will be able to have access to the duty rebate on component imports. The import-export complementation scheme has allowed automobile assemblers to earn and use import credits in order to source imported components at competitive international prices (Black and Bhanisi, 2007: 138). It was this growth in exports that was expected to increase economic growth in South Africa. Another incentive that was introduced by the MIDP was Productive Asset Allowance (PAA). (Barnes and Meadows 2008:28) This incentive facilitated an increase in investment into the South African automobile industry. The Productive Asset Allowance (PAA) allowed the OEMs to earn duty credits equivalent to 20% of the investment placed in the South African assembly plants (Black and Bhanisi, 2007: 138).However, the PAA stipulated that the duty credits could only be earned from investments that were placed on rationalising a particular product model. Hence, the PAA facilitated both increased investment and the further rationalisation of the South African automobile industry.

2.4) Export Dependence and Performance of the South African Automobile Industry

It is important to examine the nature and extent of South Africa's degree of dependence on the automobile industry. South Africa has identified the automobile industry as a strategic industry (AIEC, 2010:2). However, what need to be determined is whether the share of automobile exports to total exports has increased and what the share of automobile exports to total exports actually is. This is especially compared to the share of South Africa's other main commodity exports (i.e. minerals and base metals). The relative share of South Africa's automobile exports can be examined by the graphical representation in figure 2.4.1 below.

Figure 2.4.1: Share of Automobile Exports, Mining Products and Base Metals



Source: Computed from South African Revenue Services-Customs and Excise Data (1995-2010)

Figure 2.4.1 above indicates the percentage share of vehicle exports compared to the percentage share of mining product exports and base metal exports. The percentage share of vehicle exports was calculated by dividing the vehicle exports by total exports. Similarly, the percentage mining products exports was calculated by dividing mining product exports by total exports and the percentage base metals exports was calculated by dividing base metal exports by total exports. This is in order to examine the South Africa's possible dependence on vehicle exports compared to that of mining product exports and base metal exports. The reason that mining products exports and base metal exports have been included in this comparison is because they are both considered to be

South Africa's main export commodities (South African Revenue Services-Customs and Excise Data, 1995-2010).

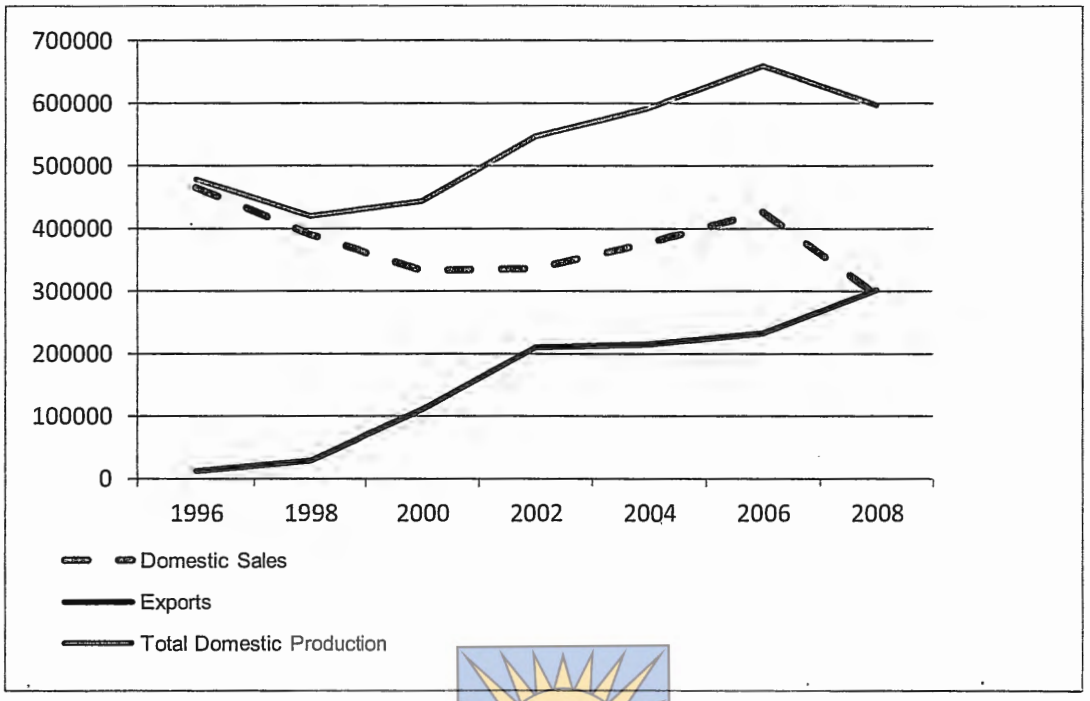
With reference to figure 2.4.1, in 1994, compared to the share of mining products exports and base me metal exports, the share of vehicle exports was extremely low. It is evident that in 1994 the share of base metal exports was relatively high and that South Africa had concentrated mainly on base metal exports. Although, the share of base metals exports decreased slightly between 1994 and 2009, it remained above both the share of vehicle exports and the share of mining product exports. Although mining product exports experienced a few fluctuations between 1994 and 2000, it remained above the share of vehicle exports. During the period 2001 to 2006, the share of mining product exports was below the share of automobile exports. This was only for a short period of time. After 2005, the share of base metal exports increased above the share of automobile exports.

Figure 2.4.1 above also indicates that automobile exports have experienced a dramatic increase with regards to their share of total exports. This is especially from 1998 onwards. Even though, the share of automobile exports did decrease slightly between 2003 and 2007, it was still higher than the share of automobile exports in 1994. After 2007, the share of automobile exports has shown another dramatic increase. This has shown that South Africa's export dependence on automobile exports has indeed increased.

South Africa seems to have shown an increased reliance on automobile exports. This is shown by both the increase in exports as well as the increase in the ratio of automobile exports to total exports. South Africa's dependence on automobile exports has shown a dramatic increase since 1996. This can be attributed to the export promotion policies and the Motor Industry Development Programme (MIDP).

South Africa has experienced a dramatic increase in automobile exports. This is mainly attributed to the introduction and implementation of the Motor Industry Development Programme (MIDP). It is useful to obtain some idea of automobile exports compared to automobile production and domestic sales of exports. In addition, it is important to examine the automobile export trends in South Africa and investigate how South Africa's automotive export performance compares to that of other developed and developing countries.

Figure 2.4.2: Domestic Production, Domestic Sales, and Export of Vehicles – units



Source: Damoense and Simon (2004:259)

With reference to figure 2.4.2 above, both vehicle exports and total domestic production of vehicles have followed an upward trend from 1995 to 2009 and vehicle exports have shown a rapid increase, especially from 1998. Even though automobile exports increased at a decreasing rate after 2002, they are relatively higher than their position in 1994. The above figure reveals that there has been an overall decrease in domestic vehicle sales. This is mainly due to the accessibility of credit in the domestic market. It also reflects the domestic market's demand for a variety of other models of vehicles which have been imported. The total domestic production of automobile decreased from 1995 to 1998. It seems that during this period, total domestic production of vehicles relied on domestic sales. In other words, the majority of locally produced vehicles were destined for the domestic market and not for the export market. However after 1998, figure 2.4.2 above suggests that total domestic production of automobiles has been influenced by automobile exports. Therefore, the majority of domestically produced vehicles are produced for the export market. This could be because of the export incentives of the Motor Industry Development Programme (MIDP).

Table 2.4.3: Share of World Automotive Exports of Selected Countries (%)

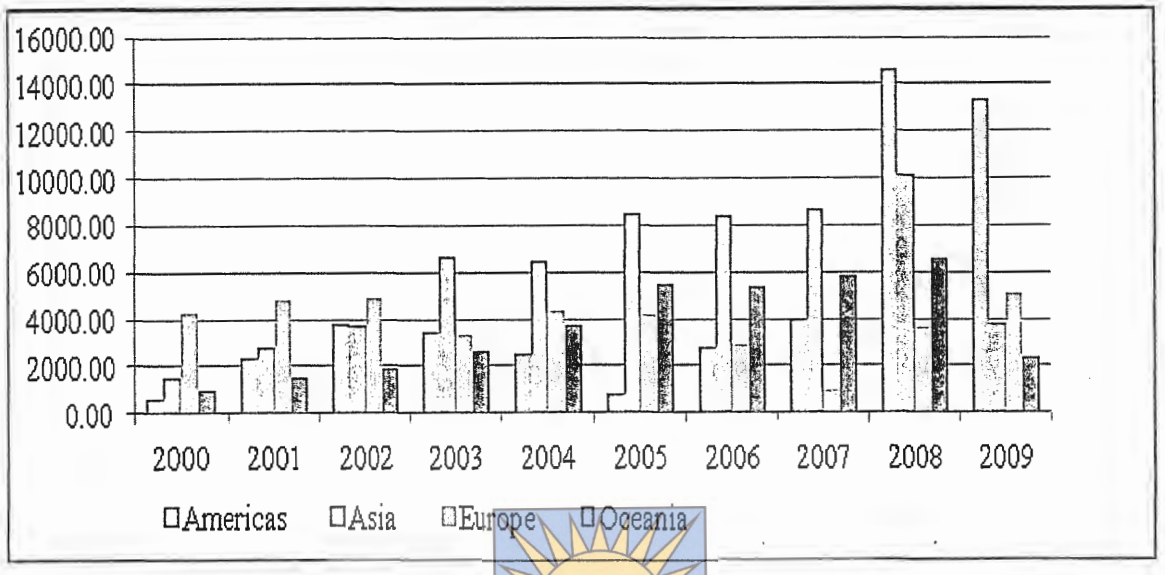
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Argentina	0.36	0.36	0.26	0.21	0.25	0.33	0.41	0.46	0.53	0.65
Australia	0.37	0.40	0.37	0.38	0.36	0.38	0.32	0.31	0.35	0.24
Austria	1.44	1.52	1.56	1.61	1.89	1.82	1.83	1.76	1.61	1.57
Brazil	0.81	0.85	0.78	0.89	1.01	1.30	1.27	1.09	1.18	1.01
Canada	10.50	9.63	8.95	7.78	7.40	7.24	6.48	5.48	4.16	4.04
China	0.27	0.33	0.43	0.49	0.73	1.08	1.41	1.92	2.30	2.34
Czech Rep	0.81	0.97	1.02	1.08	1.22	1.44	1.63	1.75	1.91	2.39
France	6.78	6.99	7.08	7.48	7.59	6.86	6.12	5.70	5.25	5.39
Germany	17.44	18.81	19.33	20.33	19.57	18.59	18.18	18.77	18.61	18.66
India	0.10	0.10	0.11	0.15	0.20	0.28	0.29	0.29	0.39	0.56
Italy	3.20	3.15	2.96	3.17	3.14	2.98	3.07	3.21	3.21	2.98
Japan	15.24	14.07	14.69	14.03	13.43	13.31	13.60	13.21	13.73	12.25
Malaysia	0.05	0.04	0.05	0.05	0.06	0.08	0.09	0.09	0.09	0.11
Mexico	5.31	5.38	4.91	4.11	3.70	3.84	4.17	3.77	3.69	4.28
New Zealand	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02
Singapore	0.12	0.11	0.12	0.20	0.23	0.25	0.23	0.24	0.27	0.35
Slovak Rep	0.41	0.40	0.45	0.82	0.74	0.62	0.82	1.13	1.24	1.34
Slovenia	0.19	0.19	0.21	0.2		0.34	0.34	0.47	0.49	0.56
South Africa	0.30	0.26	0.38	0.42	0.43	0.47	0.40	0.45	0.62	0.60
Spain	4.82	4.84	4.65	5.16	5.11	4.65	4.50	4.58	4.42	4.93
Thailand	0.42	0.47	0.45	0.54	0.64	0.86	0.97	1.05	1.30	1.38
United States	11.63	11.11	10.66	9.46	8.87	9.31	9.32	9.07	8.95	8.58

Source: WTO. International Statistics

Table 2.4.3 above reveals the relative share of world automotive exports from 2000 to 2009. Although South Africa's share of world automotive exports has increased from 0.3% in 2000 to 0.6% in 2009, it is still relatively small. This is especially compared to other countries such as Argentina (0.65%), Brazil (1.01%) and Thailand (1.38%). South Africa's share of automotive exports is greater than that of Singapore (0.35%), New Zealand (0.02%), Malaysia (0.11%), India (0.56%) and Australia (0.24%). The share of Australian automotive exports is surprisingly small since the MIDP policy adopted in South Africa was modelled on the export promotion policy adopted in Australia. Table 2.4.3 also reveals that the countries that have dominated the share of automotive exports are: Germany (18.66%), Japan (12.25%), and the United States (8.58%). Overall, most of the countries have shown an increase in their share of world automotive exports. However, the countries that have shown the greatest increase in their share of world automotive exports have been: Thailand, Slovak Republic and Brazil. Some countries have shown a decrease in

their share of world automotive exports. These countries are: Australia, Canada, France, Italy and Mexico.

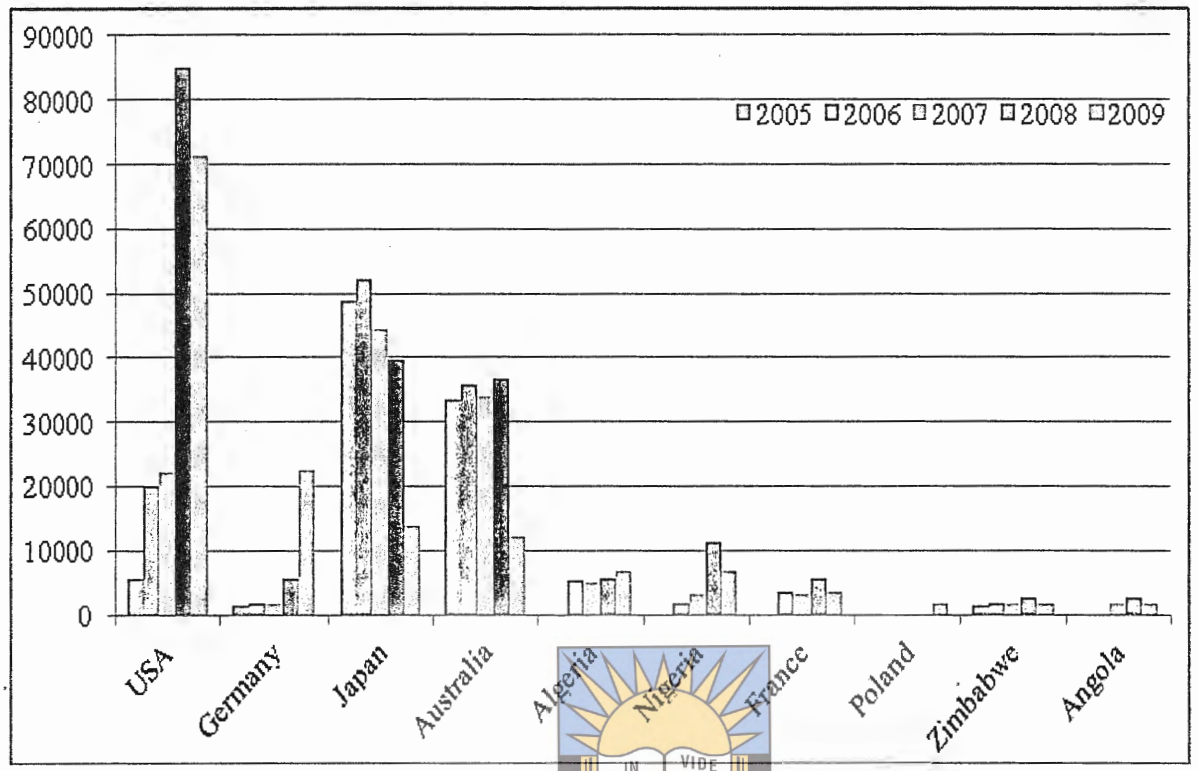
Figure 2.4.4: Main Destination of South African automobile exports (R million)



Source : NAAMSA (2010)

Between 1995 and 1997, the main destination of South Africa vehicle exports was the South African Development Community (SADC) (AIEC, 2008:51). However, since the implementation of the Motor Industry Development Programme (MIDP), South African automobile exports are destined for the SADC countries as well as other countries in the world. Another reason for the increase in destinations of South Africa's automobile exports was due to the increased integration of the South African automobile firms into the global automobile networks of their parent companies. As is evident from above, between 2000 and 2002, the main destination of automobile exports was Europe, especially Germany. However, from 2003, most of the South African automobile exports have been destined for Asia. It is only from 2008, that there was a rapid increase in South African automobile exports destined for the Americas. There has also been an increase in South African automobile exports destined for Oceania. The increase in market destinations has contributed to the increase in South African vehicle exports. This is because before the MIDP was implemented, South African automobile exports were mainly destined for the Germany, Japan and the United States (i.e. the markets of the parent companies). However, after the implementation of the MIDP, South African automobile exports are now destined for many other countries. This increase in market destinations has possibly facilitated a further increase in South African vehicle exports by increasing export base for South African vehicle exports.

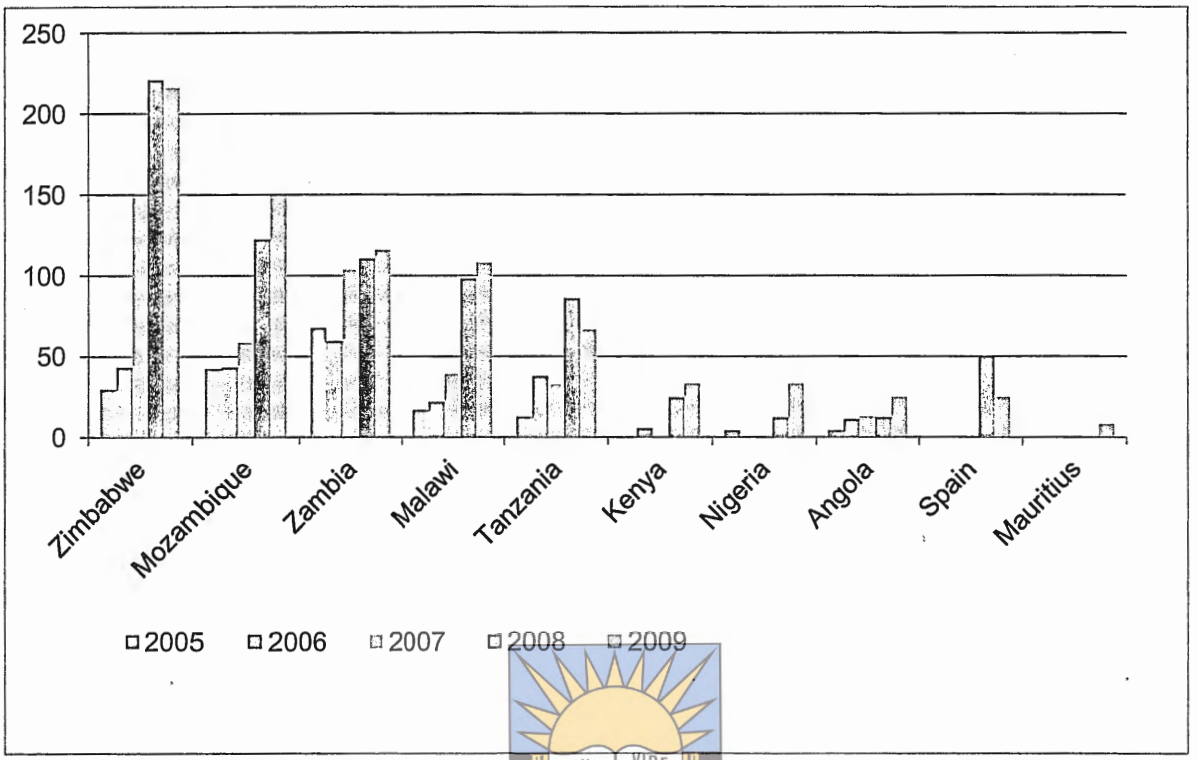
Figure 2.4.5: Destinations of Export of Light Vehicles (R million)



Source: AEIC (2010)

Figure 2.4.5 above reveals the market destination of export of light vehicles from 2005 to 2009. These light vehicles consist of light commercial vehicles and passenger vehicles. As shown in figure 2.4.5 above, the main destination of light vehicles is the United States, Japan and Australia. However, there was a dramatic decrease in the amount of light vehicles exported to Japan and Australia in 2009. Even though there was a large decrease in light vehicles to the United States in 2009, it the amount of units exported to the United States was far higher than any of the other countries. This is consistent with the findings in Figure 2.4.5 which showed that the Americas have recently become the main destination of automobile exports and that there has been a marginal decrease in South African automobile exports destined for Germany.

Figure 2.4.6: Export of Medium and Heavy Vehicles and Bus Exports (units)



Source: AEIC 2010

Figure 2.4.6 above shows the destination of South Africa's heavy and medium vehicles. Except for Spain and Mauritius, most of the destination of these exports has been African countries. The main destination for these heavy and medium vehicle exports has been Zimbabwe, Mozambique and Zambia. From 2008, Malawi has also become a main destination for the medium and heavy vehicles. It is also evident that countries such as Spain and Mauritius have started to export medium and heavy vehicles from South Africa in recent years (i.e. Spain from 2008 and Mauritius from 2009) Even though, these exports have been relatively insignificant compared to the export of light vehicles.

2.5) Conclusion

The South African automobile industry was established in the 1920s and has been characterised by a history of heavy trade protection and government assistance. The South African automobile industry remains a strategic industry in South Africa as it is viewed as being able to contribute to economic growth in South Africa. Trade protection in the South African automobile industry began with simple import substitution in which heavy tariffs were imposed on imported components. From the 1960s, a series of local content programmes were adopted. Phase VI was the first phase of trade policy in the South African automobile industry to focus on export promotion. The main problem with Phase VI was that it included a local content programme and it was implemented during a period of

political and economic uncertainty. The Motor Industry Development Programme (MIDP) has been regarded as being successful. This is because it has resulted in a rapid increase in automobile exports and investment in the South African automobile industry. The Motor Industry Development Programme (MIDP) has included a variety of incentives in order to increase South African automobile exports. These have included: reduction in import tariffs, elimination of local content programme and duty-free allowances. Although South African automobile exports have increased rapidly, it is still an empirical matter whether the focus on the automobile industry has caused economic growth in South Africa.

Chapter 3

Literature Review

3.1) Introduction

In order to examine the relationship between automobile exports and economic growth in South Africa, it is imperative to consider the relevant theoretical and empirical literature. The theoretical literature review will focus on the Export-Led Growth hypothesis which views export growth as having a positive impact on economic growth in the long run. The Export-Led Growth hypothesis will provide a suitable guideline in terms of establishing the contribution of automobile exports to economic growth as well as the relationship between automobile exports and economic growth in South Africa. In addition, other theoretical perspectives such as the Classical perspective and exports as an engine or a handmaiden of growth will be considered in the theoretical literature review. The empirical literature review will investigate whether the empirical studies performed on the automobile industry have provided a guideline with regard to the long run relationship between automobile export expansion and economic growth. The focus of the empirical literature review will be empirical studies that have examined the Export-Led Growth hypothesis in order to gain insight into what factors and possible additional variables should be used in the study.

3.2) Theoretical Literature Review

The Export-Led Growth hypothesis postulates the existence of a positive long run relationship between export growth and economic growth. If this applies to the case of the South African automobile industry, it would imply that automobile exports will make a positive contribution towards output growth in the long run. In order to investigate the dynamics of this relationship and the Export-Led Growth hypothesis, it is important, first of all, to consider the theoretical and trade policy perspectives with regard to international trade and development.

3.2.1) The Classical Perspective

The Classical Theorists, Adam Smith and David Ricardo, emphasised the importance of exports as a determinant of economic growth. According to Thirwall (2000:428), Adam Smith "... stressed the importance of trade as a vent for surplus and a means of widening the market..." In this way, a given country would produce beyond its domestic level of production so that it could export the surplus production. The export market was regarded as an additional market in which the given country would be able to sell its commodities. This would result in firms expanding their scale of production and, ultimately, achieve

economies of scale and economic growth. David Ricardo was the founder of the concept of comparative advantage. Meier (1988:3) explains that "... Ricardo demonstrated that under conditions of free trade, a country will specialize in the production and export of those commodities for which its costs are comparatively lowest ..." Furthermore, the given country would import commodities that it produced at relatively high cost. According to Ricardo, a country was deemed to have a comparative advantage in a commodity if it was able to produce the given commodity at a lower average cost and thus more efficiently than other firms in the global market. In this way, the cost of indirectly producing imports would be less than if the given country had to produce these goods domestically. Countries were, therefore, encouraged to specialise in commodities that they had a comparative advantage in and import those goods for which they had a comparative disadvantage. As a result, efficient allocation of commodities would be achieved and countries that were engaged in trade would only benefit. Taban and Aktar (2008:1537) argue that the "... better a country is at producing its specialised commodities, the more revenue it will raise from its exports and the more it will be able to procure imports." Export expansion was regarded as resulting in an increase in export revenue in the form of foreign currency. The more a country was able to specialise in producing a commodity, the greater the exports of that commodity would be and the larger the sum of foreign currency revenue the given country would receive. This foreign currency could then be used to purchase imports that would be necessary for the production of the given commodity. This relates to the South African automobile industry as foreign currency revenue is required in order to imports inputs that are necessary for production and export.

The nature of the Classical trade theory was intended to explain the possible advantages of and gains from trade and specialisation in production and the export of goods. A limitation of the Classical perspective is that it focused mainly the possible static gains from trade. As a consequence of this, any dynamic gains from trade were ignored. According to the Classical perspective, a positive long run relationship between export growth and economic growth was implied as the gains from trade could be interpreted as economic growth. It is, however, questionable as to whether South Africa actually has a comparative advantage in producing automobile exports. The South African automobile industry is highly dependent on the foreign-owned parent companies. Also, automobiles are produced at relatively lower cost in other developing countries such as Brazil. Furthermore, dynamic gains from trade are more crucial for long run economic growth than the static gains from trade as identified by the Classical perspective. It is possible that automobile exports in South Africa have made a positive contribution towards long run economic growth through dynamic gains from trade rather than static gains from trade.

Dynamic gains from trade are more likely to explain the positive long run contribution of automobile export expansion on economic growth than static gains from trade. It is, therefore, important to focus rather on the concepts of trade and growth that would be more appropriate in the analysis of the relationship between automobile exports and economic growth in South Africa. Therefore, it is necessary rather to consider the other theoretical perspectives such as the Export-Led Growth hypothesis and exports as an engine of economic growth.

3.2.2) Export-Led Growth Hypothesis and Export Pessimism

The Export-Led Growth hypothesis states that export expansion will have a long run positive impact on economic growth. This is based on the idea that exports act as an engine of growth, consisting of two critical gears. The ability of export growth to cause economic growth depends on the tightness of the fit of the two principal gears. The two critical gears are: (i) the link between growth in developing countries and trade and (ii) the stable, mechanical relationship between economic growth in developed countries and export growth in developing countries (Riedel, 1984:58). With reference to the first gear, there are two main versions of the relationship between developing countries and export expansion. These are namely the demand and supply versions.

The demand version is viewed as possibly being the more important link because it regards externally driven exports as being a paramount component of aggregate demand and the key to long run economic growth. According to the demand-side perspective, an increase in exports will lead to an increase in aggregate demand and this, in turn, will cause an increase in output growth. Balaguer and Cantavella-Jordá (2002:4) explain that "... injections into the circular flow of income caused by the aggregate exports ... implies an improvement in the output level via the multiplier effect." This refers to the notion of Keynesian national income identity in which exports are regarded as a component of aggregate demand. This is specifically represented by the following identity:

$$GDP = C + I + G + X - M \quad \text{.....(1)}$$

where GDP denotes GDP; while C, I, G, X and M represent consumption, investment, government spending, exports and imports, respectively. According to this identity, export expansion is viewed as having a positive relationship with output growth. Haldar (2009:106) explains that, in the "... context of growth theory, the Keynesian income determination model has exerted enormous influence in macroeconomic analysis over the last six decades." This is mainly because exports were regarded as an autonomous

component of GDP and the demand factors (such as exports) were viewed as the main means of achieving long run economic growth. Most economies were regarded as having insufficient demand and therefore needed an additional demand stimulus (e.g. an increase in autonomous exports) in order to achieve sustainable economic growth. Supply factors were regarded as having very little impact on economic growth as they were viewed as possibly resulting in overcapacity in the economy, rather than driving economic growth. In addition, developing countries (such as South Africa) were viewed as being characterised as under-utilising the supply factors such as labour and capital. As a result, developing countries are regarded as facing demand rather than supply constraints. Autonomous export expansion, therefore, provides a suitable means of obtaining long run economic growth via the simple Keynesian multiplier approach. In light of this, the Keynesian perspective recommended that economies should implement demand-based policies in order to achieve economic growth. This meant that export, government spending or investment should be expanded in order to obtain economic growth. Another important feature of the Keynesian feature was that an initial increase in autonomous exports would cause an even greater rise in economic growth via the simple Keynesian multiplier effect. In this way, export expansion was viewed as a more appropriate means of obtaining economic growth than supply factors.

According to the Keynesian theory, if the economy were at a level of full employment, an increase in demand would only have an inflationary effect as it would only leads to a rise in prices. The South African economy is definitely not at a level of full employment due to the high unemployment rate in South Africa as well as the underemployment of many natural resources. Therefore, it can be argued that an increase in automobile exports could cause a greater change in output growth than inflationary effects. Felipe (2003:11) explains that according to Keynesian theory, "... it is demand that drives the economic system to which supply adapts." Therefore, economic growth is not a question of the productivity and the possible current availability of supply. Growth depends entirely on the demand factors (i.e. exports expansion and the other components of demand). In this way, exports are regarded as an engine of economic growth as they directly cause a long run increase in economic growth. The demand-side perspective forms a basis for the Export-Led Growth hypothesis as it indicates how export expansion is able to influence economic growth positively in the long run.

According to the supply-side version, economic growth was assumed to be a function of mainly labour and capital productivity. In the Neoclassical perspective, total output is dependent on capital productivity, labour productivity and technological change. Demand

factors were viewed as having no effect on equilibrium output or employment. This was due to the role of interest rates as a self-stabilising factor. The augmented Neoclassical production function included exports as an additional factor that would positively affect economic growth via total factor productivity (Mallick 2002: 311).This can be represented by equation 2 below:

$$Y_t=f(X^{\alpha},K^{\beta},L^{\delta}) \quad \text{.....(2)}$$

where Y_t represents output growth; while X, K and L denote exports, technologically augmented capital and labour, respectively. α, β and δ represent the responsiveness of total factor productivity to changes in exports, capital and labour, respectively. Exports were included in the augmented Neoclassical production function as they were viewed as an additional source of output growth. The Neoclassical perspective viewed technological progress as the main factor that would increase the capital and labour productivity. In this way, technological growth would enhance the growth rate. However, even though exports were included in the augmented Neoclassical production function, labour and capital productivity were still regarded as having the greatest impact on long run economic growth. Given that the supply-side version explained the long run positive impact of export expansion on economic growth, it does not seem to be entirely relevant to the Export-Led Growth hypothesis. This is because supply-side version treats export expansion as an additional and not the main factor to cause positive long run economic growth. The Export-Led Growth hypothesis stipulates that export expansion is the key factor in causing positive long run economic growth.

The Neoclassical model focused on augmented factor productivity. Hence, emphasis was placed on potential growth rather than actual growth. In order to analyse the long run relationship between automobile exports and output growth, it is essential that emphasis be placed on the examination of the relationship between automobile export growth and the actual GDP growth rate. Felipe (2003:18) indicates that "... it is not likely that growth will be increased exclusively by policies that stimulate supply... " Supply factors are regarded as bringing about an increase in long run economic growth by means of a rise in total factor productivity. However, this could also lead to an overcapacity in the economy. As a result, demand factors (such as exports) are possibly more crucial for generating long run economic growth. This is highly applicable in the case of developing countries, such as South Africa that are already characterised by excess supply. Focus should be placed on the effectiveness of demand factors in stimulating economic growth rather than supply factors. The significance of demand factors in generating economic growth has also been warranted by the fall in capital formation, especially in the case of developing countries.

Exports as a component of export growth seems to be more pertinent to the Export-Led Growth hypothesis as it explains the reasons that export expansion will be the main factor in causing positive long run economic growth.

The second gear in the concept of exports as an engine of economic growth focused on the relationship between economic growth in the developed countries and export growth in the developing countries. This implies that export growth in the developing countries is highly dependent on the income of developed countries. Felipe (2003:4) argues that the Export-Led Growth hypothesis "... rests on exogenous world demand ..." As a result, a developing economy is able to overcome any diseconomies of scale by increasing both its production and export of a given commodity. Foreign demand will allow the developing country to gain access to additional markets in which it can sell and thus export its commodities. This exposure to the global and international market would allow domestic firms to increase their X-efficiency and, thereby, result in relatively lower average cost curves. This relationship between exports and growth would be indirect and implied because emphasis is placed on the relationship between economic growth in the developed countries and export expansion in the developing countries (Herzer, 2000:7). If national income in the developed countries increases, exports in developing countries would also increase and, ultimately, economic growth in the developing countries. Similarly, a fall in the national income of the developed countries would bring about a fall in exports in developing countries, which would eventually translate into a decrease in economic growth in the developing countries. This relationship may be relevant in the context of the South African automobile industry as vehicle exports are dependent on foreign demand and the possible rise and fall of foreign national income. However, South African automobile exports are not only destined for developed countries. South Africa exports vehicles to other African countries and other developing countries. This distorts the second gear of exports as an engine of growth because the expansion of automobile exports in South Africa does not only depend on economic growth in the developed countries. In order to examine the long run relationship between automobile export expansion and economic growth in South Africa, it is necessary rather to focus on the direct relationship between automobile export growth and economic growth in South Africa. Furthermore, it is possibly more relevant to analyse the contribution of automobile export growth to long run economic growth; rather than focusing on the relationship between GDP in foreign developed economies and automobile export growth in South Africa.

The relationship between exports and economic growth is highly dependent on the operation of the two afore mentioned gears. Any form of economic slowdown could be explained by either one or both of the gears not operating. For example, if the demand or supply factors did not lead to economic growth, this would result in an economic slowdown of growth. Similarly, if the level of the demand of developing countries' exports decreased or was halted, economic growth in the developing countries would fall. According to Meier (1988:12), Kravis (1970) found that growth was mainly linked to the ".... consequence of favourable internal factors ..." In this way, exports were viewed as a handmaiden and not as an engine of economic growth. Kravis (1970) regarded exports as an additional stimulus to economic growth. Therefore, factors other than exports were viewed as providing a greater contribution towards long run economic growth than an expansion in exports. According to the Export-Led Growth hypothesis, an expansion in exports is regarded as the main factor to influence long run economic growth positively. The view of exports as a handmaiden of economic growth would, therefore, be in contrast to the Export-Led Growth hypothesis. Automobiles constitute just one of South Africa's main exports. It is possible that automobile exports may not be the main export sector that contributes to long run economic growth in South Africa. Although South African automobile exports could be considered to be a handmaiden rather than an engine of economic growth, it is necessary to determine whether they contribute positively to long run economic growth in South Africa and thus whether the Export-Led Growth hypothesis is applicable in the case of automobile exports in South Africa.

Exports as an engine of economic growth have been regarded as being pertinent to the 19th century. During this period, the United Kingdom was viewed as the focal centre of economic expansion and the source of large movements of financial capital. Furthermore, the 19th century was characterised by substantial increases in the demand for primary commodities exports from the Regions of Recent Settlement. However, Deardorff and Stern (2007:2) explain that from World War I "... to the end of the 1950s, once the post-war recovery took hold, the production and trade of the major industrialised countries rose significantly." It was during this period that Nurkse (1961) noted the existence of a market slowdown in the export expansion of primary commodity exports (except in the case of oil) from the developing countries. Nurkse (1961) attributed this slowdown in primary commodity exports to a number of factors such as: the shift in production of the developed countries from labour-intensive commodities to capital-intensive commodities; the relatively low income elasticity of demand for primary commodities exports; increased protection in the agricultural sector; and the development of synthetic and man-made substitutes for staple goods. Nurkse (1961) argued that the reason for the failure of

exports as an engine of growth in the 20th century was due to the increased substitution by the developed countries of their products for primary commodity export products from the developing countries. This gave rise to export pessimism and the implementation of imports substitution policies. Export pessimism implied that the natures of the commodities that were exported did matter. Although the export pessimism does provide an explanation as to why long run economic growth may not be achieved, it might not relate to Export-Led Growth hypothesis in the case of the South African automobile industry. This is mainly because automobile exports constitute manufactured commodities and not primary commodities.

3.2.3) The Endogenous Growth Hypothesis

The Neoclassical growth model was challenged by the Lucas (1988) and Romer (1990) endogenous growth model. Mallick (2002:308) indicates that the endogenous growth models of Lucas (1988) and Romer (1990) emphasised the "... role of endogenous factors .... as the main engines of economic growth." However, these models differed with regard to the source innovations or spill-over effects. In the Romer (1990) endogenous growth model, focus was placed on the investment in physical capital. In the Lucas (1988) endogenous growth model, attention was placed on the investment in human capital rather than physical capital (Fedderke and Simkins, 2006:4). In this way, Lucas (1988) viewed human capital as an endogenous factor of growth that depicted the quality of labour in the domestic industry. An increase in exports is regarded as having knowledge spill-over effects. In this way, export expansion will lead to improved knowledge, skills and advanced technology being used in the export industry. As a result, labour productivity will increase in the given export industry. However, this does not necessarily occur in developing countries. Herzer (2000:7) states that "... the ability of the non-export sector to absorb potential knowledge spill-overs from the export sector depends on its absorptive capacity." The domestic firms are mainly characterised by backward production techniques and low skilled workers. This makes it difficult for developing countries to make use of both the advanced technology and the knowledge spill-overs from developed countries. The limitation in the utilisation of technology and knowledge is not the only problem that developing countries face with regard to the Export-Led Growth hypothesis. Herzer (2000:7) indicates that "... many developing countries are subject to excessive business and labour regulations that limit both the mobility of factors between sectors and the flexibility of factor prices." These factors have the ability to limit the potential knowledge spill-overs. As a result, they could cause productivity losses resulting in the underemployment of resources. Therefore, an increase in exports in developing countries

may not increase the productivity, skill-level, output, and reduce unemployment in the given country.

Economic growth is obtained through the 'learning-by-doing' effect as the rise in labour productivity is viewed as having positive externalities by enhancing both public and private investment in human capital and, thereby, leading to long run economic growth. The South African automobile industry relies on technology, knowledge and know-how from the foreign-owned parent company (Flatters, 2002: 4). With reference to the South African automobile industry, imported inputs that may contain more advanced technology from abroad are used in the production and export of vehicles in South Africa. As a result, automobile export expansion provides a means of gaining access to imported inputs that contain more complex technology. In this way, the South African automobile industry will improve its production processes by gaining access to technologically innovative and possibly more efficient methods of producing and exporting automobiles. By importing technologically sophisticated automobile components, the South African automobile industry will be able to obtain economies of scale and improve the technological knowledge and skills of its labour force. Therefore, an increase in exports will result in an increase in technologically augmented labour. According to the Lucas (1988) endogenous growth model, it is this technologically augmented labour force that will lead to economic growth. However, the Endogenous growth theory is in contrast to the Export-Led Growth hypothesis as it views exports as an additional and not the key factor in contributing to long run economic growth.

3.2.4) The Nature of Causality between Exports and Economic Growth

Assuming that exports are beneficial and not a faltering engine of economic growth, the Export-Led Growth hypothesis suggests that there is a long run causal relationship between exports and economic growth. According to Khan et al. (1995:1002), "... a definite unidirectional causality running from exports expansion to economic growth ... will lend credence to the Export-Led Growth strategy." For the Export-Led Growth hypothesis to hold, it is imperative that only a long run unidirectional causal relationship exists running from exports to economic growth. If the causal relationship occurs in the short run and not the long run, this does not constitute the Export-Led Growth hypothesis. If the long run causal relationship is found to run from economic growth to export growth, this is referred to as the Growth-Led (or Growth-Driven) hypothesis. This suggests that domestic output growth is a prerequisite for export growth. Tsen (2010:625) argues that "... there is a possibility of feedback effects from economic growth to exports and domestic demand." It

is possible that economic growth could cause both an increase in exports and domestic demand. This expansion of domestic demand is associated with the rise in national income due to the increase in domestic output. However, this rise in domestic demand could lead to a decrease in exports and result in a negative relationship between export growth and output growth. This would occur if the rise in domestic demand (as a consequence of output growth) is concentrated in commodities that were formerly destined for the export market. In this way, the rise in domestic output would cause consumers to purchase goods that might previously have been exported. For example, if domestic consumers' income increases, they may decide to change their consumption patterns and purchase more South African–produced automobiles. This would occur even though the automobiles were actually intended to be exported to foreign markets. As a result, automobile exports would decrease as automobiles produced in South Africa and destined for the export market were rather domestically consumed. This could lead to a situation where automobile imports are greater than automobile exports.

If other components of demand, other than exports are found to cause economic growth, this gives rise to the Domestic Demand-Led Growth hypothesis. This suggests that domestic demand would cause economic growth and, there would be no causation running from exports to economic growth. According to this view, domestic demand factors have a more significant role in explaining economic growth. Exports would either not cause economic growth or have a minimal role in generating economic growth. Tsen (2010:631) points out that "... an increase in economic growth in turn would lead to an increase in domestic demand, which is called the Growth-Led Domestic Demand hypothesis." This indicates that an increase in economic growth would cause a rise in domestic demand.

Bidirectional causality between exports and economic growth can also occur. This implies that a rise in exports would cause economic growth and in turn, a rise in economic growth would cause export growth. However, there is no specification as to whether a rise in exports would cause an increase in economic growth first or whether economic growth would cause a rise in exports first. Furthermore, there is no specification as to whether the export expansion or economic growth would cause each other at the same time. Bidirectional causality only indicates that there is dual causality between exports and economic growth. With reference to causality, the Export-Led Growth hypothesis can be viewed according to a narrow or a broad definition. The narrow definition of the Export-Led Growth hypothesis states that a rise in exports must cause an increase in economic growth and there is no causality running from economic growth to export growth. The broader definition of the Export-Led Growth hypothesis states that there is bidirectional

causality between exports and economic growth. It is also possible that no causality occurs between exports and economic growth. Anwer and Sampath (1997:13) explain that if "... GDP and exports do not cause each other ... there are other factors which keep them moving together." This implies that export growth would not have any causal effect on economic growth and that economic growth would not cause export growth. This does not mean that export growth will not contribute towards economic growth or that economic growth will not influence export growth. If it is found that there is no causality between automobile export growth and economic growth, it is possible that automobile exports may still contribute towards economic growth in the long run or short run, but this impact on economic growth may be minimal and will not lead to a causal relationship.

3.2.5) Import Substitution versus Export Promotion

Both inward-orientated and outward-orientated trade policies have been recommended as alternative strategies in promoting long run economic development and sustained growth. According to Sawyer and Sprinkler (2009:125), "... export promotion has been proposed as a favourable trade policy for developed and newly developing nations." Inward-orientated trade policies focus on promoting domestic production and limiting trade openness via import substitution and are characterised by protection instruments such as: import tariffs, quotas, direct import controls, exchange controls and non-tariff barriers. Inward-orientated trade policies are indicative of creating an anti-export bias. In contrast, outward-orientated trade policies emphasise trade openness and view exports as the key or engine for economic growth. These policies are characterised by instruments geared at promoting exports. Hence, under an outward-orientated trade policy, there are either very few or no import tariffs and trade restrictions. Clarke and Ralman (2005:4) indicate that inward-orientated trade strategies "... dominated in the 1950s and 1960s, whereas export expansion was the focus in the late 1970s and especially amongst Western and World Bank economists, in the 1980s and 1990s." Historically, most developing countries adopted an inward-orientated trade policy. Clarke and Ralman (2005:4) explain that "many global markets, to which the developing nations can target, are themselves often protected, making it difficult for the developing nation to compete for market share." If other economies are protected, this would result in a negative impact on the cost of production in developing countries. Manufactured exports (especially the automobile industry) would face higher costs because their exports would become relatively more expensive due to the import tariffs. The only way that developing countries would be able to compete in the global market would be to impose import tariffs and other trade restrictions

Under import substitution, exports are regarded as not having any influence on long run economic growth. The main focus of inward-orientated trade policy is to protect the domestic industry. In this way, the domestic industry and domestic production are viewed as the main determinant of economic growth. Riedel (1984:56) explains that the "... solution prescribed in the 1950s was to look inward..." Import substitution was viewed as an important element of both the development and promotion of sustainable economic growth. As a result, the protectionist import substitution policies were adopted by many developing countries. Inward-orientated trade policy favours domestic production and output rather than export growth. According to the inward-orientated trade strategy, a developing economy is unable achieve economic growth and industrialisation unless there is some means of protection. Therefore, it was recommended that domestic production be protected so that the domestic industries were able to develop and achieve economies of scale by increasing their output levels. The main aim of import substitution strategies was to promote industrialisation of the local production (Elbeydi et al., 2010:70). Inward-orientated trade policy focuses on substituting imports needed for the further development of the domestic industries. According to this view, protection through imports substitution will force local industries to acquire the means of domestically produced commodities that would normally have been imported. In this way, domestic production is characterised by commodities that contain more advanced skills and technology and have the ability to compete in the global market. In light of this, import substitution was regarded as being necessary for the assistance and protection of the newly emerging manufacturing sector, especially with regard to industries in small and developing countries. (Edwards 1993:1358) The South African automobile industry is an example of such an industry as it was characterised by high tariffs in order to protect and develop the industry.

One of the main theoretical arguments for protection is the infant industry argument. Felipe (2003:30) indicates that imports substitution policies "... typically favoured the protection of infant industries..." Many developing economies adopted the infant industry argument for the purpose of protection, developing and industrializing their domestic industries. According to the infant industry argument for protection, domestic industries that were viewed as having the potential of contributing towards domestic economic growth were identified and import tariffs were imposed via import substitution. This was so that the domestic industry would be able to develop and generate growth in the economy. However, these import tariffs were intended to be implemented on a temporary basis. Once the given industry was able to obtain economies of scale and produce output at a relatively lower average cost compared to other industries in the world market, the import tariff would be removed. It can be argued that the infant industry argument was one of the

main reasons that high import tariffs were imposed to protect the South African automobile industry. However, the high levels of protection placed on the South African automobile industry did not allow the industry to become competitive and resulted in an automobile industry that was characterised by low levels of output and relatively high average costs of production. With regard to the potential positive relationship between automobile exports and economic growth, imports substitution favoured domestic production rather than exports as a determinant of economic growth. Therefore, under imports substitution, an increase in automobile exports would have either very little or no influence on economic growth. According to the inward-orientated trade strategy, economic growth was regarded as a consequence of efficient domestic production of automobiles under a protective regime of high tariffs. In addition, the domestic production of automobiles would be entirely geared for the domestic market. Hence, domestic factors were viewed as being more important for achieving long run economic growth.

Unlike, imports substitution, outward-orientated trade policy involves the absence of trade restrictions. Outward-looking strategies involve strategies aimed at both supporting and building up the manufacturing sectors in order to create and establish potential comparative advantages. Al Mamun a[illegible] (2005:361) indicate that "... trade liberalisation and domestic deregulation were the focus of trade and industrial policies since the 1980s ..." Export promotion focuses on the importance of exports and trade openness in obtaining long run economic growth. This is unlike inward-orientated trade policy where the domestic economy is regarded as sufficient in generating growth. Export promotion views a long run positive relationship between export growth and economic growth. Outward-orientated trade policies also recognise the need for greater industry efficiency and competitiveness in the global market; the potential growth of industries through export growth; the reduction of regulations and the liberalisation of the market-based competitive economy and the disinvestment of public sectors (Al Mamun and Nath, 2005:361). Export promotion is more in line with the Export-Led Growth hypothesis as an expansion of exports are regarded as causing long run economic growth. According to the export promotion strategy, various benefits of export growth are identified. These include: access to the global market and foreign exchange, the easing of the balance of payments constraints, positive externalities on non-export sectors and promotion of economies of scale.

Silverstovs and Hertzer (2005:2) indicate that "... export expansion may indirectly affect growth by providing the foreign exchange that allows for increasing levels of capital goods imports." In this way, an increase in exports will result in access to foreign exchange and

result in foreign exchange accumulation. This, in turn, would cause an increase in imported inputs necessary for production and lead to an expansion in the scale of production of the domestic export industry. This is particularly relevant to the South African automobile industry as most of the inputs utilised in the assembly production of automobiles are imported. Therefore, a rise in automobile exports will lead to the availability of foreign exchange which can be used for procurement of imported inputs. Access to foreign exchange is regarded as being crucial for any developing economy (Tsen, 2010:628). This is because export expansion is viewed as being a more efficient way of impacting the development of needs of a developing economy rather than raising foreign debts. Palley (2002:3) explains that developing economies "... borrow in hard currency, and as their terms deteriorate it becomes even harder to earn the currency needed to service their debts." Foreign debts are regarded as resulting in debt default as they are subject to adverse shocks of the currency. This expansion of exports through foreign exchange accumulation is viewed as increasing the economies' capacity and, therefore, resulting in long run economic growth. Outward-orientated trade policy is more in line with the Export-Led Growth hypothesis as it provides the means by which exports are able to expand and make a positive long run contribution to economic growth.

A limitation of the Export-Led Growth hypothesis is the dependency of domestic exports on foreign income and tastes. Tsen (2010: 625) argues that it is unlikely that the "... reliance on Export-Led Growth hypothesis will result in sustained long run economic growth in less developing economies (LDCs)..." Global markets are viewed as being both volatile and unpredictable. A recession or financial crisis in the global markets will have a negative impact on developing countries' exports. If the national income of the global markets falls, the exports from developing countries will also fall and this will lead to either a slowdown or reduced economic growth in domestic economies. This is particularly relevant for the case of automobile exports in South Africa as they are dependent on the income levels of the economies of both the Unites States and Europe. Thus, any economic slowdown in these countries will negatively impact South African automobile exports. Another limitation pertains to fallacy of composition. Palley (2002:2) explains that "... when one country manages to increase its exports it often does so by crowding out the exports of another developing country." This implies that all developing countries cannot pursue the Export-Led Growth hypothesis at the same time. If all of the developing countries increase their exports via export promotion with the objective of obtaining economic growth, this will only lead to a zero sum gain. Tsen (2010:630) indicates that, in the global context, "... there is a danger of a beggar-thy-neighbour outcome in which all try to grow on the back of demand expansion in other countries." This is viewed as giving rise to excess supply in the

global market and deflationary effects. However, the fallacy of composition criticism is based on the total exports of the developing countries rather than specific sector exports (such as automobile exports). It is, therefore, questionable as to whether this limitation will necessarily hold for the case of South African automobiles. Despite these criticisms, the Export-led Growth hypothesis provides a guideline with the long-run relationship between total exports and economic growth. However, it is necessary to consider whether or not this impact on economic growth would differ due to the nature of the commodity exported.

3.2.6) The Nature of the Commodity Exported

Most of the criticism of the Export-Led Growth hypothesis relates to the heavy dependence of developing countries on the production and increased export of primary commodities. Edwards and Lawrence (2006:6) point out that commodity prices "... are very volatile, and excessive dependence on such products subjects the economy to considerable instability." Hence, the dependency on primary commodity exports is regarded as resulting in increased uncertainty and variability of both export revenues and economic growth (i.e. GDP). This uncertainty has a negative effect on any efforts for economic planning. In addition, the primary export sector is considered as having either very little or no linkages with technology or knowledge spill-overs into the economy. Furthermore, export dependency on primary commodities can result in a shift away from competitive manufacturing sectors. This could result in an additional negative impact on economic growth because the manufacturing sector is viewed as the key element for generating the positive externalities that are necessary for sustained economic growth.

Exports of manufactured commodities are associated with dynamic benefits from trade. Medina-Smith (2001:1) indicates that the "... association between exports and growth is often attributed to the possible positive externalities for the domestic economy arising from participation in world markets, for instance from the reallocation of existing resources, economies of scale and various labour training effects." This is important in the case of the production of automobiles as economies of scale are necessary in order to reduce the average cost of production. A growth in exports is also viewed as generating employment opportunities in developing countries. The increase in exports of automobiles can also assist in training and thus, allowing the South African labour force to become more skilled. Hence, an expansion of automobile exports is more likely to have a favourable long term affect on economic growth compared to an increase in primary commodity exports. This is due to the nature of the commodities exported.

3.3) Empirical Literature Review

The majority of the empirical studies regarding the automobile industry have focused on the structural changes in the South African automobile industry such as: the impact of policies such as trade liberalisation and the motor industry development programme. The empirical study performed by Black (2001) examined the development of the South African automotive industry over the period 1980 to 2000 and emphasised the possible link between domestic economic conditions and the incentive structure of the Motor Industry Development Programme (MIDP). Focus was placed on analysing the changes in the protection regime and export assistance in the South African automobile industry. The empirical study performed by Black and Mitchell (2002:1) investigated the possible impact of the incentive structure adopted by the South African automobile industry. Emphasis was placed on the role of incentives and the relevant economic policy in meeting the objectives of the industry and possibly obtaining a rise in automobile exports.

Since none of these studies has focused on economic growth or explored the potential link between automobile export expansion and economic growth, they have not provided any form of guideline with regard to examining the relationship between automobile exports and economic growth in South Africa. Furthermore, Black (2001) and Black and Mitchell (2002) both provided a description of and historical account of the trade policies adopted by the South African automobile industry. In the absence of any form of statistical or econometric analysis, the studies performed by Black (2001) and Black and Mitchell (2002) do not provide an adequate guideline for analysing the relationship between South African automobile exports and economic growth. The empirical literature that seems to be more relevant are those that have investigated the Export-Led Growth hypothesis. The empirical literature with regard to the relationship between exports and economic growth focuses on the issue of causality between export growth and economic growth. The format adopted in most of these empirical studies is as follows: testing for stationarity, co-integration and causality of the relevant variables. The empirical studies can be divided into two main groups: empirical studies that examine a number of different countries and country-specific empirical studies. The empirical studies differ in terms of their findings and the variables used in the each of the empirical studies.

3.3.1) Cross-sectional Empirical Studies

Bahmani-Oskooee and Alse (1993) used quarterly time-series data to analyse the bivariate relationship between export growth and economic growth in a number of developing countries for the period 1973 to 1988. The Engle and Granger two-step model found evidence of a long run relationship between export growth and economic growth in

the case of all the countries in the empirical study, except for the case of Malaysia. Hence, it was concluded that there was no long run relationship between real GDP and real exports in Malaysia. The estimated co-efficient of the long run relationship suggested the presence of a positive relationship between real GDP and real exports. Bahmani-Oskooee and Alse (1993) concluded that in Colombia, South Africa and Philippines, causation was found to run from real exports to economic growth. In Greece, Korea, Pakistan, Singapore and Thailand, bidirectional causality was found to exist between export growth and economic growth. The main findings suggested that the Export-Led Growth hypothesis was applicable (except for the case of Malaysia). This was due to the presence of a long run positive relationship between real exports and GDP.

Njikam (2003) examined the causal relationship between exports and growth for 21 Sub-Saharan countries. Njikam (2003) divided total exports into agricultural exports and manufacturing exports. Furthermore, the study was separated into two sub-periods in order to examine the effect of manufacturing and agriculture exports during the period of imports substitution and export promotion. During the period of import substitution, Njikam (2003) found that there was more evidence of a unidirectional causal relationship running from economic growth to manufactured exports; while the export promotion period revealed greater evidence of bidirectional causality between manufactured exports and economic growth or the existence of unidirectional Granger Causality running from manufactured exports to economic growth. The main findings suggested that the Growth-Led hypothesis was valid for the import substitution period; while the Export-Led Growth hypothesis was valid for the export promotion period. In addition, manufactured exports were found to play a more significant role in generating growth in the export promotion period than in the import substitution period. This revealed that both the nature of the good and the trade policy has affects whether or not export expansion positively contributes towards economic growth in the long run.

Maneschiöld (2008) examined the relationship between export and economic growth for Argentina, Brazil and Mexico, especially pertaining to the period after the introduction of NAFTA. Maneschiöld (2008) employed a bivariate model of exports and GDP, using quarterly data for the period 1991 to 2006. The Augmented Dickey-Fuller and Phillips-Perron test were employed to test for the order of integration. The Johansen Co-integration Technique revealed that the existence of only one co-integrating relationship between real total exports and real GDP for the case of Argentina and Mexico. No evidence of a long run relationship between real total exports and real GDP was found for the case of Brazil. Maneschiöld (2008:299) concluded that exports are "... the leading

variable in the co-integration between GDP and export for Argentina." The main findings indicated that exports had a major impact on economic growth and that the Export-Led Growth hypothesis was valid for the case of both Argentina and Brazil. In addition, bidirectional causality between exports and economic growth was found in both Argentina and Mexico. Even though an increase in exports seemed to influence economic growth in Brazil, this was a short run rather than a long run phenomenon. It was concluded that the Export-Led Growth hypothesis was not valid for the case of Brazil.

3.3.2) Country-Specific Studies

3.3.2.1) Countries in Africa and the Middle East

Ukpolo (1998) performed an empirical investigation of the relationship between export growth and economic growth in South Africa during the period 1964 to 1993. The Dickey-Fuller and Augmented Dickey-Fuller tests were used to test for the order of integration. The Ljung Box was employed to determine the appropriate number of lags in the bivariate VAR model. The Johansen Co-integration Technique revealed that a long run relationship existed between real GDP and real export[illegible]e Amended Granger Causality test was employed to determine the [illegible] of causality between real exports and economic growth in South Africa. Ukpolo (1998:4) concluded that economic growth Granger caused real export in South Africa for the period 1964 to 1993. The main findings suggested that the Growth-Led hypothesis was applicable for the case of South Africa. This was mainly because there was no evidence of a long run relationship running from real exports to real GDP. In this way, real exports did not seem to make a positive long run contribution towards economic growth in South Africa. Instead economic growth was found to cause export expansion. As a result, the Export-Led Growth hypothesis was not valid for the case of South Africa.

Using quarterly time-series data for the period 1970 to 1997, Deme (2002) examined the validity of the Trade-Led Growth hypothesis in the case of Nigeria. Two sets of measures for trade openness were employed. The first set of measures consisted of imports, exports and the sum of exports and imports. The second set of measures consisted of each of the afore mentioned variables as a percentage of real GDP. The Johansen Co-integration Technique found no evidence of a long run relationship between economic growth and the various measures of trade openness. A VAR model was employed to investigate the relationship between export growth and economic growth. The main findings of the study concluded that exports had positive impact on economic growth in the

short run. Deme (2002:8) explained that the possible reason for the lack of a long run relationship between the variables was due to export revenues "... not invested carefully on targeted projects with high returns ..." In Nigeria, any revenues from exports were used to finance projects with either no or very little economic returns. A bidirectional relationship was found to exist between real exports and real GDP, in the short run. The impulse response function indicated that a one-time shock in real exports stimulated positive economic growth. However, the impact seemed to subside with minor tremors (Deme 2002:11). Although export expansion was found to positively impact economic growth, this was a short run rather than a long run phenomenon. Therefore, the Export-Led Growth hypothesis was not found to be valid for the case of Nigeria.

Mohan and Nandwa (2007) analysed the validity of the Export-Led Growth hypothesis and the contribution of exports to economic growth in Kenya for the period 1970 to 2004. The variables used in the study included: real GDP, exports, imports, labour and the nominal exchange rate. In addition, a dummy variable was utilised in 1983 to denote the period of economic liberalisation in Kenya. The Augmented Dickey-Fuller and Phillips-Perron tests were employed to determine stationarity. The Bounds testing approach was utilised to examine the long run and short run contribution of exports to economic growth. The main findings revealed that both exports and labour had a positive relationship with economic growth. It was also concluded that exports made a greater contribution to economic growth than any of the other variables in the study and that unidirectional causality running from exports to economic growth existed. Since exports were found to have a greater positive long run contribution towards economic growth than the other factors (i.e. labour and capital), it was concluded that the Export-Led Growth hypothesis was applicable in the case of Kenya.

Musonda (2007) investigated the Export-Led Growth hypothesis in Zambia for the period 1970 to 2003. The variables included in the study were: real GDP, exports, imports, gross fixed capital formation, the exchange rate, the degree of trade openness and the labour force. The Augmented Dickey-Fuller test was used to investigate the stationarity of the variables. The Johansen Co-integration Technique revealed that there was evidence of a long run relationship between the variables, and the Wald Restriction Test was employed to determine the direction of causality. The main finding indicated that a bidirectional causal relationship existed between export growth and economic growth. In addition, exports were found to contribute positively towards economic growth in the long run. Therefore, the Export-Led Growth hypothesis was found to hold for the case of Zambia.

Husein (2009) focused on the relevance of the Export-Led Growth hypothesis for Jordan for the period 1969 to 2005. The variables included in the study are: real GDP, the net barter terms of trade and real exports. The Augmented Dickey-Fuller and Phillips-Perron test were employed in the study to determine the order of integration of the variables. The Johansen Co-integration Technique indicated the existence of one co-integrating vector between the variables. The Amended Granger Causality test was employed to determine the direction of causality. The main finding was that a bidirectional Granger causal relationship existed between real exports and economic growth. Since a long run relationship was found between exports and GDP, and export expansion was found to influence economic growth positively in the long run, the Export-Led Growth hypothesis was found to be applicable for the case of Jordan.

Chimobi and Uche (2010) analysed the interaction between real exports and aggregate domestic demand in generating economic growth in Nigeria, using annual data for the time period 1970 to 2005. Economic growth was viewed as a function of real exports, real government consumption and real household consumption. In this way, the potential influence of domestic demand was proxied by both government consumption and household consumption. The Augmented [illegible]uller and Phillips-Perron were employed to determine the order of integration. The Johansen Co-integration Technique did not find any evidence of co-integrating vectors. The main finding concluded that no long run relationship was found to exist between the variables. However, economic growth was found to Granger caused export growth in the short run. Evidence of bidirectional causality was found between economic growth and government expenditure and between between economic growth and household consumption in the short run. Export expansion did not seem to make any contribution towards economic growth in the long run or the short run. As a result, the Export-Led Growth hypothesis was not found to hold for the case of Nigeria. This was similar to the findings of Deme (2002).

Jordaan and Eita (2010) evaluated the causal relationship between exports and economic growth for the case of Botswana for the period 1996 to 2007. The Augmented Dickey-Fuller test was utilised to investigate the order of integration. Since both exports and real GDP were found to be stationary at levels, Jordaan and Eita (2010:10) indicated that there was no need to employ the error correction model. Two separate regressions were estimated. In the first regression, GDP was regarded as the dependent variable and exports as the explanatory variable. In the second regression, real exports were taken as the dependent variable and GDP as the explanatory variable. The main findings showed that a positive relationship existed between real GDP and export growth. In addition, the

Amended Granger Causality test indicated that bidirectional Granger Causality existed between real exports and economic growth in Botswana. Jordaan and Eita (2010:11) explained that the bidirectional "... causality between export and economic growth in Botswana is not surprising because the main export products are also the main contributors to GDP ..." The impulse response function indicated that exports responded positively to shocks in GDP and that exports responded positively to changes in GDP. Since a rise in exports was found to influence economic growth positively in the long run, the Export-Led Growth hypothesis was found to hold for the case of Botswana.

N'guessan Bi Zambe (2010) investigated the relationship between export growth and economic growth in Cote d'Ivoire for the period 1980 to 2007. The variables included in the study were: GDP, exports, imports, the exchange rate and total labour employed. In addition, a dummy variable was included in the model to capture as well as absorb any possible economic effects associated with economic and trade liberalisation in Cote d'Ivoire. The KPSS unit root test was employed to determine the order of integration. The Bounds test approach was employed to determine the short run and long run dynamic relationship between the variables. The VAR Granger (Block Exogeneity Wald Test) found evidence of a bidirectional causal relation[illegible]tween real exports and economic in the case of Cote d'Ivoire. The main findings revealed that both exports and labour had a positive impact on economic growth while the exchange rate and imports were found to have a negative influence on economic growth. Labour was found to have a more significant impact on economic growth than export expansion. This revealed that labour had a more significant factor in generating economic growth than exports in the case of Cote d'Ivoire. As a result, the Export-Led Growth hypothesis was found to be irrelevant for the case of Cote d'Ivoire.

3.3.2.2) Asian Countries

Khan et al. (1995) examined the direction of causality between economic growth and export growth, using quarterly time-series data for Pakistan for the period 1972 to 1994. Total exports were divided into manufacturing exports and primary exports. The Dickey-Fuller and Augmented Dickey-Fuller (ADF) tests were employed to test for stationarity. The Engle and Granger two-step method revealed the presence of co-integration between all of the variables, except for the case where real GDP was employed as the dependent variable and real primary exports were the explanatory variable in the regression. Khan et al. (1995:1005) found evidence of a "... two-way stable long run equilibrium relationship between exports (and manufactured exports) on economic activity." However, only a one-

way stable long run relationship was established between economic growth and primary commodity exports. As a result, a bi-directional long run relationship was found between manufacturing exports and real GDP in the case of Pakistan. However, there was only a unidirectional causation running from economic growth to primary exports. The Amended Granger Causality test was employed to determine the direction of causality. With regard to the long run regressions, all of the estimated coefficients were found to be positive. The main findings suggested a positive relationship between manufactured exports and economic growth as well as primary exports and economic growth. However, economic growth was found to influence primary commodity exports positively in the long run. In contrast, primary commodity exports were found not to contribute towards economic growth in the long run. It was concluded that there was no long run relationship running from primary exports to economic growth. It was concluded that the Export-Led Growth hypothesis applied to the relationship between manufactured commodities and economic growth in Pakistan.

Ghatak and Wheatley Price (1997) employed two different regressions in examining the relationship between export growth and economic growth in India for the period 1960 to 1992. Two separate regressions were used. In the first regression, non-export real GDP was used as the dependent variable and the explanatory variables were real total exports and real total imports. In the second regression, net export GDP was used as the dependent variable and the explanatory variables included real primary exports; real chemical and fuel exports; real manufactured exports and precious stone exports; real traditional manufactured exports; real non-traditional manufactured exports; real imports; real physical capital and real human capital. In addition, a Dummy variable was included in the second regression to take into account possible structural breaks in the chemical and fuel exports variable. The Engle and Granger two-step process was employed in the study. No evidence of co-integration was found with regard to the disaggregated model. As a result, Ghatak and Wheatley Price (1997) removed the measures of imports, human capital and exports of primary goods from the co-integrating regression in the disaggregated model. A co-integration relationship was found to exist in the revised disaggregated model. The Johansen Co-integration Technique confirmed the existence of a long run relationship between the variable in both the aggregated and disaggregated models. The Amended Granger Causality test was employed to investigate the direction of causality. Ghatak and Wheatley Price (1997) made use of the Engle and Yoo approach in estimating the long run estimates With reference to the aggregated model, the main findings indicate that real total exports did not Granger cause economic growth in the long run. In the disaggregated model, bidirectional causality was found between real non-

traditional manufactured exports and economic growth in the long run only. The regression analysis revealed that both non-traditional manufactured exports and capital had the most significant impact on economic growth in the long run. Exports of traditional manufactures were found to have no significant impact on economic growth. Even though total exports were not found to contribute positively towards economic growth in India, it was concluded that non-traditional manufactured exports had a positive long run impact on economic growth. This suggested that the relationship between export expansion and economic growth does depend on the nature of the commodity exported. This is relevant with regard to the relationship between automobile exports and economic growth as it infers that automobile exports might provide a greater contribution towards economic growth than primary commodity exports.

Al-Yousif (1999) created an augmented production function to test empirically the Export-Led Growth hypothesis in Malaysia for the period 1955 to 1996. The variables included in the study were: real exports, real GDP, the employment index (as a proxy for labour), capital and the real effective exchange rate. The Augmented Dickey-Fuller test was utilised to test for the order of integration. The Johansen Co-integration Technique was applied to both the bivariate and multivariate models. The Amended Granger Causality test was employed to determine direction of causality. The main findings revealed that real exports Granger caused economic growth in the short run only. However, in the long run, real GDP Granger caused real exports. The Export-Led Growth hypothesis did not seem to hold for the case of Malaysia as there was no unidirectional long run causality from exports to economic growth. The Growth-Led hypothesis was found to be more relevant for describing the long run relationship between exports and growth in Malaysia

Mallick (2002) examined the determinants of economic growth in the context of India for the period 1950 to 1996. Mallick (2002:307) explained that the main aim of the study was to analyse whether India's economic growth could "... be described by incorporating the mechanisms of endogenous growth with Export-Led Growth or/and Growth theory in a Keynesian model." Two separate dummy variables were used to capture the impact of the oil shocks in 1973 and 1979. The Johansen Co-integration Technique revealed the existence of two long run co-integrating vectors. The main findings suggested that both private investment in physical capital and public investment in infrastructure were the main factors determining economic growth in the short run. With regard to the estimated long run co-efficients, investment in human capital was considered to have the largest impact on economic growth in India. Mallick (2002:319) concluded that the "... key factors to long-term growth are: public investment, human capital, real interest rate and domestic credit to

the public sector." Exports were found to have a minimal effect on economic growth and it was, therefore, concluded that exports did not play a significant role in contributing to economic growth in India. The engine of growth in India was identified as domestic demand factors and not exports. As a result, the Export-Led Growth hypothesis did not seem to be applicable for the case of India. These findings supported those of Ghatak and Wheatley Price (1997) as total exports were not found to make a significant contribution to long run economic growth in India.

Al Mamun and Nath (2005) analysed the relationship between exports and output growth in Bangladesh, using quarterly time-series data for the period 1976 to 2003. The variables included in the study were the industrial production index and real exports. In contrast with the other empirical studies, Al Mamun and Nath (2005) only employed OLS econometric time-series methods. The Engle-Granger three-step process and the standard Granger Causality test was utilised to examine the relationship between the exports and economic growth. The main findings concluded that a positive long run relationship was found between the exports and the industrial production index in Bangladesh. According to the OLS error-correction method, the estimated speed of adjustment coefficient was found to be negative and statistically significant in the industrial production equation (Al Mamun and Nath 2005:364). However, the estimated speed of adjustment coefficient in the export equation was statistically insignificant. It was concluded that export growth would only impact economic growth in the short run. Export expansion was found to contribute to economic growth in the long run. Hence, the Export-Led Growth hypothesis was found to be valid for Bangladesh for the period of the empirical study.

Lonik (2006:1) investigated the Export-Led Growth hypothesis, using annual time-series data in Malaysia for the period 1978 to 2002. This empirical study differed from the other studies that focused on Malaysia as total exports were divided into primary exports and manufactured exports. The Autoregressive Distributive Lag (ARDL) model was employed in the study to examine the long run and short run contribution of primary and manufactured exports to GNP growth. The main findings of the study indicated that a long run relationship existed between GNP, primary commodity exports and manufactured exports in the case of Malaysia. Primary commodity exports were found to have a negative impact on economic growth while manufactured exports were found to have a positive effect on economic growth. It was, therefore, concluded that the Export-Led Growth hypothesis was applicable for the case of Malaysia only with regard to manufactured exports. This is because of their positive long run contribution towards economic growth. This suggested that the relationship between export expansion and economic growth does

depend on the nature of the commodity exported. This is relevant with regard to the relationship between automobile exports and economic growth as it infers that automobile exports may provide a greater contribution towards economic growth than primary commodity exports.

Dhawan and Biswal (2010) analysed the relationship between exports and economic growth in India for the time period 1961 to 1993. The variables included in the study were: real GDP, real exports and the terms of trade. The Augmented Dickey-Fuller and the Phillips-Perron tests were utilised to determine the order of integration of the variables. The Johansen Co-integration Technique and the Amended Granger Causality test were employed to investigate the presence of co-integrating vector and the direction of causality, respectively. The main findings revealed evidence of bidirectional Granger Causality between economic growth and export growth in the short run only. In the long run, it was concluded that economic growth Granger caused export growth. Thus, the Growth-Led hypothesis seemed to be applicable for the case of India.

Lee (2010) made use of annual time-series data to explore the relationship between exports and economic growth in Pakistan over the period 1960 to 2006. Lee (2010) employed the Bounds testing (i.e. Autoregressive Distributed Lag) approach to determine the possible short run and long run relationship between the variables. The Granger Causality test was used to investigate the direction of causality. The main findings indicated that bidirectional Granger Causality existed between economic growth and exports. No long run relationship was found between export growth and economic growth. Hence, there was no evidence of the Export-Led Growth hypothesis in the long run. Therefore, it was concluded that the Export-Led Growth hypothesis was not valid for the case of Pakistan.

Tsen (2010) examined the Granger Causality between real exports, domestic demand and economic growth in China, using annual time-series data for the period 1978 to 2002. Unlike other empirical studies, Tsen (2010) applied a demand-side model of the Export-Led Growth hypothesis. Domestic demand was measured in terms of household consumption and government consumption. Tsen (2010) estimated two separate models. The first model analysed the relationship between economic growth per capita, real exports and household consumption. The second model investigated the relationship between economic growth per capita, real exports, real household consumption and real government consumption. The Elliot, Rothenberg and Stock (ERS) and Phillips-Perron (PP) unit root tests were used in order to test for the stationarity of the variables. Although conflicting results were obtained from the two different unit root tests, Tsen (2010)

concluded that the variables were not integrated of the same order. As a result, the Bounds testing approach was employed to analyse both the long run and short run relationship between the variables. In addition, the Geweke methodology was utilised to determine the relative importance of both exports and domestic demand in generating economic growth and the Amended Granger Causality test was utilised to investigate the direction of causality between the variables. The main findings suggested that a long run relationship existed between exports, domestic demand and economic growth. It was concluded that a bidirectional Granger Causality existed between economic growth, domestic demand and real exports. Tsen (2010:635) pointed out that the results of the Geweke methodology suggested that the "... linear dependence between government spending consumption and GDP per capita are dominated by the Growth-Led domestic demand." Although real exports were found to contribute positively towards economic growth in China, the main factors that seem to generate economic growth were increases in both household consumption and government consumption. As a result, the Export-Led Growth hypothesis did not seem to be applicable for the case of China.

Alam (2011) examined whether the Export-Led Growth hypothesis was applicable for the case of Pakistan for the time period 1971 [illegible]. Real GDP was viewed as a function of both real exports and real imports. The Engle and Granger three-step method was employed in the study. The main results suggested that both exports and imports contributed negatively to economic growth in the short run, and positively towards economic growth in the long run. However, real imports appeared to make a greater contribution towards economic growth than exports in Pakistan. Owing to the positive long run impact of exports on economic growth in the long run, it was suggested that the Export-Led Growth hypothesis was valid for the case of Pakistan. These results differed from other studies such as: Khan et al. (1995) and Lee (2010) where no evidence of Export-Led Growth was found with regard to total exports and economic growth. The difference in findings could be due to the difference in time period, variables employed and econometric methodology utilised in each of the studies.

3.3.2.3) European Countries

Balaguer and Cantavella-Jordá (2002) examined whether or not the Export-Led Growth hypothesis was applicable for the case of Spain for the time period 1961 to 2000. The variables included in the study were: real domestic output, real aggregate exports and a variable of export composition in relative terms. The Augmented Dickey-Fuller and the Phillips-Perron tests were employed to determine the order of integration of the variables. The Johansen Co-integration Technique revealed evidence of one co-integrating vector

between the variables in the study. The Amended Granger Causality test was utilised in order to determine the direction of causality. The main findings indicated that exports had a positive effect on economic growth in Spain. Bidirectional Granger Causality was found to exist between real total exports and real GDP. Furthermore, Balaguer and Cantavella-Jordá (2002:9) concluded that the structural change in export composition had a significant impact on economic growth. Hence, evidence of the Export-Led Growth hypothesis was found in the case of Spain.

Panas and Vamvoukas (2002) tested the validity of the Export-Led Growth hypothesis for Greece for the period 1948 to 1997. This empirical study made use of only annual data and included: real GNP, real total exports and the nominal effective exchange rate. The Phillips-Perron test was used to test for stationarity. The Johansen Co-integration Technique revealed the existence of a long run relationship between the variables included in the empirical study. The Dynamic Granger Causality test was applied to the study to test for the possible causal relationship between the variables, and an impulse response function was utilised to analyse the trivariate system in order to avoid possible mis-specification bias. The main findings revealed that economic growth Granger caused export growth in the long run. This was co[illegible]by the findings of the impulse response function. It was concluded that the Export-Led Growth hypothesis was found not to be valid for the case of Greece; instead the Growth-Led hypothesis seemed to be more relevant in the long run.

Taban and Aktar (2008) investigated whether or not the Export-Led Growth Hypothesis was valid for the case of Turkey for the time period 1980 to 2007. Both the Engle and Granger two-step process and the Johansen Co-integration Technique were performed to determine whether or not a long run relationship existed between the variables. Conflicting results were found with regard to the presence of co-integration between real exports and real GDP. Since the Johansen Co-integration Technique is viewed as being more accurate that the Engle and Granger two-step approach, Taban and Akpan (2008) concluded that a long run relationship existed between real GDP and real exports. The main findings suggested that a long run bidirectional Granger causal relationship exists between real GDP and export growth in Turkey. As a result, the Export-Led Growth hypothesis was found to be applicable for the case of Turkey.

3.4) Assessment of the Literature

With reference to the theoretical literature, the Export-Led Growth hypothesis seems to provide a suitable theoretical guideline as to how automobile export growth could result in

economic growth. This is because the Export-Led Growth hypothesis emphasises the positive long run relationship between exports and economic growth. Although the Classical perspectives of Adam Smith and David Ricardo emphasised the gains from trade, they did not explore the exact relationship between export expansion and economic growth. The nature of the commodity exports is also a crucial factor that needs to be considered when examining the relationship between export growth and economic growth. Primary commodity exports are viewed as not being able to contribute as much to economic growth as manufactured goods since primary commodity exports are subject to volatility in prices and export revenues. This implies that a manufactured export commodity (i.e. such as automobile exports) would have a far greater impact on economic growth than that of primary commodity exports.

The demand-side perspective of the Export-Led Growth hypothesis views exports as a component of GDP and places emphasis on the ability of autonomous exports to generate a larger change in economic growth through the multiplier effect. In this way, exports are regarded as a major determinant of economic growth. Although automobile exports are one of the major exports sectors in South Africa, it is questionable whether they are the main constituent of economic growth in South Africa. It is possible that other export sectors or even domestic demand factors (investment, household consumption and government consumption) have made a greater contribution towards economic growth in South Africa. It is, therefore, possible that automobile exports could be regarded as a handmaiden of economic growth in South Africa rather than an engine of economic growth. However, despite this factor, focus needs to be placed on whether there is a long run relationship between automobile exports and economic growth in South Africa and the possible contribution automobile exports have made towards economic growth in South Africa.

The supply-side perspective of the Export-Led Growth hypothesis regards economic growth as a function of labour productivity, capital productivity and exports expansion. In this sense, exports are viewed as an augmented component of economic growth. However, this predicted economic growth has not necessarily occurred in most developing economies. However, most developing countries lack the required level of technology and human capital in order to make use of the knowledge spill-overs and advanced technology from developed countries. Furthermore, firms in developing countries do not have the same level of technology as those in developed countries.

With reference to the empirical literature, the case studies that focus on the automobile industry do not examine the relationship between automobile export expansion and

economic growth. Although these empirical studies provide an understanding of the South African automobile industry and its challenges, they do not address the issue of growth or even commodity dependence. Most of them merely report on the functions and structure of the South African automobile industry and the MIDP. They do not examine whether South Africa should continue to focus on the automobile exports. They do not give any indication as to South Africa's dependence on automobile exports. However, the empirical literature pertaining to the Export-Led Growth hypothesis does provide a general guideline for testing the relationship between automobile exports and economic growth. This is especially with regard to the time-series econometric methodology and possible addition variables that can be included.

Although, the empirical studies incorporate a bivariate model or create an augmented production function in testing the Export-Led Growth hypothesis, the current study will focus more on the demand perspective of the Export-Led Growth hypothesis. Although, there is vast empirical literature regarding the Export-Led Growth hypothesis, there is no agreement as to whether export expansion results in a positive impact on economic growth. Even when there has been a number of empirical studies that focused on a given country (such as Nigeria, India or Malaysia), conclusions differ. This might be due to different variables, econometric methodology used in the empirical studies. Another reason for the difference in results and findings could be because of the time period chosen.

With regard to the pattern of econometric techniques employed in the examination of the Export-Led Growth hypothesis, emphasis seems to have been placed on identifying the direction of causality. Only a few of the studies analyse the possible contribution of export expansion on economic growth. The impact of a rise in exports on economic growth should be a key focus in the investigations of the Export-Led Growth hypothesis. If export expansion causes a positive contribution towards economic growth in the long run, it should be concluded that the Export-Led Growth hypothesis holds. However, if an increase in exports only positively affects economic growth in the short run or if export expansion has a negative impact on economic growth, then it should be concluded that the Export-Led Growth hypothesis is not valid. Before examining the findings of the relationship between South African automobile exports and economic growth, Chapter 4 will review the econometric model and techniques utilised in this study.

Chapter 4

Research Methodology

4.1) Introduction

In order to determine the possible long-run impact of automobile exports on economic growth in South Africa, a demand-side version of the Export-Led Growth hypothesis will be examined. Since most of the empirical literature has employed either a VAR model or VECM to test the validity of the Export-Led Growth hypothesis, this study will follow suit and estimate the VECM to determine the relationship between automobile exports and economic growth in South Africa. The Johansen Co-integration technique will be employed to identify whether a long-run relationship exists between the automobile exports and economic growth. The Dynamic Granger Causality test will be employed to identify the causal relationship between the variables. If the Johansen Co-integration technique reveals that no co-integrating vectors exist, then a VAR model will be employed to examine the relationship between automobile exports and economic growth in South Africa. This chapter will discuss the model that will be employed as well as the various econometric tests that will be applied to the study to determine the magnitude of the impact of automobile exports to economic growth in South Africa as well as whether the Export-Led Growth hypothesis can be applied to the case of the South African automobile exports.

4.2) Model Specification

In order to investigate the impact of automobile exports on economic growth, a functional specification is needed. As indicated in the literature review, some of the empirical investigations of the Export-Led Growth hypothesis have used capital and labour data to build a supply side model. As this study focuses on the demand perspective of the Export-Led Growth hypothesis as applied to South Africa, a demand-side model will be built to determine the impact of automobile exports towards economic growth. This is mainly because South Africa's constraints are mostly demand rather supply variables. In order to obtain economic growth in South Africa, it is necessary to increase autonomous demand factors rather than supply factors. South Africa is characterized by excess supply of factors of production (especially labour). It is likely that any further rise in supply factors would merely lead to further increases in excess supply. Therefore, it is crucial that South Africa focuses on the components of autonomous demand to achieve economic growth. In light of the fact that most empirical studies have focused on the supply-side perspective of the

Export-Led Growth hypothesis, it would be beneficial to contribute to the literature by both empirically examining and identifying the relationship between demand-side factors and economic growth. Accordingly, the model is specified as follows:

RGDP = f [RVEX, ROEX, DA].....(3)

where RGDP is real GDP; RVEX and ROEX denote real automobile exports and real other exports, respectively and DA represents domestic absorption. Real other exports are calculated as real total exports of goods and services minus real automobile exports. This will provide a comparison of the impact of other variables on economic growth compared to the impact of real automobile exports to economic growth. The domestic absorption variable consists of the sum of real total consumption and real capital formation (as a proxy of investment). In this way, the domestic absorption variable will indicate the impact of domestic demand components to economic growth. All of the variables are taken at natural logarithms. According to Li et al. (2010:121), a logarithm of the variables in the regression is taken "...for convenience to get stationary more easily and is helpful to eliminate heteroscedasticity of the time-series. The logarithm format will not change any of the characteristics of the time-series relationships. When expressed in logarithm form, equation (3) becomes:

$$logRGDP_t = \beta_1 + \beta_2 logRVEX_t + \beta_3 logROEX_t + \beta_4 logDA_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

According to the Export-Led Growth hypothesis, exports are expected to have a long-run positive influence on economic growth. Furthermore, in order for the Export-Led Growth hypothesis to hold, it is necessary that a unidirectional causal relationship exists, running from exports to economic growth and that exports are found to be the main contributor to economic growth. As a result, vehicle exports are expected to impact positively towards long-run economic growth. Also, they are expected to be the most important contributor to economic growth. Since other exports are a constituent of total exports, they are also expected to have a positive impact on economic growth. Real domestic absorption is expected to have a positive impact on economic growth. ε_t represents the white noise error term.

4.3) Data Source

The Motor Industry Development Programme (MIDP) was introduced in 1995. In light of the implementation of the MIDP in 1995, the study will employ quarterly data, covering the period 1995Q1 to 2011Q2. The data pertaining to real GDP, real total consumption and real capital formation were obtained from the South African Reserve Bank's Quarterly

Bulletin while the data relating to both real total exports and real vehicle exports were obtained from the South African Revenue Services Customs and Excise trade data. Real GDP, real total consumption and real capital formation were taken at constant 2005 prices. Real vehicle exports were deflated, using the producer price index for motor vehicle exports; while real total exports were deflated, using the producer price index for total exports. Both indices for total exports and motor vehicle exports were obtained from Statistics South Africa and these figures are based on 2005 prices.

4.4) Review of Estimation Techniques

This section will discuss the various econometric tests that will be performed in this study to analyse the relationship between vehicle exports and economic growth in South Africa. The relevant steps in estimating the Johansen Co-integration Technique will be discussed. These include the stationarity and unit root tests; the determination of the appropriate lag length of the model and the correct deterministic model and the co-integrating rank. In addition, the VECM, VAR model and relevant diagnostic tests, will be examined. Since the Export-Led Growth hypothesis suggests the existence of a causal relationship between real vehicle exports and GDP, the Dynamic Granger Causality test will also be dealt with in this section.

4.4.1) The Johansen Co-integration Technique

The Export-Led Growth hypothesis postulates that a long-run relationship exists between exports and economic growth, and that exports contribute positively towards economic growth in the long-run. According to Awokuse (2002: 5), the "...concept of co-integration is intuitively appealing because it is supported by the notion of long-run equilibrium in economic theory." In order to determine the long-run impact of vehicle exports to economic growth, it is necessary to determine whether co-integration occurs between the variables. Enders (1995:374) explains that "...co-integration necessitates that the variables be integrated of the same order." Before testing for co-integration, it is essential that the order of integration be determined and that the variables of interest are found to be of the same order of integration. This will be accomplished by employing both the ADF and Phillips-Perron (PP) tests. If the variables are found to be integrated of different orders, it is possible that co-integration does occur between the variables. Before applying the Johansen Co-integration Technique, it is also crucial to determine both the optimal lag length as well as the correct deterministic trend.

4.4.1.1) Unit Root and Stationarity Tests

Determining the order of integration and, thus, stationarity of a time-series variable is the first and also one of the crucial steps in examining the relationship between any time-series variables. Most macroeconomic time-series variables are found to be non-stationary at levels. A non-stationary time-series is characterised as having stochastic trends and also changes over time in an unpredictable manner. If non-stationary variables are included in any form of regression, the estimated results will be rendered meaningless. Taban and Aktar (2008: 1542) point out that it is important to "...discern the stationarity of the series in order to avoid spurious regression." In order for a time-series variable to be considered as stationary, it needs to be characterised by three main properties. These are: a given time-series variable is time invariant; it fluctuates around a constant long-run mean; it exhibits a finite variance, and is characterised by a correlogram that diminishes as the lag length is increased (Asterious and Hall, 2007: 231). Stationary time-series fluctuate around a mean value and have a tendency to converge to the mean while non-stationary time-series tend to fluctuate in a random walk-like manner and tend not to converge towards a mean value. A non-stationary time-series can become stationary after being differenced d times. As a result, the particular time-series variable is referred to as being integrated of order d (i.e. I (d)). Unit root tests are employed to determine the stationarity or order of integration of a given time-series variable. Two different unit roots will be employed in this study to determine the order of integration. These unit root tests are: the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. The ADF test (Asterious and Hall, 2007: 231) is represented by the following equations:

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + a_i \sum_{i=1}^{m} \Delta y_{t-i} + \varepsilon_t \quad (5)$$

$$\Delta y_t = \beta_1 + \delta y_{t-1} + a_i \sum_{i=1}^{m} \Delta y_{t-i} + \varepsilon_t \quad (6)$$

$$\Delta y_t = \delta y_{t-1} + a_i \sum_{i=1}^{m} \Delta y_{t-i} + \varepsilon_t \quad (7)$$

where y_t is the time-series variable of interest; t is the time trend and ε_t is the white noise residual which possesses both a zero mean and a constant variance. β_1, β_2, δ, $\alpha_1, \ldots, \alpha_m$ are the set of parameters to be estimated. Equation 5 includes a trend and a constant; while equation 6 contains a constant and no trend. Equation 7 does not include a constant or a trend. The null hypothesis for equations 5 to 7 is that $\delta=0$. This implies that the series of interest contains a unit root and is, therefore, non-stationary. The alternate hypothesis

states that $\delta \neq 0$. This suggests that the series of interest does not contain a unit root and is, thus, stationary.

The PP test is employed in this study as an additional test in determining the order of integration of the relevant time-series variables. Chimobi and Uche (2010:213) explain that "... the possibility of the presence of structural breaks makes the ADF test unreliable for testing stationarity." If any structural breaks are present in the time-series variables, the ADF test is likely not to reject the null hypothesis. The PP test will reject the null hypothesis and conclude that the series of interest is stationary. The PP test (Chimobi and Uche ,2010:213) makes use of the following model:

$$\Delta Y_t = a + cY_{t-1} + d_1 \Delta Y_{t-2} + \ldots + d_{p-1} \Delta Y_{t-p+1} + \mu_t \quad \ldots\ldots(8)$$

where ΔY represents the first difference of the time-series variable of interest; $a, c, d_1, d_2 \ldots, d_{p-1}$ denote the parameters to be estimated and μ_t represents a white noise disturbance term. The null hypothesis of the PP test is that the co-efficient c is statistically insignificant (i.e statistically not different from zero). If the null hypothesis cannot be rejected, this implies that the time-series of interest contains a unit root and is, thus, non-stationary. The alternate hypothesis of the PP test is [illegible] efficient c is statistically significant (i.e. statistically different from zero). If the null hypothesis is rejected in favour of the alternate hypothesis, this would suggest that the time-series of interest does not contain a unit root and is, thus, stationary.

Keong et al. (1998:11058) indicate that the null hypothesis "...can be rejected if the t-test statistic from these tests is negatively less than the critical value tabulated." With reference to both the ADF and PP tests, if the calculated t-statistic is found to be greater than the critical values, the null hypothesis of a unit root cannot be rejected and it will be concluded that the time-series variable of interest is non-stationary. However, if the calculated t-statistic is less that the critical values, the null hypothesis of a unit root can be rejected and it will be concluded that the time-series of interest is stationary.

4.4.1.2) Determining the Optimal Lag Length

Asterious and Hall (2007: 322) explain that the "... issue of finding the appropriate (optimal) lag length is very important ..." This is because the appropriate lag length is associated with residuals that do not suffer from non-normality, autocorrelation or heteroscedasticity. Lag specifications that are too short will result in spurious findings (Cornwall 2009:14) In addition, they can result in mis-specification of the model and disturbance terms that are not white noise residuals or i.i.d. If the lag order selected is less than the true lag, the

regression estimates will be biased and the residuals will be serially correlated. However, if the order of lags exceeds the true order, the power of the VECM or VAR estimates is reduced. Another problem associated with selecting a higher order lag length (i.e. over fitting) is that it will result in an increase in the mean-square forecast errors of the VAR model.

The current study focuses on the following lag selection criteria: the Akaike Information Criterion (AIC), Schwartz Bayesian Information Criterion (BIC) and the Hannan-Quinn Information Criterion (HQIC). The optimal lag order is identified when the afore mentioned criteria are minimised. Attention will also be placed on the degrees of freedom and the stability and stationarity of the VAR model. Long lag lengths can also be problematic as they can consume degrees of freedom. This will result in spurious estimations. (Enders, 1995:313). If the optimal lag length is identified as being say 12 lags and 4 variables are included in the model, 48 degrees of freedom will be lost. If the model contains 66 observations, a loss of 48 degrees of freedom will jeopardise the efficiency of the model and generate biased results. If this occurs, an alternative model of estimation such as a two-stage least-square model will have to be considered. In addition to the selection of optimal lag length, it is also crucial to ensure that the stability and stationarity of the VAR model is verified. Focus will be placed on the inverse roots of the AR characteristic polynomial. If all of the roots have modulus that are less than one and lie inside the unit circle, it can be concluded that the estimated VAR is stable and stationary. If all of the roots have modulus that are greater than one and lie outside the unit circle, the estimated VAR is unstable and non-stationary. If it is found that all of the roots have some modulus that are greater than one and others that are smaller than one, or some modulus lie within the unit circle and at least one modulus lies outside the unit circle, the VAR becomes unstable and explosive.

4.4.1.3) Determination of the Co-integrating Rank

The Johansen Co-integration Technique involves determining the rank of Π (i.e. the number of co-integrating vectors). Deme (2002:5) indicates that the rank of Π "... indicates the number of independent co-integrating vectors." In order to perform the Johansen Co-integration Technique, the following VAR model (Deme ,2002:5) is estimated:

$$y_t = \mu + \sum_{k=1}^{p} \Pi_k y_{t-k} + \varepsilon_t \qquad (9)$$

where y_t is an (nxn) column vector of n I(1) variables. Π_k represents the co-efficient matrix; μ denotes the (nxn) vector of constants; p represents the lag length and ε_t is the i.i.d. residual with a zero mean and a constant variance. The Johansen Co-integration Technique employs two test statics in determining the rank of Π. They are: the trace statistic and the maximum eigenvalue statistic. Awokuse (2002: 7) indicates that the trace statistic "...considers the hypothesis that the rank of Π is less than or equal to r co-integrating vectors ..." The trace statistic (Awokuse 2002: 7) is given by the following equation:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \quad \text{......} \quad (10)$$

where T is the number of observations; n is the number of time-series variables in the model, $\hat{\lambda}_i$ denotes the estimated eigenvalues (i.e. characteristic roots) and i=1,2,...,n. The maximum eigenvalue test statistic (Awokuse 2002: 7) is represented by the following equation:

$$\lambda_{max} = -T\ln(1 - \hat{\lambda}_{r+1}) \quad \text{......} \quad (11)$$

According to Asterious and Hall (2007: 324) the maximum eigenvalue test statistic "... tests the null hypothesis, that rank (Π) = r against the hypothesis that the rank is r+1." In this way, the null hypothesis states that a co-integrating relationship exists while the alternative hypothesis indicates that there are (r+1) co-integrating vectors.

4.4.1.3.1) Specification of the Correct Deterministic Model: The Pantula Principle

The Johansen Co-integration test can only be estimated once the correct deterministic model has been identified by means of the Pantula Principle. This involves examining both the trace and maximum eigenvalue statistics. Both the trace test and maximum eigenvalue test statistics are based on the characteristic roots (i.e. eigenvalues). These characteristic roots are then arranged in descending ordered and examined as to whether or not they are significantly different from zero. The Johansen Co-integration test consists of five different models. The Pantula Principle only considers models 2, 3 and 4. This is because model 1 and 5 are regarded as being unrealistic. Asterious and Hall (2007: 324) explain that the first and the last (5th) model are not applicable as they are "...implausible in terms of economic theory..." As a result, one of the remaining models (i.e. models 2, 3 or 4) needs to be selected The Pantula Principle involves estimating models 2, 3 and 4. The results of the models are presented in order, from the most restrictive model (i.e. model 2)

to the least restrictive model (i.e. model 4). The Pantula Principle involves collecting the trace statistic and maximum eigenvalue statistic for the three models. The analysis begins with the smaller number of co-integrating vectors (i.e r=0) and examining whether the trace statistic or maximum eigenvalue statistic is greater or smaller than the respective critical values. If the trace or maximum eigenvalue is found to be greater than the critical values, then the next model is examined. The relevant model is selected when the trace statistic or maximum eigenvalue statistic is smaller than the critical value. This is when the null hypothesis of no co-integration cannot be rejected for the first time.

4.4.1.3.2) The Johansen Co-integration Rank Test

Once the correct deterministic model is identified, the Johansen Co-integration test can be employed. This involves determining the number of possible co-integrating vectors. Enders (1995:390) explains that "... the number of distinct co-integrating vectors can be obtained by checking the significance of the characteristic roots of Π." If the variables under examination are not co-integrated, the rank of Π is zero. This is determined if the trace and maximum eigenvalue statistics are found to be less than their respective critical values when the rank of Π is zero. As a result, the characteristic roots will also be equal to zero. This means that $(1-\hat{\lambda}_i)$ will be equal to 1 and each of the expressions will be equal to zero The null hypothesis of no co-integrating relationships can only be rejected when the trace and maximum eigenvalue statistics are found to be greater than their respective critical values. If the rank of Π is equal to 1, then $(1-\hat{\lambda}_i)$ will be between 0 and 1. This means at the first expression $(1-\hat{\lambda}_i)$ will be less than zero while the rest of the eigenvalues will be equal to zero. Asterious and Hall (2007: 319) explain that ".... for n number of variables, we can have only up to n-1 co-integrating vectors." Therefore, if there are 4 variables in the model, there can only be a maximum of 3 co-integrating vectors. If 4 co-integrating vectors are found, then the model specification or data will have to be reviewed and amended.

4.4.2) The Vector Error Correction Model

The VECM is based on the VAR model. The difference between these two models is that the VECM is estimated only when a long-run relationship is established. If there is no evidence of a long-run relationship between the variables, then the VAR model is estimated. Before estimating the VECM, it is essential that the time-series variables are of the same order of integration; the optimal lag length is selected; the correct model of co-integration is determined and it is concluded that at least one co-integrating vector exists between the time-series variables.

4.4.2.1) Estimation of the VECM

The VECM is based in the standard VAR model. The VAR model (Panas and Vamvoukas, 2002:732) is expressed as follows:

$$Z_t = B_t + A1Zt_{-1} + A_2Z_{t-2} + \ldots + A_kZ_{t-k} + u_t \quad (12)$$

where Z_t=[LRGDP, LRVEX, LROEX,LDA]. B_t denotes a vector of constants while u_t is a vector of residuals. The above VAR model is reformulated into a VECM (Panas and Vamvoukas, 2002:732) as follows:

$$\Delta Z_t = B_t + \Gamma_t \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \ldots + \Gamma_{k-1} \Delta Z_{t-k-1} + \pi Z_{t-1} + u_t \quad (13)$$

where $\Gamma_i = -(I-A_1-\ldots-A_i)$, $(i=1,\ldots,k-1)$ and $\Pi=-(I-A_1-\ldots-A_k)$. The estimates of Γ_i and Π contain the information regarding the short-run and long-run speed of adjustment to changes in z_t, respectively. Panas and Vamvoukas (2002:732) indicate that Π "... can be presented as $\Pi=\alpha\beta'$..." Matrix α represents the adjustment co-efficient and indicates the short-run speed of adjustment to equilibrium. Matrix β denotes the co-integration co-efficients and represents the long-run relationship between the variables. Thus, the estimation of the VECM examines both the long-run and short-run relationship between the variables as well as the speed of adjustment to equilibrium. In this way, the estimation of the VECM will indicate whether or not vehicle exports have made an impact towards economic growth in the long-run. It will also indicate what the magnitude of the impact of vehicle exports on economic growth will be. Although the study will focus on the long-run impact of vehicle exports on economic growth, the short-run impact will also be considered. The long-run impact of vehicle exports on economic growth will be compared with the impact of the other time-series variables (i.e. domestic absorption and other exports). If it is found that vehicle exports have made a greater long-run impact to economic growth than domestic absorption and other exports, then a recommendation can be made that policies should be implemented to ensure that there is an expansion in vehicle exports in South Africa. However, if domestic absorption is found to have a greater long-run impact on economic growth, then further studies would need to be conducted as to whether export promotion has been a successful policy in South Africa. If other exports are found to have a more significant effect on economic growth in the long-run, then it will be recommended that further studies focus on whether the constituents of other exports have made a greater impact towards long-run economic growth compared to vehicle exports. If vehicle exports are found to have either no impact or an insignificant impact on long-run economic growth,

then it will be recommended that South Africa's focus on the vehicle industry and vehicle exports be reviewed.

4.4.2.2) Diagnostic Tests

Various diagnostic tests will be employed to test for the model for problems such as mis-specification of the model, autocorrelation and heteroscedasticity. The Jarque-Bera test will be performed to determine whether the model has been correctly specified and if any relevant variables have been omitted. The LM serial correlation test will be used to examine whether the residual series are correlated and the White test will be performed to test for whether the variance of the residuals is constant. In addition, the Weak Exogeneity test will be employed to test whether the current values of the explanatory variables explain the current and future values of real GDP. The Weak Exogeneity test indicates whether the link between the variables is structurally stable (Ahmad, 2001:154). It is crucial that these diagnostic tests be performed as mis-specification of the model; autocorrelation and heteroscedasticity would deliver spurious and biased results. If the diagnostic tests reveal the presence of autocorrelation, heteroscedasticity or mis-specification errors, the variables and structure of the model will be re-examined.

4.4.3) Determining the Nature of the Causality

As indicated earlier, the narrow definition of the Export-Led Growth hypothesis, export expansion causes economic growth. If bidirectional causality between export expansion and economic growth is established, this constitutes the broad definition of the Export-Led Growth hypothesis. In order to examine the relationship between vehicle exports and economic growth, it is necessary to analyse the possible causal relationship between these variables. If no causal relationship is found between vehicle exports and economic growth in South Africa, it can be recommended that South Africa should not focus on the vehicle industry and vehicle exports.

The direction of causality is identified by performing the Dynamic Granger Causality test. The Granger Causality test examines whether the dependent variable can be predicted by the lagged values of the explanatory variables. According to Abu-Qarn and Abu-Bader (2001:4), the Granger Causality test indicates that "... a variable y, say economic growth, is caused by x, say exports, if y can be predicted better from past values of y and x and x than from past values of y alone." If it is found that real GDP is better predicted by including the past values of real vehicle exports than by not including them, then it is concluded that vehicle exports Granger cause real GDP. Similarly, if past values of real

GDP are found to predict real vehicle exports more accurately than by using past values of real vehicle exports, then it is found that real GDP causes vehicle exports. If real vehicle exports are found to Granger cause real GDP and real GDP is found to Granger cause real vehicle exports, then it is concluded that bidirectional causality or a feedback effect is found between the variables. However, if no form of unidirectional causality is found between real vehicle exports and real GDP, then both real GDP and real vehicle exports are found to be independent of each other. Tsen (2010: 633) explains that the Granger causality test "... does not allow one to estimate or compare the relative magnitude of causality between the series..." Thus, focus is placed on the direction of causality rather than the impact of real vehicle exports to real GDP. This study will employ the Dynamic Granger Causality test. This differs from the Standard Granger Causality test as all of the relevant variables are included in the test. As a result, the following regressions are estimated:

$$\Delta LRGDP_t = \delta_0 + \sum_{i=1} \delta_{1j} \Delta LRGDP_{t-i} + \sum_{i=1} \delta_2 \Delta LRVEX_{t-i} \sum_{i=1} \delta_3 \Delta LROX_{t-i} \sum_{i=1} \delta_4 \Delta LDA_{t-i} + \delta_5 EC_{1t-1} + u_{1t} \dots (14)$$

$$\Delta LRVEX_t = \delta_0 + \sum_{i=1} \delta_{1j} \Delta LRGDP_{t-i} + \sum_{i=1} \delta_2 \Delta LRVEX_{t-i} \sum_{i=1} \delta_3 \Delta LROX_{t-i} \sum_{i=1} \delta_4 \Delta LDA_{t-i} + \delta_5 EC_{2t-1} + u_{2t} \dots (15)$$

$$\Delta LROX_t = \delta_0 + \sum_{i=1} \delta_{1j} \Delta LRGDP_{t-i} + \sum_{i=1} \delta_2 \Delta LRVEX_{t-i} \sum_{i=1} \delta_3 \Delta LROX_{t-i} \sum_{i=1} \delta_4 \Delta LDA_{t-i} + \delta_5 EC_{3t-1} + u_{3t} \dots (16)$$

$$\Delta LDA_t = \delta_0 + \sum_{i=1} \delta_{1j} \Delta LRGDP_{t-i} + \sum_{i=1} \delta_2 \Delta LRVEX_{t-i} \sum_{i=1} \delta_3 \Delta LROX_{t-i} \sum_{i=1} \delta_4 \Delta LDA_{t-i} + \delta_5 EC_{4t-1} + u_{4t} \dots \dots (17)$$

where each of the EC variables are the respective residual from the respective co-integration equations. The Dynamic Granger Causality test involves determining the significance of each of the δ_i co-efficients. N'guessan Bi Zambe (2010: 6) explains that the chi-square statistic is used to "... test the joint significance of the other lagged endogenous variable in each equation ..." The null hypothesis is that $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$. This means that the δ_i co-efficients are statistically insignificant and the explanatory variables do not Granger cause the dependent variables. If δ_2 is found to be statistically insignificant in equation 14, the null hypothesis cannot be rejected and this would suggest that real vehicle exports do not Granger cause real GDP. If, however, δ_2 is found to be statistically significant, the null hypothesis is rejected and it would be concluded that real vehicle exports Granger cause real GDP. Similarly, if δ_1 is found to be statistically insignificant in equation 15, the null hypothesis cannot be rejected and this would suggest that real GDP does not Granger cause real vehicle exports. If, however, δ_1 is found to be statistically

significant, the null hypothesis is rejected and it would be concluded that real GDP does Granger cause real vehicle exports.

4.5) Conclusion

This study will employ the demand-side of the Export-Led Growth hypothesis to examine the relationship between real vehicle exports and economic growth in South Africa for the period 1995:01 to 2011:02. The VECM will be estimated to analyse the short-run and long-run impact of real vehicle exports on economic growth. In order to estimate the VECM, the order of integration, optimal lag length and number of co-integrating vectors will have to be determined. If it is found that no co-integrating vectors are present, a VAR model will be estimated. In order to analyse the possible causal relationship between real vehicle exports and economic growth, the Dynamic Granger Causality test will be performed. The findings will be presented in Chapter 5.

Chapter 5
Presentation and Analysis of Empirical Findings

5.1) Introduction

The main objective of this study is to examine the long run impact of real vehicle exports on economic growth.Before estimating the possibility of a long-run relationship between the time-series variables, the order of integration will be determined. If the time-series variables are found to be integrated of the same order the Johansen Co-integration Technique will be employed to examine whether a long-run relationship occurs between the variables. If, at least one co-integrating vector is found, the VECM model will be estimated. In this way, the possible magnitude of the long-run and short impact of real vehicle exports to economic growth, will be analysed. If there is no presence of a co-integrating vector, the VAR model will be estimated. The Granger Causality test will be employed to determine the possible direction of causality between the variables. Diagnostic tests will also be performed to verify that there is no existence of mis-specification of the model employed in the study and no autocorrelation or heteroscedasticity between the residual series.

5.2) The Johansen Co-integration Technique

Before the Johansen Co-integration Test can be estimated, it is necessary to first determine the order of integration of the variables; the optimal lag length and the correct deterministic model and co-integrating rank.

5.2.1) Stationarity and Unit Root Tests

In order to avoid the estimation of a spurious regression, the time-series variables are tested for stationarity. Before the formal unit root tests are performed, an informal test for stationarity will be conducted by means of a graphical representation of the time-series variables. The ADF and PP tests will then be employed to determine the order of integration. This is a critical step as it is necessary to verify that the time-series variables are all integrated of the same order before considering whether or not there is a long-run relationship between the variables. If the time-series are found to be integrated of different orders, it is likely that there will be no co-integration and thus the results will be biased. The Johansen Co-Integration Technique necessitates that the variables must be integrated of the same order. The possibility of stationarity or non-stationarity of the variables can be viewed by means of a graphical representation. This is shown in figure 5.2.1.1 and 5.2.1.2 below.

Figure 5.2.1.1 – Graphic Representation of the Variables at Levels

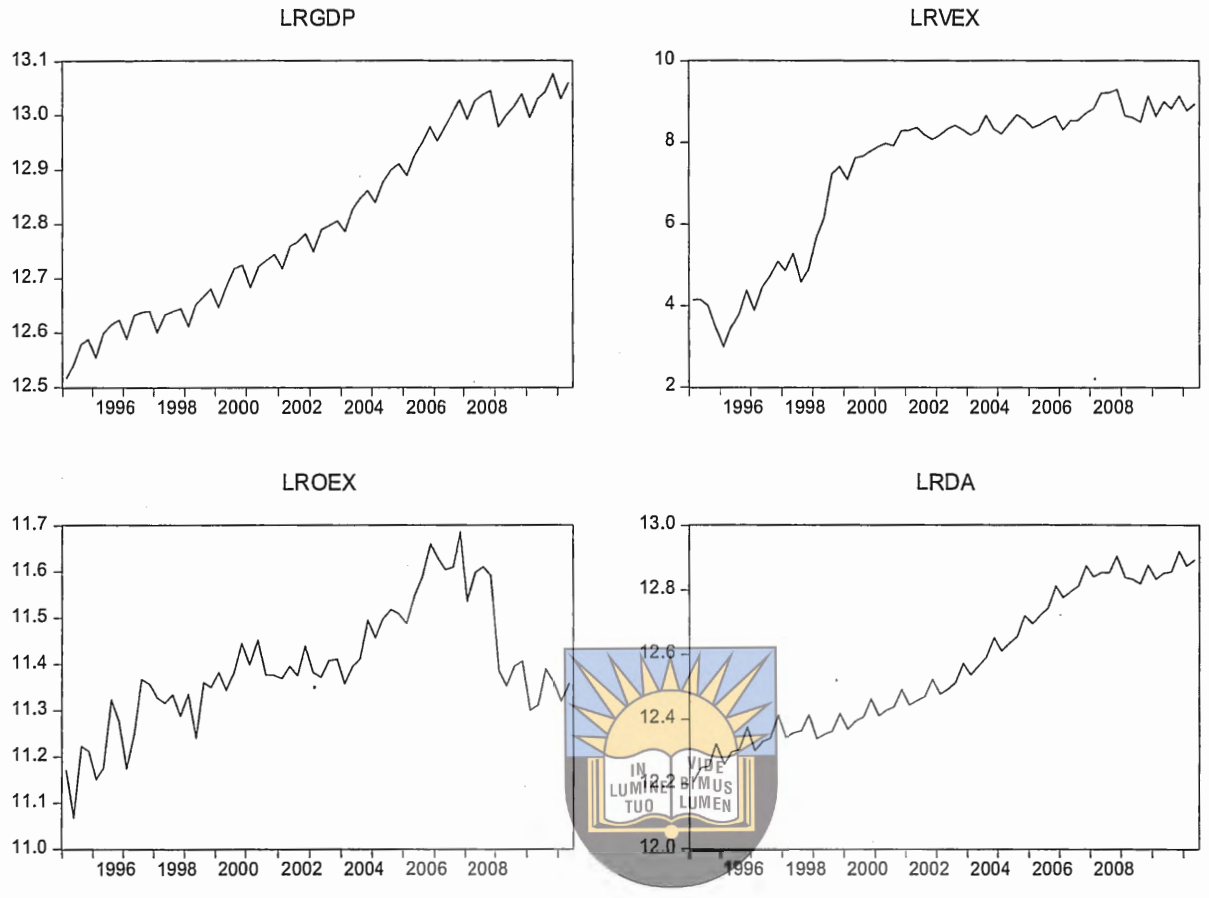


Figure 5.2.1.1 plots the log values of the time-series variables employed in this study over time. This analysis is in order to inspect the possible stationarity of the variables. The log of real GDP, real vehicle exports, real other exports and domestic absorption seem to be non-stationary at levels as they do not display a constant mean and variance. From the graphical representation above, it can be concluded that all of the variables employed in this study are I(0). However, it is questionable whether the log of real GDP and the log of real other exports may be stationary with a deterministic trend. In order to establish this, it is necessary to conduct the appropriate unit root tests. It is also evident from figure 5.2.1.1 that all of the above time-series variables have exhibited an increasing behaviour. Although, the log of real other exports experienced a dramatic decrease in 2008, an overall increase in the log of real other exports has been displayed. This decrease in the log of real other exports after 2008 could be associated with the effects of the financial crisis. This is especially so since reduced incomes in foreign countries would affect South Africa's total exports. The log of real vehicle exports does not seem to have shown any drastic decrease after 2008. This could be because the price of South Africa's vehicle exports is possibly relatively less expensive compared to that of other countries. With reference to figure 5.2.1.1, the log of real vehicle exports experienced a drastic increase after 1995. This could be associated with the MIDP. On graphic inspection, domestic

absorption seems to display a similar pattern to that of the log of real GDP and thus seems to have more influence on the log of real GDP than either the log of real vehicle exports or the log of real other exports. However, it is necessary to conduct the relevant econometric tests to determine the magnitude and the significance of the relationship between real GDP and real vehicle exports.

Figure 5.2.1.2 – Graphic Representation of the Variables at First Differences

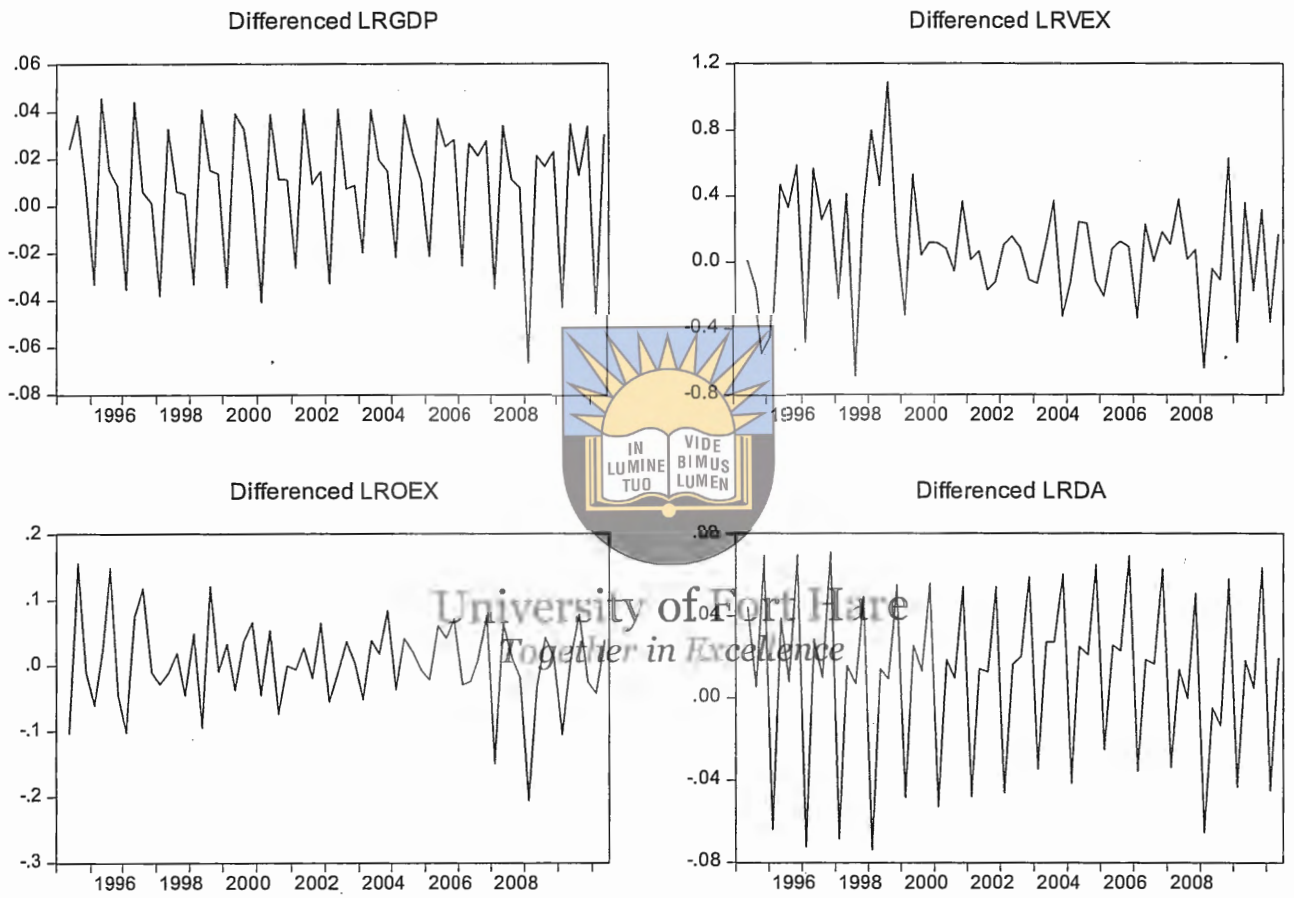


Figure 5.2.1.2 displays the first difference log values of real GDP, real vehicle exports, real other exports and domestic absorption. This analysis is in order to inspect the possible stationarity of the variables. Both the log of real GDP and domestic absorption seem to be stationary at levels as they display a constant mean and variance from the mean. Although the log of real vehicle exports and real other exports also seem to fluctuate around the mean, they do not appear to have a constant variance as in the case of real GDP. It cannot be determined from the above diagrams whether these time-series variables are in fact I(1) or not. As a result, the unit root tests will be conducted to determine the order of integration.

Table 5.2.1.3: Results of the ADF and PP tests

Variable	Model	Lag	ADF Test		PP Test	
			τ-statistic	F-statistic	Newey-West	t-statistic
LRGDP						
	Trend	3	-0.9828	19.401	8	-4.8779*
	Intercept	3	-0.3151	24.0168	13	-0.7613
	None	3	8.6115	----------	13	5.1194
DIRGDP						
	Trend	2	-14.0799***	91.7079***	15	-15.6793***
	Intercept	2	-14.2022***	124.3912***	15	-16.0747***
	None	2	-7.544805***	----------	8	-10.0698***
LRVEX						
	Trend	0	-1.2566	1.2888	5	-1.14339
	Intercept	0	-1.4826	2.1981	7	-1.5042
	None	0	1.3152	----------	5	1.3990
DLRVEX						
	Trend	2	-5.9788***	23.54774***	7	-8.8559***
	Intercept	0	-8.5914***	73.81296***	5	-8.6067***
	None	0	-8.2387***	----------	1	-8.2380***
LROEX						
	Trend	3	-1.8643	2.7054	2	-3.5393
	Intercept	3	0.6205	2.9356	8	0.03122
	None	3	2.2409	----------	15	3.5019
DLROEX						
	Trend	0	-10.7366***	57.6298***	10	-15.2425***
	Intercept	0	-10.7683***	115.9552***	8	-13.8043***
	None	0	-10.3583***	----------	3	-10.5720***
LRDA						
	Trend	3	-0.9927	21.80791	2	-0.716079
	Intercept	3	0.2783	26.9039	13	-0.71608
	None	3	7.5649	----------	13	4.06649
DLRDA						
	Trend	2	-13.3473***	113.7553***	20	-16.3283***
	Intercept	2	-13.4296***	153.6092***	20	-16.6307***
	None	2	-7.95503***	----------	4	-12.2195***

*- denotes rejection of null hypothesis of existence of unit root at 10% level of significance.
**- denotes rejection of null hypothesis of existence of unit root at 5% level of significance.
***- denotes rejection of null hypothesis of existence of unit root at 1% level of significance.

Table 5.2.1.3 above indicates that all of the variables are I(1). At levels, both the computed ADF and PP t-statistic are found to be greater than the critical values. Therefore, the null hypothesis of the presence of a unit root cannot be rejected and the variables are found to be non-stationary at levels. This is except for the case of the log of real GDP at levels. The ADF test suggests that the log real GDP is non-stationary at levels while the PP test finds that the log of real GDP at levels is stationary at the 10% level of significance. However, since the other tests at levels indicate that the computed t-statistics are greater than the critical values, it is concluded that the log of real GDP is non-stationary at levels. In the

case of all of the time-series variables, the computed t-statistics are found to be negative and less than the critical values when differenced. Thus, the null hypothesis of the presence of a unit root can be rejected at the 1% level of significance and the variables are all found to be I(1). Since the variables are all integrated of the same order, they can be tested for co-integration.

5.2.2.) Determination of Optimal Lag Length

Table 5.2.2.1: Results of the VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LRGDP LRVEX LROEX LRDA
Exogenous variables: C
Date: 11/13/11 Time: 16:25
Sample: 1995Q1 2011Q2
Included observations: 58

Lag	LogL	LR	FPE	AIC	SC	HQ
0	98.84799	NA	4.46e-07	-3.270620	-3.128521	-3.215270
1	304.4035	375.6704	6.48e-10	-9.807017	-9.096520	-9.530264
2	370.1685	111.1203	6.47e-10	-11.52305	-10.24416	-11.02490
3	404.3695	53.07038	6.41e-[illegible]	[illegible]	-10.30338	-11.43111
4	431.2778	38.04279*	4.58e-11	-12.52682	-10.11113	-11.58586
5	479.4641	61.47909	1.61e-11*	-11.63669*	-10.65260	-10.47433*
6	523.6528	50.28373	6.77e-12	-14.60872	-9.05623*	-12.22495
7	544.1573	50.50448	[illegible]	[illegible]	-10.64316	-13.15888
8	576.6988	58.05305	6.76e-12	-15.33444	-10.64516	-13.50787

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 5.2.2.1 indicates that the optimal lag length is 5 lags. This is because the FPE, AIC and HQ information criteria have the smallest values at 5 lags. However, the LR indicates that the optimal lag length is 4 lags; while the SC information criterion suggests that the optimal lag length is at 6 lags. In order to verify the optimal lag length, the inverse roots of the characteristic polynomial are analysed. As indicated in Appendix 1a, at 6 lags, it is found that at least one modulus 1 lies outside the unit circle. This suggests instability in the model. As a result, the model is estimated at 5 lags. Appendix 1b shows that at 5 lags, all of the moduli are smaller than one and lie within the unit circle. Therefore, 5 lags is determined to be the optimal lag length. Although the LR statistic indicates that the optimal lag length should be 4 lags, this study will adopt 5 lags as the optimal lag length. This is because the majority of the lag test statistics have confirmed that the optimal lag length is

5 lags. In addition, the inverse AR polynomial revealed that the moduli are smaller than 1 and they lie within the unit circle at 5 lags. If 4 lags were taken as the optimal lag, this could result in mis-specification of the model as it would involve making use of be a smaller number of lags in the estimation of the model.

5.2.3) Determining the Correct Co-integrating Model: The Pantula Principle

The Pantula Principle is performed to determine the correct co-integration model. In order to perform the Pantula Principle, the relevant models will be arranged from most restrictive to least restrictive and then compared. The results of the Pantula Principle are presented in table 5.2.3 below.

Table 5.2.3 – The Results of the Pantula Principle

Trace statistic

R	n-r	Model 2		Model 3		Model 4	
		Trace Statistic	Critical Values (0.05)	Trace Statistic	Critical Values (0.05)	Trace Statistic	Critical Values (0.05)
0	4	84.60132	54.07904	65.0840	47.85613	102.0850	55.2458
1	3	48.04487	35.192275	**28.5288***	29.79707	62.876	35.0109
2	2	23.3868	20.26184	10.2010	15.4971	27.549	18.39771
3	1	6.010161	9.164546	0.376404	3.841466	9.5334	3.841466

*- indicates the first time the null hypothesis of no co-integrating vector cannot be rejected.

Max- Eigenvalue Statistic

R	n-r	Model 2		Model 3		Model 4	
		Max-Eigen Statistic	Critical Values (0.05)	Max-Eigen Statistic	Critical Values (0.05)	Max-Eigen Statistic	Critical Values (0.05)
0	4	36.55645	28.58808	36.55513	27.58434	39.2089	30.81507
1	3	24.6580	22.9962	**18.32787***	21.13162	35.326	24.25202
2	2	17.37671	15.89210	9.82459	14.2644	18.0159	17.14769
3	1	6.101016	9.164546	0.376404	3.84166	9.533	3.841466

*- indicates the first time the null hypothesis of no co-integrating vector cannot be rejected.

At the rank value of 0, both the trace and maximum eigenvalue statistics are greater than the critical values in models 2, 3 and 4. Therefore, the null hypothesis of no co-integrating vector is rejected for all three models at rank 0. At rank of 1, the trace and maximum eigenvalue statistics are greater than the critical values in model 2. Therefore, the null hypothesis of no co-integrating vector is rejected for model 2. However, in model 3, both the trace and maximum eigenvalue statistics are smaller than the critical values; therefore, the null hypothesis cannot be rejected. This is the first time in the test that the null hypothesis cannot be rejected. According to the Pantula Principle, model 3 is selected as the correct co-integration model.

5.2.4) The Johansen Co-integration Test

Once the variables are found to be integrated of the same order, the correct lag length is selected and the correct co-integration model is determined, the Johansen Co-integration Technique can be estimated. The results of the Johansen Co-integration Technique are presented in table 5.2.4.1 below.

Table 5.2.4.1 – The Results of the Johansen Co-integration Test

Date: 11/13/11 Time: 17:13
Sample (adjusted): 1996Q3 2011Q2
Included observations: 60 after adjustments
Trend assumption: Linear deterministic term
Series: LRGDP LRVEX LROEX LRDA
Lags interval (in first differences): 1 to 5

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.456243	65.08400	47.85613	0.0006
At most 1	0.263219	28.52887	29.79707	0.0695
At most 2	0.151040	10.20100	15.49471	0.2656
At most 3	0.006254	0.376404	3.841466	0.5395

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.456243	36.55513	27.58434	0.0027
At most 1	0.263219	18.32787	21.13162	0.1181
At most 2	0.151040	9.824599	14.26460	0.2237
At most 3	0.006254	0.376404	3.841466	0.5395

Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5.2.4.1 reveals the findings of the Johansen Co-integration test. Both the maximum eigenvalue and the trace test are greater than their respective critical values when the rank

r is equal to zero. Therefore, the null hypothesis of no co-integrating vectors can be rejected at the 5% levels of significance. However, the trace and maximum eigenvalue statistics are smaller than the critical values for the possibility of more than one co-integrating vector. As a result, it can be concluded that one co-integrating vector exists between the variables.

Figure 5.2.4.2 – Graphic Representation of the Co-integration Relationship

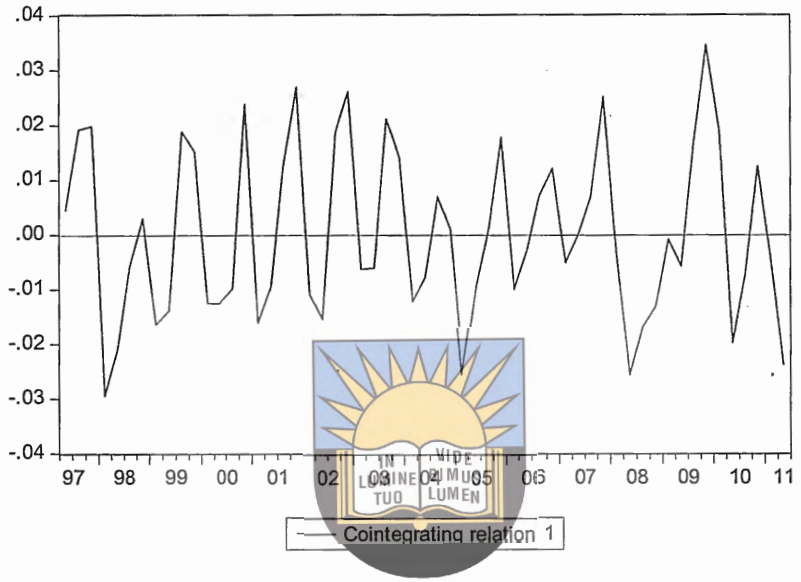


Figure 5.2.4.2 above displays the co-integration vector. The residuals appear to be fluctuating around a constant mean and they also reveal a constant variance. As a result, the residual series seems to be stationary. This confirms the existence of a long-run relationship between the variables. It is, therefore, necessary to estimate the VECM in order to analyse long-run relationship. Although the Export-Led Growth hypothesis postulates that only a long- run relationship should exist between real vehicle exports and economic growth, the VECM will also estimate the short-run relationship between the variables. This will give insight as to whether real vehicle exports only affect economic growth in the long run. In this way, the possible long-run and short run relationship between real vehicle exports and economic growth will be examined.

5.3) The VECM

The VECM reveals both the long run and short run relationship between the variables. These results will be presented separately below. Full results of the VECM are shown in Appendix 2. The result of the estimated long-run relationship between the time-series variables is listed in table 5.3.1 below.

Table 5.3.1 – VECM – Long-run Relationship

Dependent Variable : LRGDP			
Explanatory	**Co-efficient**	**SE**	**t-statistic**
β_1	4.759043		
$LRVEX_{t-1}$	0.007716	0.00099	7.83100***
$LROEX_{t-1}$	0.037018	0.01092	3.38901***
$LRDA_{t-1}$	0.611300	0.02299	26.5905***
Adjusted R^2	0.949680	R^2	0.949680

*- statistically significant at 10% level of significance
**- statistically significant at 5% level of significance
***- statistically significance at 1% level of significance

Table 5.3.1 above displays the long-run result of the estimated VECM. All of the variables are statistically significant and characterised by the correct signs. The VECM findings indicate that a 1% increase in real vehicle exports will cause real GDP to increase by 0.0077% while a 1% increase in real other exports will lead to a 0.037% increase in real GDP. Therefore, although real vehicle exports have positively contributed towards economic growth, they have not made a significant impact compared to other exports. With regard to real domestic absorption, a 1% increase in real domestic absorption has caused a 0.6113% increase in real GDP. [illegible], real domestic absorption has made a greater impact towards economic growth than real vehicle exports and real total exports. Although real vehicle exports make a positive impact towards economic growth, they are not the main contributor to economic growth. When export promotion is adopted in an economy, it is expected that real other exports have had a positive long run impact on economic growth, domestic absorption still plays a key role in economic growth in South Africa. A possible reason for this is that even though South Africa has adopted an outward-oriented trade policy, the export sectors have not been as competitive as expected. This is especially with regard to the South African automobile industry which is still characterised by relatively low output levels and high average costs. Even though real vehicle exports have shown a drastic increase after 1995, their relative uncompetitiveness does not allow them to contribute towards economic growth as expected. The adjusted R^2 of the VECM model reveals that 95% of the variation in real GDP is explained by real vehicle exports, real other exports and real domestic absorption. Although this study focuses mainly on the long-run relationship between real vehicle exports and real GDP, it is also important to analyse the short-run relationship between the variables. The results of the short-run relationship are presented in table 5.3.2 below:

Table 5.3.2 – VECM – Short-run Relationship

Dependent Variable : LRGDP			
Explanatory Variables	**Co-efficient**	**SE**	**t-statistic**
β_1	0.006900***	0.00230	2.99829***
α	-0.188459	0.10175	-1.85221**
$DLRVEX_{t-1}$	0.002169	0.00528	0.41104
$DLROEX_{t-1}$	0.012107	0.00911	1.32898*
$DLRDA_{t-1}$	0.244476	0.19586	1.24822

*- statistically significant at 10% level of significance
**- statistically significant at 5% level of significance
***- statistically significance at 1% level of significance

According to table 5.3.2, the adjustment co-efficient (α) in the GDP equation is negative, as expected. The adjustment co-efficient represents the speed of adjustment to long run equilibrium and is found to be statistically significant at the 1% level of significance. This confirms that the adjustment co-efficient is acceptable for inclusion in this model and that the speed of adjustment to long-run equilibrium is 0.188 (or 18.8%) . As a result, 18,8 % of the variation in GDP is corrected from its equilibrium. The lagged values of the explanatory variables are found to be positive. Table 5.3.2 indicates that both the lagged values of real vehicle exports and real domestic absorption are statistically insignificant; while the lagged value of real other exports is statistically significant. However, as reported in appendix 2, real vehicle exports and real domestic absorption become statistically significant in the second short-run period. This suggests that both real vehicle exports and domestic absorption have a greater impact on economic growth in the long run than in the short-run. It can, therefore, be concluded that real vehicle exports have a greater impact on economic growth in the long run than in the short run. This is in line with the Export-led Growth hypothesis as real vehicle exports are expected to have a positive long run impact on economic growth. In order to verify that the model is appropriate and has not been mis-specified or contains autocorrelation or heteroscedasticity, the diagnostic tests need to be conducted. The results of the diagnostic tests are displayed in table 5.3.4 below and the full details of these tests are shown in Appendix 3a, 3b and 3c

Table 5.3.4 – Results of the Diagnostic Tests

Test	Statistic	Probability
Jarque-Bera Test	JB-stat : 5.77031	0.67722
Serial Correlation LM test	Chi-Square : 55.76015	0.8913
White Test	Chi-Square: 442.6060	0.2150
Weak Exogeneity	Chi-square: 55.76015	0.0000

The above table reveals the findings of the diagnostic test performed on the estimated VECM model. The normality tests reveal a Jarque-Bera statistic of 5.77031 with a probability of 0.67722. The null hypothesis of no mis-specification of the model can, therefore, not be rejected and the VECM is found to be correctly specified. Similarly, the LM test for Serial Correlation indicates that the null hypothesis of no autocorrelation cannot be rejected. This is because the associated chi-square statistic of 55.76 has a probability of 0.8913, which is greater than 0.05. In the case of the White test, the null hypothesis of heteroscedasticity cannot be rejected as the chi-square statistic has a probability of 0.215 which is greater than 0.05. This proves that the estimated VECM in this study is not mis-specified and does not contain any signs of either autocorrelation or heteroscedasticity. The weak Exogeneity test (full results shown in table 5.5.1) reveals a chi-square statistic of 55.76016 with a probability of 0.000. This indicates that the explanatory variables (real vehicle exports, real other exports and real domestic absorption) correctly explain real GDP in the VECM.

5.4) Determination of the Direction of Causality

Since a long-run relationship between the variables has been confirmed, the Granger Causality test can be performed to determine the direction of causality. In order for the Export-Led Growth to hold, there must be a unidirectional causal relationship running from real vehicle exports to economic growth. The results of the VEC Granger Causality test are displayed in table 5.4.1 below. It is important to note that this test also reveals the results of the Block Exogeneity Wald test which indicates whether or not the given variables explain the dependent variable.

Table 5.4.1- Results of the Granger Causality Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 11/14/11 Time: 10:12
Sample: 1995Q1 2011Q2
Included observations: 60

Dependent variable: D(LRGDP)

Excluded	Chi-sq	Do	Prob.
D(LRVEX)	21.21283	5	0.0007
D(LROEX)	28.67171	5	0.0000
D(LRDA)	20.41974	5	0.0010
All	55.76015	15	0.0000

Dependent variable: D(LRVEX)

Excluded	Chi-sq	Df	Prob.
D(LRGDP)	7.046175	5	0.2172
D(LROEX)	8.248307	5	0.1431
D(LRDA)	21.65225	5	0.0006
All	38.49093	15	0.0008

Dependent variable: D(LROEX)

Excluded	Chi-sq	Df	Prob.
D(LRGDP)	8.239674	5	0.1435
D(LRVEX)	9.199817	5	0.1014
D(LRDA)	5.760253	5	0.3301
All	28.00095	15	0.0216

Dependent variable: D(LRDA)

Excluded	Chi-sq	Df	Prob.
D(LRGDP)	11.94156	5	0.0356
D(LRVEX)	2.112005	5	0.8334
D(LROEX)	10.26959	5	0.0679
All	25.54918	15	0.0430

With reference to real GDP as the dependent variable, the null hypothesis of Granger causality cannot be rejected for real vehicle exports, real other exports and domestic absorption. As a result, it can be concluded that real exports Granger cause real GDP. In addition, real other exports and domestic absorption are also found to Granger cause economic growth. However, real GDP and real other exports are not found to Granger cause real vehicle exports. Therefore, a unidirectional causal relationship is found to run from real vehicle exports to real GDP. However, there is no evidence of a unidirectional Granger causality running from real GDP to real vehicle exports. When the log of real

other exports is taken as the dependent variable, there is no evidence that real GDP is Granger caused by real vehicle exports or real domestic absorption. Thus, it can be concluded that there is no unidirectional Granger causal relationship running from real GDP to real vehicle exports. It can, therefore, be concluded that the Export-Led Growth hypothesis holds for the case of real vehicle exports and economic growth as a unidirectional causal relationship exists between real vehicle exports and real GDP.

5.5) Conclusion

Both the ADF and the PP tests indicated that all of the variables were I(1). The results of the Engle-Granger two-step and the Johansen Co-integration Technique revealed the existence of one co-integrating vector. The VECM suggested that real vehicle exports make a positive impact towards economic growth. However, the magnitude of the long-run impact was relatively less than that of domestic absorption. The short-run adjustment co-efficient suggested that 18.8% of the variation in GDP is corrected from its equilibrium. All of the explanatory variables were found to have a positive relationship with economic growth in the long-run. The main contributor to economic growth was found to be real domestic absorption. The Granger Causality test reveals that real vehicle exports Granger caused economic growth. However, no unidirectional Granger causality was found to be running from economic growth to real vehicle exports. This indicates that the Export-Led Hypothesis holds to explain the relationship between real vehicle exports and economic growth in South Africa.

Chapter 6

Summary, Conclusions, Recommendations and Limitations

6.1) Summary of Study and Conclusions

This chapter attempts to draw conclusions and give policy implications and recommendations based on the previous chapter. The study investigated the impact of al vehicle exports on economic growth in the period 199Q1-2011Q2. Since its establishment in the 1920s, the South African automobile industry has been regarded as a strategic industry and an emblem of success in South Africa. This was mainly attributed to the ability of automobile exports in generating economic growth. As discussed in the previous chapters, manufactured exports have been regarded as having a greater impact on economic growth than primary commodity exports because primary commodity exports are viewed as being subject to volatility in revenues and price shocks. As reviewed before, the South African automobile industry has been characterised by high levels trade protection via heavy import tariffs on imported components and automobiles. The purpose of this inward-oriented trade policy was to protect the South African automobile industry and allowing it to become competitive. However, as discussed in previous chapters, the high tariff levels and protective trade regime resulted in an automobile industry that was relatively uncompetitive as it was characterised by high average costs and low levels of output. From the 1960s, a series of local content programmes were adopted in the South African automobile industry. Most of these local content programmes focused on protecting the South African automobile industry by imposing high tariff rates. The first phase of trade policy to focus on export promotion in the South African automobile industry was Phase VI. However, as discussed before, this policy was criticized for not including any form of local content programme. Another limitation of Phase VI was that it was implemented during a period of political and economic uncertainty and, therefore, it was not able to generate a significant increase in automobile export or economic growth. As reviewed before, the Motor Industry Development Programme was introduced in 1995 with the aim of expanding automobile exports in South Africa. The MIDP endeavoured to increase South African automobile exports by reducing tariffs and introducing an export-import complementation scheme which would allow domestic automobile firms to reduce their cost of imported components by expanding their export operations and ,thereby, gaining duty drawbacks. As discussed earlier, due to the attention placed on MIDP, it was necessary to establish the relationship between automobile exports and economic growth

from 1995 to 2011 and whether an expansion in automobile exports has resulted in economic growth.

As reviewed in the before in the literature review, the Export-Led Growth Hypothesis explained the relationship between export expansion and economic growth, and postulated that a rise in exports would lead to a long-run increase in economic growth. The notion of export expansion having a favourable effect on an economy's economic growth was introduced by both Adam Smith and David Ricardo. As discussed earlier, the Classical theorists recommended that a country should specialise in the commodities in which the given country has a comparative advantage in and import those commodities for which it has a comparative disadvantage. Although the Classical perspectives of Adam Smith and David Ricardo emphasised the gains from trade, they did not explore the exact relationship between export expansion and economic growth. The demand-side perspective of the Export-Led Growth hypothesis views exports as a component of GDP. In this way, emphasis is placed on the ability of autonomous automobile exports in generating a larger change in economic growth through the multiplier effect. In order for the Export-Led Growth hypothesis to hold, three main characteristics must be found. Firstly, it must be concluded that a long-run relationship exists between export growth and economic growth. Secondly, a unidirectional causal relationship running from export growth to economic growth must be found to exist. Finally, there must be evidence that the increase in exports is the key factor leading to economic growth.

The empirical literature reviewed various studies regarding the South African automobile industry. Although empirical literature pertaining to the South African automobile industry was found to provide an understanding of the South African automobile industry and its challenges, the empirical literature failed to address the issue of economic growth or the relationship between automobile expansion and economic growth. As reviewed before, the empirical literature pertaining to the Export-Led Growth hypothesis provided a satisfactory guideline for empirically testing the relationship between automobile exports and economic growth. Although, the empirical studies incorporate a bivariate model or create an augmented production function in testing the Export-Led Growth hypothesis, the current study focused on the demand perspective of the Export-Led Growth hypothesis. This was because the demand factors were perceived as being more relevant in describing and examining the long run relationship between automobile exports and economic growth in South Africa. In addition, South Africa's constraints are perceived to be mostly demand rather than supply variables.

Although, vast empirical literature exists regarding the Export-Led Growth hypothesis, there was no agreement as to whether export expansion results in a positive impact on economic growth. As discussed before in the literature review, some of the studies that analysed the validity of the Export-Led Growth hypothesis for a number of countries constructed a neoclassical production function or an augmented neoclassical production function. However, it was found that the limitation with regard to this approach was that countries differed in terms of the factors of production and that some of the country-specific factors were not taken into account. As reviewed before, the empirical studies that focused on specific countries either employed bivariate models or they failed to decompose total exports. As discussed before, the main problem that was found to be associated with focusing only on total exports was that the relationship between sectoral export growth and economic growth was not analysed. It was concluded earlier that it was possibly more relevant to empirically examine the relationship between individual export sectors (such as the automobile industry) and economic growth as this approach would both reveal and identify which sectors have had little or no impact on economic growth in South Africa. Similarly, disaggregating total exports into individual sectors would shed light on which sectors possibly have the potential to make the most significant impact towards economic growth in South Africa. In so doing, amendments could be made to the current trade policy to ensure that those export commodities that are able to generate the largest magnitude of economic growth be given the appropriate and relevant assistance.

As discussed earlier, the Demand-Perspective of the Export-Led Growth hypothesis was applied in order to examine the relationship between automobile exports and economic growth. According to this view, automobile exports were seen as an autonomous component of economic growth and were expected to be the key factor in causing long-run economic growth. The estimated model took into account other demand factors such as domestic absorption and other exports. Both the ADF and the PP tests indicated that the time series variables were integrated of order one. The Johansen Co-integration Technique revealed the existence of one co-integrating vector. Since a long-run relationship was established between the variables, the VECM was estimated and it was concluded that all of the explanatory variables were found to have a positive relationship with economic growth in both the long-run and the short-run. In addition, the results suggested that real vehicle exports made a positive long-run impact on economic growth. The first objective of this study entailed estimating the contribution of automobile exports and economic growth. The VECM findings indicated that a 1% increase in real automobile exports would cause real GDP to increase by 0.0077% while a 1% increase in real other exports would lead to a 0.037% increase in real GDP. However, the magnitude of the

long-run impact was found to be relatively less than that of domestic absorption since a 1% increase in real domestic absorption was found to result in an 0.6113% increase in real GDP. Although it was concluded that real vehicle exports made a positive impact towards economic growth, they were not found to be the main contributor to economic growth. As discussed earlier, this revealed that even though an outward-oriented trade policy has been adopted in South Africa, domestic absorption had a greater impact on economic growth than both real vehicle exports and real other exports. Even though South Africa has adopted an outward-oriented trade policy, the export sectors have not been as competitive as expected. In the case of the South African automobile industry, the impact of vehicle exports may have been influenced by the industry's uncompetitiveness in terms of low output and high average costs. However, since real vehicle exports were shown to have a positive long-run impact on economic growth, focus should be placed on improving the production and export competitiveness of the South African automobile industry. The adjusted R^2 of the VECM model revealed that 95% of the variation in real GDP was explained by real automobile exports, real other exports and real domestic absorption in the long-run. As discussed earlier, the adjustment co-efficient indicated that the speed of adjustment to long-run equilibrium was 18.8%. The lagged values of the explanatory variables were found to be positive. However, both the lagged values of real vehicle exports and real domestic absorption were found to be statistically insignificant after the first lag; while the lagged value of real other exports is statistically significant. It was concluded that real vehicle exports have a greater impact on economic growth in the long run than in the short run. In light of the above, the first null hypothesis of this study can be rejected in favour of the alternate hypothesis which states that automobile exports do contribute to economic growth in South Africa. The diagnostic tests concluded that there were no signs or autocorrelation, heteroscedasticity, mis-specification or endogeneity in the estimated model. The second objective of this study entailed testing the causal relationship between automobile exports and economic growth. The Granger Causality test revealed that real vehicle exports Granger caused economic growth. No causal relationship was found to exist running from economic growth to real vehicle exports. In light of this, it can be concluded that automobile exports make a positive long-run impact towards economic growth and the relationship between automobile exports. Economic growth in South Africa for the period 1995-2011 can be explained by the Export-Led Growth hypothesis, as it was concluded that real automobile exports Granger cause economic growth. As a result, the second null hypothesis of this study can be rejected in favour of the alternate hypothesis which states that there is a causal relationship between automobile exports and economic growth in South Africa.

6.2) Policy Implications and Recommendations

The final objective of this study entailed making conclusions and policy recommendations based on the empirical findings. Although the automobile firms in South Africa predominantly foreign-owned, the export and production policies of the South African automobile industry are guided by domestic trade policy via the Automobile Industry Export Council (AIEC). Therefore, the policy implications and recommendations should be considered by South Africa's trade policy and the Automobile Industry Export Council (AIEC) of South Africa. The parent companies' ownership is a signal of investment confidence in the South African automobile industry. If South Africa's automobile export and production policy leads to favourable results, the parent companies are likely to be willing to further assist in expanding the infrastructure of the South African automobile industry.

Export promotion has been recognized as a suitable trade policy in achieving economic growth. This is mainly due to the perceived link between export expansion and economic growth. This has given rise to trade liberalization and export promotion schemes. Automobiles constitute manufactured exports. It has been argued that manufactured exports will make a larger and more significant impact towards economic growth than primary commodity exports. This is mainly because primary commodity exports are subject to greater volatility and instability in prices and export revenues than manufactured exports. However, despite the MIDP export promotion schemes, the South African automobile industry is still characterised by relatively high average costs and low output levels. This has lead to the debate as to whether the MIDP programme has generated sufficient export expansion to obtain economic growth.

This study endeavoured to contribute towards this debate by examining whether the automobile export expansion has positively impacted on economic growth in South Africa. The study revealed that a long-run relationship exists between automobile exports and economic growth, and that automobile exports made a positive impact towards economic growth. Furthermore, it was revealed that a unidirectional Granger causal relationship was found to run from real automobile exports to economic growth. It is, therefore, recommended that focus be placed on the export promotion schemes in the automobile industry so that automobile exports will be able to contribute even more significantly to domestic economic growth. In order for this to be achieved, it is advised that focus be placed on the production and export environment so that both the production and export capacity of the South African automobile industry can be expanded. The MIDP and any of its successor programmes should focus on building the export capacity of the automobile

industry by implementing programmes that will increase the foreign demand for automobiles produced in South Africa. This can be accomplished in a number of ways. Firstly, focus should be placed on the cost effectiveness of automobile production and exports in South Africa. This is so that South African automobile exports will be able to compete with automobile exports from other countries. In order for South Africa to expand its export capacity, it needs to examine its infrastructure and focus on ways to improve production and export productivity. One of the main constraints of the South African automobile industry is that a relatively small number of automobiles are produced and exported. This characteristic is a result of the former import substitution policy. Although, the MIDP has entailed rationalization of the number of models produced and exported, it is recommended that further rationalization take place. This is in order to reduce the low output and high average costs currently faced by the South African automobile industry.

In addition, focus should be placed on the type of automobiles produced in South Africa. It is advised that the foreign demand for light-weight, passenger and heavy-weight vehicles be determined. The South African automobile industry should possibly only produce and export the type of automobiles for which there is the greatest foreign demand. If there is relatively insufficient foreign demand for he[illegible]y vehicles, the South African automobile industry should rather consider halting the production and export of heavy-duty vehicles and rather concentrate on the production of passenger vehicles for which there is possibly a relatively greater foreign demand. This will allow the South African automobile industry to adjust its production processes in a manner that will enable it to increase both the output and export of automobiles and achieve economies of scale. In so doing, the parent companies may be more willing to invest in the South African automobile operations and assist in further expanding operations in South Africa. Since the parent companies have invested in the South African operations, their interest would be on ways to expand the production and exports of South African automobiles.

It is also recommended that measures to be taken to reduce any form of disturbance to the production and exports of automobiles in South Africa. This is especially since these disturbances can have a negative impact on the production costs and exports of vehicles. The South African automobile industry needs to take into account disturbances to the production and export process such as strike action and power failures. Attention needs to be placed on measures both to reduce and overcome any of these potential disturbances. These decisions and measures will have to be taken at a strategic level. However, it is also advised that the relevant trade unions and stakeholders be consulted with regard to reducing and shocks to the production of automobiles. The South African automobile

industry needs to focus on maintaining relationships with the parent automobile companies so that they do not opt for relocation of their operations. This could be achieved by ensuring that the automobile industry in South Africa is productive and is striving towards efficiency in production and export of automobiles. Policies should be implemented to focus on achieving production efficiency and expanding automobile exports. The parent companies should be consulted with regard to disturbances and measures to reduce such disturbances. This will contribute stronger links between the South African automobile firms and the parent companies and possibly result in increased investment in the South African automobile industry.

The South African automobile industry should examine the export and production policies adopted in other developing countries such as Brazil and Mexico. This is in order to develop strategies to improve the current domestic operations. The parent companies could be consulted with regard to providing this form of information and would most probably be willing to assist in improving the operations of the South African automobile industry. By doing this, policies need to be implemented to assist the South African automobile industry to increase both its export and production capacity. Focus should also be placed on how automobile industries in other countries have been able to maintain their relationships with the parent companies; what type of vehicles are being produced and exported; how automobile firms in other countries have been able to reduce any production shocks due to sudden shocks in costs and reduced foreign demand. By identifying how automobile industries in other countries have improved relations with the parent companies, the South African automobile industry could implement similar strategies and improve the conditions and operations of the domestic industry, .A marketing campaign should be adopted to attract foreign demand for automobiles produced in South Africa. This could be achieved by working closer with the parent companies. In this way, the parent companies could assist in the facilitation of both advertising and promotion materials with the aim of increasing foreign demand for South African automobile exports. It is most likely that respective parent companies would agree to facilitate in this regard as they are major stakeholders in the operations South African automobile industry. In order to achieve the above recommendations, it is imperative that favourable relationships exist between the parent companies and the South African operations. The parent companies provide an important link with regard to increasing foreign demand for South African automobile exports and further investment in the South African automobile industry.

6.3) Limitations of the Study and Areas for Further Research

The main limitation of this study is the availability of data. This is the case particularly with regard to data relating to real capital formation and real employment in the South African automobile assembly plants. As a result, this study could only examine the demand perspective with regard to the relationship between automobile exports and economic growth. Another limitation was the availability of yearly data with regard to automobile exports and possibly even other sectors such as the main mining and manufacturing industries so that a comparison could be drawn between automobile exports and that of other sectors. The availability of yearly data from 1980 onwards would also have assisted with challenges faced with incorporating quarterly data in this study. In terms of further research, it would be beneficial to examine the productivity impact of automobile exports on labour and capital productivity in South Africa. In addition, it is recommended that further studies be conducted to compare the productivity of the South African automobile industry with that of other developing and developed countries. This would assist in order to examine how productive the South African automobile industry is compared to that of other countries as well as investigating ways in which South Africa can improve its production and export capacity of automobiles.

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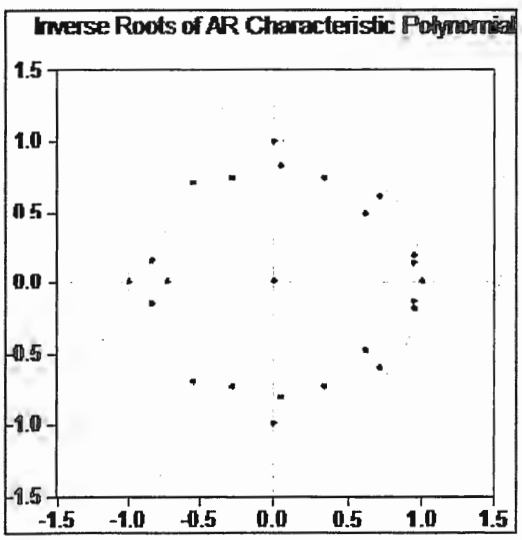
8) Appendices

Appendix 1a - Estimated Stability of Model at 6 lags.

Roots of Characteristic Polynomial
Endogenous variables: LRGDP LRVEX LROEX LRDA
Exogenous variables: C
Lag specification: 1 6
Date: 11/13/11 Time: 16:32

Root	Modulus
1.008160	1.008160
-0.996812	0.996812
0.003660 + 0.993533i	0.993539
0.003660 - 0.993533i	0.993539
0.952175 - 0.187250i	0.970412
0.952175 + 0.187250i	0.970412
0.948378 - 0.138348i	0.958416
0.948378 + 0.138348i	0.958416
0.722729 - 0.605718i	0.942991
0.722729 + 0.605718i	0.942991
-0.540892 + 0.698425i	0.883381
-0.540892 - 0.698425i	0.883381
-0.841246 + 0.152456i	0.854949
-0.841246 - 0.152456i	0.854949
0.052804 - 0.814638i	0.816348
0.052804 + 0.814638i	0.816348
0.343337 + 0.729888i	0.806608
0.343337 - 0.729888i	0.806608
0.625718 + 0.483929i	0.791018
0.625718 - 0.483929i	0.791018
-0.265937 - 0.731524i	0.778363
-0.265937 + 0.731524i	0.778363
-0.729857	0.729857
0.008766	0.008766

Warning: At least one root outside the unit circle.
VAR does not satisfy the stability condition.

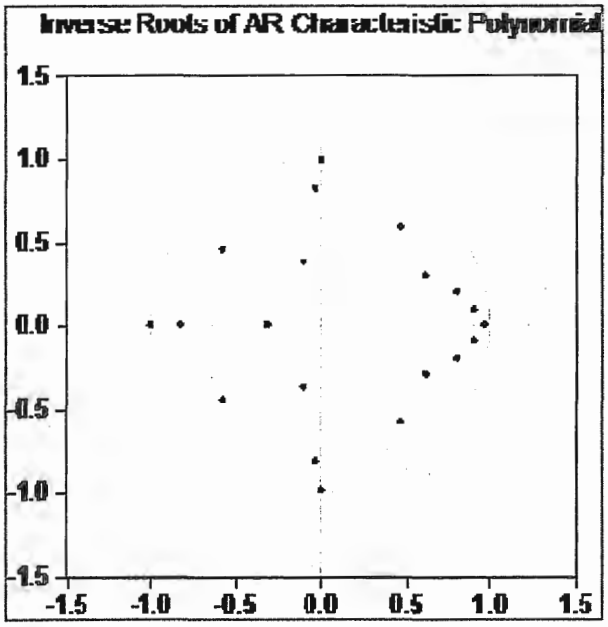


Appendix 1b - Estimated Stability of Model at 5 lags.

Roots of Characteristic Polynomial
Endogenous variables: LRGDP LRVEX LROEX LRDA
Exogenous variables: C
Lag specification: 1 5
Date: 11/13/11 Time: 16:33

Root	Modulus
-0.997255	0.997255
0.001906 + 0.990083i	0.990085
0.001906 - 0.990083i	0.990085
0.973542	0.973542
0.916354 - 0.088661i	0.920634
0.916354 + 0.088661i	0.920634
0.800914 - 0.203712i	0.826415
0.800914 + 0.203712i	0.826415
-0.826111	0.826111
-0.027825 - 0.814220i	0.814695
-0.027825 + 0.814220i	0.814695
0.468282 - 0.581401i	0.746535
0.468282 + 0.581401i	0.746535
-0.570510 - 0.454212i	0.729239
-0.570510 + 0.454212i	0.729239
0.618839 + 0.292893i	0.684652
0.618839 - 0.292893i	0.684652
-0.110489 - 0.378337i	0.394141
-0.110489 + 0.378337i	0.394141
-0.314520	0.314520

No root lies outside the unit circle.
VAR satisfies the stability condition.



Appendix 2- The Estimated VECM

Vector Error Correction Estimates
Date: 11/13/11 Time: 17:12
Sample (adjusted): 1996Q3 2011Q2
Included observations: 60 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Co-integrating Eq:	CointEq1
LRGDP(-1)	1.000000
LRVEX(-1)	0.007716 (0.00099) [7.83100]
LROEX(-1)	0.037018 (0.01092) [3.38901]
LRDA(-1)	0.611300 (0.02299) [26.5905]
C	4.759043

Error Correction:	D(LRGDP)	D(LRVEX)	D(LROEX)	D(LRDA)
CointEq1	-0.188459 (0.10175) [-1.85221]	-27.13114 (7.2227[illegible]) [-3.75635]	-11.45486 ([illegible].08971) [- 2.80090]	- 0.286442 (0.18391) [-1.55748]
D(LRGDP(-1))	0.195238 (0.25448) [0.76721]	25.62771 (8.31159) [3.08337]	9.541857 (4.70625) [2.02738]	0.008383 (0.21164) [0.03961]
D(LRGDP(-2))	0.151180 (0.24221) [0.62417]	29.64987 (7.91081) [3.74802]	6.572249 (4.47932) [1.46724]	0.251048 (0.20143) [1.24630]
D(LRGDP(-3))	-0.046116 (0.23870) [-0.19319]	18.46653 (7.79629) [2.36863]	6.217554 (4.41448) [1.40845]	0.177199 (0.19852) [0.89260]
D(LRGDP(-4))	0.460991 (0.18720) [2.46257]	16.04827 (6.11415) [2.62478]	7.434103 (3.46200) [2.14734]	0.246326 (0.15569) [1.58220]
D(LRGDP(-5))	0.097177 (0.18219) [0.53338]	20.22335 (5.95048) [3.39861]	6.417942 (3.36933) [1.90481]	0.010242 (0.00061) [1.67901]
D(LRVEX(-1))	0.002169 (0.00528) [0.41104]	-0.441404 (0.17233) [-2.56140]	0.220949 (0.09758) [2.26434]	0.000236 (0.00439) [0.05376]
D(LRVEX(-2))	0.006831 (0.00504) [1.35495]	-0.267945 (0.16465) [-1.62733]	0.006293 (0.09323) [0.06750]	0.001633 (0.00419) [0.38959]
D(LRVEX(-3))	0.006017 (0.00399) [1.50708]	-0.184147 (0.13040) [-1.41222]	0.072948 (0.07383) [0.98801]	0.001878 (0.00332) [0.56574]
D(LRVEX(-4))	0.003167	-0.364133	0.022369	0.003254

	(0.00176)	(0.12879)	(0.07293)	(0.00163)
	[1.80315]	[-2.82726]	[0.30674]	[1.99632]
D(LRVEX(-5))	0.006939	-0.126970	0.153530	0.002614
	(0.00390)	(0.12729)	(0.07207)	(0.00145)
	[1.78054]	[-0.99752]	[2.13021]	[1.80275]
D(LROEX(-1))	0.012107	0.324728	-0.028457	0.000883
	(0.00911)	(0.32182)	(0.18222)	(0.00819)
	[1.32898]	[1.00903]	[-0.15616]	[0.10773]
D(LROEX(-2))	0.016550	1.204741	0.067388	0.001147
	(0.00886)	(0.28939)	(0.16386)	(0.00737)
	[1.86789]	[4.16298]	[0.41125]	[0.15570]
D(LROEX(-3))	0.024140	1.223384	0.051936	0.018099
	(0.00876)	(0.28620)	(0.16205)	(0.00729)
	[2.75491]	[4.27465]	[0.32049]	[2.48358]
D(LROEX(-4))	0.016572	0.671564	0.095598	0.008620
	(0.00874)	(0.28540)	(0.16160)	(0.00727)
	[1.89654]	[2.35307]	[0.59156]	[1.18617]
D(LROEX(-5))	0.009936	0.341640	-0.109268	0.002071
	(0.00744)	(0.24296)	(0.13757)	(0.00619)
	[1.33574]	[1.40617]	[-0.79427]	[0.33471]
D(LRDA(-1))	0.244476	17.68009	7.653021	0.559706
	(0.19586)	(6.39701)	(3.62216)	(0.16289)
	[1.24822]	[2.76381]	[2.11283]	[3.43613]
D(LRDA(-2))	0.077156	11.12650	2.624974	-0.162403
	(0.05007)	(4.65901)	(2.63806)	(0.11863)
	[1.54089]	[2.38811]	[0.99504]	[-1.36895]
D(LRDA(-3))	0.137475	10.37246	4.151106	-0.007817
	(0.07009)	(4.67081)	(2.64474)	(0.11893)
	[1.96141]	[2.22070]	[1.56957]	[-0.06573]
D(LRDA(-4))	0.175296	9.125566	2.210760	0.591302
	(0.12306)	(4.01912)	(2.27574)	(0.10234)
	[1.42453]	[2.27054]	[0.97145]	[5.77782]
D(LRDA(-5))	0.499101	7.285469	3.559815	-0.628054
	(0.13690)	(4.47133)	(2.53179)	(0.11385)
	[3.64572]	[1.62937]	[1.40605]	[-5.51628]
C	0.006900	0.022309	0.141783	0.004800
	(0.00230)	(0.07517)	(0.04256)	(0.00191)
	[2.99829]	[0.29679]	[3.33122]	[2.50757]
R-squared	0.949680	0.630962	0.575080	0.983776
Adj. R-squared	0.921871	0.427021	0.340256	0.974810
Sum sq. Resides	0.002271	2.422866	0.776804	0.001571
S.E. equation	0.007731	0.252507	0.142976	0.006430
F-statistic	64.15052	3.093835	2.448979	109.7237
Log likelihood	220.3167	11.14549	45.27103	231.3767
Akaike AIC	-6.610556	0.361817	-0.775701	-6.979223
Schwarz SC	-5.842630	1.129743	-0.007775	-6.211296
Mean dependent	0.007674	0.091390	0.025884	0.009919
S.D. dependent	0.027659	0.333583	0.176026	0.040511
Determinant resid covariance (dof adj.)		1.98E-12		
Determinant resid covariance		3.18E-13		
Log likelihood		522.7411		
Akaike information criterion		-14.35804		

Schwarz criterion	-11.14671

Appendix 3a

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/14/11 Time: 10:36
Sample: 1995Q1 2011Q2
Included observations: 60

Component	Skewness	Chi-sq	df	Prob.
1	0.138056	0.187417	1	0.6651
2	0.159506	0.250180	1	0.6169
3	0.076776	0.057964	1	0.8097
4	0.385130	1.458530	1	0.2272
Joint		1.954091	4	0.7442

Component	Kurtosis	Chi-sq	df	Prob.
1	2.909396	0.020181	1	0.8870
2	3.976475	2.344030	1	0.1258
3	3.334127	0.274450	1	0.6004
4	3.694076	1.184280	1	0.2765
Joint		3.822941	4	0.4305

Component	Jarque-Bera	df	Prob.
1	0.207598	2	0.9014
2	2.594210	2	0.2733
3	0.332414	2	0.8469
4	2.642810	2	0.2668
Joint	5.777031	8	0.6722

Appendix 3b

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/14/11 Time: 10:13
Sample: 1995Q1 2011Q2
Included observations: 60

Lags	LM-Stat	Prob
1	20.16740	0.2128
2	17.62020	0.3466
3	12.73076	0.6923
4	20.84534	0.1845
5	19.50111	0.2435
6	9.502355	0.8913

Probs from chi-square with 16 df.

Appendix 3c

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 11/14/11 Time: 10:14
Sample: 1995Q1 2011Q2
Included observations: 60

Joint test:

Chi-sq	df	Prob.
442.6060	420	0.2150

Individual components:

Dependent	R-squared	F(42,17)	Prob.	Chi-sq(42)	Prob.
res1*res1	0.761103	1.289535	0.2910	45.66620	0.3223
res2*res2	0.819324	1.835502	0.0879	49.15944	0.2082
res3*res3	0.811374	1.741077	0.1080	48.68242	0.2220
res4*res4	0.841782	2.153496	0.0444	50.50693	0.1727
res2*res1	0.709432	0.988240	0.5345	42.56592	0.4466
res3*res1	0.696404	0.928462	0.5947	41.78422	0.4804
res3*res2	0.714802	1.014471	0.5091	42.88815	0.4329
res4*res1	0.804381	1.664377	0.1279	48.26289	0.2345
res4*res2	0.699120	0.940498	0.5825	41.94719	0.4733
res4*res3	0.559570	0.514254	0.9594	33.57423	0.8199