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THE IMPACT OF FOREIGN DIRECT INVESTMENT ON LABOUR PRODUCTIVITY OF THE AUTOMOTIVE SECTOR IN SOUTH AFRICA

by

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ABSTRACT

The determinants of Foreign Direct Investment (FDI) and its effects on macroeconomic growth in developing countries have been investigated exhaustively by numerous researchers. The dominant message that has emerged from these studies is that FDI promotes growth. However, few studies have dealt with the influence of FDI on labour productivity in the automotive industry. The aim of this study was to examine the impact of FDI on labour productivity in this industry in South Africa, covering the period 1995 to 2013.

The Johansen cointegration test was utilised to analysis the long-term relationship between FCI and labour productivity. The empirical results revealed that there is a long-term relationship between the two variables. The Vector Error Correction Model was also estimated to examine the short-term relationship between the variables. The empirical results revealed that FDI has a positive statistical significant impact on labour productivity in South Africa. The results suggest that policies aimed at enhancing FDI should be pursued as this enhances productivity in the automotive sector which will spill over to other sectors of the economy.

Key words: Foreign Direct Investment, Labour productivity, Automotive sector, South Africa

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LIST OF ABBREVATIONS AND ACRONYMS

ADF	Augmented Dickey–Fuller
AIEC	Automotive Industry Export Council
AIS	Automotive Investment Scheme
APDP	Automotive Production and Development Programme
AR	Autoregressive Representation
ASEAN	Association of Southeast Asian Nations
BEE	Black Economic Empowerment
BRICS	Brazil, Russia, India, China and South Africa
CI	Capital Input
DTI	Department of Trade and Industry
ECE	East Central European
ECM	Error-Correction Models
EU	European Union
FDI	Foreign Direct Investment
FPI	Foreign Portfolio Investment
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
GDP	Growth Domestic Product
GEAR	Growth, Employment and Redistribution
LI	Labour Input
LM	Langrange Multiplier
LP	Labour Productivity
MIDP	Motor Industry Development Programme
MNE	Multinational Enterprises
NAACAM	National Association of Automotive Component and Allied Manufacturers
NAAMSA	National Association of Automobile Manufactures South Africa
OECD	Organisation for Economic Co-operation and Development
OEMs	Original Equipment Manufactures
OLS	Ordinary Least Squares
PAA	Productive Asset Allowance
PP	Phillips–Perron
SA	South Africa
SARB	South African Reserve Bank

STATSSA	Statistics South Africa
UNCTAD	United Nations Conference on Trade and Development
VAA	Vehicle assembly allowance
VAR	Vector Auto Regressive
VECM	Vector Error-Correction Model
VWSA	Volkswagen South Africa
WIR	World Investment Report

CHAPTER 1

INTRODUCTION TO THE STUDY

1.1 introduction and background

Many studies such as Hansen and Rand (2005); Buckley, Clegg and Wang (2002); Akinlo, (2004) and Seetanah and Khadaroo, (2007) have found that foreign capital inflows accelerates growth performance of an economy through complimenting domestic resources which do not meet the domestic demand. The available studies which supports the promotion of foreign capital points to the development of the Asian economies which have grown enormously for the past 20 years (Agrawal, 2000). However Nnadozie (2008) argue that less developed countries, especially in Africa can close the gap between developed and developing countries through attracting foreign capital.

Foreign capital inflow refers to the amount of money coming from foreign countries for the purchase of domestic capital assets (land, equipment or building). There are various forms of foreign capital inflows and these forms includes foreign direct investment (FDI), portfolio investment, official development assistance (ODA) and other commercial loans and investment (Delwar, 2012). However their impact on economic growth is varied.

Despite the establishment of a positive role of foreign capital on economic growth in the literature as highlighted earlier on, its impact on labour productivity is still a contenitious issue. Of the available studies which have examined the link between FDI and labour productivity, there are a number of studies which have used cross sectional and panel data to examine the impact of FDI on labour productivity. The majority of these studies have established a positive relationship between the two in the host countries. These studies include Mebratie (2010); Buckley et al (2007); Tomohara and Yokota (2005). However, other studies (Aitken and Harrison, 1999; Konings 2000) have found that FDI has a negative effect on labour productivity of local firms in developing countries due to high levels of competition. These studies argue that the foreign investment enhances the labour productivity of foreign firms because the skilled workers may be offered higher wages by the foreign firms and leave the local firms with less skilled labourers and that result to low labour productivity of local firms.

In the case of South Africa, it is interesting to note that the automotive sector is one of the nine manufacturing sectors in the country which have played a very important role towards the development of the economy. In addition, it is also interesting to note that Foreign Capital flows to the country has been on the rise, especially Foreign Direct Investment (FDI) as evidenced by a number of foreign automobiles operating in the country such as Mercedes Benz, Ford, Toyota, Volswagen, General motors, Daimlyer Chrysler as well as a number of foreign suppliers of automotive parts such as Arvin Exhust, Bloxwitch, Kolbenco, Senior Flexonics (National Association of Automotive Component and Allied Manufacturers (NAACAM, 2011)). Thus given this surge in FDI, it makes it interesting to examine its impact of labour productivity of the automotive sector in South Africa.

2. RESEARCH PROBLEM

The automotive industry is one of the largest manufacturing sectors in South Africa which has contributed 11.7% to the South Africa's manufacturing export and 7.2% to the country's GDP in 2014. It has played a significant role into the creation of jobs. The South African Government introduced the motor industry development programme (MIDP) in 1995 with the aim of promoting competitiveness and export expansion in the automotive industry. Since the inception of MIDP, the industry has been growing as a result, the share of exports as a percentage of domestic production increased from 4.8% in 1995 to 52.4% in 2012 (Automotive Industry Export Council (AIEC), 2013).

According to NACAAM (2011), the number of vehicles produced per employee increased from 7 to 17 vehicles per annum in year 2010, this increase in labour productivity has resulted in a huge growth of vehicle production from nearly 300 000 in 1998 to 566 083 units vehicles produced in year 2014. This suggest that the automobile industry labour productivity is improving but there is a lot that need to be done on the sector as the growth rate of production in South Africa is still very low compared to other countries in the BRICS such as China (14.8%) and Brasil (9.9%) (Automotive Industry Development Centre (AIDC), 2014).

The importance of labour productivity to the overall economy cannot be taken for granted. Dudas and Lukac (2014) argue that increasing labour productivity is one of the major tools to increase efficiency and competitiveness of companies as well as the economic well-being in a country. In addition, labour productivity is also related to other economic indicators such as economic growth, competitiveness as well as the living standards in the domestic economy. Labour productivity is also reflected in the growth of labour costs which directly impact on the living standards of the population (Dudas and Lukac, 2014). It is also important to note that labour productivity in one sector has also spillover effect on the other sectors, which also has a bearing on labour productivity growth in them too. This phenomenon of the spillover effects on labour productivity can be potentially dangerous in the event that growth rates of labour cost driven labour productivity growth reduce the investment attractiveness of the country. This will likely deter foreign investors from their intentions to invest in the economy or investors may go to the extent of withdrawing their existing investment into other countries with more favourable ratio of productivity and labour costs (Dudas and Lukac, 2014).

Therefore given the extent to which the industry is automated, of which much of it comes through FDI, the study thus seeks to examine the extent to which FDI impact on labour productivity of the automotive sector in South Africa given also the important role played by sector on the manufacturing sector and the overall economy. The perspective adopted in this study aims to build a theoretical and empirical case for the way in which state intervention can implement more policies to attract foreing investment relations in the automotive industry towards the goal of improving productivity, employment, and economic growth.

1.3. Research objectives

The main focus of the study is to examine the impact of foreign capital inflows on labour productivity in the automotive industry in South Africa. The specific objectives include:

i. Examining trends in FDI flows to South Africa and the development of the South African automotive sector;
ii. Examining empirically the relationship between FDI and labour productivity in the South African automotive sector; and
iii. Formulating policy recommendations, based on the empirical results of the research, to improve productivity in the South African automotive sector.

1.4. Hypothesis

H_0: Foreign Direct Investment do not statistically enhance labour productivity of the automotive sector in South Africa.

H_1: Foreign Direct Investment statistically enhance labour production in South Africa.

1.5. Significance of the study

Few studies have been conducted on the impact of FDI on labour productivity in South Africa. Waheed (2004) suggest that FDI has played a significant role in the growth of the economies of other developing countries. FDI is also acknowledged to be an important sources of capital stock in the creation of job opportunities. There have been calls to attract more FDI flows to South Africa in order to achieve sustainable economic growth and to reduce the level of unemployment, given that the country has low levels of savings. It addition, it is important to to note that the automotive sector in South Africa is exclusively built through FDI, reinforcing the relevance of the research. In addition, the sector is also an essential pillar of the South African econ omy. It is important, therefore, to examine the impact of FDI flows on labour productivity, especially as the country struggles to find skilled labour.

1.9 Outline of the chapters

The study consists of six chapters. Chapter 1 provides the background to the study, problem statement and objectives of the study. Chapter 2 focuses on the overview of labour productivity and FDI in South Africa. Chapter 3 presents the theoretical framework and literature review. Chapter 4 is centred on the empirical analysis, emphasising the formulation and estimation of the econometrics methodology. The results are interpreted in Chapter 5, while Chapter 6 contains the conclusion, provides policy recommendations and discusses the implications of the study.

CHAPTER 2

AN OVERVIEW OF FOREIGN CAPITAL INFLOWS IN LABOUR PRODUCTIVITY IN SOUTH AFRICA

2.1 Introduction

The purpose of this chapter is to provide an overview of FDI in the automotive industry in South Africa. The chapter is divided into three sections. The first part gives the historical background of FCI to South Africa, and compares FDI inflows into South Africa with those into other BRICS (Brazil, Russia, India, China and South Africa) countries, as well as into other African countries. The second part of this chapter gives an overview of the automotive industry in South Africa. The third section discusses on the various policies which have been formulated for the automotive industry in South Africa.

2.2. Overview of global FDI inflows

Developed countries have received a greater share of FDI inflows (OECD, 2002). However, since the 1980s, global FDI inflows have fluctuated between developed and developing countries. According to WIR(1995), between 1982 and 1986 developed countries received a 70% share of FDIs, while 30% went to developing countries. By the end of 1994, the developed countries' share of FDI had been reduced to 60%, and it fluctuated around these ratios until 2006, while the proportion of transitional economies gained more than 5% of the world's FDI (WIR, 2006).

WIR (2006) reported that the United Kingdom and Asian countries received the largest share of FDI in 2005 and 2006 respectively. The growth of FDI in Asia has been attributed to various policy changes at national and regional levels. For example, China signed an agreement to establish a free-trade area by 2010, and other Asian countries also signed free-trade agreements, notably with the United States, and also formed the Association of Southeast Asian Nations (ASEAN) (WIR, 2006).

According to WIR (2011), from 2007 to 2010, FDI inflows to developed countries contracted, in contrast to developing and transitional economies, which, for the first time, surpassed the 52% in global FDI flows. In 2013 developing countries took the lead; in 2012, for the first time, developing economies absorbed more FDI than developed countries, accounting for 52% of global FDI flows. This is partly because the biggest fall in FDI inflows occurred in developed countries, which now account for only 42% of global flows. Developing economies also accounted for almost one-third of global FDI outflows, continuing a steady upward trend (WIR, 2013), which was attributed to the strength of domestic demand and the increase in cross-border mergers and acquisitions. These were the result of attractive valuations of company's assets, strong earnings growth and robust economic indicators such as market growth (WIR, 2011).

2.2.1 Historical background of foreign capital inflows into South Africa

According to the South African Reserve Bank, both FDI and FPI are regarded as FCI. FDI is an important form of private external funding for developing countries and FDI is currently regarded as the major source of foreign capital for developing countries, unlike portfolio investment and foreign aid (Asafo-Adjei, 2007).

Different authors define FDI in various ways: Bjorvatn (2000) defines FDI as an investment made to acquire a long-term interest in a foreign enterprise, with the purpose of having an effective voice in its management. Pugel (1999), defines it as the process whereby residents of one country (the home country) acquire ownership of foreign assets for the purpose of controlling the production, distribution and other activities of a firm in another country (the host country).

Eatwell et al. (1987) define FDI as the act of acquiring assets outside one's home country. These assets may be financial, such as bonds, bank deposits, real estate and equity shares, or they may involve the ownership of a means of production, such as factories and land. Jayaratnam (2003) concurs with the view that FDI does not only add to investment resources and capital formation, but also serves as an engine for technological development, with benefits arising from spillover effects.

The quality and quantity of FDI flowing into South Africa depends upon the returns that investors expect and the uncertainties around those returns (Asiedu, 2002). These expectations can be categorised follows.

First, there is a set of macro- or country-level issues concerning economic and political stability and national policy towards foreign trade and investments; these generally refer to macroeconomic, fiscal, monetary and exchange-rate policies, as well as political stability. As far as these macro indicators go, South Africa performs quite well (Asiedu, 2002).

Second, there is the efficacy of a country's regulatory framework. As far as the firms that constitute the motor industry are concerned, the setback of efficiency of a country's regulatory framework relates to the entry and exit, labour relations and flexibility in labour use, efficiency and transparency of financing and taxation, the application of regulations concerning the operational environment, including those relating to safety, health, and other matters of public interest (Asiedu, 2002).

Third, there are important expectations concerning the quality and quantity of available physical and financial infrastructure, such as power, transport, telecommunications, banking and finance (Asiedu, 2002). FDI in South Africa has grown at a phenomenal rate since 1980 and it has become more competitive around the world. However, from 1980 to 1993 South Africa attracted very little foreign investment because of the political environment. Arvanitis (2004) highlighted the imposition of trade, financial sanctions, the tightening of capital controls, the declaration of a moratorium on payment to external creditors as the factors which cut the South Africa off from the international capital market during the apartheid period.

Figure 2.1 shows that the inward FDI into South Africa has been on a cyclical trend since 1995, and a large increase of FDI inflows occurred in 2007, when FDI inflows increased from US$ 623 billion in 2006 to US$9,885 billion in 2008. Due to the global economic crisis, FDI inflows fell to US$3,693 billion in 2010, but the decline was not of long duration and they rose to US$8,118 billion in 2012.

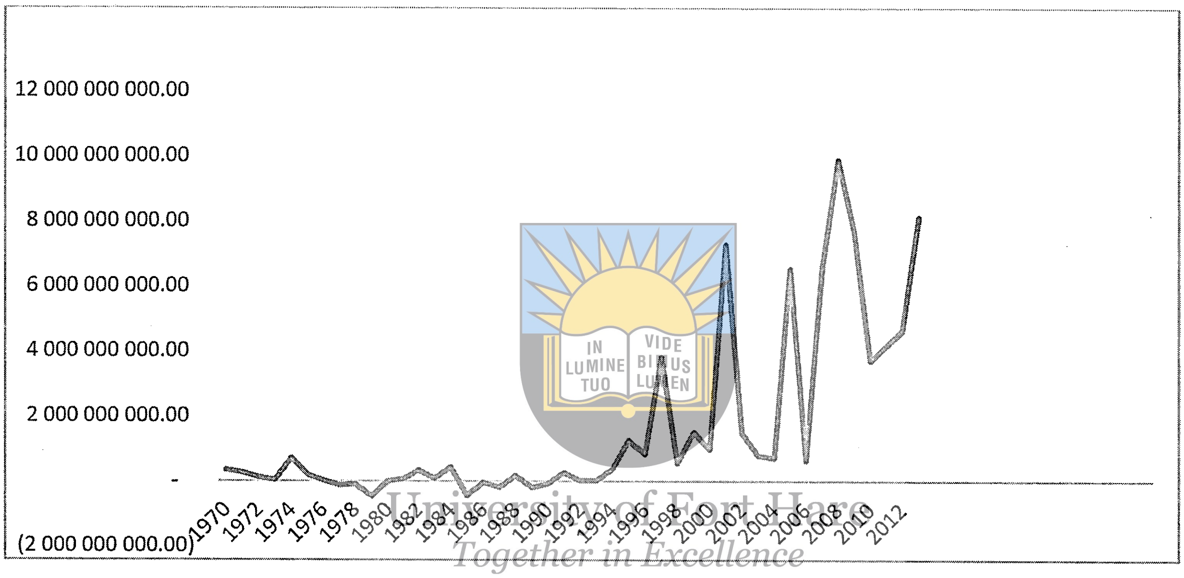

Figure 2.1: FDI inflows into South Africa, 1970-2012

Source: World Bank, (2014)

Figure 2.2 illustrates FDI inflows into South Africa by sources until 2012 and shows that the main sources of FDI were European countries. FDI inflows into South Africa increased from US$81 million in 1997 to US$1,016 million in 2010 (Sandrey, 2013). The United Kingdom, the Netherlands, the United States and Germany were the top five countries with high investment in South Africa. Much has been made of the role of China as a source of FDI for South Africa, but Figure 2.2 shows that, while it had certainly increased by 2012, it remained relatively modest.

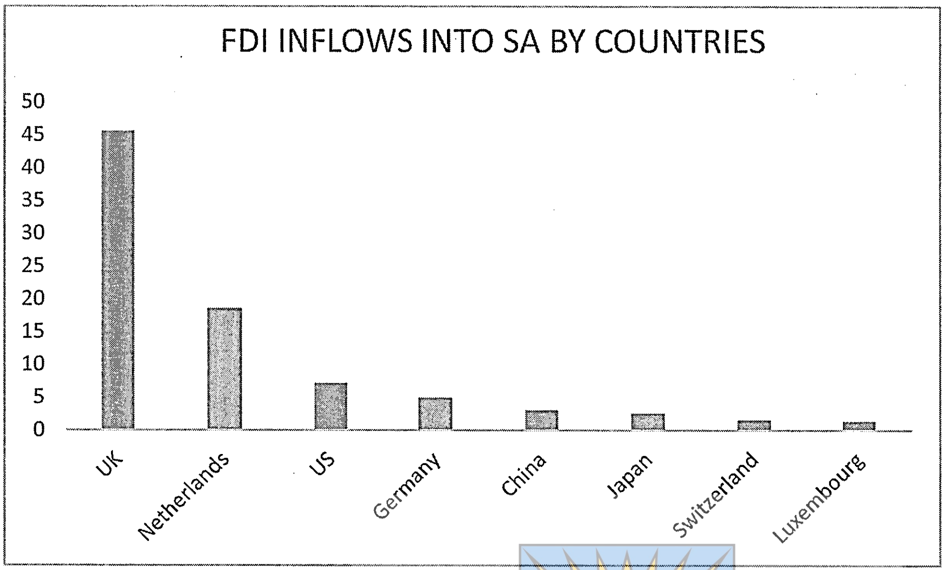

Figure 2.2: FDI Inflows into SA by countries, 2012(%)

Source: SARB (Quarterly bulletin March 2014)

2.2.2 Comparison of South African FDI inflows and those of other African countries

In 2011 and 2012, South Africa had been in the third place among the top five recipients of FDI inflow in Africa; Nigeria and Mozambique were the two top recipients of FDI. By 2013 South Africa had become the largest recipient followed by Mozambique (see Table 2.1), due to the increase of forign loans from parent companies to subsidiary companies that are investing in South Africa.

It is essential for a country to keep enhancing its attractiveness as a prime investment destination (UNCTAD, 2013). In 2013, South Africa was rated as the most attractive destination to do business in Africa, as the inflow of FDI into the country increased by 80%, with about US$8,2-billion pouring in. It was followed by Mozambique, which received US$5,9-billion. Nigeria followed closely behind, with US$5,6-billion in FDI. However, far more is possible if the country's advantages are used more effectively to attract investors, and factors that are of particular concern to the investor community are successfully addressed (Ernst and Young, 2013).

According to Chimhanzi (2012), it is wrong to assume that since South Africa is sometimes seen as "the gateway to Africa", investors will choose the country as an entry-point for all African investments. She claims that, in reality, significant amounts of investment are flowing directly into other African countries, as these markets currently boast higher GDP growth rates than South Africa.

Ernst & Young (2013) documented the various factors that attract FDI inflows into South Africa. These included:

- South Africa's highly developed first world economic infrastructure and its vibrant emerging market economy;
- Sectors that are open to foreign investors;
- The incentives available to exporters;
- Investment incentives offered for the production of goods and services;
- Sound economic and investor-friendly policies;
- A large-scale investment infrastructure development programme being rolled out;
- Small businesses, skills development and targeted sector interventions under way in all sectors of the economy; and
- The country's favourable legal and banking environment.

Table 2.1: Africa's top recipients of FDI in 2013 (US$ Billions)

Country	2013
South Africa	8,19
Mozambique	5,94
Nigeria	5,61
Egypt	5,55
Morocco	3,36
Ghana	3,23
Sudan	3,69
DRC	2,10
Congo	2,04
Equatorial Guinea	1,91

Source: UNCTAD (2013)

2.2.3 A comparison of FDI inflows into South Africa and other BRICS countries

According to Table 2.2 in 2013 South Africa still received the lowest FDI inflows within BRICS, followed by India. Table 2.2 reflects the growing attractiveness of all five countries to foreign investors, even during the recent economic slump. Their respective investment climates improved significantly over the past decade, particularly in terms of macroeconomic stability and a greater openness to foreign ownership of business assets (UNCTAD, 2013). China is the world's largest FDI recipient, followed by Brazil.

Table 2.2: FDI inflows in BRICS countries (US$ Billions)

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brazil	15 459	19 378	44 579	50 716	31 480	53 344	71 538	76 110	80 842
China	111 210	133 272	169 389	186 797	167 070	272 986	331 591	295 625	347 848
India	7 269	20 029	25 227	43 406	35 581	27 396	36 498	23 995	28 153
Russian Federation	15 508	37 594	55 873	74 782	36 583	43 167	55 083	50 587	70 653
South Africa	6 522	623	6 586	9 885	7 624	3 693	4 139	4 626	8 118

Source: World Bank (2013)

According to Leape and Thomas (2009), the low rate of FDI inflows into South Africa in comparison with other BRICS countries might reflect the fact that the stock of FDI in South Africa is high compared to that in middle-income countries, and has increased enormously in recent years. Another reason for low FDI coming to South Africa is the shortage of skilled workers, followed by macroeconomic instability, legislative regulations and crime as the main constraints listed by the World Bank (2011).

2.2.4 Foreign direct investment inflows into South Africa by sector

The South African manufacturing sector has experienced the largest amount of investment by European manufacturers over the past decade, followed by the United States and Japan. The European Union (EU) was the largest investor, accounting for about 90% of total FDI inflows into South Africa (Sandrey, 2013). The gas and oil industries also attracted large amounts of foreign investment between 1994 and 1999 (Hanouch and Rumney, 2005), while investment in the mining sector has been strong affected, negatively, by the 2008 global financial crisis followed by the protest and shooting of mineworks by the police in 2012. This has cause bad impact on the foreign investors of mining sector.

The well-designed and efficiently-managed policies put in place by the South African government aimed at injecting more foreign capital flows into the country, have, according to the Small Enterprise Development Agency (Seda), resulted in a huge increase of FDI in the South African manufacturing sector, particularly in the automotive industry (Seda, 2012). Since 2002, the automotive industry has been the third-largest industry, measured by percentage contribution to GDP. From 2002 to 2010, there was a shift in this sector's contribution of FDI to the economy. Greenfields projects in sectors such as information technology attracted more FDI than the historically dominant mining sector, suggesting a change in FDI motives from natural seeking FDIs to market and efficiency-seeking FDIs (SARB, 2011a).

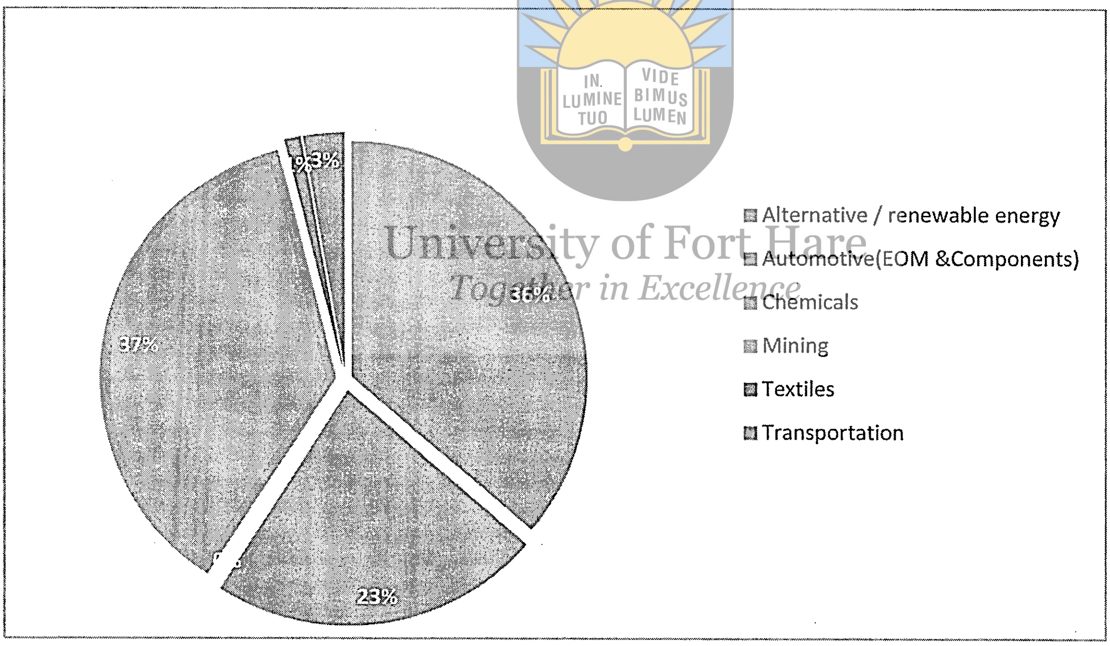

Figure 2.3: FDI inflows into South Africa by Sectors, 2013

Source: FDI Intelligence (2013)

Figure 2.3 illustrates that the largest foreign investment into South Africa between 2007 and 2013 was in the mining sector, which totalled US$7,419 billion in capital expenditure and created 22 786 job opportunities. It was followed by alternative/renewable energy, with the capital investment of US$7,333 billion which resulted in 1256 job opportunities. The automotive sector, which included OEM and automotive production was in third place, with the largest foreign investment of US$4,617 billion and 23 212 job opportunities.

2.3 The automotive sector in South Africa

The automotive sector is one of the most vibrant and rapidly-growing sectors of the economy, with eight of the top 10 manufacturers producing vehicles in South Africa for both local and international markets. The automotive manufacturing industry in South Africa comprises OEM and component manufacturers. Based on its contribution to national GDP, the level of employment that it provides and its status as an export-oriented manufacturing sector, according to National Association of Automobile Manufactures South Africa (NAAMSA), the automotive industry in South African is of key importance to national development (NAAMSA, 2012).

The first developments in automotive production in the South African automotive industry began with the entrance of Ford and General Motors in the 1920s as manufactures for the domestic market (Black, 2001). The industry witnessed rapid expansion for the first four decades, with the entrance of many other car manufacturers.

The automotive industry was isolated for 15 years, from the 1980s until 1994, due to apartheid-driven sanctions (Barnes, Kaplinsky and Morris, 2004; Black, 2002). Other factors that hindered growth in the industry during apartheid include inwardly-oriented, poor quality products, outdated products and inefficient supplier chains. Over a number of years, local content programmes, introduced under South Africa's industrial policy, were altered to address these issues (Barnes & Morris, 2008; Flatters, 2005; Kaplan, 2004). However, these alterations still failed to create economies of scale and to rationalise the number of vehicle models produced locally (Black, 2002; Black & Bhanisi, 2007).

As part of its plan to attract manufacturing investment, the government, in 1995, replaced its local content strategy to develop a local motor vehicle manufacturing industry with the seven-year-old MIDP. Before that, the government made use of local content requirements and high tariffs on imported vehicles (in excess of 100%) to protect and develop the local industry. Although this policy led to the creation of a significant assembly industry, most producers were not internationally competitive. Most locally-assembled vehicles were sold at a premium, compared to world prices. This protected environment led to the production of a number of vehicle makes and models for the domestic market, although the resulting low volumes per model were a significant cost-raising factor.

After the implementation of MIDP , the industry became more and more important to the economy; in 2014 it contributed 7,2% to the country's GDP, 30,2% of manufacturing output and 11,7% of all South African exports, and it is currently the third-largest economic sector (after mining and agriculture) as well as the largest manufacturing sector (AIDC, 2015). However, looking at the global figures in terms of vehicle production, the South African automotive industry is ranked 24th in the world and currently contributes only 0,63 % of global vehicle production (AIEC, 2015).

According to NAAMSA's annual report for 2004, the automotive industry was responsible for approximately 80,0% of Africa's vehicle output and 0,7% of global vehicle production. Since the introduction of the MIDP in 1995, the automotive industry has achieved a lot in terms of production and exports. Other automotive polices such as the Automotive Incentive Scheme, which is now in the first phase, and the Automotive Production and Development Programme (ADPD) have since replaced the MIDP and present new challenges and opportunities to the automotive sector.

South Africa has established an OEM sector that produces well-known brands of high quality. The firms are located in KwaZulu-Natal (Toyota), Eastern Cape (Mercedes Benz-South Africa, General Motors, Volkswagen) and Gauteng (Ford, Nissan). There is also a well-established automotive components industry in South Africa and the majority of the components that are manufactured are for export. In 2010 the country exported manufactured components worth approximately R30 billion; this was an increase of 12% since 2009. South Africa exports components to more than 70 countries including Japan, Australia, the USA and the United Kingdom (Seda, 2012).

As of 2009 South Africa was the nineteenth-largest automotive supplier worldwide, and manufactures 0,7% of the world's automotive production. Of the 560 000 vehicles manufactured in 2013, 272 238 (48%) of the vehicles were exported internationally and 240 552 of them were sold in domestic markets. According to AIDC (2014), the automotive industry exported vehicles with a value of around R40 billion in 2002 and during 2013, and the total automotive industry exports increased by R62.7 billion, or 104,17%, to R102,7 billion (AIDC,2014). This increase is even more impressive if one takes into account the strengthening of the rand against the US dollar.

The components industry is responsible for over 60% of the export success of the automotive industry (AIEC, 2013). In total, the country was able to increase its exports for components from R5,115 million in 1997 to R45,7 billion in 2014 (AIDC, 2015). The expansion of the component industry, as well as the provision of new service stations created more jobs and expanded the government's income. Moreover, the automotive industry stimulated product expansion in supply industries such as steel, paint, rubber and the textile, plastic and petrochemical industries.

The automotive parts sub-sector has been identified by the Industrial Development Corporation as a specialist field in which South Africa has a competitive edge. This sector has a strong reputation for producing products of excellent quality and this is supported by the success of the catalytic converter sector. What initially began as a start-up industry in the 1990s has grown immensely, and now 14% of the world's market for catalytic convertors is manufactured in South Africa.

2.3.1. Trends in FDI inflows in the automotive sector in South Africa

According to FDI intelligence, as illustrated in Table 2.3, Germany is the top source country out of a total of 11 source countries, with FDIs of OEM and automotive components into South Africa, accounting for highest total investment of US$1,150 million, with the highest average investment per project of US$104 million from 2007 to 2013. Germany has also created the highest number of jobs in the automotive industry in South Africa. This totals about 7 260 jobs and has the largest project size, with 660 jobs per project on average, more than any other source countries. The United States has the highest number of both projects and companies invested in South Africa from 2007 to 2013, accounting for six companies.

Table 2.3: Automotive FDI flows into South Africa by source of country, 2013(US$ millions)

Country	Number of projects	Number of companies	Capital Investment (US$ millions)
Austria	1	1	23,80
Brazil	1	1	10,00
China	6	6	442,64
Germany	11	8	1 150,01

India	2	2	35,36
Italy	1	1	115,20
Japan	5	3	515,96
Sweden	1	1	1,40
Taiwan	1	1	1 000,00
United State	11	5	871,80

Source: FDI intelligence (2013)

2.3.2 FDI inflows of automotives into South Africa by provinces

There are also well-established OEM and automotive components industries in South Africa and the majority of manufactured automotive components are for export. The automotive sector plays a big role in the wellbeing of the country due to the large inflows into foreign automotive companies are based in South Africa, and this impacts positively on the trade balance account of the country. Figure 2.4 below illustrates the value of FDI in 2013 by region. The Eastern Cape has remained the province with the largest FDI into the automotive sector, at R1,689 million in 2013 followed by Gauteng with R1,307 million and the Free State with R1,000 million. The attraction of foreign investment in the Eastern Cape also benefited the province through the creation of job opportunities. Figure 2.4 shows that more than 9 000 jobs were created in the automotive sector in Eastern Cape during the period 2007 to 2013.

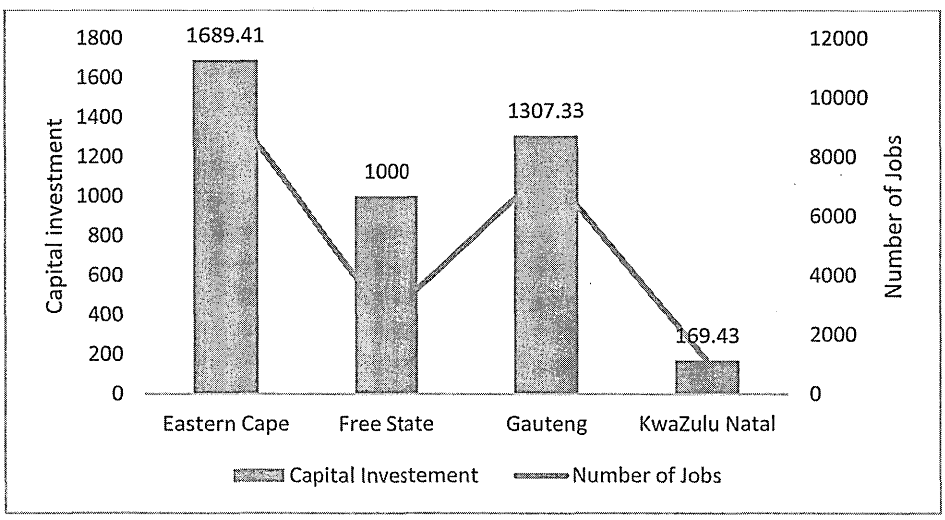

Figure 2.4: FDI Inflows of automotive sector by SA provinces, 2007-2013 (R millions)

Source: FDI intelligence (2013)

Figure 2.4 indicates that the attraction of FDI inflows into South African provinces before 2013 did not only contribute to the economy through the increase in output in the automotive industry, but also contributed to the creation of job opportunities. This suggests that FDI had a positive, multiplier effect on the economic growth of South Africa.

2.3.3. The automotive industry in the global context

According to Automotive Export Industry Council (AIEC) (2013), automotive production was mainly spread across six regions, namely Western Europe, North America, Japan, South America, the Asia-Pacific and Eastern Europe. Table 2.4 summarises vehicle production in the top 10 countries as well as in South Africa. Since 2009 China has ranked first in vehicle production, with a global share of 22,5%, displacing the USA, which was in the lead in previous years. South Africa was a small player in the global automotive market, with only 0,1% of the market. South Africa's internal market is small, which means that expanding and exporting to global markets is necessary to build and sustain international competitiveness. In 2005, South Africa's key vehicle export destinations were China, Zimbabwe and Malawi. However, in 2012 South Africa had expanded its market and was exporting to countries such as the USA, the UK, Japan, China, Algeria and Germany (AIEC, 2011; 2013).

Table 2.4: World rankings – automobile production, 2013

Country	Ranks	% of Global Production
China	1	25,0
USA	2	12,0
Japan	3	11,0
Germany	4	6,5
South Korea	5	5,1
India	6	4,4
Brazil	7	4,2
Mexico	8	3,4
Thailand	9	2,9
Canada	10	2,8
South Africa	25	0,1

Source: OICA, 2014

2.3.4. Trends in the labour productivity of the automotive sector in South Africa

Labour productivity is defined as a gross output per worker (output/employee). In South Africa, labour productivity in the automotive industry was found to be high in comparison with the manufacturing industry in general, due to the large amount of FDI and technology transfer (Seda, 2012).

The labour productivity of the South African automotive industry has been increasing since 1980s, but at a steady rate. A dramatic increase started in 1995 after the introduction of MIDP. Figure 2.5 shows that the labour productivity of the automotive sector increased by 99% since 1995. According to Quantec Easy Data (2012), shown below in Figure 2.5, labour productivity in the automotive industry gradually increased from 42,24% in 1970 to 158,9% in 2012. It shows an increase of 116,66% in absolute terms during the period under study.

The South African automotive sector has been able to achieve significant production growth from a volume of 388 442 units in 1995 to 587 719 units in 2006, with a levelling-off to 534 490 units in 2007 and 562 965 units in 2008. In 2008, exports from the automotive sector amounted to R65,5 billion, while imports amounted to R95,3 billion, leading to a R29,7 billion trade deficit. In the absence of local production and exports, this trade deficit would have been of a higher order of magnitude (DTI, 2010).

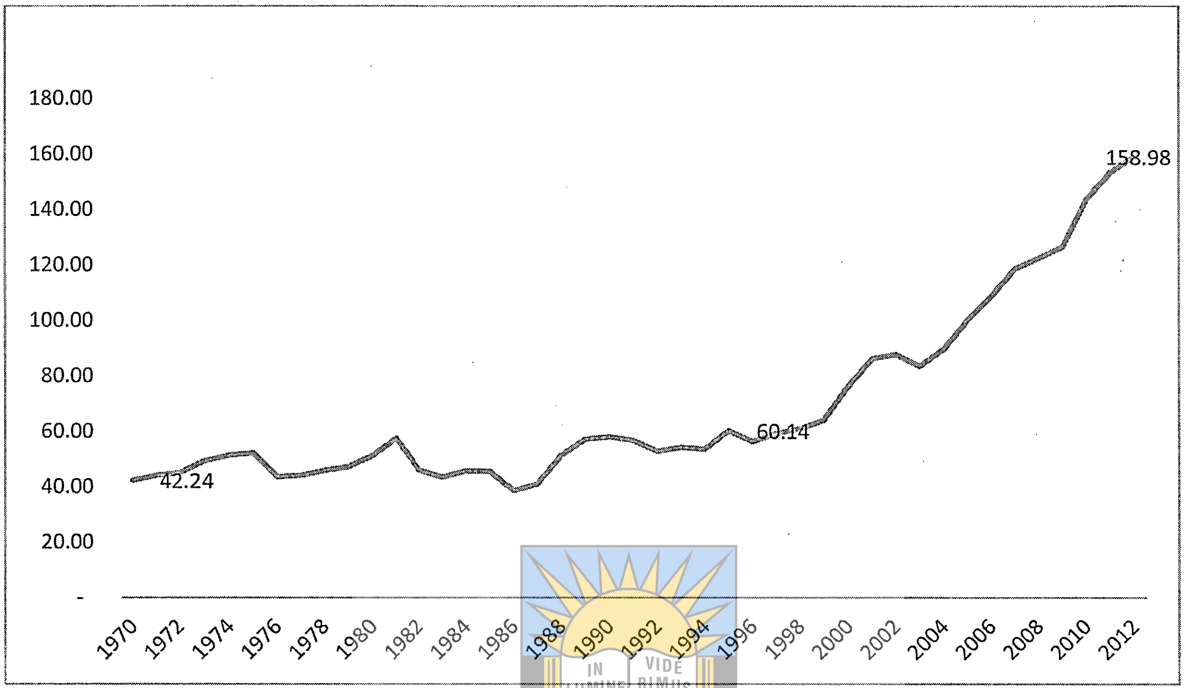

Figure 2.5: Labour productivity of automotive sector in South Africa, 1970-2012(%)

Source: Quantec Easy Data (2012)

2.4 Government policies designed to enhance the automotive industry in South Africa

South Africa's motor industry has always been protected and has received support from government initiatives. It could be argued that the industry currently suffers from inefficiencies and that there is room for improvement in operations and price-setting. However, it is also clear that it provides substantial amounts of employment within the national and local economies, since it is the main source of livelihood in a number of geographical areas. At present, the industry is facing a severe crisis which could have even more serious macro- and micro-economic consequences. The industry should be granted assistance by government, using innovative methods of stimulating demand through pricing deals, cutting back on surplus production and using this as an opportunity for government to push the automotive industry onto the high level in car-manufacture.

2.4.1 The Motor Industry Development Programme

MIDP was implemented in 1995 to encourage OEM in South Africa to become globally integrated, increase its competitiveness, specialise in one or two high-volume models on behalf of parent companies, obtain economies of scale benefits via exports and, in turn, import low-volume models not manufactured in the country to complement their domestic model mix (Seda, 2012). These national objectives were to be achieved by:

- Encouraging a phased integration into the global automotive industry;
- Increasing the volume and scale of production by the expansion of exports and gradual rationalisation of models produced domestically; and
- Promoting the modernisation and upgrading of the automotive industry in order to achieve higher productivity and facilitate the global integration process.

The major policy instruments to achieve the objective have been:

- Gradually and continuously reducing tariff protection so as to expose the industry to greater international competition,
- Encouraging higher volumes and a greater degree of specialisation by allowing exporting firms to earn rebates on automotive import duties; and
- Introducing a range of incentives designed to upgrade the capacity of the industry in all spheres.

2.4.2 Automotive Investment Scheme

From July 2009, this assistance replaced the Productive Asset Allowance (PAA) and provided for a taxable cash grant of 20% of the value of qualifying investment in productive assets by light motor vehicle manufacturers, and 25% of the value of qualifying investment in productive assets by component manufacturers and tooling companies, as approved by the Department of Trade and Industry (DTI). In addition, by achieving certain performance objectives, companies will be able to earn an additional 5% or 10% (Nkunzi, 2014).

This support is available to encourage investments by OEMs and component manufacturers in a manner that supports productive capacity upgrading. A competitiveness improvement cost grant of 20% of qualifying costs will also be available for automotive component manufacturers. The objective of this benefit is to enhance the competitiveness of component manufacturers through the improvement of processes, products, quality standards and related skills development, as well as through the use of business development services. The grant is a function of expenditure incurred by component suppliers to improve competitiveness, and must be linked to the new or replacement model of a light vehicle manufacturer (NAACAM, 2011).

2.4.3 Automotive Production and Development Programme

The South African government replaced MIDP with the Automotive Production and Development Programme (APDP) in 2013, with the aim of increasing local vehicle component content, in contrast to MDIP, which was concerned only with the competitiveness of local firms (Kotze, 2013). Another objective of APDP is to increase the total number of vehicles produced. In 2012 approximatedly 525 000 cars and light commercial vehicles were produced, and the aim is to increase this to 1,2 million vehicles a year by 2020, as well as ensuring that vehicles are quality and price competitive worldwide (Bronkhorst et al., 2013).

Newman (2013) stated that, owing to the significantly globalised automotive industry, South Africa, with its newly-introduced APDP, was continually competing to keep automotive investment in the country. Other countries were also willing to provide lucrative incentives for investors when there was an automotive industry in a country, as long as it was perceived by investors as an attractive investment destination and a successful and sophisticated country.

The APDP comprises four pillars:

- **Import duty** – this applies to vehicles and components and is 25% for light vehicles and 20% for OEC. These tariffs are valid until 2020, when the APDP ends. The duty on goods imported from European countries is lower, at only 18%. The import tariffs are required only to restrain more automotive imports coming into South Africa and also to protect local vehicle manufacturing.
- **Vehicle assembly allowance (VAA)** – this is in the form of duty-free import credits, issued to vehicle manufacturers and based on 20% of the ex-factory vehicle price in 2013. In 2014 the VAA was reduced to 19% and also fell in 2015 by 1% on the value of light motor vehicles produced domestically. The equivalent value of this to the OEMs will be the allowance multiplied by the duty rate, so 4% of the ex-factory vehicle price in 2013 was reduced to 3,6% in 2015. This support effectively provides a lower duty rate for local vehicle manufacturers and should encourage high-volume vehicle production in line with the target of doubling production.
- **Production incentive (PI)** – this is also in the form of duty-free import credit. It was implemented in 2013 to replace the export base scheme. The incentive started at 55% in 2013 and is reduced by 1% annually until it reaches 50% of value added. The

production incentive is intended to encourage increasing levels of local value addition along the automotive value chain, with positive spin-offs for employment creation.

- **Automotive investment scheme** – this scheme has been set up to encourage the investment by OEM and component manufactures. AIS replaced the production asset allowance which was introduced in 2009 to support the objectives of MIDP.

ADPD only applied to light vehicles (light motor vehicles and passenger cars) and did not encourage or support the production of middle and heavy commercial vehicles (MCVs and HCVs). The government acknowledged that there was no policy which supported the production of MCVs and HCVs, and a support package similar to ADPD was implemented to stimulate the production of heavy commercial vehicles with a mass of more than 3 500 kg.

All these policies were designed to enhance the development of the automotive sector in South Africa. This has resulted in the sector becoming world class: companies such as Mercedes Benz have one of their largest plants in South Africa.

2.5 Conclusion

This chapter has given an outline of trends in the growth of the South African automotive sector, as well as FDI inflows into the country. The review indicates that the local automotive industry has improved since 1995, and is also associated with a huge increase in FDI inflows into the country. It was also found that the country has well-developed policies which were formulated to enhance the automotive industry and which protects the local automotive market. However, despite the increase in the productivity of the automotive industry, it still lags behind other BRICS countries as it makes the lowest contribution in the global production of vehicles and there is lot that needs to be improved so that it can attract more FDI inflows into the country and boost the productivity of the sector.

CHAPTER 3

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

3.1 Introduction

The aim of this chapter is to present a review of theoretical and empirical literature which has analysed the relationship between FDI and labour productivity. A number of theories have been developed to examine the impact of foreign capital on the productivity of domestic firms. The chapter consists of two sections: the first section reviews theories relating to FDI, and to productivity. The second section provides a review of empirical studies.

3.2 Theories of FDI on productivity

3.2.1 Eclectic theory

The eclectic paradigm was developed by Dunning (1973). It is a theory of FDI and international production that offers a general framework for determining the extent and patterns of both the foreign-owned production undertaken by a country's own enterprises and that of domestic production owned by foreign enterprises. In addition, the eclectic theory also seeks to explain why multinational enterprises (MNEs) exist and how the MNE accelerates production of domestic firms in a host country where MNE operates.

In this explaining this theory, Dunning (1981b) distinguishes between two types of investment that a firm can undertake, namely FPI and FDI. FPI is defined as the passive holdings of securities and other financial assets, which do not entail active management or control of the securities issuer (Dunning, 1981). FPI is positively influenced by high rates of return and reduction of risk through geographic diversification. The return on FPI is normally in the form of interest to payments or non-voting dividends. On the other hand, FDI is defined as "the acquisition of foreign assets for the purpose of control" (Dunning 1973).

According to Dunning (1973), MNEs (in this case, automobile and automotive components) are the only firms that are entitled to the costs of foreignness; therefore they must have other ways of either earning higher revenues or incurring lower costs in order to stay in business. For an MNE to be profitable in a foreign market, it must have some advantages which are readily transferrable and not shared by its local competitors.

Eclectic theory proposes three advantages that assist MNEs when making the strategic decision to enter a foreign market. These are O (ownership) + L (location) + I (internalisation). Each of these advantages focuses on different questions that investors need to answer.

Ownership advantage (O), tries to explain **why** a firm is investing internationally. Ownership advantage implies that there is evidence of a competitive advantage in holding a resource, capability or specific asset that confers on the MNE an ability to generate superior value. Ownership advantages may be supported in a variety of operations: in the technologies employed, the manufacturing or distribution process, better management know-how and other, less tangible assets (Ferreira et al., 2011)

Location advantage (L) refers to the foreign place of investing. Dunning (1973) points out that questions about location advantage seek to answer the question of **where** to conduct the operations. His paradigm (1981) maintains that when the firm is selecting a location, it should take into account location-specific factors such as costs of production, availability of knowledge, accessibility, government industrial policies, size and potential of the market. Dunning adds that the choice of investment location depends on several complex calculations, relating to economic, social and political factors, that determine whether investing in a country will be profitable or not.

Internalisation advantages (I) address the **how** question, and require the internalising of foreign operations through control over supplies or market outlets. A multinational enterprise has various choices of entry mode, such as exports, licensing or joint venture. The MNE might choose internalisation even if the market does not exist, or functions poorly, so that transactional costs of the external route are high (Dunning, 1983).

According to Dunning (1983), in each case the possession of ownership advantage is a necessary prerequisite for foreign involvement. However, the presence of internalisation advantages suggests that enterprises will exploit these advantages by way of exports or FDI rather than by contractual resources. Dunning (2000) further explains that all of the above criteria in the paradigm must be satisfied for a firm to engage in international production. It should be noted that the internalisation advantage is merely an expression of the first two advantages, which is further clarified by Dunning (1983) when expressing the correlation of the advantages as follows: the more ownership-specific advantages possessed by an enterprise, the greater the inducement to internalise them, and the wider the attractions of a foreign rather than a home-country production base, the greater the likelihood that an enterprise, given the incentive (relative to home country) to do so, will engage in international production.

Dunning (1985) claims that two different types of FDI can be distinguished. While resource-seeking investments are made in order to establish access to basic resources like raw materials or other input factors, market-seeking investments are made so as to enter an existing market or establish a new market. Dunning makes a more detailed distinction with the terms "efficiency-seeking investments", "strategic-seeking investments" and "support investments".

According to Dunning (2000) the presence of FDI has helped to raise the productivity of many domestic suppliers, and this has often had beneficial spillover effects on the rest of their operations.

The eclectic theory has its weaknesses. It suggests that the OLI variables are independent of each other, and this notion has been criticised by international trade scholars. It is very difficult to separate these variables, as they occur simultaneously and are integrated in their functioning. For example, a firm's response to its exogenous locational variables might itself influence its ownership advantages and its ability and willingness to internalise markets. Therefore, over time, the separate identity of variables becomes difficult to justify.

In addition, Kojima (1982) claimed that the explanatory variables identified by the eclectic theory under each pillar are so numerous that its predictive value is almost zero. The author argued that, furthermore, the eclectic theory does not insufficiently allow for differences in the strategic response of firms to any given configuration of OLI variables

The eclectic theory is not relevant to this study as it only identifies the advantages of MNEs (such as automotive firms) investing abroad, as portrayed in the OLI variables. For instance, in the case of the location advantage, foreign investors are able to choose the location where the plants will be built. In most cases, these locations are close to the ports and harbours for ease of transportation. Foreign investors also have an ownership advantage, which includes brand names and benefits of economies of scale and technology. this theory does not give an impact of FDI on labour productivity of domestic firms, it only shows the cost and profit of the foreign investor.

3.2.2 Production cycle theory

Production cycle theory was developed by Vernon (1966) to examine the types of foreign direct investment made by U.S. companies in Western Europe after the Second World War in the manufacturing industry. Vernon (1966) implies that production cycle comprise of four stages which includes innovation, growth, maturity and decline. According to Vernon, in the first stage the U.S. transnational companies create new innovative products for local consumption and export the surplus in order to serve also the foreign markets. According to the theory of the production cycle, after the Second World War in Europe has increased demand for manufactured products like those produced in USA. Thus, American firms began to export, having the advantage of technology on international competitors. If in the first stage of the production cycle, manufacturers have an advantage by possessing new technologies, as the product develops also the technology becomes known. Manufacturers will standardize the product, but there will be companies that you will copy it. Thereby, European firms have started imitating American products that U.S. firms were exporting to these countries. US companies were forced to perform production facilities on the local markets to maintain their market shares in those areas

3.2.3 Spillover effects of FDI on productivity

The impact of FDI on the productivity of a hosting country can be divided into direct effects and indirect effects. The direct effects refer to the impact of productivity on a foreign domestic investment recipient firm, whereas indirect effects refer to the productivity spillover effects from foreign to local firms (Buckley et al., 2007).

Direct productivity benefits occur when the proportion of industrial output produced by foreign firms or FDI-receiving firms increases, assuming that foreign firms are more productive on average than indigenous firms. MNEs must have monopolistic or ownership advantages that allow them to overcome the higher costs associated with production abroad (Hymer, 1976) MNEs may also exhibit higher levels of productivity than their domestic counterparts due to a number of other factors: employees with greater skills and training, more machinery and equipment per worker; and greater technical efficiency. Most studies which have focused on the productivity differences between foreign and indigenous firms in developing countries have concluded that foreign firms are superior in this respect.

According to Kinoshita (1998; cited by Buckley et al., 2007) spillover effects from FDI are the demonstration–imitation effect, the competition effect, the foreign linkage effect and the training effect. These effects make up the underlying impact of FDI on the domestic economy.

- **Demonstration–imitation effect**

The demonstration–imitation effect arises when the foreign firms come up with more advanced technologies than those available in the domestic market, and introduce them into the local industry. The domestic firms can easily monitor and imitate the way the foreign firms use their technologies, for instance to establish and maintain production levels (Buckley et al., 2007). Aitken and Harrison (1999) implied that, in some cases, domestic firms might increase their productivity by simply observing the nearby foreign firms. According to Mebratie (2010), the other channel of technology transfer may be through labour turnover from foreign to domestic firms, or by direct training provision by MNEs in order to facilitate local enterprises.

- **Competition effect**

The competition effect arises from the additional competition created by multinational enterprises (MNEs). Because competition in the domestic market is increased, indigenous firms have to perform more efficiently and increase their innovative activity to maintain their market position (Bertschek 1995). The entry of foreign firms can lead to crowding out of domestic firms. Those firms, which are unable to compete with the foreign firms, are forced to make an exit. Aitken and Harrison (1999) assert that foreign firms actually divert demand from the domestic firms. Therefore in the short run, the productivity of the domestic firms declines.

- **Training effect**

Finally, MNEs might be only able to transfer superior technology to their foreign affiliates after having trained local workers. The training might be provided by foreign joint-venture partners, foreign buyers or suppliers. Local firms might also train their own workers in order to increase product quality, or to cope with foreign competition. In addition, spillovers might occur through labour turnover from foreign to domestic firms. However, this type of spillover is less likely to materialise if there is very little labour mobility between foreign and domestic firms (Fosfuri et al.2001).

3.3. Empirical literature review

There are a number of studies which examine the link between foreign capital and labour productivity in the automotive sector. Of the available studies, Racula (2010) conducted a survey of the literature that concentrates in the impact of foreign domestic investment on labour productivity in different countries. The main finding was that FDI increases labour productivity of national companies through technology and managerial competencies borrowed from the foreign companies. Raluca (2010) discovered that higher labour productivity results in higher wages for employees, and that determines the growth in the salaries of national companies' skilled workers. However Raluca (2010) also suggested that the policy-makers of the host country should consider what type of investment is most beneficial to promote, for example greenfields investments, mergers and acquisitions, or joint ventures.

Alam et al. (2013) employed an error-correction model to investigate the causality relationships between labour productivity, FDI and economic growth for a panel of 19 OECD member countries covering the period 1980 to 2009. One of their main findings was that FDI impacts economic growth through its interaction with labour and productivity. FDI increased labour productivity in both the short and the long term. These researchers confirmed the significance of the role played by FDI in advancing the technology and enhancing managerial skills. These results are consistent with Alam et al. 2013 who also noted that, to enhance its economic growth, a country should implement policies that attract FDI, as this would lead to an increase in economic growth and maintain the long-term labour productivity of the host country. A panel regression study of FDI impact on automotive labour productivity of Visegrad group was conducted by Dudas and Lukac (2004). The athours hypothesized that inflows of FDI in the automotive sector in the Visegrad region increases labour productivity in the industry. Random effect model employed to test the hypothesise and the result show positive correlation between FDI and labour productivity of automotive sector in Visegrad region.

Scepanovic (2013) used a hyper-integrationist development model to examine the solutions to key development challenges that affected the East Central European (ECE) automotive industry, particularly capital, technology and labour productivity. He suggested FDI as the main solution for the above-mentioned challenges. The hyper-integrationist development model shows that FDI had a positive spillover effect on the development of the ECE automotive industry. However, domestic firms were all but eliminated from the competition, the demand for technology production remained low and the region continued to rely on its low-cost advantage, with limited investments in workforce skills. Scepanovic concluded that FDI does not necessarily enhance the productivity of local firms, it only increases the productivity of foreign firms.

There are studies that employed the pooled ordinary least squares model and fixed effect model (FEM). Of these studies, Buckley et al. (2007) studied the impact of FDI on aggregate labour productivity in the automotive industry over the period of 1995 to 1999. The results showed that FDIs in China are playing a significant role in raising the labour productivity of China's automotive industry. These authors also found that compatible government policies were the main factor that allowed foreign investors to increase labour productivity. On the other hand, the same authors argued that the Chinese government could not rely on FDI alone to increase labour productivity and competitiveness in the automotive industry. They concluded that capital intensity, firm size and the quick turnover of working capital were equally, if not more, important at that stage of the industry's development. The result revealed that sub-sectors of the automotive industry could benefit in terms of productivity growth through an increase in average firm size, which would help to achieve scale economies. Employing the same model, Wang et al. (2013) carried out a similar study in China for the period of 1999 to 2008. This team of researchers found that FDI had a negative role in China's automotive industry and the results suggested that the government policies introduced to attract FDI are not necessarily effective in promoting labour productivity of automotive sector.

Barrios and Strobl (2002) investigated the impact of FDI on a firm's productivity using a panel of Spanish manufacturing firms for the period 1990 to 1998. They used the standard ordinary list square (OLS) model to analyse the impact of FDI on productivity in manufacturing firms. The OLS results showed that that greater foreign presence in a sector induced lower productivity among firms, indicating that any productivity spillovers are possibly crowded out by a negative competition effect. The authors suggested that for countries like Spain, that are undergoing significant structural changes over the period in question, it is important to control for both time-invariant as well as time-variant sectoral characteristics. Secondly, the authors confirmed the previous findings that one needs to take into account the "absorptive capacity" of firms when considering whether they are able to utilise externalities associated with FDI presence. Barrios and Strobl (2002) found that, in Spain, only firms with sufficient levels of such capacity experienced positive spillovers.

Demir and Su (2013) carried out a firm-level panel study for the period of 1998 to 2007 with the intention of exploring three questions regarding FDI inflows in China's automotive industry. One of the question was: "Does foreign investment increase future productivity levels compared to public and private investments?" A non-linear model and the Cobb–Douglas Production function were employed, and the results shows that the FDI inflows into China did improve productivity levels by statistically and economically significant levels.

Subash (2006) studied the horizontal and vertical spillover effects of FDI in Indian manufacturing industries over the period of 1994 to 2002. A pooled ordinary least squares method was employed, using the firm's level data of Indian manufacturing industries. Subash found positive horizontal spillover for those domestic firms supplying to foreign subsidiaries. However, the author could not find evidence of significant horizontal spillover effect. Negative vertical spillover effects were found in the study, but they were not statistically significant. The results of the study showed that the local firms were not benefiting from the contacts with the foreign firm.

Ordinary least squares and Olley–Pakes regression models were employed by Javorcik (2004) to establish the relationship between FDI and productivity of domestic firms. Firm-level data from Lithuania for the period of 1996 to 2000 was employed in the study. The results for both regression models showed a positive productivity spillover from FDI taking place through contacts between foreign affiliates and their local suppliers in upstream sectors. Javorcik (2004) indicated that positive spillovers are associated with projects with shared domestic and foreign ownership, but not with fully-owned foreign investments.

Haskel et al. (2007) carried out a regression study to examine the productivity spillovers from inwards FDI. The study was based on two questions:

- Are there productivity spillovers from FDI to domestic firms?
- If so, how much should host countries be willing to pay to attract FDI?

To examine these questions the authors employed plant-level panel data covering manufacturing in the UK for the period 1973 to 1992. They found a robust and significantly positive correlation between a domestic plant's total factor productivity (TFP) and the foreign-affiliate share of activity in that plant's industry. Typical estimates suggested that a ten-percentage-point increase in foreign presence in a British industry raised the TFP of that industry's domestic plants by about 0,5%.

Rajalakshmi and Ramachandran (2011) applied the auto regression integrated moving average (ARIMA), coefficient, linear and compound model, to study the impact of FDI on India's automobile sector with particular reference to the passenger segment. Their study covered the period 1991 to 2011, and they found that FDI inflows impact positively on India's automobile industry. Furthermore, the authors identified the basic advantages provided by India in the automobile sector, which include advanced technology, cost-effectiveness and efficient manpower. Beside these advantages, India has a well-developed and competent auto-ancillary industry, along with automobile testing and research and development centres. The automobile sector in India ranks third in the world in manufacturing three-wheelers, and second in manufacturing two-wheelers.

A survey carried out by Griffith et al. (2004) to examine the relationship between foreign ownership and productivity focused mainly on the service sector and a research and development lab in Britain. The researcherss found that multinational companies played a vital role in the service sector, and that the entry of foreign multinationals by takeover is more prevalent than greenfields investment. They also found that British multinationals have lower levels of labour productivity than foreign multinationals, but the difference is less stark in the service sector than in the production sector.

Liang (2008) investigated the impact of FDI on the productivity of domestic firms in China over 2000 plants, between 1998 and 2005. A firm's level data were tested on the fixed effect regression. Olley–Pakes methodology and the empirical findings show the positive productivity spillover between foreign suppliers and their domestic customers. Another finding from the study showed that domestic firms learn from both joint ventures and wholly-owned foreign subsidiaries, and the effects are larger from wholly-owned subsidiaries.

Pavlinek (2014) conducted a firm-level survey to establish the role of the state in the development of the automotive industry in Slovakia. The firm-level interviews were conducted between 2011, 2013 and 2005. In addition, a case-study based on a 2010 survey of 299 Slovakian automotive firms, with a response rate of 44%, was used as empirical literature in the study. The findings showed that the state had played an important role by accommodating the strategic needs of foreign capital through neoliberal economic policies. Firm-level interviews suggested that long-term state investment in higher education and vocational training is important for maintaining and improving the competitiveness of Slovak-based automotive firms, and it is crucial for the development of higher value-added functions in both foreign subsidiaries and domestic firms.

Bruhn and Calegorio (2013) did a study on productivity spillovers from foreign direct investment in the Brazilian processing industry and they applied a moderate multiple regression model and generalised liner model to identify the potential spillovers resulted from FDI. They found both positive and negative effects arising from FDI on Brazilian industries' productivity. Their results showed that inward FDI leads to positive spillover effects in high-absorption industries and to negative effects in labour-intensive industries

Using firm-level data from 10 transitional countries over the period 1995 to 2005, as well as the methodology of Olley–Pakes and ordinary least squares, Damijan, Rjec, Majcen and Knell (2008) investigated the impact of firm heterogeneity on direct and spillover effects of FDI. Variables in the study were labour, input-output, foreign ownership, firm size and FDI productivity. The empirical findings showed that both direct effects from foreign ownership, as well as the spillovers from foreign firms, substantially depend on the absorptive capacity and productivity level of individual firms. Only more productive firms and firms with higher absorptive capacities are able both to compete with foreign affiliates in the same sector and to benefit from the increased upstream demand for intermediates generated by foreign affiliates. In addition, these results showed that foreign presence may also affect smaller firms to a larger extent than larger firms, but this impact may be in either direction.

Aitken and Harrison (1991) used plant-level data to examine the impact of foreign presence on the total productivity growth of Venezuelan manufacturing between 1976 and 1989. OLS was employed in the study and the result showed that the effect of foreign investment on the productivity of upstream local firms was generally negative. They asserted that foreign firms diverted demand for domestic inputs to imported inputs, which meant that the local supplier firms were not able to benefit from potential economies of scale. Their results differed from most other findings in this respect. One reason was that their study also included local firms that had not been fortunate enough to establish linkages with foreign affiliates, and because they did not take into account the increase in local content that seemed to take place over time. Yet their conclusions highlighted the need for more research, in which the connection between spillovers and linkages is examined explicitly.

A literature survey was conducted by Blomstrom and Kokko (1997) to review the empirical evidence of the impact of foreign investment on productivity of host countries. The authors concluded that multinational companies may play an important role in productivity and export growth in their host countries, but that the exact nature of the impact of FDI varies between industries and countries, depending on country characteristics and the policy environment.

Unbalanced panel data over the period 2003 to 2007 was used by Mebratie (2010) to examine the impact of FDI on labour productivity within South African manufacturing firms. Mebratie employed pooled ordinary least squares to estimate the impact of foreign aid on productivity of South African local firms, and found the positive significant impact of FDI within the firms. Mebratie suggested that in order to increase labour productivity, the firm should put effort into increasing the capital intensity and size of the firm. However, Mabratie also conducted a detailed sensitivity analysis using alternative specifications, and the findings showed that FDI had no effect on the labour productivity of domestic firms.

Mebratie and Bedi (2011) used firm-level panel data for two periods (2003 and 2007) to examine the impact of FDI on the labour productivity of domestic firms in South Africa. In their study, the authors also examined the effect of the interaction between foreign-firm ownership and black economic empowerment (BEE) on labour productivity. The results, based on cross-sectional data, showed that foreign-owned firms were more productive compared to domestic firms. The authors did not find spillover effects from the estimates based on the cross-section data on compliance with BEE procurement measures, and the result showed a negative effect on foreign-firm productivity. Mebratie and Bedi (2011) concluded that for the period of 2003 and 2007, the results showed no spillover effects of FDI on elasticity of labour productivity of domestic firms in the South African context.

A South African study conducted by Opperman (2012) revealed a long-term relationship between FDI and manufacturing imports, as well as between FDI and manufacturing exports. Cointegration technique and error-correction mechanism (ECM) were employed to establish the causal link between FDI and manufacturing imports and exports in South Africa for the period 1994 to 2011.

3.4. Assessment of literature

This chapter has provided an overview of theoretical and empirical literature relating to the to the main topic of the study. The review of theoretical literature shows the positive and negative spillover effects of FDI on the labour productivity of MNEs. In the analysis of FDI theories, the eclectic theory was discussed. The eclectic model addresses the questions of why, where and how investors go abroad. In accordance with the model, an investor will only invest if answers to all three of these questions are positive, which means that the firm has a competitive edge at the potential destination and is likely to succeed in its investments. This suggest the major aim of foreign investment is to maximise profit. Any other benefit which might arise will be a spillover. Eclectic model doesn't address the effect of FDI on labour productivity. The study also reviewed the production cycle theory which postulate that foreign direct investment have a positive effect on labour productivity through innovation and immitation. The theory implies that by having the advantage of technology on international competitos, manufacturers have an advantage of using new technology to produce more by inceasing labour productivity but a lower cost.

With respect of empirical literature, the literature reviewed shows that the impact of FDI on labour productivity is uncertain. There are studies that have established a positive impact of FDI on productivity, there are others that found a negative relationship between the two and there are yet others that did not establish any relationship at all. The review of indicated that the available studies in South Africa have been at firm level and there is no time series study which have been done. From the the literature reviewed many shortcomings were found, including, for example, the lack of available data, causing not completely clear confirmation whether the total productivity growth is due to productivity spillover from foreign companies directly to individual domestic companies with lower productivity or the presence of highly productive foreign companies in the economy induces better productivity for the whole economy averaging less productive domestic companies and more productive foreign companies. Thus the study will be based on time series which the objective of getting robust result.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter describes the methodology applied to establish the impact of FDI on labour productivity in the automotive sector in South Africa. The chapter outlines the theoretical framework reviewed in Chapter 3 as the analytical framework which was used. The chapter consists of five sections. Following this introduction, Section 4.2 presents the model specification, Section 4.3 presents the definition of variables and *a priori* expectations, Section 4.4 presents the data sources and Section 4.5 provides a review of the estimation techniques for the study of the effect of FDI and explanatory variables on labour productivity. Section 4.6 provides a conclusion to the chapter.

4.2. Model specification

The model to be utilised in the study is based on Dudas and Lukac (2014). The model assumes that an increase in labour productivity is assumed to be a natural phenomenon which is associated with the inflow of advanced production technolodges, which are usually brought about FDI inflows into the economy. Dudas and Lukac (2014) suggest that the automotive sector is particularly vulnerable to this effect given the high degree of production automation in the sector. However, the level of production requires quality workforce on one hand, in addition, there is need for qualified professionals to control the production technology. Also as far as work efficiency is concerned, there will be smaller finishings and partial works which will be done manually by the labour force. Dudas and Lukac (2014) therefore suggest that in all these cases labour productivity is reflected. Given this link between labour productivity and FDI, the model to be utilised in the study can be estimated as follows:

$LP = f\,(FDI_t, X_t, LI_t, CI_t,)$ 4.2

Where:

LP_t = Labour productivity of automotive industry in year t

CI_t = Capital input in automotive industry in year t

LI_t = Labour input in automotive industry in year t

FDI_t = Foreign direct investment in automotive industry in year t

X_t = Exports in automotive industry in year t

The empirical model to be used in the study in its logarithmic form can be written as follows:

$$LLP_t = \beta_0 + \beta_1 LCI_t + \beta_2 LLI_t + \beta_3 LFDI_t + \beta_4 LX_t + +\mu_t \quad \text{...} 4.3$$

Where $\beta 1, \beta 2, \beta 3$ *and* $\beta 4$ are the coefficients to be estimated and μ_t is the error term. The error term represents the influence of the omitted variables in the construction of the data.

4.3 Definition and expectations of variables

Labour productivity is the ratio of total output of vehicles sold (in Rands) divided by the annual average number of employees in the automotive sector. This definition of labour productivity is consistent with Buckley et al., (2007). The labour productivity of automotive sector data obtained from Quantec Easy Data.

FDI is a measure of value of productive assets from foreign ownership such as factories in the automotive sector. A positive relationship between FDI and labour productivity was expected and this relationship was supported by a number of studies such as those of Tamohara and Yokota (2005), Buckley et al. (2007), Mebratie (2010), Dudas and Kukac (2014). As highlighted earlier on, the automotive sector is influenced greatly by the high degree of production automation in the sector which usually comes through FDI.

Capital input is the ratio of total fixed or real assets to the annual average of employees (Buckley et al., 2007). A positive relationship between capital and labour productivity was expected. In the event that the firm had a tangible asset to produce, then the labour productivity would be high. Labour input is measured by the total numbers of hours worked by the total number of employees (Buckley et al., 2007). A positive relationship between labour input and labour productivity was expected. If there was an increase in the number of hours worked per day, the labour productivity would increase. The data for capital input and labour input was obtained from Quantec Easy Data

Exports are defined as the ratio of goods or services produced in one country and sold to a foreign country. Exports are measured as the value of vehicles exported. The study focused on the exports of the automotive sector. Exports are considered to have a great impact on growth through the exploitation of resources and economies of scale. An increase in exports will result in more vehicles being produced. A positive relationship between exports and labour productivity was expected (Demir & Su, 2013). The data for this variable was obtained from the Quantec Easy Data.

4.4 Data sources

In this study, the quarterly time series data on labour productivity of the automotive sector and FDI were employed, along with other variables, covering the period 1995 to 2013. The data in the study were obtained from different sources, which included various series of Quantec Easy Data (labour productivity, capital input, labour input and exports of automotive industry), and FDI intelligence (FDI in the automotive industry).

4.5 Estimation techniques

The study sought to establish if there was a long-term relationship between FDI and labour productivity, applying the Johansen cointegration technique. However, prior to employing the Johansen approach to cointegration, ADF and the Phillips–Peron test were used to determine the stationarity of the time series.

4.5.1. Unit root test/stationarity

A time series is said to be stationary when the statistical properties such as mean, variance and autocorrelation are all constant over time. To check the stationarity of the time series and to determine the order of integration of variables, the study employed the most common applied ADF test and Phillips–Perron test.

- **Augmented Dickey–Fuller test**

The ADF test was developed by Dickey and Fuller to improve the assumption they made on the Dickey–Fuller test. The latter was developed when only error term μ_t is assumed to be uncorrelated. The ADF test was developed to test the unit root in cases where the μ_t is correlated. The ADF test includes extra lagged values of the dependent variable to get rid of autocorrelation among error term and to enhance the robustness of the result. In algebraic terms, the ADF is given in the following equation:

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} \sum_{i-1}^{m} \alpha_i \Delta Y_{t-1} + \mu_t \quad \text{.......... 4.5}$$

The null hypothesis of a unit root is rejected in favour of the stationary alternative in each case, if the test statistic is more negative than the critical value (Brooks, 2008:328).

- **Phillips–Perron test**

The Phillips–Perron (PP) test was employed to check the consistency of the ADF result. PP tests are similar to ADF tests and they often give the same result because of the asymptotic distribution are identical for both tests. The regression test using PP is given as follows:

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \mu_t \quad \text{........} \quad 4.6$$

The main advantage of a PP test is that it is non-parametric, not requiring specification of the lag length for regression as in the ADF test. However, the PP test has its disadvantages and it has been suggested that a PP test is based on asymptotic theory. Therefore it works well only in large samples that are indeed a luxury; if not, it comes for financial time series data. It also shares the disadvantages of ADF tests: sensitivity to structural breaks and poor small sample power resulting too often in unit root conclusions.

4.6. Cointegration test

After establishing the order of integration, the next step was to check if there is a long-term relationship between the variables, using the Johansen cointegration technique as there was likely to be endogenous variables used in the model. The Johansen technique is based on the maximum likelihood estimation, using sequential tests for determining the number of cointegrating vectors.

Campbell and Perron (1991) define cointegration as when two more time series are both integrated in order of order one I(1) and two or more time series are said to be cointegrated if there exists a parameter α such that $\mu t = Y_t - \alpha X_t$ is a stationary process.

Brooks (2008) argued that two variables will be cointegrated if they have a long-term or equilibrium relationship between them. There are at least three models of cointegration that could be used to test the long-run relationship of variables. These models include the Engle–Granger, Engle–Yoo and Johansen techniques.

Engle–Granger two-step method is a single equation method which suffers from a number of weaknesses. These include the lack of power in unit root tests, simultaneous equation bias and the impossibility of performing hypothesis tests about the actual cointegrating relationships (Brooks, 2002:395).

Engle–Yoo is an improvement on the Engle–Granger method; it is a three-step method but faces the same weaknesses as the Engle–Granger procedure, especially the inability to test the actual hypotheses concerning the cointegrating relationship. For these reasons, the study used the Johansen maximum likelihood test because it is a multivariate technique which takes into account the problem of more than two variables.

The Johansen procedure relies heavily on the relationship between the rank of matrix and its characteristic roots and it uses vector cointegration test method. Johansen and Juselius proposed two tests for determining the number of cointegrating vectors: the first they termed the likelihood ratio test, which is based on the maximum eigenvalue, and the second they termed the likelihood ratio test, based on the trace test. According to their analysis, the power of the trace test is lower than the power of the maximal eigenvalue test (Johansen and Juselius 1990).

- **The trace test**

It tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors

$$\lambda_{trace}(r) = -T\sum_{t=r+1}^{g} \ln(1-\lambda_t) \quad \text{...... 4.7}$$

- **The maximum eigenvalue test**

It tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of (r+1) cointegrating vectors

$$\lambda_{max}(r_1 r + 1 = -T ln(1-\check{\lambda}_{i+1}) \quad \text{...... 4.8}$$

Where T is the sample size, and $\hat{\lambda}_i$ is the $_i^{th}$ largest canonical correlation. The larger is $\hat{\lambda}_i$, the more large and negative will be ln $(1 - \hat{\lambda}_i)$ and hence the larger will be the test statistic. The Johansen and Juselius testing and estimating procedure is as follows:

- Pre-test the variables for their order of integration.
- Estimate the cointegrating regression.
- Check whether there is a cointegrating (i.e. long-run equilibrium) relationship.
- If so, estimate the dynamic error-correction model.
- Assess model adequacy (Johansen & Juselius, 1990).

4.7 Vector error-correction model (VECM)

Once the long-term relationship is established in the cointegration, VECM was estimated to specify both the short-term and the long-term dynamics of each variable in the system. In a VECM, the short-term dynamics of the variables in the system are influenced by the deviation from equilibrium (Aziakpono, 2006).

$$\Delta yt = \beta 1 \Delta \chi t + \beta 2\ (yt\text{-}1 - \gamma xt\text{-}1) + \mu t \qquad 4.9$$

The error-correction term is given by yt-1 – γxt-1. The implied coefficient on xt-1 of one in this term suggests a proportional long-run relationship between y and x. The error-correction model specifies that y is supposed to change between t-1 and t as a result of changes in the values of the explanatory variables x between t-1 and t. The change in y will also account for part correction to any disequilibrium at time t. γ defines the long-run relationship between x and y. $\beta 1$ describes the short run relationship between changes in x and changes in y. $\beta 2$ describes the speed of adjustment back to equilibrium. The implication is that it measures the proportion of the last period's equilibrium error that is corrected.

The VECM specification used in the study was as follows:

$$\Delta lnLP_{1,t} = \beta_{10} \sum_{i=1}^{p} \beta_{11,i}\, \Delta lnLP_{1,t-1} + \sum_{i=1}^{p} \beta_{12,i} \Delta lnCI_{2,t-1} + \sum_{i=1}^{p} \beta_{13,i} \Delta lnLI_{3,t-1} + \sum_{i=1}^{p} \beta_{14,i}\, \Delta lnFDI_{4,t-1} + \sum_{i=1}^{p} \beta_{15,i}\, \Delta lnX_{5,t-1} + \lambda_1 ECT_{t-1} + \mu_t \qquad 4.10$$

$$\Delta lnCI_{1,t} = \beta_{20} \sum_{i=1}^{p} \beta_{11,i}\, \Delta lnLP_{1,t-1} + \sum_{i=1}^{p} \beta_{12,i} \Delta lnCI_{2,t-1} + \sum_{i=1}^{p} \beta_{13,i} \Delta lnLI_{3,t-1} + \sum_{i=1}^{p} \beta_{14,i}\, \Delta lnFDI_{4,t-1} + \sum_{i=1}^{p} \beta_{15,i}\, \Delta lnX_{5,t-1} + \lambda_1 ECT_{t-1} + \mu_t \qquad 4.11$$

$$\Delta lnLI_{1,t} = \beta_{30} \sum_{i=1}^{p} \beta_{11,i}\, \Delta lnLP_{1,t-1} + \sum_{i=1}^{p} \beta_{12,i} \Delta lnCI_{2,t-1} + \sum_{i=1}^{p} \beta_{13,i} \Delta lnLI_{3,t-1} + \sum_{i=1}^{p} \beta_{14,i}\, \Delta lnFDI_{4,t-1} + \sum_{i=1}^{p} \beta_{15,i}\, \Delta lnX_{5,t-1} + \lambda_1 ECT_{t-1} + \mu_t \qquad 4.12$$

$$\Delta lnFDI_{1,t} = \beta_{40} \sum_{i=1}^{p} \beta_{11,i}\, \Delta lnLP_{1,t-1} + \sum_{i=1}^{p} \beta_{12,i} \Delta lnCI_{2,t-1} + \sum_{i=1}^{p} \beta_{13,i} \Delta lnLI_{3,t-1} + \sum_{i=1}^{p} \beta_{14,i}\, \Delta lnFDI_{4,t-1} + \sum_{i=1}^{p} \beta_{15,i}\, \Delta lnX_{5,t-1} + \lambda_1 ECT_{t-1} + \mu_t \qquad 4.13$$

$$\Delta lnX_{1,t} = \beta_{50} \sum_{i=1}^{p} \beta_{11,i} \Delta lnLP_{1,t-1} + \sum_{i=1}^{p} \beta_{12,i} \Delta lnCI_{2,t-1} + \sum_{i=1}^{p} \beta_{13,i} \Delta lnLI_{3,t-1} + \sum_{i=1}^{p} \beta_{14,i} \Delta lnFDI_{4,t-1} + \sum_{i=1}^{p} \beta_{15,i} \Delta lnX_{5,t-1} + \lambda_1 ECT_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \; 4.14$$

"ECT_{t-1}" is the lagged error-correction term which shows the degree of disequilibrium levels of variables in the previous period. The ECT_{t-1} was expected to be negative and statistically significant as evidence that in the event that there was disequilibrium in the short-term, the variables would adjust to their long-run equilibrium

4.8 Impulse response and variance decomposition analysis

4.8.1 Impulse response analysis

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

There are several ways of performing impulse response analysis, but the Cholesky orthogonalisation approach to impulse response analysis, which is a multivariate model extension of the Cholesky factorisation technique, was preferred in this study, because, unlike other approaches, it incorporates a small sample degree of freedom adjustment when estimating the residual covariance matrix used to derive the Cholesky factor (Lütkepohl, 1991: 155-158).

4.8.2 Variance decomposition analysis

According to Brooks (2008), variance decompositions give the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables. Thus variance decompositions determine how much of the *s*-step-ahead forecast error variance of a given variable is explained by innovations to each explanatory variable.

Brooks also observed that own series shocks explain most of the forecast error variance of the series in a VAR. The same factorisation technique and information used in estimating impulse responses is applied in the variance decompositions.

4.10. Diagnostic test

Diagnostics tests are done to check the stochastic properties of the model such as residual autocorrelation, heteroscedasticity and normality, among others. The multivariate extensions of the residual test just mentioned was applied in this and are briefly discussed below.

4.10.1 Residual Normality Test

The Jarque–Bera test was used to test for normality. It uses the property of a normally distributed random variable. The entire distribution is characterised by the first two moments of the mean and the variance. The test statistic asymptotically follows an X2 under the null hypothesis that the distribution of the series is symmetric. The null hypothesis of normality would be rejected if the residuals from the model were either significantly skewed or leptokurtic (Gujarati, 2004:148).

4.10.2 Autocorrelation test

Autocorrelation test or serial correlation refers to a case where the error term in one time period is correlated to the error term of another period. The Lagrange Multiplier (LM) test used in this study was a multivariate test statistic for residual serial correlation up to the specified lag order. Harris (1995: 82) argued that the lag order for this test should be the same as that of the corresponding VAR. The LM statistic tests the null hypothesis of no serial correlation against an alternative of auto correlated residuals

4.10.3. Heteroscedasticity test

There are number of formal heteroscedasticity tests formulated. Heteroscedasticity test will be run using the Langrange multiplier, also known as Engle's Arch LM test (Engle, 1983) to check if the residuals are homoscedasticity. Acceptance of null hypothesis indicates homoscedasticity and the rejection of null hypothesis indicates the heteroscedasticity. The test procedure will be as follows:

H_0 : there is homoscedasticity

H_1: there is heteroscedasticity

4.11 Conclusion

The study constructed the model that was employed to examine the impact of FDI on labour productivity of the automotive industry in South Africa, among other variables. The unit root test was applied in the chapter to test the stationarity of time series variables and the ADF test was selected to determine the integration order of variables of interest. To check the long-term relationship between variables of interest, the Johansen cointegration test was chosen over the Engle–Granger and other types of cointegration models due to its ability to take care of multivariate. In the event of cointegration existing, VECM was estimated to specify both the short-term and the long-term dynamics of each variable in the system. The Granger causality test will be constructed to identify the causal relationship between variables of interest. A diagnostic test will be applied on the check fitness of the model.

CHAPTER 5

EMPIRICAL ANALYSIS AND FINDINGS

5.1. Introduction

This chapter presents the empirical analysis and interpretation of results of the models estimated in Chapter 4. The chapter comprises six sections, namely, descriptive statistics, the analysis of the time series properties of the data through unit root tests, the lag length selection criteria to choose the appropriate lag, the model selection and the Johansen cointegration technique, VECM and the diagnostic tests.

5.2 Descriptive statistics

Table 5.1 provides the summary statistics for all variables used in the study. The mean value of the labour productivity is 100 with a standard deviation of 35.

Table 5.1: Summary statistics

	LP	FDI	CI	LI	EXPORT
Mean	100,7474	243,6899	85,76489	114,7739	29,97574
Median	89,45015	4,081444	93,51285	102,8078	26,59300
Maximum	159,6799	1622,779	126,9615	188,1214	53,23088
Minimum	56,03622	3,655138	48,84816	77,53661	9,562944
Std. Dev.	34,71365	436,6518	23,78941	27,77750	12,99631
Skewness	0,361668	1,886737	-0,203884	1,051258	0,417238
Kurtosis	1,829049	5,550156	1,599992	3,032545	1,977885
Jarque-Bera	5,998748	65,68427	6,733271	14,00184	5,513387
Probability	0,049818	0,000000	0,034506	0,000911	0,063501
Sum	7656,803	18520,43	6518,132	8722,816	2278,156
Sum Sq. Dev.	90377,83	142998,57	42445,19	57869,23	12667,80
Observations	76	76	76	76	76

Table 5.2 Correlation matrix (relationship between labour productivity and the variables of interest)

Correlation					
Probability	LP	FDI	CI	LI	EXPORT
LP	1,000000				

FDI	0,712***	1,000000			
p-value	0,0000	-----			
CI	0,943***	0,564***	1,000000		
p-value	0,0000	0,0000	-----		
LI	0,856***	0,691***	0,741***	1,000000	
p-value	0,0000	0,0000	0,0000	-----	
EXPORT	0,943***	0,663***	0,896***	0,839***	1,000000
p-value	0,000	0,000	0,000	0,000	-----

***.Correlation is significant at the 0.01 level of significance

**. Correlation is significant at the 0.05 level of significance

*.Correlation is significant at the 0.1 level of significance

Table 5.2 shows the relationship between labour productivity and FDI, capital input, labour input and exports. The results in Table 5.2 suggest that there is a positive and significant correlation between labour productivity and FDI, capital input, labour input and exports. It should be noted that all variables used in the study had a higher correlation with labour productivity and the highest was capital input and exports, with 94% correlation. However, these preliminary results were insufficient to arrive at a conclusion. Further tests were carried out to arrive at the findings in the next section.

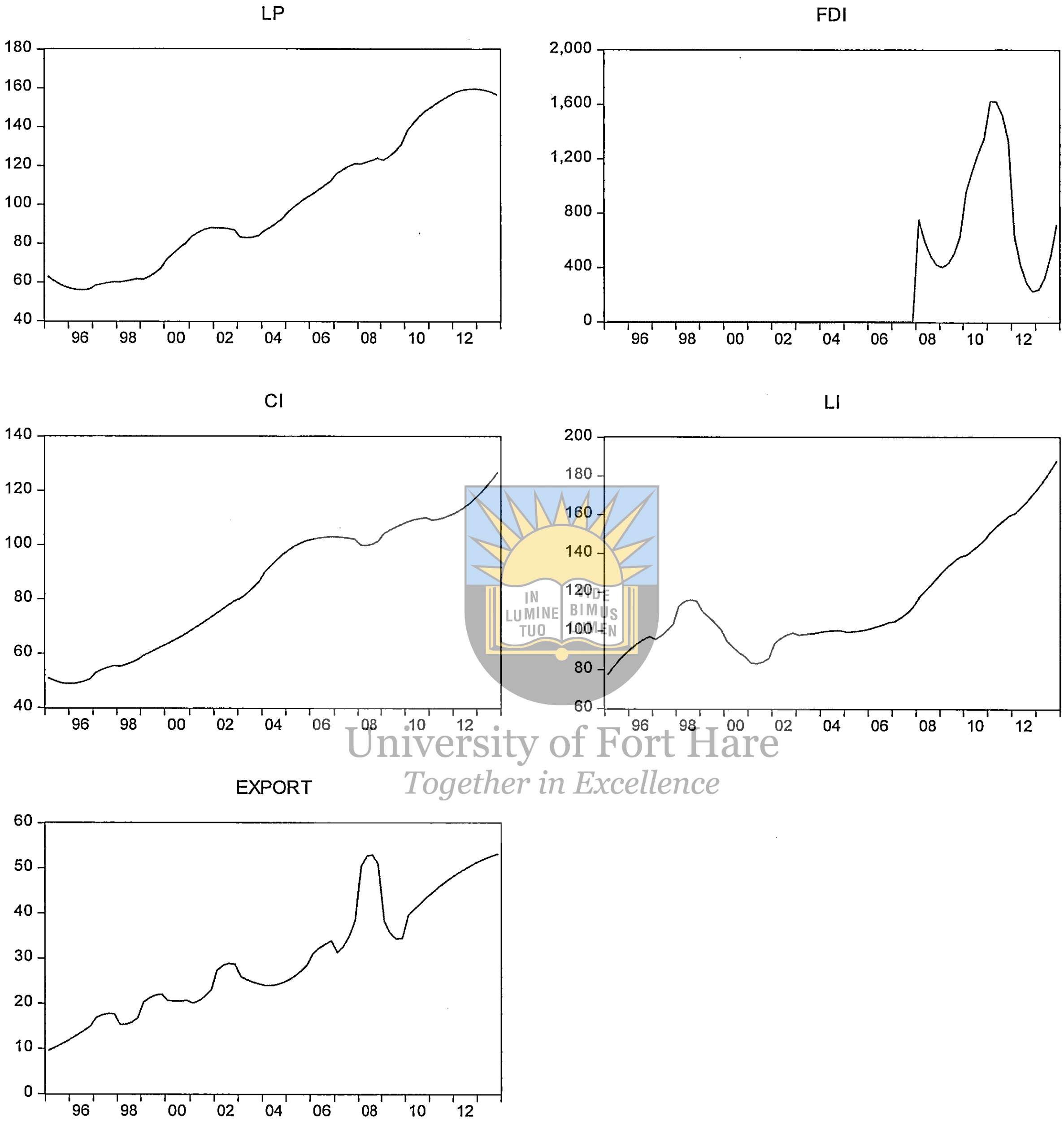

Figure 5.1: Graphical Plots of Key Variables at Level Series

The graphical plots of variables at level series showed that the variables were non-stationary as they trended. All variables used in the study trended upward, although there were fluctuations. This confirmed that that all variables posed unit root in levels series. However, the same variables were examined at first difference, and the result are demonstrated in Figure 5.2.

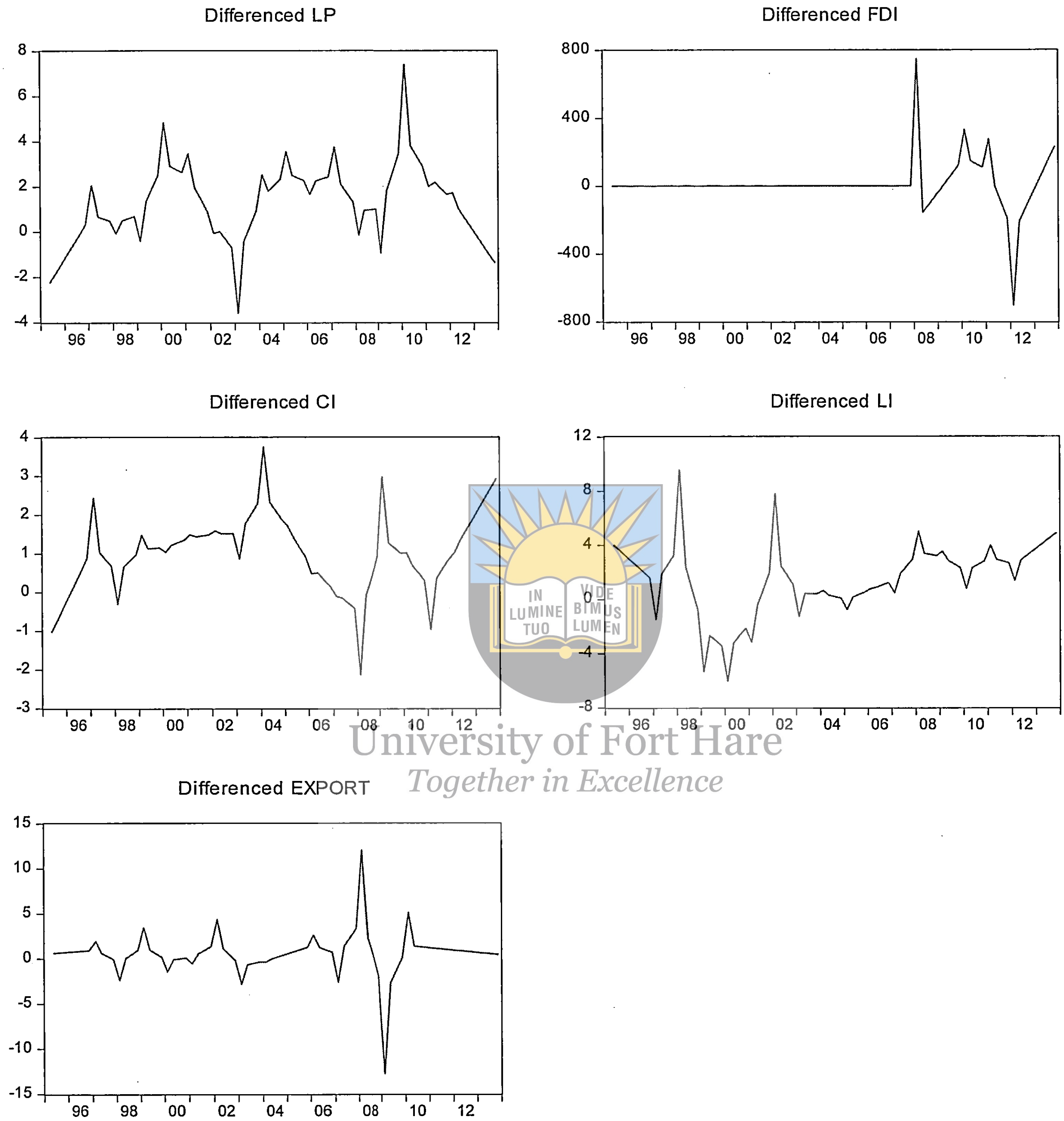

Figure 5.2: Graphical Plots of Key Variables at First Difference Series

The results in Figure 5.2 above show that all variables became stationary after first differencing. All variables showed the stationarity process as they seemed to hover around their means. The variables therefore had a constant mean which was required for the stationarity process even though their variances were time variant.

5.3. Unit root tests

5.3.1 Unit root tests (formal tests): level series

The study used the ADF and PP to test the unit root of the variables of interest. The empirical results obtained from the ADF and PP tests are summarised in Tables 5.3 ad 5.4. The variables were tested for stationarity under all deterministic trend assumptions of constant, constant and trend and no constant and no trend. The result showed that in both ADF and PP, all variables used on the study were non-stationary in level series. Therefore the results suggest that the mean, variance and covariance of the series were not constant. However, at first difference level, all variables examined were stationary as reported by ADF and PP tests.

Table 5.3 Unit root tests: Level series

	Augmented Dickey-Fuller Test			Phillips-Perron Test		
Variable	Constant	Constant and trend	None	Constant	Constant and trend	None
Labour productivity	-0,689	-2,818	1,596	0,520	-3,027	3,410
FDI	-1,803	-2,724	-1,340	-1,748	-2,524	-1,320
Capital input	-0,112	-2,224	2,515	0,295	-1,934	4,359
Labour input	1,023	-0,633	1,855	1,276	-0,161	2,961
Exports	-0,315	-3,007	1,696	-0,863	-3,275	1,135

Note: *** denotes significance at 1%; ** significance at 5% and * significance at 10%

5.3.2. Unit Root tests: first difference series

The series were examined for stationarity at first different and the results are reported in Table 5.4.

Table 5.4 Unit root tests: First difference series

	Augmented Dickey-Fuller Test			Phillips-Perron Test		
Variable	Constant	Constant and trend	None	Constant	Constant and trend	None
ΔLabour productivity	-3,319***	-3,107*	-2,542***	-3,356***	-3,138*	-2,523***
ΔFDI	-6,084***	-6,047***	-6,101***	-6,116***	-6,079***	-6,133***
ΔCapital input	-3,162**	-3,159***	-1,612***	-3,167**	-3,177**	-1,470**
ΔLabour input	-3,295***	-2,919*	-2,822***	-3,305***	-3,698**	-2,740***
ΔExports	-3,171**	-3,226*	-2,278**	-5,755***	-5,721***	-5,599***

Note: *** denotes significance at 1%; ** significance at 5% and * significance at 10%

The results presented in Table 5.4 illustrate that the variables were stationary in the first difference series; this suggests that all that was required was to difference the time series in order to make them stationary. Therefore we could check whether there was a long-term relationship between variables of interest by testing the cointegration using the Johansen cointegration technique. However, prior to this, the lag length was determined.

5.4 Lag length selection

The study used the lag length to determine optimal lag length which eliminated serial correlation in the residuals as well as determining the deterministic trend assumptions for the VAR model. Table 5.5 presents the lag length selection test results. As shown in Table 5.5, the information criteria used in the study were the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Information Criterion (HQ), Final Prediction Error (FPE) and the likelihood ratio test (LR). In this study, the selection was made using a maximum of six lags in order to permit adjustment in the model and accomplish well-behaved residuals.

Table 5.5 Lag length selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1559,238	NA	1,77e+13	44,69251	44,85312	44,75631
1	-941,041	1130,417	772014,9	27,74404	28,70768	28,12681
2	-853,279	147,942	129906,7	25,95083	27,71750*	26,65257
3	-839,539	21,1990	184288,0	26,27254	28,84225	27,29326
4	-830,410	12,780	306145,3	26,72600	30,09875	28,06570
5	-744,694	107,758	59182,31	24,99126	29,16703	26,64993
6	-682,803	68,965*	23790,82*	23,93722*	28,91603	25,91486*

Notes

* 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

The study utilised both the lag of two, based on SC information criteria, as well as the lag of six, based on other different information criteria. Therefore the study was estimated using the lag length of six for each endogenous variable.

5.5 Johansen Cointegration results

Prior to estimating the Johansen cointegration test, the appropriate model was determined empirically and the results are reported in Table 5.6.

Table 5.6 Johansen Cointegration Method Model selection results

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	5	5	5	4	3
Max-Eig	5	5	3	3	4

*critical values based on Mackinnon-Haug-Michellis (1999)

As reported in Table 5.6, there is a consistency between trace statistics and the maximum eigenvalue for the first of no intercept and no trend and the second model of intercept and no trend. However, there is contradiction between trace statistic and the maximum eigenvalue on other models. The model of intercept and no trend was therefore chosen in checking if there was a long-term relationship between the variables using the Johansen cointegration test. Table 5.7 illustrates a model in which a lag length of six was used.

Table 5.7. Johansen Cointegration Technique results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesised		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0,414481	127,5739	76,97277	0,0000
At most 1 *	0,364580	90,64123	54,07904	0,0000
At most 2 *	0,360093	59,35183	35,19275	0,0000
At most 3 *	0,217244	28,54799	20,26184	0,0029
At most 4 *	0,155326	11,64753	9,164546	0,0166

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesised		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0,414481	36,93269	34,80587	0,0274
At most 1 *	0,364580	31,28940	28,58808	0,0220
At most 2 *	0,360093	30,80384	22,29962	0,0026
At most 3 *	0,217244	16,90046	15,89210	0,0347
At most 4 *	0,155326	11,64753	9,164546	0,0166

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Using a lag length of six, the results indicate that there were five cointegrating relationships. This shows that the variables used in the study had a long-term relationship. The focus of this study was not to analyse the interaction between the variables, but to establish if there was a long-term relationship between the variables. Therefore, from Table 5.7, the null hypothesis of no cointegration was rejected at 0.05 level of significance from both the trace statistic and the maximal eigenvalue at none, indicating that there was a cointegrating relationship among the variables of interest. Based on this evidence, it can be stated that labour productivity of the automotive sector, FDI, capital input, labour input and exports were moving together in the long run in South Africa. Given that there existed a long-term relationship between the variables of interest, a VECM was estimated.

Given that the aim of the study was to examine the impact of FDI, capital input, labour input and exports on labour productivity of automotive sector, the cointegrating vector normalised on labour productivity is reported. The result of the long-run labour productivity function are reported in equation form:

$$\begin{array}{lllll} LP = 3{,}926 + 0{,}03431FDI & + 0{,}01552LI & + 1{,}115632CI & - 0{,}051378X \\ \quad (0{,}00543) & (0{,}10817) & (0{,}15474) & (0{,}36459) \\ \quad [6{,}31943] & [0{,}14355] & [7{,}20969] & [0{,}14092] \end{array}$$

The standard procedure in interpreting the long-run VECM result was applied. A negative coefficient was interpreted as a positive coefficient and vice-versa. All coefficients were therefore multiplied by -1. The empirical results suggested that FDI and other variables of interest had a positive impact on the labour productivity of the automotive sector in South Africa.

The coefficient for the FDI variable is positive and statistically significant. This confirms the hypothesis that the inflow of FDI in the automotive sector in South Africa increases labour productivity in this industry. These results are consistent with Smarzynska (2002) in the case of Lithuania, Haskel and Pereira (2007) in the case of of the UK, Blomstrom and Wolff (1989) in Mexico and Bijsterbosch and Kolasa (2010) in Central and Eastern Europe. The nature of the relationship established is explained by the nature of the production in the sector. It can be explained that the production of automobiles is largely based on automated production. This to some extent increases productivity per employee. In such industries, physical work of employees is mainly used in finishing work and fine tuning the car after work performed in the production line. Therefore as highlighted by Dudas and Lukac (2014) given the implementation of variaous sub-activities of various employees, there will be an increase in workers performance or productivity. This increase in the labour productivity in the automotive industry will also spillover into the entire production sector.

The labour input variable is positive though statistically insignificant. Economically this result implied that labour input does affect labour productivity and this was consistent with the result of the Buckley et al. (2007) and the Cobb–Douglas Production function discussed in Chapter 3. The magnitude of labour input suggested that a 1% increase in labour input would result in an increase of 0,02% in the labour productivity of the automotive sector in South Africa. This in a way suggest that the skills of the labour force have an impact on productivity.

The empirical results showed that the coefficient of capital input was positive and significant at 10%, indicating that the capital input positively affected labour productivity in South Africa's automotive industry. This was consistent with the Cobb–Douglas Production function discussed in Chapter 3. The magnitude of the capital input variable revealed that a 1% increase in capital input would raise labour productivity by 1,12%.

The exports variable was also positive and statistically insignificant with respect to labour productivity, with a 1% increase in exports leading to a 0,05% increase in labour productivity. This result was consistent with prior expectations as far as the sign of the coefficient is concerned. These results are consistent with Wagner (2005).

5.6 Vector Error-Correction Model

Having established that there was a long-run relationship between the variables used in the study, the next step was to do a VECM test.

Table 5.8 Vector error-correction model

Error Correction:	D(LP)	D(FDI)	D(LI)	D(EXPORT)	D(CI)
CointEq1	-0,074050	13,96983	0,090792	0,036517	-0,010909

	(0,02072)	(3,83675)	(0,05204)	(0,04185)	(0,01618)
	[-3,57445]	[3,64106]	[1,74454]	[0,87255]	[-0,67438]
D(LP(-1))	0,614582	42,63789	0,526359	-0,088713	-0,097743
	(0,13076)	(24,2174)	(0,32850)	(0,26416)	(0,10210)
	[4,70003]	[1,76063]	[1,60232]	[-0,33583]	[-0,95729]
R-squared	0,874307	0,488335	0,702525	0,787045	0,768686
Adj. R-squared	0,798307	0,178956	0,522656	0,658281	0,628821
Sum sq. resids	23,01209	789319,2	145,2318	93,91302	14,03073
S.E. equation	0,731550	135,4853	1,837793	1,477844	0,571223
F-statistic	11,50399	1,578437	3,905765	6,112330	5,495936

From Table 5.8, the long-term Granger Causal Relationship can be seen based on the value of ECT-1 for every variable in the table. Based on the result of the VECM test, it was found that the value of ECT-1 for the LP variable was significant and positive. This proved that the variables of FDI, labour input, capital input and exports were the long-term Granger cause for labour productivity. In other words, the labour productivity variable in the equation bore the burden of dispersing the error.

5.8 Impulse response and variance decomposition

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

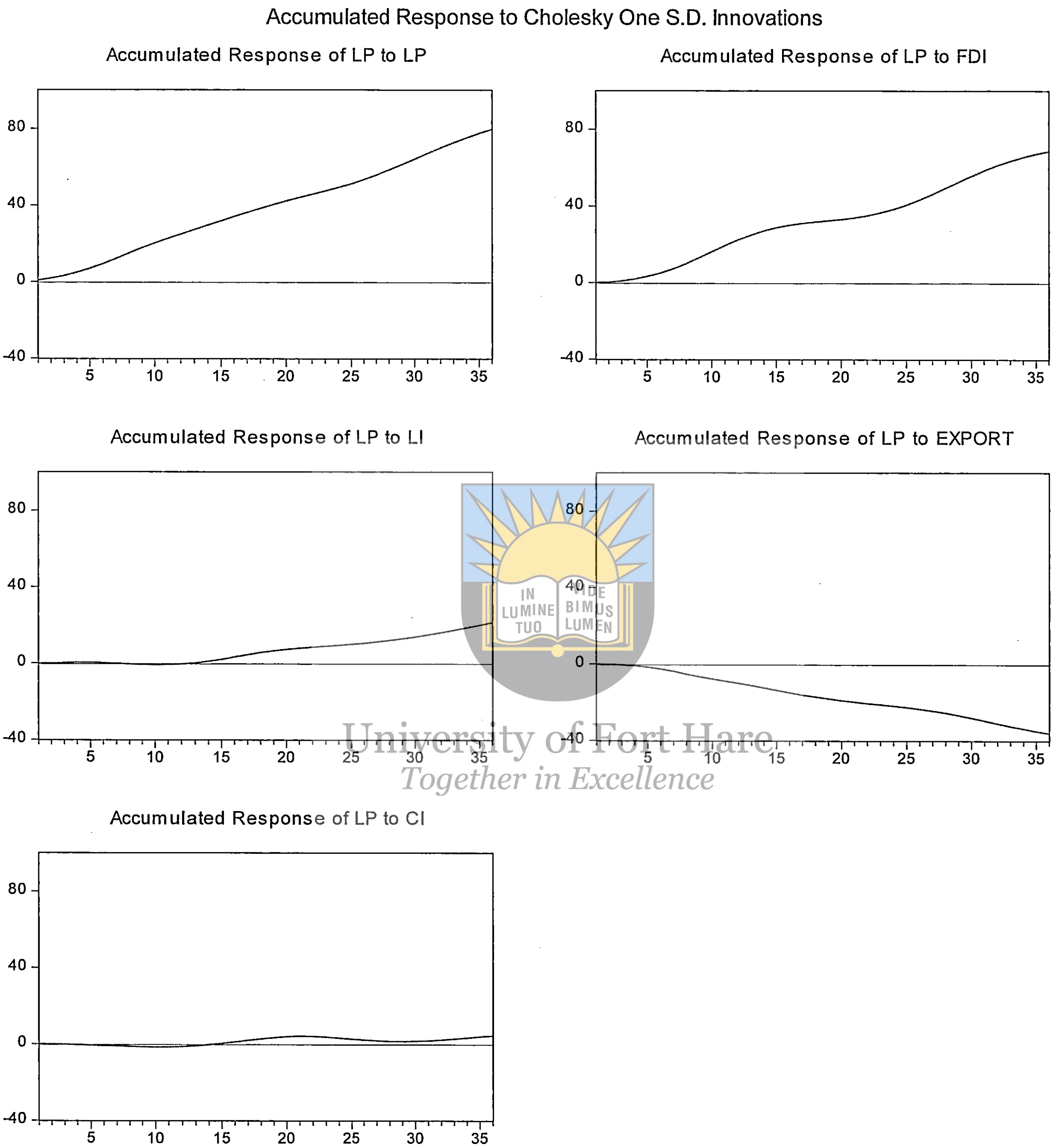

Figure 5.3: Impulse Response

As shown in the impulse response result in Figure 5.3 above, a persistent standard deviation shock on LP produced a large positive impact on itself by nearly 8%. This was persistent from the first to the 35th quarter. Innovations on FDI and exports also showed a positive impact which rose gradually during from the fifth quarter and continued to be persistent from the 26th quarter to the 35th quarter. Shock to LI was constant at zero from the first quarter to the 15th quarter, and started rising consistently on the 16th quarter. Shocks on CI were not significantly different from zero and were transitory. Among the analysed variables, only FDI and exports were shown to have a persistent and significant impact on labour productivity; the rest were shown to have only a minimal impact.

5.8.1. Variance decomposition

As highlighted in Chapter 4, variance decomposition analysis indicated the proportion of the movements in a sequence due to its own shocks, versus shocks to other variables. In the context of this study, it provided a way of determining the relative importance of shocks to each of the variables that helped to explain variations in labour productivity. Table 5.10 illustrates the result of the variance decomposition analysis and these show the proportion of the forecast error variance in the labour productivity, explained by its own innovations and innovations in its determinants.

Table 5.10 Variance decomposition

Period	S.E.	LP	FDI	LI	EXPORT	CI
1	0,732	100,000	0,000	0,000	0,000	0,000
6	5,003	66,059	25,618	0,432	7,170	0,718
10	9,671	48,956	41,127	0,460	9,126	0,328
15	12,816	44,420	43,679	1,605	9,500	0,792
20	14,288	46,405	37,083	4,083	10,481	1,946
25	15,423	46,650	37,180	4,114	10,105	1,948
30	18,081	44,299	40,907	3,956	9,262	1,573
35	20,252	44,283	39,419	5,022	9,731	1,541

The variance decomposition analysis above covers a period of 35 quarters in order to determine the impact when the variables were allowed to affect labour productivity for a longer time.

In the first period, all of the variance in labour productivity was explained by its own innovations or shocks, which is consistent with Brooks (2002) and Goyenko et al. (2009). Labour productivity explained about 66% of its variation on the sixth quarter ahead of forecast error variance. This is consistent with impulse response results. Explanatory variables accounted for 33% of the error variance. FDI explained 26%, labour input about 0.4%, capital input about 0,7% and exports about 7 %.

The results showed that, for 35 periods, the dependent variable explained between 100 and 44% of its variation, while the independent variables the remainder. The variance decomposition analysis results were compatible with economic theory. Shocks to the explanatory variables continued to explain a significant proportion of the variation in labour productivity, and FDI manifested as a very important variable determining labour productivity in the automotive sector in South Africa. These results are consistent with the lon-term results explained earlier.

5.9 Diagnostic test results

Rigorous diagnostic tests were carried out on the study to discover if the assumptions which underlie the classical linear regression model were observed and the model was reasonably well specified. The VAR is stationary if all roots have modulus less than one and lie inside the unit circle. Figure 5.4 presents the result of AR Roots and serial correlation, and the results showed that the VAR model is stationary because all roots lie inside the unit circle.

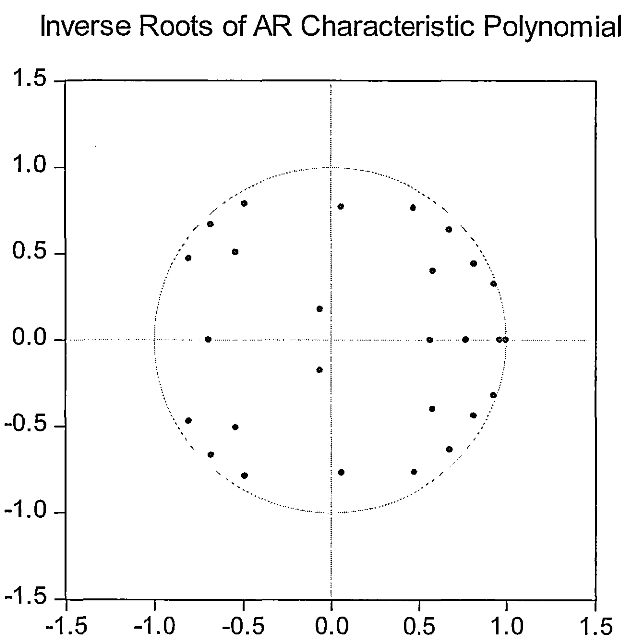

Figure 5.4: Inverse roots of AR characteristics polynomial

The model was also tested for normality, serial/autocorrelation and heteroscedasticity. The results are illustrated in Table 5.11.

Table 5.11: Other diagnostic tests

Test	H_0	Test Statistic	p-vale	Conclusion
Jarque-Bera	Residuals are normally distributed	4,50	0,21	Errors are normally distributed
VEC Residual Serial Correlation LM Tests	There is no serial Correlation in the residuals	6,281	0,10	No 6th-order autocorrelation
VEC Residual Heteroskedasticity Tests	The residuals are homoscedastic	720,424	0,94	No Heteroskedasticity

The diagnostic test results revealed that the residuals were normally distributed, homoscedastic and there was no serial correlation.

5.10 Conclusion

This chapter has focused on interpreting the results of models estimated in Chapter 4. The chapter started with an analysis of the time series properties of the data, using ADF test and PP tests for unit root. Both methods confirmed that the variables were integrated of order one, I(1).

Having determined the order of integration of the variables, the lag length to be used in the estimation for the Johansen cointegration was determined empirically, with the majority of the information criteria settling for the lag of six while the SC suggested a lag of two. The lag lengths of six were therefore used in the estimation. At a lag of six, the Johansen cointegration test established that there were five cointegrating equations. This therefore implied that there was a long-term relationship between labour productivity of automotive sector and FDI, and its determinants as estimated in the model. The VECM was also estimated to analyse both the long-run and the short-run interaction between the variables.

The long-run equation showed that FDI and CI are statistically significant and have a positive influence on labour productivity in SA. On the other hand exports and LI were statistically insignificant thought the sign was inline with the apriori expectation. The results established that FDI has facilitated the accumulation of labour productivity in the automotive industry in South Africa, which was the aim of the study. These results were all confirmed by the impulse response and the variance decomposition. The results also observed all the assumptions which underlie the classical linear regression model.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATION

6.1. Introduction

This chapter concludes this report and makes policy recommendations based on the study. The chapter is divided into three sections: the first section gives an overall summary of each chapter discussed in the study, while the second section presents the policy implications and recommendation to the study. Limitations of the study and suggestions for further research are provided in the final section.

6.2 Summary

The aim of this study was to establish the impact of foreign capital inflow on labour productivity in the automotive sector in South Africa, using a time series data over the 35 quarters from 1Q1995 to 4Q2013.

Chapter 2 presented an overview of foreign capital inflow into automotive labour productivity in South Africa. The chapter was divided into three sections: the first section discussed the historical background of FDI into SA and compared FDI into South Africa with other African countries; the second section presented an overview of the automotive industry in South Africa and the last section presented the policies implemented for the automotive sector.

Chapter 3 presented FDI and productivity theories; eclectic theory and spillover effect from FDI was discussed as theories of FDI and productivity. Various studies were reviewed, giving insight into the empirical literature on the determinants of labour productivity. The empirical literature has been consistent with the theories reviewed. Aspects such as technological progress, competitiveness and investment were found to be significant factors in raising the labour productivity of an MNEs.

Studies that were reviewed on the effect of FDI on labour productivity were found to be positive and significant. However, some of the reviewed study the result were found to be negative.

Chapter 4 presented the model specification and how the model was estimated to examine the impact of FCI on the labour productivity of the automotive industry in South Africa, among other variables. A unit root test was presented to test the stationary nature of time series variables and the ADF test and the PP test were selected to determine the integration order of variables of interest. The Johansen cointegration technique model was employed to test the long-run relationship between variables of interest. Impulse response and variance decomposition tests were done to check the responsiveness and importance of shocks to the variable of interest. Diagnostic tests were also done to check the fitness of the model.

Chapter 5 analysed the impact of FDI and other explanatory variables on labour productivity, as well as dynamic adjustment of labour productivity following shocks to its determinants. The chapter started analysing the time series properties of the data, using the ADF test and PP test for unit root. Variables were found non-stationary at level series. After being different once, all variables became stationary, implying that all variables entered the model in first difference. Having determined the order of integration of the variables, the lag length to be used in the estimation for the Johansen cointegration was determined empirically, with the majority of the information critera settling for a lag of six, while the SC suggested a lag of two. The lag lengths of six were therefore used in the estimation. At a lag of six, the Johansen cointegration test established that there were five cointegrating equations. The results from Johansen cointegration tests implied that there is a long-term relationship between labour productivity in the automotive sector and FDI and its determinants. The VECM was also estimated to analyse both the long-run and the short-run interaction between the variables. The long-run equation showed that all the variables employed in the model had a positive relationship with productivity. The null hypothesis that the FDI induce labour productivity of automotive sector was rejected and the alternative hypothesis was accepted based on the regression estimate that FDI have a positive long term relationship with labour productivity of automotive sector in South Africa

Impulse response results were found to be consistent with the long-run results. Shocks on labour productivity, FDI and exports had an impact on labour productivity in South Africa. Shocks on capital input and labour input were not significantly different from zero and were transitory.

6.3 Policy Implications and recommendations

The results imply that FDI has a positive relationship with labour productivity in South Africa. The results from the findings imply that the policies and incentives implemented by the government to attract FDI have had a multiplied effect: apart from providing development finance, they have also enhanced labour productivity in the long-run. Therefore integration of the the domestic workforce associated with intensive cooperation of domestic professional training institutions, Foreign Automakers and producers of components will be able to increase the quality level of the South African economy as well as strengthening the knowledge economy. This therefore suggests that the government should continue to attract FDI inflows into the industry.

The results also indicated that exports of vehicles have played a very important role in determining the level of productivity in the industry. This suggests that the more the exports, the more automobiles are produced, and companies will devise better methods of producing them. The study suggests that government should be cautious about export tariffs, as high export duties can harm development in the industry. Another important factor of labour productivity in the South African automotive sector in South Africa is labour input. Government should provide more policies to promote investment in human capital in the country and provide incentives for more training that will strengthen the quality of the labour force. As a result of high quality labour, the industry is more likely to grow faster in terms of labour productivity.

6.4 Limitations and areas of further research

The main focus of the study was to investigate the extent to which Foreign Direct Investment impacted on labour productivity of the automotive industry in South Africa for the period between 1995 to 2013. The problem of unavailabity of data for factors which has also experienced by the previous researchers like level of education of employees, political institutions and particularly in the automotive industry, on the actual variables suggested by the theoretical models of foreign direct investment on productivity. This means that some of the variables either have to be excluded in the empirical model, albeit with the risk of an omitted variables bias, or proxies have to be found for those variables. The risk involved in finding proxies is that they may not correctly represent the impact of the actual variables, resulting in inconsistent results. Striking this balance poses a serious challenge to empirical studies on the impact of FDI on labour productivity. Futhermore, in the events which are outside this period could have had an impact on the relationship between the variables of interest. However the results obtained are supported by a number of empirical studies as well as theory. The areas of further research that emerge from this study include investigations into the impact of FDI on productivity at industry level.

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APPENDICES

Appendix 1: Summary of empirical literature of FDI effect on labour productivity

Authors	Country(s)	Period	Methodology	FDI effect of productivity
Alam et al. (2013)	19OECD member countries	1980 to 2009	error-correction model	Positive effect both in short run and long run
Scepanovic (2013)	East Central European	1990-2011	hyper-integrationist development model	Positive effect
Buckley et al. (2007)	China	1995 to 1999	OLS and fixed effect model (FEM)	Positive effect
Wang et al. (2013)	China	1999 to 2008	OLS and fixed effect model (FEM)	Negative effect
Barrios et al. (2002)	Spanish	1990–1998	OLS	Indirect effect Crowded out by negative competition effect
Demir and Li(2013)	China	1998 -2007	Non-linear and Cobb– Douglas Production function	Positive and significant
Haskel (2007)	UK	1973-1992	Regression	Positive and

				significant
Pavlinek (2014)	Slovakia	2011-2013, 2005	Survey	Positive effect
Aitken and Harrison (1991)	Venezuelan	1976-199	OLS	Negative effect
Blomstrom and Kokko (1997)	Multinational corperations		Literature survey	Mixed result
Mabratie (2010)	South Africa	2003 - 2007	POLS	Positive effect
Mebratie and Bedi (2011)	South Africa	2003 and 2007	OLS	No significant effect
Opperman (2012)	South Africa	1994 - 2007	Cointegration and error-correction model	Positive Long-run relationship
Bruhn and Calegorio (2013)	Brazil		Multiple regression model	Mixed result
Rajalakshmi and Ramachandran (2011)	India	1991 to 2011	(ARIMA), coefficient, linear and compound model)	Positive effect
Griffith et al. (2004)	Britain		Survey	Negative effect
Javorcik (2004)	Lithuania	1996 -2000	OLS and Olley-Pakes regression	Positive effect

Appendix 2

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	5	5	5	4	3
Max-Eig	5	5	3	3	4

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	-726.7303	-726.7303	-720.3923	-720.3923	-714.1829
1	-708.3740	-708.2640	-702.6365	-698.5407	-692.3738
2	-692.7389	-692.6193	-687.1757	-681.4130	-675.4273
3	-680.2811	-677.2174	-673.6435	-666.3450	-660.3877
4	-671.9741	-668.7672	-667.0248	-657.4607	-651.7679
5	-668.6340	-662.9434	-662.9434	-651.7435	-651.7435
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	25.41247	25.41247	25.37369	25.37369	25.33863
1	25.17026	25.19606	25.14889	25.05915	24.99634

2	25.00693	25.06143	24.99060	24.88154	24.79499
3	24.93568	24.93384	24.88822	24.76362	24.64892*
4	24.98476	25.00774	24.98623	24.82495	24.68893
5	25.17780	25.15778	25.15778	24.97807	24.97807
	Schwarz Criteria by Rank (rows) and Model (columns)				
0	30.26923*	30.26923*	30.39234	30.39234	30.51917
1	30.35080	30.40897	30.49131	30.43396	30.50066
2	30.51125	30.63051	30.65681	30.61250	30.62310
3	30.76379	30.85908	30.87821	30.85075	30.80081
4	31.13664	31.28914	31.30001	31.26824	31.16460
5	31.65347	31.79534	31.79534	31.77753	31.77753

Date: 07/15/15 Time: 12:46

Sample (adjusted): 1996Q4 2013Q4

Included observations: 69 after adjustments

Trend assumption: No deterministic trend (restricted constant)

Series: LP FDI LI EXPORT CI

Lags interval (in first differences): 1 to 6

Unrestricted Cointegration Rank Test (Trace)

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.414481	127.5739	76.97277	0.0000
At most 1 *	0.364580	90.64123	54.07904	0.0000
At most 2 *	0.360093	59.35183	35.19275	0.0000
At most 3 *	0.217244	28.54799	20.26184	0.0029
At most 4 *	0.155326	11.64753	9.164546	0.0166

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.414481	36.93269	34.80587	0.0274
At most 1 *	0.364580	31.28940	28.58808	0.0220
At most 2 *	0.360093	30.80384	22.29962	0.0026
At most 3 *	0.217244	16.90046	15.89210	0.0347
At most 4 *	0.155326	11.64753	9.164546	0.0166

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegrating Coefficients (normalised by b'*S11*b=I):

LP	FDI	LI	EXPORT	CI	C
-0.211387	0.008166	0.016273	-0.195763	0.327407	1.757571
-0.224469	0.002339	-0.036919	0.249512	0.153303	1.495164
-0.241880	0.008080	-0.032706	0.416567	0.060702	7.194924
0.041703	0.001544	0.007492	-0.319221	0.028306	-2.176963
0.141639	0.002957	-0.137599	-0.015167	-0.092058	8.516871

Unrestricted Adjustment Coefficients (alpha):

D(LP)	0.300629	0.125266	0.118904	-0.098636	-0.113397
D(FDI)	-40.42288	8.052389	-48.95329	-19.44666	-15.25227
D(LI)	-0.323925	-0.009126	-0.247889	0.019614	0.532835
D(EXPORT)	0.089601	-0.216150	-0.623638	0.171557	-0.061302
D(CI)	0.085915	-0.162557	0.124520	-0.135474	0.009726

1 Equation(s): CointegratingLog likelihood -708.2640

Normalised cointegrating coefficients (standard error in parentheses)

LP	FDI	LI	EXPORT	CI	C
1.000000	-0.038632	-0.076984	0.926088	-1.548849	-8.314457
	(0.00781)	(0.15590)	(0.49177)	(0.21037)	(14.5031)

Adjustment coefficients (standard error in parentheses)

D(LP)	-0.063549
	(0.01992)
D(FDI)	8.544884
	(3.81541)
D(LI)	0.068474
	(0.05027)
D(EXPORT)	-0.018941

	(0.04027)
D(CI)	-0.018161
	(0.01575)

2	CointegratingLog		
Equation(s):		likelihood	-692.6193

Normalised cointegrating coefficients (standard error in parentheses)

LP	FDI	LI	EXPORT	CI	C
1.000000	0.000000	0.253632	-1.863986	-0.363222	-6.050293
		(0.17923)	(0.71773)	(0.30539)	(15.8673)
0.000000	1.000000	8.558016	-72.22128	30.69004	58.60804
		(6.21529)	(24.8887)	(10.5900)	(550.232)

Adjustment coefficients (standard error in parentheses)

D(LP)	-0.091667	0.002748
	(0.02838)	(0.00078)
D(FDI)	6.737372	-0.311277
	(5.55067)	(0.15292)
D(LI)	0.070522	-0.002667
	(0.07332)	(0.00202)
D(EXPORT)	0.029579	0.000226
	(0.05774)	(0.00159)
D(CI)	0.018328	0.000321
	(0.02149)	(0.00059)

3	CointegratingLog		
Equation(s):		likelihood	-677.2174

Normalised cointegrating coefficients (standard error in parentheses)

LP	FDI	LI	EXPORT	CI	C
1.000000	0.000000	0.000000	1.575211	-2.085977	26.87310
			(0.83162)	(0.40942)	(13.2342)

0.000000	1.000000	0.000000	43.82369	-27.43894	1169.505
			(23.5479)	(11.5931)	(374.736)
0.000000	0.000000	1.000000	-13.55980	6.792343	-129.8078
			(2.62911)	(1.29436)	(41.8391)

Adjustment coefficients (standard error in parentheses)

D(LP)	-0.120428	0.003709	-0.003621
	(0.03527)	(0.00105)	(0.00467)
D(FDI)	18.57822	-0.706815	0.645969
	(6.33128)	(0.18940)	(0.83909)
D(LI)	0.130482	-0.004670	0.003173
	(0.09184)	(0.00275)	(0.01217)
D(EXPORT)	0.180424	-0.004813	0.029835
	(0.06175)	(0.00185)	(0.00818)
D(CI)	-0.011791	0.001328	0.003327
	(0.02614)	(0.00078)	(0.00346)

4 Cointegrating Equation(s): Log likelihood -668.7672

Normalised cointegrating coefficients (standard error in parentheses)

LP	FDI	LI	EXPORT	CI	C
1.000000	0.000000	0.000000	0.000000	-1.606763	8.333299
				(0.18798)	(11.3618)
0.000000	1.000000	0.000000	0.000000	-14.10681	653.7124
				(5.24969)	(317.291)
0.000000	0.000000	1.000000	0.000000	2.667154	29.78732
				(1.18463)	(71.5988)
0.000000	0.000000	0.000000	1.000000	-0.304222	11.76973
				(0.08726)	(5.27370)

Adjustment coefficients (standard error in parentheses)

D(LP)	-0.124541	0.003556	-0.004360	0.053422

	(0.03490)	(0.00105)	(0.00465)	(0.05430)
D(FDI)	17.76724	-0.736845	0.500272	-4.262072
	(6.24446)	(0.18736)	(0.83146)	(9.71598)
D(LI)	0.131299	-0.004639	0.003320	-0.048388
	(0.09235)	(0.00277)	(0.01230)	(0.14370)
D(EXPORT)	0.187579	-0.004548	0.031120	-0.386024
	(0.06113)	(0.00183)	(0.00814)	(0.09511)
D(CI)	-0.017441	0.001118	0.002312	0.037738
	(0.02482)	(0.00074)	(0.00331)	(0.03863)

Vector Error-Correction Estimates
Date: 07/15/15 Time: 12:51
Sample (adjusted): 1996Q3 2013Q4
Included observations: 70 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LP(-1)	1.000000
FDI(-1)	-0.034310
	(0.00543)
	[-6.31943]
LI(-1)	-0.015528
	(0.10817)
	[-0.14355]
EXPORT(-1)	0.051378
	(0.36459)
	[0.14092]
CI(-1)	-1.115632
	(0.15474)

	[-7.20969]
C	3.926408

Error Correction:	D(LP)	D(FDI)	D(LI)	D(EXPORT)	D(CI)
CointEq1	-0.074050	13.96983	0.090792	0.036517	-0.010909
	(0.02072)	(3.83675)	(0.05204)	(0.04185)	(0.01618)
	[-3.57445]	[3.64106]	[1.74454]	[0.87255]	[-0.67438]
D(LP(-1))	0.614582	42.63789	0.526359	-0.088713	-0.097743
	(0.13076)	(24.2174)	(0.32850)	(0.26416)	(0.10210)
	[4.70003]	[1.76063]	[1.60232]	[-0.33583]	[-0.95729]
D(LP(-2))	0.102737	-9.612577	-0.135415	-0.072707	0.003164
	(0.10864)	(20.1208)	(0.27293)	(0.21947)	(0.08483)
	[0.94565]	[-0.47774]	[-0.49616]	[-0.33128]	[0.03730]
D(LP(-3))	0.053353	-14.99827	-0.064089	-0.028050	0.007191
	(0.10890)	(20.1677)	(0.27357)	(0.21999)	(0.08503)
	[0.48995]	[-0.74368]	[-0.23427]	[-0.12751]	[0.08457]
D(LP(-4))	-0.332504	32.39663	0.385008	0.947424	-0.309702
	(0.10768)	(19.9418)	(0.27050)	(0.21752)	(0.08408)
	[-3.08803]	[1.62456]	[1.42332]	[4.35556]	[-3.68355]
D(LP(-5))	0.209195	-28.79847	-0.114362	-0.606131	0.243070
	(0.10493)	(19.4340)	(0.26361)	(0.21198)	(0.08194)
	[1.99360]	[-1.48186]	[-0.43382]	[-2.85935]	[2.96657]
D(FDI(-1))	-8.95E-05	0.499345	0.001631	-0.001098	7.08E-05
	(0.00081)	(0.14945)	(0.00203)	(0.00163)	(0.00063)
	[-0.11090]	[3.34111]	[0.80431]	[-0.67326]	[0.11234]

D(FDI(-2))	-0.001315	0.378681	0.001318	0.000755	-0.000423
	(0.00093)	(0.17177)	(0.00233)	(0.00187)	(0.00072)
	[-1.41821]	[2.20457]	[0.56579]	[0.40308]	[-0.58453]
D(FDI(-3))	-0.001178	0.251070	0.001329	0.000828	-0.000458
	(0.00092)	(0.17070)	(0.00232)	(0.00186)	(0.00072)
	[-1.27827]	[1.47080]	[0.57383]	[0.44442]	[-0.63607]
D(FDI(-4))	-0.000447	0.404759	0.003217	-0.001581	0.000296
	(0.00092)	(0.17038)	(0.00231)	(0.00186)	(0.00072)
	[-0.48589]	[2.37563]	[1.39198]	[-0.85056]	[0.41226]
D(FDI(-5))	-0.002019	0.086840	-1.78E-06	0.001892	-0.000819
	(0.00099)	(0.18421)	(0.00250)	(0.00201)	(0.00078)
	[-2.03005]	[0.47142]	[-0.00071]	[0.94143]	[-1.05404]
D(LI(-1))	0.037486	10.74946	0.761850	-0.005547	-0.006534
	(0.05842)	(10.8200)	(0.14677)	(0.11802)	(0.04562)
	[0.64165]	[0.99348]	[5.19085]	[-0.04700]	[-0.14324]
D(LI(-2))	-0.036353	-2.856267	0.162951	-0.009006	0.008704
	(0.06338)	(11.7385)	(0.15923)	(0.12804)	(0.04949)
	[-0.57355]	[-0.24332]	[1.02339]	[-0.07034]	[0.17586]
D(LI(-3))	-0.011534	-0.039171	0.046994	0.000305	0.000764
	(0.06418)	(11.8865)	(0.16123)	(0.12965)	(0.05011)
	[-0.17972]	[-0.00330]	[0.29146]	[0.00235]	[0.01525]
D(LI(-4))	-0.303749	-2.736894	-0.385990	0.063301	-0.043488
	(0.06364)	(11.7863)	(0.15988)	(0.12856)	(0.04969)
	[-4.77291]	[-0.23221]	[-2.41431]	[0.49238]	[-0.87513]
D(LI(-5))	0.174474	26.47407	0.451735	-0.000940	-0.006215

	(0.06824)	(12.6386)	(0.17144)	(0.13786)	(0.05329)
	[2.55670]	[2.09469]	[2.63499]	[-0.00682]	[-0.11664]
D(EXPORT(-1))	-0.122707	3.772487	0.167786	0.569385	-0.037998
	(0.08807)	(16.3106)	(0.22125)	(0.17791)	(0.06877)
	[-1.39331]	[0.23129]	[0.75837]	[3.20037]	[-0.55256]
D(EXPORT(-2))	0.005159	-4.882209	0.027323	0.028009	0.020059
	(0.05555)	(10.2874)	(0.13954)	(0.11221)	(0.04337)
	[0.09289]	[-0.47458]	[0.19580]	[0.24960]	[0.46248]
D(EXPORT(-3))	0.004991	2.141006	0.008728	-0.000988	0.009491
	(0.05500)	(10.1853)	(0.13816)	(0.11110)	(0.04294)
	[0.09075]	[0.21021]	[0.06317]	[-0.00889]	[0.22102]
D(EXPORT(-4))	-0.171017	-20.33820	0.030958	-0.892507	0.015696
	(0.05467)	(10.1247)	(0.13734)	(0.11044)	(0.04269)
	[-3.12828]	[-2.00878]	[0.22542]	[-8.08155]	[0.36770]
D(EXPORT(-5))	0.028413	25.15679	0.210095	0.456166	-0.059540
	(0.09545)	(17.6779)	(0.23979)	(0.19283)	(0.07453)
	[0.29767]	[1.42307]	[0.87615]	[2.36568]	[-0.79885]
D(CI(-1))	-0.165481	-10.21666	0.279284	-0.191312	0.717820
	(0.19921)	(36.8945)	(0.50046)	(0.40244)	(0.15555)
	[-0.83068]	[-0.27692]	[0.55806]	[-0.47538]	[4.61466]
D(CI(-2))	-0.137268	14.29942	0.242415	0.034041	0.116777
	(0.21889)	(40.5396)	(0.54990)	(0.44220)	(0.17092)
	[-0.62710]	[0.35273]	[0.44084]	[0.07698]	[0.68322]
D(CI(-3))	-0.075429	16.55116	0.085543	0.061724	0.008927
	(0.21932)	(40.6191)	(0.55098)	(0.44306)	(0.17126)

	[-0.34392]	[0.40747]	[0.15526]	[0.13931]	[0.05213]
D(CI(-4))	0.350549	42.71033	0.442682	-0.754618	-0.261626
	(0.21707)	(40.2021)	(0.54532)	(0.43852)	(0.16950)
	[1.61491]	[1.06239]	[0.81178]	[-1.72085]	[-1.54354]
D(CI(-5))	-0.536699	19.14307	-0.343277	0.724857	0.095255
	(0.19797)	(36.6638)	(0.49733)	(0.39992)	(0.15458)
	[-2.71108]	[0.52212]	[-0.69024]	[1.81250]	[0.61622]
C	1.395483	-152.3464	-1.901946	0.359003	0.698677
	(0.44126)	(81.7228)	(1.10853)	(0.89141)	(0.34455)
	[3.16249]	[-1.86418]	[-1.71574]	[0.40273]	[2.02777]
R-squared	0.874307	0.488335	0.702525	0.787045	0.768686
Adj. R-squared	0.798307	0.178956	0.522656	0.658281	0.628821
Sum sq. resids	23.01209	789319.2	145.2318	93.91302	14.03073
S.E. equation	0.731550	135.4853	1.837793	1.477844	0.571223
F-statistic	11.50399	1.578437	3.905765	6.112330	5.495936
Log likelihood	-60.38906	-425.8908	-124.8700	-109.6113	-43.07211
Akaike AIC	2.496830	12.93974	4.339142	3.903179	2.002060
Schwarz SC	3.364107	13.80701	5.206418	4.770456	2.869337
Mean dependent	1.434099	10.22245	1.350903	0.572693	1.112408
S.D. dependent	1.628914	149.5233	2.659996	2.528101	0.937593

Determinant resid covariance (dof adj.)	5995.578
Determinant resid covariance	524.4247
Log likelihood	-715.8091
Akaike Information Criterion	24.45169
Schwarz criterion	28.94868

Period	S.E.	LP	FDI	LI	EXPORT	CI
1	0.731550	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.341613	94.70931	3.721703	0.292222	1.181279	0.095486
3	2.031997	86.70135	9.944468	0.636151	2.235128	0.482906
4	2.821412	77.92743	17.06834	0.985103	2.935222	1.083903
5	3.854370	71.40318	21.94253	0.527954	5.283870	0.842458
6	5.003947	66.05955	25.61882	0.432618	7.170296	0.718723
7	6.253375	61.10650	29.30126	0.515279	8.487881	0.589081
8	7.565826	57.08558	32.47742	0.630219	9.352416	0.454356
9	8.687786	52.30731	37.36093	0.556068	9.385815	0.389878
10	9.671505	48.95691	41.12798	0.460006	9.126824	0.328282
11	10.52193	46.49676	43.93846	0.393853	8.892950	0.277978
12	11.22409	44.78788	45.76278	0.411577	8.756328	0.281441
13	11.83279	44.37515	45.82029	0.587666	8.866619	0.350279
14	12.36168	44.26119	45.06146	0.986082	9.156775	0.534492
15	12.81660	44.42092	43.67989	1.605939	9.500325	0.792927
16	13.21316	44.67101	42.01777	2.410372	9.833101	1.067748
17	13.55745	44.97262	40.43105	3.083735	10.08855	1.424044
18	13.84384	45.37589	39.05228	3.602427	10.27185	1.697564
19	14.08275	45.85157	37.94024	3.934073	10.40021	1.873916
20	14.28812	46.40572	37.08346	4.083594	10.48102	1.946203
21	14.45845	46.81333	36.55526	4.184118	10.53230	1.914989
22	14.63169	47.11465	36.26678	4.222360	10.52297	1.873235
23	14.83402	47.19407	36.26718	4.217318	10.45236	1.869072
24	15.08827	46.99249	36.59228	4.185096	10.31649	1.913651
25	15.42394	46.65041	37.18013	4.114664	10.10589	1.948906
26	15.84564	46.11110	38.04710	4.029864	9.864081	1.947853
27	16.34509	45.52802	39.00425	3.953691	9.620223	1.893810
28	16.90478	44.99481	39.89061	3.908928	9.411492	1.794166
29	17.49494	44.56781	40.55674	3.903321	9.294787	1.677347
30	18.08155	44.29932	40.90780	3.956962	9.262678	1.573239
31	18.63923	44.17076	40.94533	4.068366	9.312846	1.502691

32	19.14691	44.15766	40.71341	4.231607	9.424109	1.473211
33	19.58360	44.17026	40.34920	4.460118	9.541340	1.479072
34	19.95135	44.22601	39.88940	4.727387	9.649463	1.507747
35	20.25283	44.28395	39.41972	5.022893	9.731752	1.541688
36	20.49760	44.33657	38.98482	5.330983	9.780406	1.567214

Chole
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EXPO
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Component	Kurtosis	Chi-sq	df	Prob.
1	4.015156	3.005747	1	0.0830
2	14.88442	411.9481	1	0.0000
3	4.437312	6.025439	1	0.0141
4	6.723880	40.44625	1	0.0000
5	4.429572	5.960721	1	0.0146
Joint		467.3862	5	0.0000

Component	Jarque-Bera	df	Prob.

1	3.006574	2	0.2224
2	415.4238	2	0.0000
3	6.073771	2	0.0480
4	43.73332	2	0.0000
5	6.271333	2	0.0435
Joint	474.5088	10	0.0000

VEC Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 07/15/15 Time: 13:35

Sample: 1995Q1 2013Q4

Included observations: 70

Lags	LM-Stat	Prob
1	4.958035	1.0000
2	7.852839	0.9996
3	21.67792	0.6543
4	130.1707	0.0000
5	20.96190	0.6947
6	6.280703	0.9999

Probs from chi-square with 25 df.

Joint test:

Chi-sq	df	Prob.

720.4244	780	0.9372

Individual components:

Dependent	R-squared	F(52,17)	Prob.	Chi-sq(52)	Prob.
res1*res1	0.577349	0.446583	0.9865	40.41443	0.8783
res2*res2	0.666436	0.653169	0.8795	46.65055	0.6836
res3*res3	0.939554	5.081621	0.0003	65.76880	0.0950
res4*res4	0.765781	1.068877	0.4605	53.60467	0.4125
res5*res5	0.435935	0.252661	0.9999	30.51545	0.9924
res2*res1	0.619329	0.531885	0.9581	43.35305	0.7978
res3*res1	0.841218	1.732025	0.1065	58.88529	0.2382
res3*res2	0.590641	0.471699	0.9803	41.34487	0.8553
res4*res1	0.694276	0.742417	0.7975	48.59931	0.6084
res4*res2	0.591458	0.473296	0.9799	41.40205	0.8538
res4*res3	0.635546	0.570098	0.9382	44.48820	0.7609
res5*res1	0.500772	0.327935	0.9990	35.05407	0.9656
res5*res2	0.573879	0.440283	0.9878	40.17150	0.8840
res5*res3	0.418542	0.235324	1.0000	29.29794	0.9954
res5*res4	0.699873	0.762359	0.7774	48.99111	0.5930