THE EFFECT OF FOREIGN DIRECT INVESTMENT INFLOWS ON ECONOMIC GROWTH: SECTORAL ANALYSIS OF SOUTH AFRICA

by

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I thank God for giving me a second chance to do things right in my life.

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To my mother – I dedicate this thesis to you. You always made sure I had everything that I needed growing up, and your love and support are always appreciated.

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ABSTRACT

A number of developing countries have been on a quest to attract foreign direct investment (FDI) with the intention of increasing capital inflow through technological spillovers and transfer of managerial skills. FDI can increase economic growth and development of a country by creating employment, and by doing so, increasing economic activity that will lead to economic growth. South Africa is one of the economies that strive to attract more FDI inflows into the country to be able to improve its economy, and the country has adopted policies that drive the motive to attract FDI inflows. This study investigated the effect of FDI on sectoral growth over the period 1970–2014. The purpose was to find out where in the three key sectors of South Africa FDI is more significant.

The review of theoretical and empirical literature on FDI revealed that FDI has a diverse effect on economic growth, both in developed and developing countries. Theoretical literature analysed the behaviour of multinational firms and the motive behind multinationals investing in foreign countries. According to Dunning (1993), firms have four motives to decide to produce abroad, namely natural resource-seeking, market-seeking, efficiency-seeking and strategic asset-seeking. Empirical studies on sectors show that FDI inflows affect different sectors in different ways, and that the agricultural sector does not usually gain from FDI inflows, whereas subsectors in the industry and services sector grow from receiving FDI inflows. Sectoral analysis revealed that the services sector receives more FDI inflows, when compared to the agriculture and industry sector.

The study followed an econometric analysis technique to test the effect of FDI inflows on the agriculture, industry and services sectors. The augmented Dickey–Fuller and Phillips–Perron tests were used to test for unit root. Both tests revealed that variables were not stationary at level, but that they become stationary at first difference. Vector autoregressive (VAR) models were estimated, and four types of diagnostic tests were performed on them to check the fitness of the models. The tests showed that residuals of the estimated VARs were robust and well behaved. The Johansen cointegration test suggested there is cointegration and that there is a long-run relationship between variables. Following the existence of cointegration, the estimated Vector error correction model (VECM) results showed that FDI has a significant effect on the services and industry sector, but has a negative effect on the agricultural sector. Impulse response analysis

results revealed the correct signs, and confirmed the VECM results. FDI inflows explain a small percentage of growth in agriculture and industry, but a sizable and significant percentage in the services sector.

Key terms: South Africa, foreign direct investment, cointegration, vector autoregressive, vector error correction model, agriculture sector, industry sector, services sector, impulse response, variance decomposition

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ADF:	Augmented Dickey Fuller
ANC:	African National Congress
ASGISA:	Accelerated and Shared Growth Initiative South Africa
DBSA:	Development Bank of South Africa
dti:	Department of Trade and Industry
FDI:	Foreign direct investment
FIG:	Foreign Investment Grant
GDP:	Gross domestic product
GEAR:	Growth, Employment and Redistribution
GIRF	General Impulse Response Function
GMM:	Generalised method of moments
IDC:	Industrial Development Corporation
M&As:	Mergers and Acquisitions
MIP:	Manufacturing Investment Programme
MNC:	Multinational Company
OLS:	Ordinary least squares
PRASA:	Passenger Rail Agency of South Africa
PP:	Phillips–Perron test
RDP:	Reconstruction and Development Programme
SADC:	Southern Africa Development Community
SARB:	South African Reserve Bank
SARS:	South African Revenue Service
SMMEs:	Small, medium and micro enterprises
TISA:	Trade and Investment South Africa
UK:	United Kingdom
UNCTAD:	United Nations Conference on Trade and Development
VAR:	Vector autoregressive model
VECM:	Vector error correction model
WIR:	World Investment Report

CHAPTER ONE:

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Background of the study

According to the World Bank (2015), foreign direct investment (FDI) is a direct investment of a sum of equity capital, reinvestment of earnings, and other capital by foreign companies. FDI is a direct investment by a multinational with control or a significant level of influence over the management of a firm that is based in another country (World Bank 2015). The United Nations Conference on Trade and Development (UNCTAD) defines FDI as an investment made to acquire lasting interest and a percentage on management decisions in a foreign firm (UNCTAD 2015).

FDI is a type of investment, which theoretical and empirical literatures have demonstrated to be a potentially substantial factor in the economic growth of the recipient country. It is believed that attracting FDI will lead to a spillover of modern technology, through the new advance technologies that foreign firms brings to the country, and the transfer of innovative managerial skills and knowledge (Borensztein, De Gregorio & Lee 1998). The potential of economic growth from FDI has encouraged developing and developed countries to adopt policies that will attract FDI and accelerate growth (Rusike 2008), where many countries have restructured their economies to appeal to FDI. The attraction of FDI depends on the different motives of foreign firms to invest abroad. According to Dunning (1993), firms invest abroad for four reasons, namely the availability of natural resources, access to new markets, potential improvement in efficiency, and strategy seeking. Many studies found that mostly multinationals from developed countries are encouraged to find new markets and new and efficient ways to produce their products in developing countries.

Yearly World investments reports by the UNCTAD show that developing countries have markedly improved in banking FDI inflows. However, Africa has ranked very low in global FDI in recent years, providing the least contribution as a region, compared to its counterparts Asia,

the United Kingdom and America. The World Investment Report (WIR) (2010) revealed that Africa's contribution to the global FDI was 1.3 per cent, compared to the 10.9 per cent from Asia. However, Africa has been growing over the years and attracting FDI into the region. The inflows have increased by 60 per cent from 34 billion in 2005 to 54 billion in 2015 (WIR 2015). Foreign investors see potential in the existing sustainable economic growth and the increase in population in African countries. The world investment report (2014) reported that FDI inflows into Africa are concentrated in consumer market-oriented industries mostly.

After 1994, South Africa introduced new polices such as the Reconstruction and Development Programme (RDP) in 1994 (African National congress 1994), the Growth, Employment and Redistribution policy (GEAR) in 1996 (South African National Treasury 1996), and the Accelerated and Shared Growth Initiative South Africa (ASGISA) in 2007 (South African Presidency 2007). The aim of these policies was to move South Africa out of poverty, increase employment, and induce economic growth. The GEAR policy adopted the low fiscal deficit, trade liberations, and low stable inflation to reach South African objectives for a better economy. As policymakers realised that the FDI could fuel the economic growth of South Africa, these policies were also used as tools to improve the macro-economy so as to attract more FDI inflows into the country. The importance of FDI in South Africa was highlighted by dedicating the Department of Trade and Industry (dti) to administer FDI grants to further entice potential investors to invest in South Africa (dti 2015).

In spite of evident improvements on the macroeconomic situation in South Africa, the country has been attracting relatively fewer FDI inflows compared to other upper middle-income countries (Thomas & Leape 2005). Studies in South Africa over the years have stated different results. Fedderke and Romm (2004) found FDI inflows to be complementary to capital in the long run, which result in positive spillovers from multinationals to South Africa firms. They also found that FDI inflows crowds out domestic investment in the short run, which will ultimately hinder economic growth. Moolman et al. (2006) established that FDI inflows into South Africa have a positive effect on aggregate output, as it leads to new capital formation, and ultimately increases economic growth. However, Mazenda (2014) concluded that FDI inflows do not have a positive relationship to the South African economic growth in the long or the short term. These studies were conducted only on the effect that FDI inflow had on the overall economic growth at

the time of the research, and did not take into consideration the effect FDI had on different sectors in the economy.

South Africa's key sectors (i.e. agriculture, industry & service) attract different volumes of FDI inflows, and the type of FDI the sectors attract also differs from sector to sector (Alfaro 2003). Limited studies have been conducted on the effect of FDI inflows on the sectoral growth in South Africa. FDI inflows into South Africa are based in two main sectors, the industry and services sector (Akinboade, Siebrits & Roussot 2006). A study by Alfaro (2003) explains how the effect of FDI inflows to sectors differs, and shows that FDI has a negative effect on the agriculture sector, because there will be little to no spillover effects from FDI on the sector. Dlamini and Fraser (2010) found that FDI and agricultural sector growth have a one-way causality effect in South Africa, where agricultural sector growth attracts FDI, but an increase in FDI does nothing for agricultural growth. However, the industry and the services sector have, according to available studies (Basu & Guariglia 2007, Ulla et al. (2011), & Massoud 2008), shown a positive relationship with FDI inflow.

1.2 Problem statement

In the past, efforts to attract FDI inflow into South Africa have been shown to be futile, when compared to other developing countries (Thomas & Leape 2005). It is evident that similar developing countries like Brazil, Turkey and China have an average of 2 per cent, as FDI–GDP ratio, whereas South Africa ranks below this, at an average of 1.5 per cent. In fact, FDI in South Africa declined significantly in the period between 1986 and 2006 (UNCTAD 2007). As a result, the South African FDI–GDP ratio has been yielding only small percentages for the past three decades (UNCTAD 2013), when compared to similar middle-income countries such as Brazil, China, and Nigeria, even though there has been relatively small improvement in the ratio in South African in recent years (UNCTAD 2015).

Nordas (2006) found the major factors limiting FDI in South Africa to be a shortage of skills, inflexible markets, a small and slow growth of the domestic and regional market, and a highly concentrated ownership structure in the South African economy, where all these factors differ across sectors. The present study focused on three major sectors in the South African economy: the services industry and the agriculture sector. The study argues that sectoral growth of the three

key sectors in South Africa cannot be classified to be homogenous, and that the effect of FDI on sector growth cannot be the same in these different sectors in South Africa. It has been evident that the three sectors in South Africa possess different amounts of FDI inflow. The services sector is the largest recipient, whereas agriculture receives far less of the inflow (SARB quarterly bulletin 2012). Therefore, this study investigated the effect of FDI on growth in the South African economic sector. A sectorial analysis of FDI on growth is noteworthy as the effect of FDI inflow differs from sector to sector (Onakoya 2012).

1.3 Research questions

The study endeavoured to answer two main questions, which will be underpinned at the end of the study by economic theory and empirical findings:

- What is the effect of FDI on economic growth of the South African's three key sectors;
- What policy changes to be done to attract FDI in South Africa?

1.4 Aims of the study

The study also had three aims, namely:

- to analyse FDI inflows into South Africa;
- to determine the effect of FDI inflows on sectoral growth in South Africa; and
- to propose policy recommendations based on the findings.

1.5 Objectives of the study

- to investigate the effect of FDI inflows on South Africa's three key sectors; and
- to provide policy recommendations.

1.6 Significance of the study

This study is important as an instrument to South African policy makers to utilise with regard to the formulation or review of macroeconomic policies in attracting more FDI into South Africa to enhance economic growth. The purpose of the study was to show to what extent South Africa has recognised the importance of FDI in the process of growth, and hence, which measures can

be adopted in attracting more FDI. The study intended to further studies completed in South Africa on the effect of FDI inflows on economic growth, by studying the effect this has on growth in South African sectors. It will be of benefit to know where FDI inflows can be significant among the different sectors in the economy in order to formulate polices in accordance with the need of each sector.

1.7 Methodology of the study

This study employed a time series econometric technique (Enders 2004). Secondary annual data for the period 1970–2014 from World Bank was used to formulate economic models for the three key South African sectors. The econometric analysis was performed following the Johansen cointegration approach (Johansen 1988). The study took the initial step of regression to test for unit root using the augmented Dickey–Fuller test (ADF) (Dickey & Fuller 1979) and the Phillips–Perron test (PP) (Phillips & Perron 1988). Thus, when the robustness of the result allowed this study to treat the variables as I (1), the study proceeded with cointegration analysis (see chapter 4 of the study).

The long-term relationship between variables was tested by utilising the Johansen cointegration test, which was designed to determine the number of cointegrating vectors in the estimated vector autoregressive model (VAR) (Johansen 1988) statistically. Diagnostic tests were carried out on the estimated VAR to check for stability and normality of the models. Following the existence of cointegration in the VAR, the vector error correction model (VECM) was estimated to obtain the long-run and short-run dynamics of the variables. The general impulse response analysis (GIRA) and variance decomposition analysis were executed to forecast the long-run effect shocks would impose on variables. A detailed discussion of the methodology of this study is provided in Chapter Four.

1.9 Study outline

This study report consists of six chapters. The second chapter will present the analysis of the South African economy and FDI inflow trends. The analysis of FDI inflow trends will be reported in a global context as well as African trends, overall South Africa FDI inflows, and South African sectors analysis. The third chapter presents an overview of the theoretical and empirical literature. The fourth chapter presents the methodology used in the study to investigate

the effect FDI inflows have on sectoral growth in South Africa. Chapter Five presents a discussion of the results from the econometric analysis. Chapter Six presents the conclusion of the study and policy recommendations.

CHAPTER TWO:

SOUTH AFRICAN ECONOMY AND FDI

2.1 Introduction

This chapter comprises ten sections analysing the macroeconomic situation of South Africa, covering FDI trends from a global perspective to a view of sectors in South Africa. The chapter starts with a discussion of the macroeconomic position of South Africa. The third section discusses sectors in South Africa and their performance and contribution towards the overall economic growth of South Africa. The fourth section of the chapter presents an analysis of economic growth trends of South Africa. Global FDI trends are analysed in the fifth section, which includes an analysis on the performance of FDI globally, comparing developed and developing countries. The sixth and seventh sections present an analysis on FDI inflows into Africa and South Africa, respectively, and FDI inflows by sectors in the economy of South Africa are debated. Thereafter, South African FDI incentives are put forward to show initiatives by South Africa to attract FDI. Thereafter a conclusion is presented.

2.2 South Africa's economy

South Africa remains the most developed country and the second largest economy in Africa. After the transition to formal democracy in 1994, the country introduced new policies (such as the RDP and GEAR) in order to achieve its main objectives of reducing poverty, accelerating growth and decreasing unemployment. However, in the midst of all the change, South African experienced both victories as well as challenges.

Macroeconomic indicators show that South Africa's growth has been dampened over the past five years, with growth in 2014 averaging at about 1.5 per cent, the lowest rate since the 2008 global crisis. In addition to the global economic crisis, this downward trend has been attributed to the labour unrest (service delivery protests), inadequate energy supply, and decreasing demand from the country's trading partners. These instabilities have led the existing and potential

investors to lose business confidence in the country. Due to these exports, growth has also decreased to 2 per cent in 2015, from 4 per cent in 2014.

Over the years, the South African Reserve Bank (SARB) remained committed to ensuring price and financial stability in the economy. Inflation has remained within the Reserve bank's target of 3–6 per cent, except in 2014, when it reached a high of 6.6 per cent. The hike was attributed to the increase in wheat and maize prices, plus the weak exchange rate. However, the decrease in the oil prices took the pressure off the price increase (National Treasury Budget Review 2015).

Unemployment remains high at 26.4 per cent and a major challenge in the country. Unemployment has decreased by 1 per cent from 26 per cent in 2014 to 25 per cent in 2015, but the youth unemployment rate remains high at 48 per cent. The labour force survey shows that there is a decrease in employment in the mining and manufacturing sector, with more than 8 000 jobs lost in 2014 (Statistics South Africa 2015). South Africa's unemployment is mostly structural, as it is difficult to find skilled labour matching scarce skills positions in the country, although the labour force survey revealed that the agricultural sector provided 28 000 jobs in 2014 (National Treasury Budget Review 2015). South Africa is set on promoting industrialisation to help unemployment in the country. The country has 6.5 million people out of the population of 53 million paying income taxes. This indicates that unemployment is a problem in the country, that the income inequality gap is broad, and that the informal sector is thriving more than the formal sector (African Economic Outlook 2015).

Labour strikes, on the other hand, have increased sharply, especially in the platinum mining sector and metal and steel industry. In 2015 nearly 12 million working days were lost due to the labour strikes. In addition, the main electricity supplier, Eskom, is struggling to provide sufficient power, which has led to the country experiencing widespread hours of load shedding. Businesses have been affected both significantly and negatively by the power cuts, and that contributed as part of other reasons to the falling economic growth in the past two years (2013–2015), caused by a reduction in manufacturing output.

In the case of investment, South Africa's gross fixed capital formation grew by 0.2 per cent in 2014, while private investment was reduced by 2.8 per cent. The country had a 39 per cent ratio of government debt to GDP in 2014. The country's debt averaged 36 per cent between 2000 and

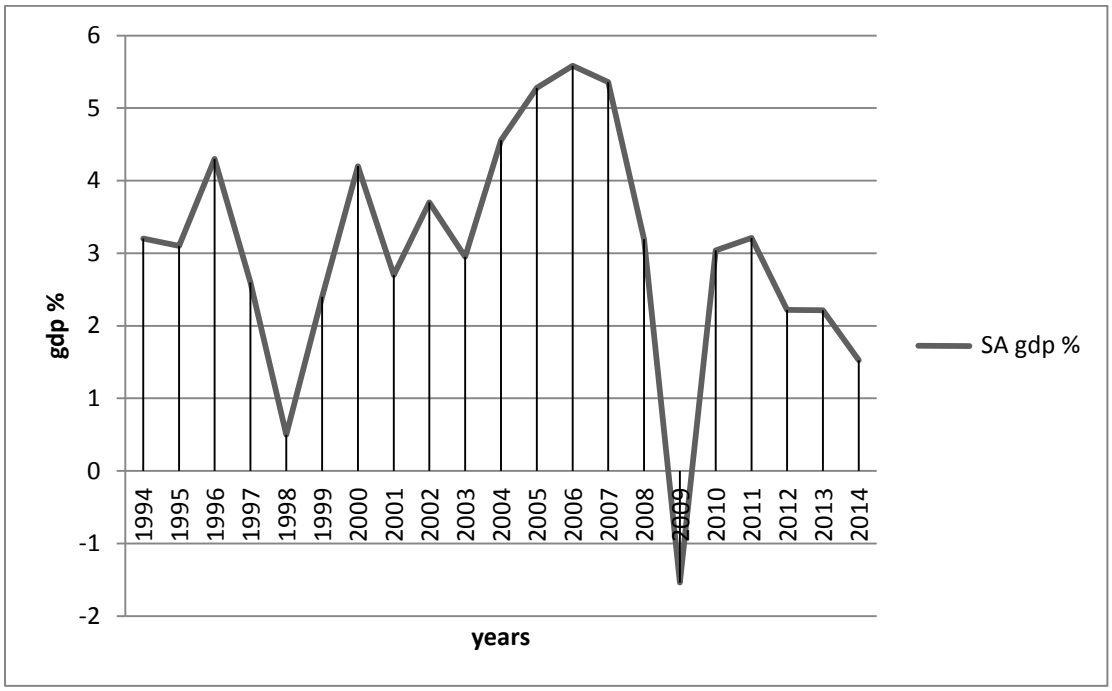
2014. It was high in 2001 at 43.5 per cent, and at its lowest in 2008 at 27.8 per cent (National Treasury Budget Review 2015). Investors use government debt to measure the country's ability to handle future debt and the ability to borrow money, where a good record of managing debt can work in a country's favour when it comes to attracting investors.

Investors are usually attracted to South Africa rather than other African countries, as the country has the most developed infrastructure in Africa. The South African government has set up infrastructure programmes that will improve physical infrastructure in the country. These programmes are predominantly focused on developing electricity and transport. The National Infrastructure Plan (Presidential Infrastructure Coordinating Commission 2015) stated states that it would spend ZAR 827 billion on the development of the country's infrastructure between 2013 and 2016. The fund is intended to build a new power station, since the country is facing an electricity supply shortage. As Eskom has failed to keep up with the growing population, and recent power cuts have proved that the number of power stations that were sufficient 10 years ago will not be able to handle the growing industrialisation of the country. Further to this, Transnet has a 7-year capital investment programme to reform the freight logistics. The Passenger Rail Agency of South Africa (PRASA) saw recent victory in building 95 electrical locomotives in 2014 in partnership with the Chinese South Rail Zhuzhou (CSR). Transnet aims to have 1 000 trains and developed railways, ports and pipeline infrastructure in the future (African Economic Outlook 2014). Efficiency in transportation is an advantage in a developing country like South Africa, which intends to attract investors; therefore, South Africa is developing and growing in some parts of the economy.

2.3 South Africa's economic growth trends

South Africa macroeconomic objectives are geared towards higher economic growth, poverty reduction, price stability, and decreasing unemployment. Even in the light of those initiatives to elevate growth in the country, economic growth continues to slow down. Figure 2.1 present the GDP growth rates of the economy from 1994 to 2014.

Figure 2.1 South African GDP growth rates



Source: Author's own graph using data from the World Bank

As shown in Figure 2.1, since 1994, South Africa's growth rates have remained on an upward trend until the global financial crisis set in from 2007. The growth after 1994 could be attributed to many factors, such as lifting of the economic sanctions, which opened up trade and international capital flows. The global competition that evolved created an improvement in productivity, which reflected a positive increase in the growth rate. After 1996, there was a drastic fall in the growth rate, reaching a low of 0.5 per cent in 1998. This was mostly due to the East Asian financial crisis that affected the globe. During this period, South Africa experienced an outflow of capital, which forced the rand to depreciate against foreign currencies by about 20 per cent. In addition, inflation drastically increased from 5 per cent to 9.3 per cent during this period.

The growth rates started to improve from 1999, recording an average growth rate of 3 per cent between 1999 and 2000. In 2006, the growth rate reached a high of 5.4 per cent, which was the highest rate on record since 1984. The 2008 financial crisis had a negative effect on South Africa, resulting in a drastic fall of the growth rates between 2007 and 2009. The economy

recovered from the recession in 2010, recording a GDP growth of 3 per cent. Part of this growth was contributed by the 2010 World Cup via the tourism sector, whose contribution increased by about ZAR 8.3 million in 2011, showing about 3.2 per cent growth in 2011. Thereafter, growth began to fall and remained on a downtrend trend. A slowdown in economic growth can make investors question their investment decisions. Falling economic growth not only affected domestic firms, but also affected foreign multinationals that had invested in the economy.

2.4 South Africa's key sectors

According to the World Bank, South Africa has three key sectors, namely the agriculture, industry and services sectors. All three of these sectors have many subsectors under them, and all contributes to the overall economic growth of South Africa differently. In addition, growth in these sectors is dissimilar and is affected by different factors. The largest sector of the economy is services, which accounted for around 68 per cent of GDP in 2014. Traditionally, South Africa's economy was embedded in the agriculture sector, because of the rich mineral resources and the favourable climate for agriculture. However, in recent decades, the economy has transitioned from relying on the primary sector and has moved to the secondary and tertiary sector. After the 1990s, the economy was mainly driven by the tertiary sector. Table 2.1 shows GDP contribution by sector from 2004.

Table 2.1: Sectoral growth (% of GDP)

Year	Agriculture	Industry	Services
2004	3.063646	30.28037	66.65599
2005	2.666141	30.27764	67.05622
2006	2.611328	29.38571	68.00296
2007	2.958642	29.68988	67.35148
2008	3.169723	31.35294	65.47733
2009	2.988144	30.37611	66.63575
2010	2.629614	30.15966	67.21073
2011	2.517081	29.93634	67.54658
2012	2.389575	29.72732	67.8831
2013	2.315131	29.89742	67.78745

2014	2.486773	29.46771	68.04552

Source: Author's own compilation from the World Bank databank

The South African agricultural sector comprises commercial farming and subsistence-based production from the rural areas. Although the sector was the primary sector before the 1990s, presently it is the least performing sector. For the past 10 years, agriculture has only been contributing about 2 to 3 per cent. However, the agricultural sector still plays a significant role in the economy, through foreign currency generation from export of commodities such as wines, food and flowers, and employment creation.

The industry sector is the second-best performing sector among the three major sectors. The sector consists of large subsectors, such as manufacturing, mining and construction. The two largest subsectors in the industry sector are the manufacturing and mining sectors. Output of the mining sector has decreased in the past last two decades, even though the country has minerals in abundance. Growth and performance of the manufacturing sector have declined due to the labour unrest the country has been experiencing, while it is still recovering from the recession. According to World Bank data, the growth in the manufacturing sector was 0.74 per cent in 2013 and 0.04 in 2014. It is evident from Table 2.1 that the contribution of the industry sector to GDP is decreasing.

Despite a decline in the agriculture and industry sectors, the services sector has shown substantial growth. The services sector has been the pillar of the South African economy for decades now, where it contributes significantly to the overall GDP. It is shown in Table 2.1 that the services sector contributed 66 per cent and has increased to 68 per cent in 2014. The services sector is dominated by the financial services subsector, where South Africa has a robust banking system that contributes more than 20 per cent to the GDP. Telecommunication is the second best performer in the service sector.

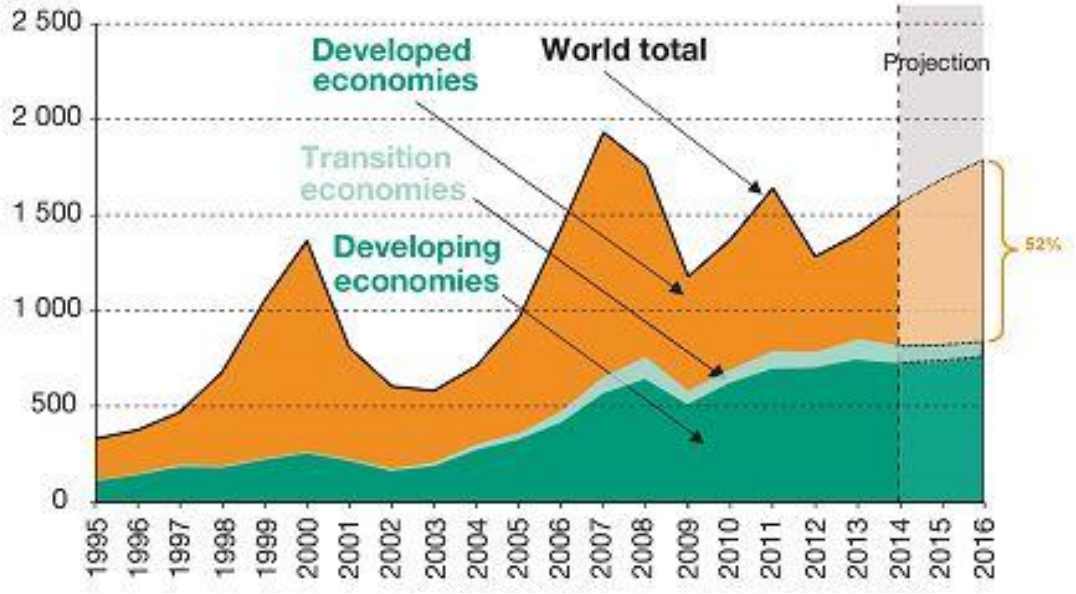
South Africa has broad economic sectors that contribute differently to the outcome of the growth of the country. Some sectors have performed well under the pressure the economy is experiencing, and some have shown not to have coped with the economic challenges the country is facing. It is evident that subsectors in the industry sector are not well equipped to handle the

economic shocks caused by labour unrest, violence, and price instability. However, the services sector is growing and performing despite the slowing economy.

2.5 Global FDI inflows

Global FDI is reported every year by the United Nation Conference of Trade and Development (UNCTAD). The latest reports have not been providing good news for global FDI. The Greenfield investment (a form of FDI where a parent company starts a new plant in a foreign country) increased by a small fraction compared to the past years. However, there was some growth in some regions like Africa, where the Greenfield investment grew in 2014, which was due to the large investment that was welcomed by Egypt. The decreasing global FDI inflows are currently affected by the unstable global economy. Investors are concerned with current FDI inflows, and potential investors have been discouraged by existing investors divesting in certain regions. However, the current stance of global FDI shows that there is a development from decades ago. Looking at Figure 2.2, which was adapted from the World Investment Report of 2015, it shows global FDI over the period 1995–2013 in the world in total, developing, developed and transitioning economies, and global FDI projection from 2014 till 2016.

Figure 2.2: FDI inflows, global and by group of economies, 1995–2013 and projections, 2014-2016 (Billion USD)



Source: Adapted from world investment report 2014

Global FDI inflows increased drastically by 40 per cent between 1994 and 1995, thus recording a total of $315 billion. According to UNCTAD, the increase was stimulated by the growth of investment by developed countries in developing countries. Developed countries invested $270 billion in developing countries, and they received FDI inflows of $203 billion in 1995. The inflows kept growing, with an average of 40 per cent every year going forward until the 1998 East Asian financial crisis. Records in 1999 showed that developed countries attracted $636 billion FDI in inflow, which constituted three quarters of the overall world FDI inflows of $865 billion. The financial crisis caused a decline of FDI inflow in four Asian economies, namely China, Indonesia, Thailand and the Philippines. Prior to the financial crisis, China was receiving FDI inflows above $40 billion a year, and during the crisis, the inflows fell by 8 per cent in 1999. The United States and the United Kingdom were the top two best performers in attracting FDI during this period (World Investment Report 1999).

During the recovery of the financial crisis, Asian countries formulated strategies from the sectoral level to encourage mergers and acquisition (M&As) and trade openness. In 2000, Africa experienced a drop in FDI inflows from $10.5 billion to $9.1 billion. The continent's contribution to global FDI consequently decreased to less than 1 per cent. South Africa and Angola were the two main countries that had a major decrease in FDI inflows, which led to Africa's decline in FDI inflows. However, the Southern African Development Community (SADC) was still the greatest contributor, with about 44 per cent of Africa's FDI inflows. In 2000, developing Asian countries saw an increase to a total of $143 billion. The largest contributor was Hong Kong, where the country was the highest recipient of FDI in all developing countries (World Investment Report 2000).

After the millennium, global inflows kept falling until 2004, when FDI picked up again. The growth was brought on by a steady increase of FDI inflows into developing countries, making developing countries the leading recipients of FDI, as opposed to developed countries. There was an increase of 2 per cent of global FDI inflows between 2003 and 2004, where the inflows were at $648 billion. Developing countries' inflows increased by 40 per cent from 2003 to 2004, and due to that, developing countries were in the lead since 1997 in receiving FDI. The top three recipients of FDI were the United States, the United Kingdom and China. According to UNCTAD, developing countries' high performance in attracting FDI was due to industries in

developing countries that improved their competitiveness. The developing countries expanded operation in growing markets of transitioning economies and by decreasing production costs. Developing countries that have natural resources, such as oil and minerals, also saw an increase in FDI inflows (World Investment Report 2004).

In 2008, another financial crisis originating from the United States hit the global economy. Global FDI inflows decreased from a high of $1.979 trillion to $1.697 trillion, which was a 14 per cent decrease. The decrease was felt mostly in the developed countries where the financial crisis started, while developing countries was still recording growing FDI inflows but at a slower rate. Sales of M&As decreased by 39 per cent in 2008, and reflected the negative effect of the crisis. In 2009, global FDI inflows declined further by 37 per cent to $1.114 trillion. In 2010, the effect of the financial crisis faded and the inflows subsequently increased by a modest 5 per cent to $1.24 trillion. Africa was still receiving fewer FDI inflows in 2011, where the majority recipients of FDI (Egypt and Libya) experienced a decrease, which affected the whole region (World Investment Report 2012).

In 2012, the global FDI fell again by 18 per cent to $1.35 trillion from $1.62 trillion in 2011. However, in 2013, the inflows picked up again and returned to an upward trend recording $1.45 trillion. An increase was seen by all economies (developed, developing and transitioning economies). In 2014, global FDI inflows decreased again to $1.23 trillion. UNCTAD stated that the decline was caused by fragility of the global economy, policy uncertainty and increased geopolitical risks. However, UNCTAD has projected growth for 2015 and 2016, while in 2015 FDI inflows will be up to $1.75 trillion and an expected $1.85 trillion in 2016. The growth will be inspired by the recovery of developed countries from the economic crisis (World Investment Report 2014).

2.6 FDI in Africa

Africa has ranked very low in global FDI in the past years, proving to be the region contributing the least when compared to other regions. Although, Africa has lagged behind other regions, it has experienced growth in FDI over the years. The growth is inspired by the growing market in Africa, although Africa is well known for its natural resource endowments, but investors are also recognising potential in existing markets and creating new markets in the region. According to

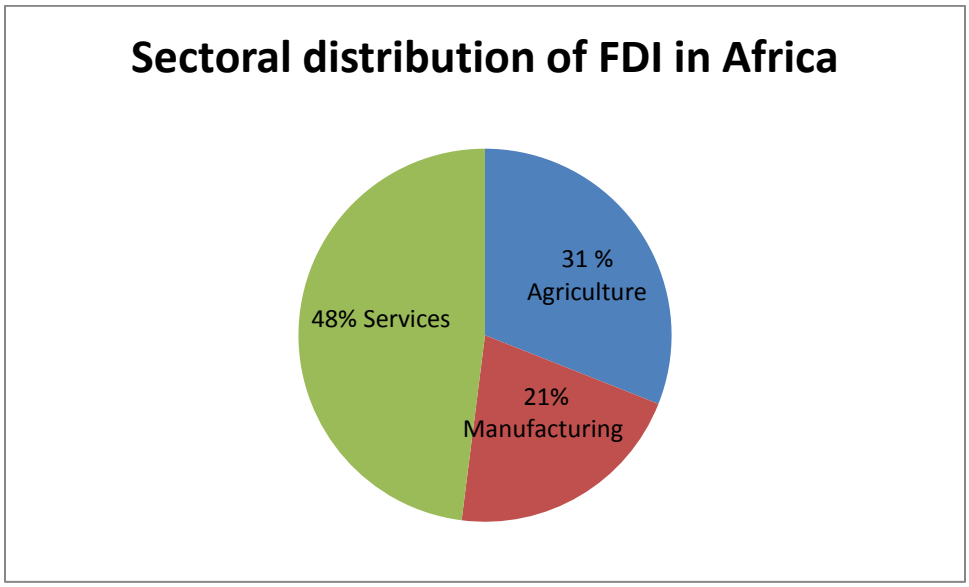
UNCTAD, the services sector is the recipient of the most FDI inflows as Greenfield investment in the region. In particular, investors are pursuing investments in construction, business services and telecommunications (World Investment Report 2013).

Assessing African FDI inflows trends from a decade ago, it is evident that Africa has grown and developed. FDI inflows into Africa improved from 2003. By then they grew by 28 per cent to $15 billion. The World Investment Report 2004 states that the increase was due to the persistent improvement of FDI policies and natural resources. The increase was mostly a result of M&As, which amounted to $6.4 billion. The following year's (2004) inflows continued to increase due to the high prices of minerals such as oil, copper, gold, platinum and diamonds. In 2004, M&As were worth three times that of their value in 2003, mostly in the mining sector.

In 2005, FDI inflow increased in 34 African countries, and declined in 19 African countries. Even with growth in inflows, Africa's share of the global FDI inflows remained relatively low at 3 per cent. In 2006, the inflow increased by 20 per cent to $36 billion, where the rise in inflows continued until 2008. Africa experienced a fall of 9 per cent from $59 billion in 2009 to $55 billion in 2010. Every part of the world was affected by the financial crisis, which caused a contraction in global demand. The African region recovered from the crisis, and then FDI inflows went up by 5 per cent in 2012 to $50 billion. The increase was driven by investors interested in growing their markets and investment in infrastructure. Investors continued to invest in Africa, because consumer-oriented industries are expanding in Africa due to population growth, where especially the middle-class population is growing. That was the motivation behind the increase of the inflows in 2013 to $57 billion. In 2014, the region was steady at $54 billion (World Investment Report 2015).

Investors' expectations of sustained economic growth and the increase in population have made them be interested in investing in various types of sectors in Africa. According to World Investment Report (2014), it has been proved that FDI inflows into Africa are concentrated in consumer market-oriented industries. Investors are mainly attracted to consumer products, such as food, technology, finance, tourism, telecommunication, transport and retail. FDI inflows into Africa in 2012 are shown in Figure 2.3.

Figure 2.3: Sectoral distribution of FDI in Africa 2012



Source: World Investment Report 2015

According to World Investment Report (2015), the service sector in Africa attracts most foreign investors. The report shows that in 2012, services received 48 per cent of FDI inflows into Africa, agriculture received 31 per cent, while manufacturing attracted 21 per cent. Sectoral analyses of FDI inflows into Africa still proved the importance of the services sector and manufacturing in 2014. In 2014, 33 per cent of global Greenfield investments were in the manufacturing sector in Africa. The manufacturing sector thrived due to the increase in electronic equipment, motor vehicles and food industries. Manufacturing car companies like Peugeot, Nissan and Hyundai started manufacturing plants in Nigeria in 2014, which increased inflows into the African region. The injection came after Nigeria adopted the Automotive Industry Plan in 2012, and attracted motor investors to produce in their country. In food manufacturing, Danone France bought a stake of 40 per cent in the largest milk processor in Kenya Brookside Dairy. On the other hand, the services sector attracted 60 per cent of FDI inflows, due to the growing of construction developments. The financial services, however, is the greatest sector at the moment under services, where Africa also shared in its acclaim, as South Africa welcomed Barclays as part of ABSA bank in 2012, forging the largest inflow in Africa in 2005 (World Investment Report 2015). Africa is however still the lowest contributor to global FDI.

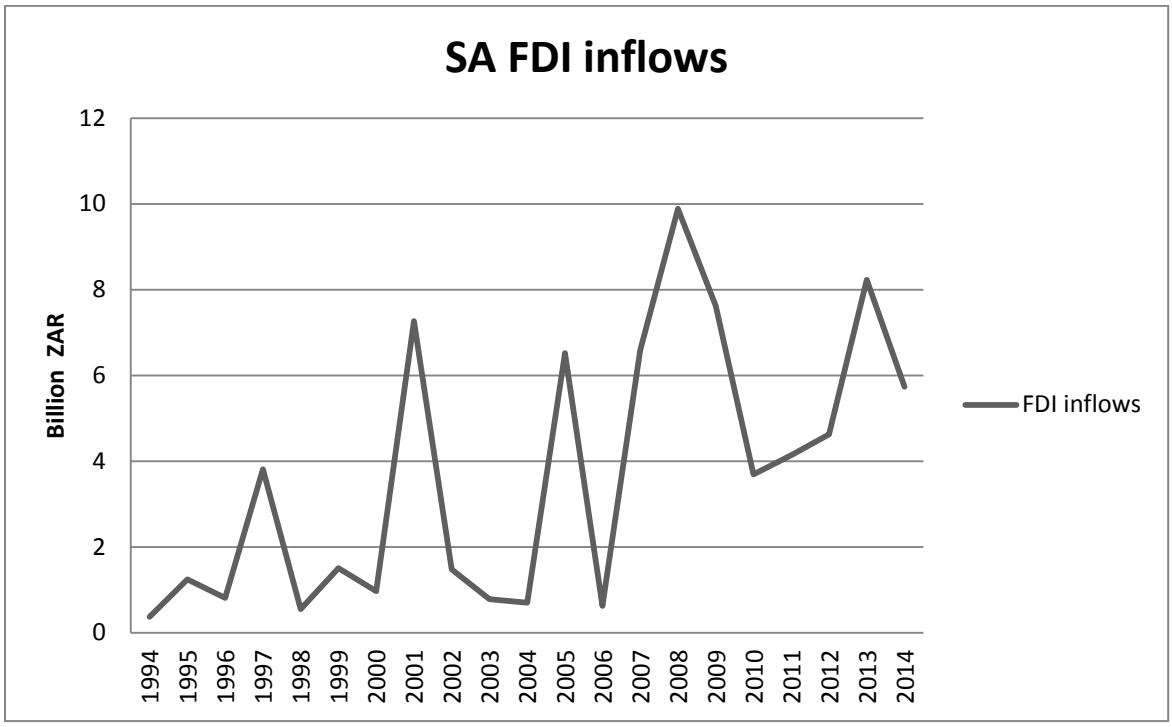
2.7 FDI inflows into South Africa

Before the democratic elections in 1994, South Africa was avoided by investors, as a result of policies and regimes that did not encourage the attraction of FDI. By that time, international banks had disinvested in the country, and more than 350 foreign firms also sold their investments in South Africa. It was only after 1994 that the country saw an increase in FDI inflows. At present, South Africa is the leading country when it comes to FDI in the SADC, even though it contributes only a small fraction to the global FDI. South Africa now receives 70 per cent of FDI inflows into the SADC. Statistics from the UNCTAD (2015) show that South Africa has been struggling to attract new FDI in the past two decades. Nevertheless, FDI contribution to overall economic growth in South Africa has remained relatively low, compared to similar emerging countries. Many foreign companies that disinvested during the sanction era came back and invested in the country, which caused South Africa's FDI inflows to grow by an average of 46 per cent every year thereafter.

South Africa mostly receives its FDI inflows from European and American countries, and receives less from surrounding African countries. The inflows are mostly concentrated in the Gauteng province. Most of the FDI inflows into South Africa are market and efficiency seeking, as they occur mostly in the manufacturing, services, financial services and telecommunication sectors. In addition, there is a portion in resource seeking that comes in the mining and oil sector. The natural resource seeking investors are attracted by South Africa's rich natural resources in both platinum and gold. Foreign investors are also attracted by the efficiency to produce in the country so as to cut input costs. The motor production industry has proved that many foreign investors consider better efficiency when scouting to expand and grow their profit margins (Akinboade et al. 2006).

South Africa has policies and incentives formulated for foreign investors, which has worked to attract investors to the country since the advent of formal democracy. Figure 2.4 below shows FDI inflows into South Africa between 1994 and 2014.

Figure 2.4: FDI in South Africa (1994-2014)



Source: Own graph with data from the World Bank 2015

Since 1994, there is been a gradual increase in FDI inflows into South Africa. In 1995, there was an increase to South African rand (ZAR) 1.2 billion from ZAR 37 million in 1994. This major increase in the attraction of FDI was due to democratisation of South Africa, where there was subsequent openness to trade. Clark and Borgan (2003) claim that South Africa was not attractive to investors in the apartheid era, because the country's economic policies were not conducive to the inflow of FDI, as the government was extensively controlling trade decisions. In 1997, however, there was a significant increase of FDI, up to ZAR 3.8 billion, due to the partial privatisation of Telkom and South African Airlines (Thomas & Leape 2005).

A remarkable increase occurred in 2001, when FDI inflows reached a peak of ZAR 7.2 billion. Telkom sold its strategic stake to Thintana consortium for ZAR 1.2 billion, and Anglo American bought out De Beers's minority shareholders. South Africa had a 1.5 per cent share contribution to FDI inflows from developing countries between 1994 and 2002, even though it was one of the most frequent recipients of FDI inflows into the SADC region (World Investment Report 2003).

However, in 2002, FDI inflows decreased to ZAR 1.4 billion, and continued to fall to ZAR 701 million in 2004. The following year (2005), South Africa was the largest FDI recipient in Africa, after Barclays made an acquisition deal with Absa bank for ZAR 5.5 billion. This major inflow added an increase to the inflows to ZAR 6.5 billion, and that was 21 per cent part of the overall FDI inflows into Africa. In 2006, the inflows declined drastically to ZAR 623 million, but made a comeback in 2007 to reach ZAR 6.59 billion. There was a steady increase until 2008 and 2009. In 2010, the inflows decreased to ZAR 3.6 billion, as the world was experiencing a contraction in demand due to the 2008 financial crisis, even though there was an increase in the tourism industry's FDI inflows as a result of the 2010 World Cup, hosted by South Africa.

In 2012, the country faced one of the biggest situations of labour unrest in its history from the mining industry, and as a result, FDI inflows slumped. During this period, South Africa saw disinvestment by major foreign companies, such as the UK pharmaceutical company GlaxoSmithKline selling 50 per cent of their 12.4 per cent stake in Aspen Pharmacare. FDI inflows stood at ZAR 4.63 billion in 2012, and increased to ZAR 8.2 billion in 2013. In 2014, FDI inflows decreased again to ZAR 5.7 billion. South Africa's FDI inflow comes from different countries around the world, and the inflows are diverse, with different motives for investing in South Africa. Below is a table showing the main investors by country in 2012, according to the SARB.

Table 2.2: South Africa's FDI inflows by country 2012

Country	FDI inflows %
United Kingdom	45.6
The Netherlands	18.6
United States	7.2
Germany	5
China	3.1
Japan	2.6
Switzerland	1.6
Luxembourg	1.4
Other	14.9

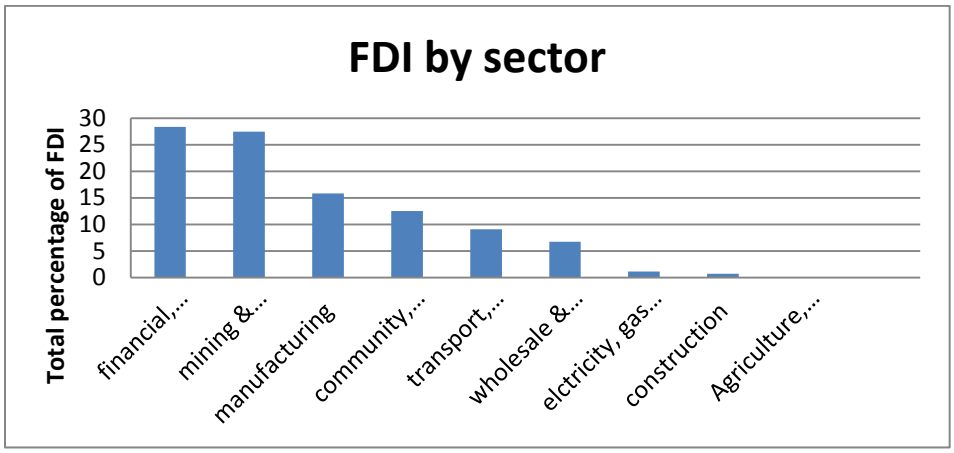
Source: SARB quarterly bulletin March 2014

European countries make up a large share of the FDI inflows into South Africa. Europe has been the largest source of FDI in South Africa for decades, followed by countries from America, Asia, Africa and Australia. The most important factor contributing to the increase of European companies in South Africa is that many South African multinationals (i.e. BHP Billiton, Old Mutual, Anglo American and SAB Miller) moved to and are now based in the United Kingdom. As multinationals permanently based in the United Kingdom, they now affect South Africa in the form of FDI inflows (Thomas & Leape 2005). These companies from abroad are based in different sectors of the economy, mostly in the services and natural resources sector.

2.8 Sectoral FDI in South Africa

The analysis of FDI inflows into South Africa by sector shows some sectors have been successful in attracting FDI, but for others, it has been difficult to attract new FDI and to maintain existing FDI. Figure 2.5 shows FDI inflows by sector in South Africa in 2010. The services sector was the largest receiver of FDI, which increased by $21 billion from 2001 to 2009. The major player in the services sector is the financial industry. It is visible which sectors are top performers and the least recipients of FDI. In 2010, the financial sector received 28 per cent of the overall FDI, followed by the mining sector with 27 per cent and the manufacturing sector, which attracted 15 per cent. Despite the decrease in the output in the mining sector, FDI inflows doubled from $15 billion to $35 billion from 2001 to 2008. In the manufacturing sector, FDI inflows increased from $11 billion to $29 billion from 2001 to 2009.

Figure 2.5: South African FDI by sector 2010



Source: SARB quarterly bulletin 2012

The increase in the manufacturing sector in the 2000s followed an injection of $290 million from Daimler Ag, while BMW also invested $290 million to expand their production plants in the country, as 25 per cent of their model 3 series is produced in South Africa to export to the world. The least recipients of FDI inflows into South Africa are agriculture, electricity and gas, and construction. This proves that investors have largely targeted three sectors, namely the finance, mining and manufacturing sectors. This event shows that investors' motives for investing in South Africa have changed from natural resource seeking to market and efficiency seeking.

2.9 FDI incentives in South Africa

South Africa has dedicated two departments to focus on investment and trade in the economy, the Department of Trade and Industry (dti) and Trade and Investment South Africa (TISA). The departments composed three main incentives programmes to promote FDI in the economy, namely the Foreign Investment Grant (FIG), Manufacturing Investment Programme (MIP), and the 12I Tax Allowance Incentive (121 TAI). These programmes are discussed below.

2.9.1 Manufacturing Investment Programme (MIP)

The dti formulated the Manufacturing Investment Programme (MIP) for local and foreign manufacturers who intend to start a new production plant or expand an existing production facility. The primary goal of the programme is to encourage investment in the manufacturing sector. The initiative aims to meet its objective of encouraging investment in the sector by

aiming to support small enterprises and medium to large manufacturing businesses with a grant. The grants cover 30 per cent of the value of the needed cost of machinery, equipment, business vehicles, land and buildings. The 30 per cent is also for existing manufacturers who wish to expand, as the grant will also cover the upgrade and expansion. The grant is payable within three years. Foreign investors will have the advantage that the grant will also cover the cost of moving machinery and equipment from abroad to South Africa. The relocation payment can be up to ZAR 10 million. Manufacturers approved for the incentive are not limited to MIP only, but may be considered for other investment incentives (Department of Trade and Industry 2015).

2.9.2 Foreign Investment Grant (FIG)

The Foreign Investment Grant (FIG) is a compensation grant for qualifying foreign investors on the cost incurred while relocating new machinery and equipment, excluding vehicles to South Africa. Second-hand machinery and equipment will only be allowed to be shipped if a dti-appointed consultant engineer certifies that they are of the latest technology. The grant will cover 15 per cent of the value of the machinery and equipment in costs up to ZAR 10 million. The FIG is only granted to foreign businesses that are starting a production facility in the country for the first time. The manufacturers further need to be approved for the MIP to qualify for the FIG. The grant excludes South African Customs Union (SACU) countries, and the SADC (Department of Trade and Industry 2015).

2.9.3 12I Tax allowance incentive

The tax allowance incentive programme was established in 2010 to support Greenfield, which utilises only new manufacturing assets and Brownfield investments that intend to upgrade or expand their industrial facilities. The incentive is grounded by section 121 of the South African Income Tax Act (No. 58 of 1962). The aim of the incentive programme is to improve production in the manufacturing industry in South Africa, and to train workers to acquire skills and improve labour productivity. The investment allowance for Greenfield, with a preferred status investment, is 55 per cent of the qualifying assets, or up ZAR 900 million investments. The incentive also offers ZAR 36 000 per full-time employee. Between 2010 and 2015, the tax allowance has supported 50 projects worth ZAR 36 billion (Department of Trade and Industry 2015).

2.10 Conclusion

This chapter has intensely discussed trends in economic growth and FDI in South Africa. The chapter started by discussing the current macroeconomic stance of South Africa. The third section of the chapter reported on an analysis of economic growth trends, showing how the country has evolved since the democratic election in 1994. The fourth section provided a discussion on the three South African key sectors, the agriculture, industry and services sector. It showed how the three sectors contributed differently to the overall economic growth of the country, with the services sector being in the lead and the agricultural sector trailing as the sector contributing least to GDP. The chapter also elaborated on global FDI inflows. The discussion portrayed the way in which Africa is the continent receiving the least FDI globally. The top two recipients are the United Kingdom and United States of America, as developed countries attract more FDI than developing countries. The discussion on African trends on FDI implied that even though Africa shows the least percentage of recipients of global FDI, it has attracted more FDI in the past decades. The services sector proved to be the sector that most attracts foreign business, when compared to the agriculture and manufacturing sectors. The chapter further discussed FDI trends in South Africa, where the inflows have been erratic since 1994, but overall showing an upward trend. Europe is the main investor in South Africa, with the largest number of multinationals in the country. Analysis on sectoral FDI in South Africa proved that services receive a large injection of FDI, predominantly through the financial sector. The agriculture sector has attracted very little FDI according to the figures. The last section provided a discussion of FDI incentives, offered by the dti to encourage investment mostly in the manufacturing sector.

CHAPTER THREE: LITERATURE REVIEW

3.1 Introduction

This chapter provides a review of literature on FDI and economic growth, with evidence from South Africa especially. The chapter is divided into two main sections: a theoretical and empirical literature review. The first part comprises a discussion of a theoretical literature review of FDI theories: FDI-growth theory by Neuhaus, product life cycle theory, OLI eclectic paradigm, internalisation theory, industrial organisation theory, oligopolistic reaction hypothesis, Kojima's macroeconomic approach and the FDI motives by Dunning. The second part is the review of empirical literature, which reports on analyses of some selected empirical literature for both developed, and developing countries, South Africa and sectoral studies.

3.2. Theoretical literature review

Theoretical literature review analyse theories on global foreign direct investment (GFDI) and economic growth. These theories are long-standing theories that discuss the way in which FDI can affect the economy of the host country, and also articulate different reason as to why foreign firms decide to start new plants in foreign countries.

3.2.1 Product life cycle theory

The product life cycle theory was developed by Raymond Vernon (1966) to explain trade and investment. The product cycle theory was a reaction to failure of the Heckscher–Ohlin model to explain international trade. Vernon based his approach on the US experience in the post-war period after 1960, as US firms were the first to develop new labour techniques in response to high cost of skilled labour and a large domestic market (Vernon 1966). This model stipulated that, for FDI to happen, it takes four stages of product life of the new product, namely innovation, growth, maturity and decline. The theory holds that firms will develop products in their foreign domestic markets and then set up manufacturing plants in chosen countries that have additional skills beyond those of the firm. The theory assumes imperfect information flows and knowledge can be transferred across borders, and that a new product goes through predictable changes in its production and marketing characteristics over time. In this model, Vernon used the United States, as he believes that the US markets offered certain unique kinds of

opportunities to producers who were able to see the demand in the market (Vernon 1966). An advantage of producers or entrepreneurs in the United States was that the market consisted of consumers with an average income, which was higher than that in other markets around the world.

The first stage of the product is the innovation stage, where a new product is successfully developed for the large local market, after thorough research and development. At this stage, the product is still unstandardised and its inputs, processing, and final specification will be insecure. The insecurity of the product will come with locational implications. First, the producers' concern will be the insecurity of their product and the degree of freedom they have to change the product. With time, as these insecurities are not fixed and steady in the future, the calculation of cost must include the general need for flexibility in any locational choice. Second, the price elasticity of demand for the output of firms is comparatively low. Third, there will be a high need for effective communication from producers to suppliers, and even competitors. At this point, the product is introduced to the local market and the sales are undertaken while the product is being improved. This stage ends when the product is accepted and sales are growing, according to demand.

The second stage is the growth stage, where the product starts to be exported subsequent to the growth of the product. The increasing demand gives producers a reason to improve the production method and process. Imitation products will emerge from other producers, and that will result in consumers being price-sensitive to the original product. The original company will face the challenge of cost saving to keep their originality in rival with copy products in the market for a lower price. The product will, in due course, reach maturity at the third stage, where by this time, the product is standardised and the cost is reduced. As the competition from copycat manufacturers grows, it is important for the producers to start considering low-cost labour to help narrowing profit margins (Vernon 1966). The magnitude of the whole stage will make the production location move to low-cost labour countries (which are mostly developing countries) as a form of FDI. Producing in a foreign country will bring down the production cost, as at this point, the product is standard, and that is the decline stage. Criticism of the model has been that it only considered the United States perspective, and emphasised the technology advantage from the original firm in developed countries. As a result, the theory did not take into consideration

those instances where there was no technological advancement, as for example in the textile and garments industry.

3.2.2 The oligopolistic reaction hypothesis

Knickerbocker (1973) developed the oligopolistic reaction hypothesis to explain why firms follow competing firms to foreign markets. The hypothesis states that the decision of one firm to invest in a foreign country results from increased advantages and chances for competing firms to invest in the same foreign market (Knickerbocker 1973). Knickerbocker emphasises that the more an industry is concentrated and focused, the more it will be likely for the industry to show oligopolistic reactions. He rationalises the idea by stating that firms stand to gain large profits if they are in a small group rather than alone if there are positive spillovers (Musonera 2008). These firms will be encouraged to move or to invest in a foreign country to copy the rival firm. The firms have tendencies to follow each other's locational decisions, because the follower is not sure about the gain that the competitor might make from the move. Knickerbockers' oligopolistic reaction hypothesis can be dignified in terms of FDI decisions being strategic complements, where a firm minimises the risk by following the rival's decisions on foreign investment. Knickerbockers' theory was tested on data for 107 American multinational firms, and it was found that the firms grouped themselves according to the location decision made by rival firms to foreign markets.

3.2.3 The Kojima macroeconomic approach

Kojima (1973) argues that FDI theory mostly focused on microeconomics, rather than on macroeconomics. He therefore decided to develop the macroeconomic approach to FDI theory. In his theory, Kojima identified two types of FDI, namely the trade-oriented (Japanese type) and the anti-trade-oriented (the American type) of FDI. The Japanese strived to invest in developing countries with the motive of securing an increase in imports of primary products, which play a significance part in production of their large number of produces, which is why the trade-oriented FDI is called the Japanese type. Kojima (1973) implied that FDI in developing countries should be trade-oriented, with the aim of strengthening and complementing the comparative advantage the host country already has.

Kojima (1973) called the anti-trade FDI the typical American-type, which was characterised by Raymond Vernon (1966) and Stephen Hymer (1976) in their FDI theories. Kojima (1973) put forward that in their theories, the product life cycle and the industrialisation approach ought to be classified as microeconomics theories that deal with one commodity, which means the theories are partial equilibrium approaches.

Kojima (1973) classified FDI motives into natural resource-oriented FDI, labour-oriented FDI, and market-oriented FDI. According to Kojima (1973), natural resource-oriented FDI is a trade-oriented FDI, as the initial motive of the multinational firm to invest abroad is that the host country has a comparative disadvantage to produce the product, and this leads to welfare for both the investor and the host country, by means of trade. It is cost saving and profitable for the multinational to invest in industries in countries that have a comparative advantage, and leads to vertical specialisation between producers, manufacturers and primary products. Labour-oriented FDI is also trade-oriented. As the labour cost of the labour intensive multinationals increases, it will make sense for the multinationals to produce in a country where labour is less costly than in the investor's country, since their motive to invest abroad is low wages. The market-oriented FDI can be trade and anti-trade-oriented. Usually, investors will be encouraged by trade barriers in the host country to decide to develop a production plant in a foreign country. This type of FDI will also play a role in the host country's strategy of import substitution.

3.2.4 Industrial organisation theory

Stephen Hymer (1976) created the theory of the FDI approach to industrial organisation from his PhD dissertation. His theory was one of the first approaches to explain international production in an imperfect market framework. Two market imperfections were significant to the development of Hymer's theory, namely structural imperfection and transaction cost imperfection. A structural imperfection, which causes multinational firms to increase their market power, comes from economies of scale, advantages of knowledge, distribution processes, product diversification and credit advantages. Transaction costs, on the other hand, make it profitable for multinational firms to substitute an internal market for external transactions. Hymer's argument (1976 is that firms abroad have to compete with domestic firms that have the advantage of having suitable information about the economic environment of their country and consumer preference, amongst many other advantages. Foreign firms will have to counterbalance

these disadvantages by having a market advantage that they bring to the domestic market. Hymer (1976) stipulated two conditions that have to be satisfied to explain the existence of FDI:

- foreign firms must possess a countervailing advantage over the local firms to make such investment possible; and
- the sale must take place in an imperfect market

According to Hymer (1976), a foreign firm's advantage over domestic firms is advanced technology, well-known brands, marketing and managerial expertise. The most important implication of this theory is that it states that market advantages can be transferred effectively from one firm to another, regardless of the fact that one firm is located in a certain country and the other is located in another country. Transaction costs, on the other hand, make it profitable for multinational firms to substitute an internal market for external transactions (Caves 1971).

3.2.5 Internalisation theory

Buckley and Casson (1976) created the internalisation theory in support of the idea that there is a way that the FDI can be a conduit of informative knowledge and technology internationally. They formulated their theory from the broad-base framework developed by Coase (1937). Buckley and Casson's (1976) theory is based on three assumptions:

- firms maximise profits in a market that is imperfect;
- when markets in intermediate products are imperfect, there is an incentive to bypass them by creating internal markets; and
- internalisation of markets across the world leads to the formation of multinational corporations (MNCs).

Buckley and Casson (1976) assume that market imperfections will generate great benefit for internalisation. Markets for intermediate products and markets for knowledge are seen as the two most important aspects where multinationals generate advantages through FDI. Buckley and Casson's (1976) theory states that firms that commit to research and development will come up with new knowledge for technological advancement and input. The transfer or selling of these new technologies and inputs to other firms will be costly to such firms, as they will find the transaction cost to be high, that is, when the firms that developed these new technologies and inputs internalise through backward and forward integration. This is when output can be used as

an input in the production process of another, or the technology invented can be utilised in the development of other technologies. Due to the market imperfections, firms seek to make use of their monopolistic advantage themselves. Buckley and Casson (1976) suggest that firms can overcome the market imperfections by internalising their own markets. When internalisation involves operations in different countries, then this necessarily means FDI (Nayak & Choudhury 2014).

Buckley and Casson (1976) identify five types of market imperfections that result in internalisation:

- the co-ordination of resources requires a long time lag;
- the efficient exploitation of market power requires discriminatory pricing;
- a bilateral monopoly produces unstable bargaining situations;
- a buyer cannot correctly estimate the price of the goods on sale; and
- government interventions in international markets create an incentive for transfer pricing.

Although Buckley and Casson (1976) acknowledge the risk of host government intervention, they do not consider the difference in the magnitude of this risk across various industries. For example, industries such as power generation and telecommunications, may face a greater risk of government intervention, because societal considerations may require the balancing of private objectives with social objectives (Nayak & Chouaudhury 2014).

3.2.6 The OLI eclectic paradigm

This paradigm was developed from a combination of firm theory, trade theory, organisation theory and location theory by John Dunning. Dunning (1976) was influenced by his colleagues Buckley and Casson to successfully develop the theory, which discusses three interrelated advantages to explain the importance of factors that motivate firms to set up production plants at foreign countries, as competition pressure on firms persists to sustain and increase their profit margin. The eclectic paradigm states that the success for international production is determined by three factors, namely ownership-specific advantage, location-specific advantage and internalisation advantage; hence, this is referred to as the OLI eclectic paradigm (Dunning (1976). Producing in a foreign country market can create extra cost, and this extra cost can be influenced by a lack of knowledge about the local market conditions, culture, legalities, tariffs,

politics and many more social issues. Therefore, foreign firms should possess some advantage to balance out these extra production costs.

The ownership advantage arises when the foreign firm has a net ownership advantage over that of competing foreign firms. This includes advantage in technology advances, economies of scale, management skills and assets produced by the firm itself (Dunning 1980). The internalisation advantages involve multinationals making a decision to expand internally, or to sell their exclusive rights on their tangible and intangible assets, and defend their competitive advantage from rival firms (Woldemeskel 2008). According to Dunning and Rugman (1985), a firm will choose internalisation if the transactional cost of the option to set up a plant in a foreign country is high. This cost is the result of cultural, legal, institutional and language differences.

3.2.7 The Bhagwati hypothesis

According to the Bhagwati hypothesis (1978), countries that follow the export-promoting (EP) strategy are more likely to attract FDI inflows than those who follow the import substitution (IS) strategy. The EP strategy is a strategy used by government to provide exporting local firms with incentives to be able to export more. In this strategy, the effective exchange rate will equal the effective exchange rate of imports, and this will usually happen by means of a reduction of tariffs and devaluation of the currency. EP countries follow the strategy mainly to open domestic firms to international completion and free trade. The IS strategy is a policy regime using the effective exchange rate to stimulate growth and development through decreasing international dependency, by substituting imported goods by local products and by using import tariffs and quotas. This is where the effective exchange rates of imports exceed the effective exchange rate of imports, thereby supporting import substitution activities (Balasubramanyam, Salisu & Sapsford 1996).

The approach by Bhagwati (1978) states that not only do countries following the EP strategy attract more FDI, but they are also are in a position to utilise the positive spillovers from FDI inflows more efficiently than IS countries. Due to the cheaper cost that comes with the EP regime, foreign firms will be encouraged to enter and produce in a country with lower labour cost and raw material (Bhagwati 1978).

3.2.8 New FDI-growth model by Neuhaus

The new FDI-growth theory by Neuhaus (2006) was not only developed to explain the relationship between FDI and growth for transition countries, but also to explain the relationship for developing countries in general. Unlike most FDI theories that focus on why multinational firms invest in foreign markets, the new FDI growth theory embarks on the question "given the occurrence of FDI, through which channel does it affect the rate of growth in the recipient country over time?" In reply to the question, Neuhaus (2006) indicated that earlier neoclassical theories were poorly developed (unsatisfactory), arguing that FDI-growth literature often views FDI as just another input of production, usually as capital stock or technology transfer.

Based on this, Brems (1970), the neoclassical growth model considered FDI to be just as another variable input in production. He argued that FDI increased capital accumulation and therefore enhanced economic growth. The problem was that in the neoclassical growth model, the effect of FDI through capital accumulation on per capita growth was transitory, and not permanent. The Solow growth model (1956) prompted the formation of the basic concept of capital widening (capital accumulation), which is a simple increase of the physical amount of capital inputs utilised in production, where depreciating capital is simply replaced by the same type of capital and the same quality of the capital first employed (Neuhaus 2006). Thereafter, the development came with the endogenous growth models and it was then that FDI was proved to improve the long-term per capita growth by technology transfer. Romer (1986) noted the diminishing returns on the neoclassical growth model, and modelled an endogenous growth model that increased the returns through knowledge spillovers. It was then that technological spillovers began to be acknowledged in FDI-growth models, in order to show the long-term effect of FDI on economic growth.

Thereafter, Neuhaus (2006) stated there to be three transmission channels through which FDI affects technological change, increases capital stock and ultimately enhances economic growth in host countries:

- The direct transmission, usually by Greenfield investments, is found when multinational firms set up a plant in a host country. By doing so, the companies directly use new advanced production technologies, and if these new technologies are used in the

intermediate production process of capital, they can improve the existing capital stock by increasing it or improving the quality of the capital in the host country.

- A transmission channel is an indirect form of transmission, when management expertise and production know-how are transferred to facilitate the production of new types of capital goods in the host firm.
- The last transmission channel is the second-round effect of FDI on developing countries. The existence of FDI in a developing country gives the domestic country an advantage of adopting the new technology advances that are being introduced by foreign firms, which will increase production and ultimately increase growth.

Recent FDI models based on technology spillovers are able to show a long-term effect of FDI on economic growth, but only focus on the second-round transmission channel of FDI on economic growth, and exclude the effect FDI had from direct and indirect transmission channels. Neuhaus (2006) states that there is no model that includes the two first-round transmission channels, which is the motivation for developing the new FDI-growth model. This model describes the direct transmission channel of FDI on economic growth, to show that capital accumulation and technology transfer can have a long-term effect on economic growth. The model follows and further develops capital deepening models by Aghion and Howitt (1992) and Romer (1990). Neuhaus (2006) emphasises that improving the quality of the existing types of capital goods and inventing completely new types of capital goods through technological change have a long-term effect on economic growth, through permanent FDI inflows, not only through capital accumulation (capital widening).

The new FDI-growth model (Neuhaus 2006) assumes that the capital deepening process is no longer the responsibility of domestic firms, but is that of foreign multinationals, and so the model is not an expression of general equilibrium, but of partial equilibrium. This model is similar to a standard closed-economy models, whereby domestic firms are taken as the intermediate sector firms, where, in the case of the Neuhaus (2006) model it is assumed that foreign firms are the intermediate sector firms, which produce quality approved or completely new types of capital goods and then sell these to final goods producers. Even if the framework of the new FDI model and the closed-economy models are the same, there were changes implemented. The model also

leaves open whether the final goods producers are owned by foreign multinationals or by domestic firms.

3.2.9 FDI motives by Dunning

Dunning (1993) developed and explained four types of FDI motives. According to Dunning (1993), firms have four motives to decide to produce abroad, where he classified these as natural resource seeking, market seeking, efficiency seeking and strategic asset seeking. Dunning (1993) states that larger multinational firms will tend to pursue more than one motive for them to invest in foreign countries. These motives may change as the firm becomes established and experienced in the foreign market. The initial motive of most multinational firms aspiring to invest or produce abroad will be to acquire natural resources that are lacking in the home country, whereas such a firm might prosper, and the interest to grow its global market share might be encouraged by other motives like efficiency.

Natural resource-seeking multinationals' intention to invest in another country is mostly motivated by their desire to acquire high-quality natural resources at a lower real cost when compared to what it will cost them in their home country, were the same kind of resources available. Natural resource seekers can be in a position where they do not have a choice, as this type of resources e.g. oil, minerals and agricultural resources tend to be location-specific. Multinational firms that require natural resources will be captivated by the fact that they can access these resources in abundance and at a low cost price, which supports their main objective of profit maximisation. Dunning (1993) mentions three types of natural resource seekers:

- Firstly, there are those who pursue physical natural resources, like agricultural products, mineral fuels and industrial minerals. This type of investors are mostly primary producers and manufacturing firms, whose production inputs are likely to require physical resources, such as those mentioned above, and for them to minimise costs, they will have to consider producing abroad.
- The second type of natural resource seekers are those investors seeking large numbers of cheap and motivated unskilled or semi-skilled labour. These investors usually come from the manufacturing or service industry in countries that have high labour costs.
- The third type of resource-seeking investors tend to be interested in technological advances, managerial expertise or marketing expertise from countries abroad, where there

is, for example, a prevalence of Asian firms that have collaborated with or invested in US companies (Dunning 1993).

Market-seeking FDI is usually prompted by firms that want to supply good or services in countries abroad. In cases like that, most of the firms that are market seeking will be in a position where they had been exporting to these foreign countries before, and because of market growth or costs to export, such as tariffs by the host country, that will be the firm's motivation to produce in the foreign country. Dunning (1993) is convinced that there are four reasons why a firm will engage in market-seeking FDI.

- The firm's has a large number of main suppliers or customers or had moved to that foreign country, which can encourage them to set up a plant in that host country.
- Some products may need to be the local culture, its taste, or needs. If not, the local firms may have the upper hand in the market.
- The third reason is motivated by costs, where firms might conclude that to produce in the host country is cheaper than producing many kilometres away. Costs to transport these products are likely to be higher in the long term than the setting up of a plant in the short term.
- The last and most important reason for firms to seek market-oriented FDI, will be sustain their market share in the host country while rivalling their competitors, as that will affect their global production and marketing strategy (Dunning 1993).

According to Dunning (1993), multinationals that engage in efficiency-oriented FDI tend to be experienced, large, diversified and in the stage where their product is standardised. Usually, these multinationals will become efficiency seekers, after they had been resource or market seekers. The main reason for efficiency-seeking multinational firms to seek out FDI is to take advantage of many diverse factor endowments in the host country, by focusing on a limited number of locations to supply multiple markets.

3.3 Empirical literature

The empirical literature reports on studies done in developed and developing countries, studies in South Africa, and sectoral studies, respectively.

3.3.1 Studies on developed countries

Empirical studies on FDI and growth in developed countries have found both positive and negative relationships between the two variables. Although theoretical literature has shown many ways that FDI can benefit the host country, empirical literature is inconclusive on the issue. As a result, many developed countries have formulated policies in ways to attract more FDI. In the latter, empirical literature has lagged behind in reaching a conclusive consensus on how FDI affects economic growth. The reviewed empirical literature in this chapter is summarised in Table 3.1.

De Mello (1999) used panel data to estimate the effect of FDI on capital accumulation and output on Organisation for Economic Co-operation and Development (OECD) and non-OECD countries in the period between 1970 and 1990. The estimates explained how the positive effect of FDI on growth depends on the level of complementarity and substitution between FDI and domestic investment. De Mello (1999) argues that FDI not only contributes to economic growth through capital accumulation and technological transfers, but it can also affect growth through an increase in knowledge as a result of labour training and skills acquisition. The result is that FDI has a significant effect on OECD countries and no effect on non-OECD countries.

Georgantopoulos and Tsamis (2011) performed a study in Greece to investigate the significance and causal relationship between FDI and economic growth. The study used the Johansen cointegration test and the Granger causality for the period 1970–2009. Strong empirical results showed that there is a long-run equilibrium relationship from the Johansen cointegration test. The study, however, found that there is one-way causality from economic growth to FDI, and FDI does not cause economic growth. Georgantopoulos and Tsamis (2011) recommended that for Greece to attract greater FDI inflows, the country would need to improve infrastructure and promote human capital and tax incentives.

According to Alshehry (2015), FDI inflows play a role in the improvements of the Saudi Arabic economic growth. Alshehry's (2015) study exploited the Johansen cointegration and Granger causality methods to study the effect of FDI inflows on the economic growth of Saudi Arabia for the period 1970–2012. Alshehry (2015) found that FDI could be an important factor in the growth of the country due to capital inflows, technology acquisition, training and human skills, employment and spillover effects to domestic companies. Alshehry (2015) followed the endogenous growth theory of FDI, which states that FDI has a significant effect on the economic growth of the host country. These results supported the hypothesis of the growth model, by proving that FDI evidences both a long and a short-run positive relationship between the two variables. The Granger causality test showed the variables to have a bidirectional causal relationship running from FDI to economic growth. The study made recommendations based on the results, namely that Saudi Arabia requires improvement, both in foreign and domestic investment, and that it attracts FDI in other sectors, beyond hydrocarbons.

Vu and Noy (2009) used data from six developed countries over the period between 1980 and 2003 to identify the sector-specific effect of FDI on economic growth. The result of their study showed that FDI has a significant effect on growth through labour. However, the effect differs across the six developed countries and sectors. Because there was a lack of equal distribution of the effect, no evidence was found that FDI enhances growth in other sectors, such as the financial sector, but for sectors like real estate, mining and quarrying, construction and trade, there was a positive correlation (Vu & Noy 2009).

Debab and Ve Mansoor (2011) constructed a study to identify the determinants and effect of FDI on the economic growth of Bahrain for the period 1990–2009. Regression analysis and the ordinary least squares (OLS) were used to formulate a model, which presented that FDI inflows have a significant effect on the economic growth of Bahrain. The result showed that there was a high correlation between FDI and economic growth, where an increase in FDI by one per cent could lead to a 12.3 per cent increase in economic growth. The results also showed that economic growth could be a factor in attracting FDI.

Cakovic and Levine (2002) used a data panel of 72 developed and developing countries for the period 1960–1995 to assess the relationship between FDI and growth. They used the generalised method of moments (GMM) and ordinary least squares (OLS) to reach conclusion that FDI has

no independent effect on growth. In addition, Campos and Kinoshita (2002) used OLSon 25 Central and Eastern European transition countries between 1990 and 1998 to investigate the effect of FDI on economic growth. They found that FDI is a significant explanatory variable for economic growth in these transition economies.

Ghosh and Van den Berg (2006) state that studies on FDI focus mostly on technological transfers from developed countries to developing countries, and they performed a study on the country receiving most United States (US) FDI. The study used time series data for the period 1970–2000 on a simultaneous equation model (SEM). The estimated result of the model found that FDI inflows have a significant effect on the US economic growth, and that the SEM showed that FDI growth is income inelastic. They concluded that the United States was gaining from FDI inflows as one of the factors sustaining the current account deficit of the United States by having a positive effect on productivity. The aim of Ghosh and Van den Berg's (2006) study was to show that even a technologically advanced country like the United States could benefit from FDI inflow.

Using a panel vector autoregression (VAR) model for 80 countries over the period 1971–1995, Choe (2003) estimated the causality effect between FDI and economic growth, and found that FDI Granger causes economic growth, and also that economic growth causes FDI, even when the causality from economic growth to FDI is much stronger than from FDI to economic growth. The findings found a strong correlation between the two, but Choe (2003) stipulated that due to the weak causality from FDI to economic growth, high FDI inflows do not necessarily mean a rapid increase in economic growth.

Vector error correction modelling (VECM) and the Johansen cointegration test were used by Vongvichith (2012) to evaluate the effect of FDI on the economic growth of Laos. The study used quarterly time series data for fourth quarter 1980 to the fourth quarter 2010 in a linear model as a consequence of a limited number of observations, in order to establish the relationship between FDI and economic growth. The cointegration results of the study showed that there was a long-standing relationship between FDI and economic growth, while the VECM results showed that there was a short-run relationship between FDI and economic growth, where the linear model proved that FDI inflows had a positive effect on economic growth in Laos at the time of the study.

Li and Liu (2005) used panel data to investigate 84 countries over the period 1970–1999 regarding FDI effects on economic growth. They employed both the single and simultaneous equation system techniques to explain the relationship between FDI and economic growth. The results showed that there existed a significant endogenous relationship between FDI and economic growth from the 1980s going forward. Li and Liu (2005) argue that FDI does not promote an increased economic growth on its own, but through human capital, whereas FDI with the technology gap has a significant negative effect on economic growth.

Johnson (2006) argues that FDI should have a positive effect on economic growth through capital inflows and technological spillovers. The study employed both cross-sectional and panel data from 90 countries for the period 1980–2002. The study used exploratory time series analysis to conclude that FDI enhances growth in developing countries, but does not encourage economic growth in developed countries. In addition, Johnson (2006) found the direction of causality flows from FDI to the economic growth of the host country, and also that economic growth can cause FDI. However, the study stipulates that even sustained economic growth by developing countries will rarely attract market-seeking FDI in the case of low income levels.

Kim and Pang (2008) used time series data over the period 1975–2006 to determine the long-term and short-term relationship of FDI and economic growth in Ireland. Their study employed the augmented aggregate production function model, Granger causality and the bound testing approach for cointegration. The outcome of the model showed that there was a long-and short-run relationship between FDI and Ireland's economic growth, proving FDI to be significant. The study also showed that there was a bi-directional causal relationship: FDI and economic growth attracted one another. It was concluded that a well-educated and skilled workforce are factors attracting FDI, ultimately leading to Ireland's enhanced economic growth.

By using the panel approach, Baharumshah and Thanoon (2006) confirmed the FDI-growth theory, by finding a positive relationship between FDI and growth, where FDI enhances the economic growth of the host country. Dynamic generalised least square (DGLS) was used on panel data of East Asian countries, including China, for the period 1982–2001. They emphasised that the results of their study depicted the famous fact that FDI positively affects growth processes in Asian countries, both in the short-run and in the long-run. Their robust findings

resulted in the conclusion that countries that attract more FDI can finance more investments and can show a more rapid growth rate than countries that attract less FDI, or none.

3.3.2 Studies on developing countries

Despite the growing literature on the relationship between FDI and growth, there is still uncertainty or a lack of consensus on the direction of causality. Many empirical studies lean on the perspective that shows FDI to have a clear, positive and significant effect on economic growth, while some do not reflect the same for developing countries. Numerous studies show that FDI affects the economic growth of the host country through technological advances, knowledge spillovers, and human capital. All the reviewed studies in this section have also been summarised in Table 3.1.

Borensztein et al. (1998) tested the effect of FDI on economic growth in a cross-country regression framework, using panel data from 69 developing countries for the period 1970–1989. The study showed that FDI was significant to economic growth through technology transfer. However, according to the findings, this positive effect is only found when the host country has a sizable stock of human capital. Using education as a proxy for human capital, it was concluded that FDI contributes positively to economic growth when there is a sufficient absorptive competence of the advanced technologies brought by the investors into the host country.

Balasubramanyam et al. (1996) investigated the role FDI played in the process of growth in a new growth theory framework. By means of panel data of 46 developing countries in the period 1970–1989, the study followed the Jagdish Bhagwati hypothesis. This hypothesis states that the volume and efficiency of FDI inflows will differ depending on whether a country is following the export promoting (EP) or the import substituting (IS) strategy (Balasubramanyam et al. 1996). The outcome of the resultswas that FDI has a robust effect in countries that follow the EP policy, rather than in those following the IS strategy in support of the hypothesis.

Makki and Somwaru (2004) grouped 66 developing countries during a period 1971–2001, in a study using a cross-section of data in the seemingly unrelated regression (SUR) method and the three-stage least squares (TSLS) approach to analyse the role that FDI and trade play in economic growth. The second purpose of Makki and Somwaru's (2004) study was to show how FDI relates with trade, domestic investment and human capital. The outcome of the regression

showed that FDI affected economic growth positively in developing countries, and it indicated that FDI had a positive relationship with trade and could stimulate domestic investment. Makki and Somwaru's (2004) concluded that the host country could receive greater benefits from FDI if only a healthier stock of human capital were available.

Herzer (2010) challenged many empirical findings by using panel cointegration techniques on 44 developing countries in the period 1970–2005, to analyse the relationship between FDI and economic growth. In contrast to the FDI-growth theory, Herzer (2010) found that per capita income, human capital, openness and financial market development cannot explain the relationship between FDI and economic growth. However, the study found that the FDI-growth effect could be increased by government intervention and freedom from business regulation, and negatively relates unstable FDI and dependence on natural resources. Ultimately, the researchers concluded that, on average, the effect of FDI on economic growth in developing countries was negative.

Eight Islamic (D8) developing countries were used in a study by Rabiei and Masoudi (2012). In their study, Rabiei and Masoudi considered the relationship between FDI and economic growth, both from an empirical and theoretical point of view. The study used panel data for Bangladesh, Indonesia, Iran, Malaysia, Nigeria, Turkey, Egypt and Pakistan over the period 1980–2009. It examined the hypothesis that FDI enhances economic growth by facilitating access to new technology from abroad, and investigated the significance of FDI in these processes. The conclusion was that FDI has a positive effect on economic growth in the D8, where the positive effect depends on the characteristics of the host country's different sectors, local firms and the type of FDI.

Seetenah and Khadaroo (2007) meanwhile analysed 39 sub-Saharan African countries over the period 1980–2000, exploring the effect of FDI on economic growth. The study used both static and panel data to develop the Cobb–Douglas production function. The researchers used OLS analysis and the generalised method of moments (GMM) estimator, and the results of the study supported existing literature on FDI and growth, by finding that FDI has a positive and significant effect on economic growth in the 39 sub-Saharan countries, even though a lesser effect of FDI on these developing countries appeared to be found when compared to other types

of investment, like domestic investment. Consequently, FDI was not only found to encourage growth, but also to follow growth.

Hassen and Anis (2012) saw it as necessary to study the effect of FDI on economic growth in Tunisia, by using annual time series data on recent econometrics techniques, such as the Johansen cointegration test and the VECM, over the period 1975–2009. The Johansen cointegration test found the variables to be cointegrated, which implied that there was a long-term relationship between FDI and economic growth in Tunisia. The outcome of the developed model suggested that FDI had a positive relationship with variables that positively affected economic growth, namely human capital and financial development of the country. Ultimately, this implies that FDI could enhance the economic growth of Tunisia.

Threshold regression techniques were used in a study by Jyun-Yi and Chih-Chiang (2008) to investigate whether the effect of FDI on economic growth is dependent on different absorptive capacities. The capacities investigated were GDP, human capital and trade used in the regression analysis. Jyun-Yi and Chih-Chiang (2008) used OLS and the GMM estimator. The researchers utilised panel data of 62 countries over the period 1975–2000. The empirical analysis showed that GDP and human capital were important factors to explain FDI in the 62 countries. Furthermore, the study showed that FDI had a significant and positive effect on economic growth on countries that have healthier levels of GDP and human capital.

Fadhil, Yao and Ismeal (2012) studied the developing country of Qatar for the causality relationship between FDI and economic growth over the period 1990–2009. They used annual time series data in the VAR impulse response and Granger causality test methods. The main findings of the study demonstrated that there was a bi-directional causality relationship between FDI and economic growth in Qatar, as well as a long-term relationship between FDI and economic growth. FDI had a negative effect on economic growth in the long term, and the impulse response results emphasised that FDI was more sensitive in its response to the change in FDI than to economic growth (Fadhil et al. 2012).

Kotrajaras (2010) emphasises that FDI, through technology transfer, can positively affect economic growth, depending on the economic environment of the recipient country. Using time series data for 15 Asian countries during the period 1990–2009, Kotrajaras (2010) categorised

the countries concerned by levels of human capital, investment on infrastructure and trade openness into three groups, i.e. high income, middle income and low income. Kotrajaras applied panel cointegration analysis on the endogenous growth model to show that FDI does not necessarily encourage economic growth. The results showed that there was a significant relationship between FDI and economic growth in high-income and middle-income countries, due to better economic factors, such as a skilled labour force, developed infrastructure and trade openness. As a result, low-income countries were shown to benefit less from FDI inflows than developed countries.

According to Yu et al. (2011) findings in a study that used panel data and implementing the VAR model and the Johansen cointegration test on 15 Asian countries in the period 1978–2008, FDI had no significant effect on the economic growth in these Asian countries. By way of contrast, in the better-known FDI literature, the results of the study showed that FDI tended to decrease GDP in the long-run, and that FDI was evidently enhanced by growth of employment and trade openness. Yu et al. (2011) consequently argued that FDI had a crowd-out effect on domestic investment in the countries under study, with the result of decreasing domestic capital formation as well as decreasing the aggregate output in the long-run, by decreasing employment growth.

Esso (2010) used annual time series data from the World Bank for the period 1970–2007 to explain the relationship between FDI and economic growth through cointegration and a procedure for the non-causality test in ten African countries. The results illustrated that there was a long-run relationship between FDI and economic growth in Angola, Kenya, Cote d'Ivoire, Senegal, Liberia and South Africa. However, the direction of causality was from FDI to economic growth, where FDI caused economic growth in Kenya, Angola and Cote d'Ivoire.

3.3.3 Studies on South Africa

Limited South African studies could be found regarding the effect of FDI on economic growth, unlike those found for other African countries, such as Nigeria. South Africa's FDI inflows have taken place in a slow progression of growth, but concern comes from the fact that the ratio of FDI growth in South Africa is lower than that of other developing countries (Rusike 2008). The results showed that South African could increase its economic growth by attracting more FDI into the country. Literature analysed in this section is summarised in Table 3.1.

Mazenda (2014) put forward that FDI could lead to increased technology transfer, managerial skills, employment and transfer of technological knowledge. Mazenda's study was based on evidence from South Africa over the period 1980–2010. The study used Johansen cointegration test and the VECM to investigate the effect of FDI on economic growth. The estimated results showed that, at the time of the study, FDI did not have a long-run relationship with economic growth, but did have a significant short-term effect on economic growth of South Africa. However, in the process, it crowded out domestic investment. The conclusion to be drawn from this was that domestic investment was the variable which had a positive effect on growth.

Mebratie and Bedi (2011) studied the effect of FDI on South African growth in a different manner when compared to other studies, where these authors put emphasis on the fact that there were few studies on the effect FDI has on domestic firms in Africa. Using two periods, viz. 2003 and 2007, and cross-sectional firm-level data from South Africa, they examined the effect FDI had on labour productivity. Their second intention was to investigate the effect of the interaction of the newly introduced policy, and then, the effect of black economic empowerment (BEE) on labour productivity. They concluded that there were no spillover effects on labour productivity, and that BEE compliance by multinationals also did not have any significance in the enhancement of labour productivity in South Africa, proving that there existed no intra-industry knowledge flow.

Dlamini and Fraser (2010) conducted a study in South Africa on the causal link between agricultural FDI, agricultural exports, and agricultural GDP in South Africa for the period 1994–2006. The study used the error correction method (ECM) and the Granger causality test to conclude that FDI and agricultural have a long-term relationship. In the study, agricultural exports showed bidirectional causality with FDI, whereby FDI gave rise to agricultural exports and vice versa. However, FDI and agricultural growth had a one-way causality effect, where agricultural growth attracted FDI, but an increase in FDI did nothing for agricultural growth.

Moolman et al. (2006) studied the determinants of FDI and their effect in South Africa. Moolman used times series data and cointegration techniques for the period 1970–2003 to formulate a model. The study took on a selection of five variables as determinants of FDI in South Africa, namely market size, openness, infrastructure, exchange rate and a dummy variable for sanctions. The results implied that at the time of the study, variables that were significant

when explaining FDI in South Africa were market size, openness and infrastructure development. The study also found that FDI had a positive relationship to aggregate output as it brought about new capital formation and, ultimately, an increase in economic growth.

One of a few studies conducted in South Africa was undertaken by Fedderke and Romm (2004), who looked at the growth effects and determinants of FDI on economic growth in South Africa. Fedderke and Romm employed aggregate time series data in South Africa over the period 1960–2002 using a VECM. The results indicated that, at the time of the study (2004), FDI did affect South African economic growth positively. FDI was also found to be complementary to capital in the long term, and it was speculated that this would result in positive spillover from technology that was brought to South Africa by multinationals. Consequently, the study found that FDI crowded out domestic investment in the short term. Fedderke and Romm concluded that, at the time of their research, FDI in South Africa tended to be capital-intensive, suggesting that FDI in South Africa was horizontal, rather than vertical.

3.3.4 Sectoral studies

Sectoral analysis is not prominent in the study of the relationship between FDI and economic growth, and the studies are mostly motivated by the assumption that FDI and growth have been studied only at the aggregated macroeconomic level, and not at sector and industry level. The results of the studies on the relationship between FDI and economic growth prove that the effect of FDI differs across sectors, where frequently, the relationship will be positive for industrial sectors and negative for the agricultural sector. A summary of studies analysed in this section is presented in Table 3.1.

Basu and Guariglia (2007) used panel data from 119 developing countries for the period 1970–1999 to investigate whether FDI enhances growth in the agricultural and industrial sector. Their study found a robust relationship between economic growth and FDI in the industry sector, but a negative correlation between agricultural growth and FDI. According to Basu and Guariglia's model, as FDI industrialises the host country, ultimately the country's agricultural sector becomes less important, and its share of economic growth diminishes.

Ulla et al. (2012) studied the role that FDI plays in relation to the sectoral growth of Pakistan, by developing two models from the two-stage least squares (TSLS) technique, using time series data

from 1979–2009. The main finding of the study was that, at the time of the study, FDI inflows into Pakistan had a positive effect on the industrial sector, but that capital accumulation and technology transfer were statistically insignificant. On the other hand, Ulla et al. (2012) found that FDI inflows had a negative but significant relationship with the economic growth of Pakistan. The availability of resources like water, the public sector development programme and the number of tractors in Pakistan had a significant effect on the growth of the agricultural sector. Other factors identified by the study, which referred to stimulation of the growth of the industry sector were the growth of the service sector, growth in real GDP and growth in terms of trade.

Mathiyazhagan (2005) examined the long-term relationship between FDI and sectoral gross output, sectoral exports and labour productivity in India. The study used annual data from two periods, namely 1991 and 2001. The study employed the panel cointegration test (PCONT) over nine sectors. The results were significant for some sectors and insignificant for others. The finding demonstrated that, at the time of the research, FDI inflows had a positive effect on sector output, labour productivity and sector exports of certain sectors. In addition, the results revealed that there was no cointegration relationship between FDI, sector exports, labour productivity and sector output, meaning that the increase in sector exports, labour productivity and sector output were not the results of the introduction of FDI. It can be concluded that the arrival of FDI did not affect the Indian economy at the sectoral level.

Posu et al. (2010) argue that many previous studies on the relationship between FDI and economic growth focused on the macroeconomic level, and ignored the sectoral level. Posu et al.'s (2010) study used time series data from Nigeria for the period 1970–2003. By using OLS to investigate the effect that FDI inflows had on sectoral growth in selected sectors, the study found that, at the time of the research, FDI had a significant effect on the mining, quarrying, and transportation and communication sectors, through increasing employment and the level of gross capital formation, but that it was insignificant in terms of the sectoral growth of the agriculture, forestry and fishery sectors.

Javorcik (2004) conducted a study to determine whether FDI increased productivity in firms. The study tested for productivity spillovers taking place through backward linkages (contacts between multinationals and their domestic suppliers) and forward linkages (contacts between

multinationals who supplied intermediate inputs and their domestic customers). The analysis was done by using firm-level panel data from Lithuania for the period 1996–2000, using OLS, focusing predominantly on manufacturing firms. The results showed that there were productivity spillovers by backward linkages in upstream sectors.

Cipollina et al. (2012) demonstrated the effect of FDI on economic growth through a study using cross-country panel data of 14 manufacturing industries of developed and developing countries over the period 1992–2004 using the GMM estimator method. The empirical result of the study showed that FDI had a strong economically and statistically significant positive effect on economic growth at industry level; however, the effect was more robust in capital-intensive and technological advanced sectors. The significant effect was furthermore enhanced by an increase in total factor productivity (TFP) as well as an increase in capital accumulation.

Massoud (2008) argues that the relationship between FDI and economic growth differs across sectors, whether this be manufacturing, agricultural or service sectors. Using evidence from Egypt for the period 1974–2005, Massoud's (2008) study followed the sectoral approach by using the instrumental variables technique and TSLS. The results showed that, at the time of the research, FDI inflow had a significant effect on the manufacturing and service sectors, and that FDI affected the manufacturing sector through the stock of human capital. The results concluded that, at the time of the research, the agricultural sector's growth had a negative relationship with FDI.

Khaliq and Noy (2007) followed Alfaro (2003) and Vu et al. (2009) in investigating the effect of FDI on economic growth, by using sectoral data from Indonesia for the period 1997–2006. Khaliq and Noy (2007) used 12 selected sectors and utilised the fixed effect estimation methodology to test the relationship between FDI and growth in the sectors. The estimation from the results showed that, at the time of the research, FDI had an insignificant effect on a few like mining and quarrying. Hence, at sectoral level, the effects of FDI on economic growth varied across sectors, and no aggregate affects were observed in Alfaro's (2003) study.

Chakraborty and Nunnenkamp (2008) used the panel cointegration framework and Granger causality test to analyse the relationship between FDI and economic growth at sector level in India over the period 1987–2000. The study showed that the effect of FDI on economic growth

varied across sectors. The results further showed that, at the time of the research, FDI and manufacturing growth had a positive relationship, and the causality effect was both ways. There was a temporary effect of FDI on the service sector growth; however, FDI in the service sector managed to enhance growth in the manufacturing sector through cross-sector spillovers. The study found no evidence of a causal relationship between FDI and growth in the primary sector.

Alfaro's 2003 study proved that the FDI effect radically differed across sectors when he used data from 47 OECD countries using cross-section regression over the period 1981–1999. Alfaro (2003) examined the effect of FDI on economic growth in the primary, manufacturing and services sectors, where the results of the study proved ambiguous. The effect of FDI on the primary sector was negative and insignificant, unlike for the manufacturing sectors, where the effect of FDI on the services sector was shown to be uncertain. Alfaro (2003) explains the outcome of the negative effect FDI had on agriculture and mining, by stating that there would be little to no spillover effect from FDI on these sectors. Alfaro (2003) also emphasised that most literature reporting a significant and positive relationship between FDI and growth tends to focus mainly on the manufacturing sector. All the reviewed empirical literature above is summarised in Table 3.1 below.

Table 3.1: Summary of selected empirical literature

AUTHOR(S)	COUNTRY(S)	PERIOD	METHOD	EFFECT OF FDI ON GROWTH
Vu and Noy (2009)	6 developed countries	1980-2003	Ordinary Least Squares (OLS) endogeneity t-test	Positive
Cakovic and Lavine (2002)	72 developed countries	1960-1995	Generalized Method of Moments (GMM) Ordinary Least Square (OLS)	Positive

Choe (2003)	80 countries	1971-1995	Vector Autoregression (VAR) Granger Causality test	FDI causes growth and growth causes FDI. Causality is stronger from economic growth to FDI.
Li and Liu (2005)	84 countries	1970-1999	Single and Simultaneous equation system techniques	FDI enhances growth through human capital not by itself.
Johnson (2006)	90 countries	1980-2002	Exploratory time series analysis	Positive FDI causes growth and vice versa.
Baharumshah and Thahoon (2006)	East Asian countries	1982-2001	Dynamic Generalised Least Squares (DGLS)	Positive in both short-run and long-run.
Borensztein et al. (1998)	69 developing countries	1970-1989	Framework of cross-country regressions	Positive when there is an absorptive competence.
De Mello (1999)	32 OECD and non-OECD countries	1970-1990	Bivariate Vector Autoregression (VAR)	FDI has a significant effect on OECD countries and no effect on non-OECD countries.
Balasubramanyam et al. (1996)	49 developing countries	1970-1989	Jagdish Bhagwati hypothesis	FDI has a strong effect in countries that follow the EP policy rather than those that are following the IS strategy.
Makki and Samwaru	66 developing	1971-	Unrelated	Positive

(2004)	countries	2001	Regression (SUR) Method Three Stage Least Squares (TSLS)	If has a better level of human capital.
Herzer (2010)	44 developing countries	1970-2005	Panel cointegration techniques	Negative
Seetanah and Khadaroo (2007)	39 Sub-Saharan African countries	1980-2000	OLS Analysis General Methods of Moments (GMM) estimator	Positive Economic growth causes FDI.
Jyun-Yi and Chih-Chiang (2008)	62 countries		OLS General Methods of Moments (GMM) estimator	Positive in countries that have healthier GDP and human capital.
Kotrajaras (2010)	15 Asian countries	1990-2009	Panel cointegration analysis	Positive in high and middle income countries. Negative for low income countries.
Yu and Liu (2011)	15 Asian countries	1979-2008	Vector Autogressive (VAR) Model Johansen Cointegration Test	Negative FDI crowds out domestic investment.

Esso (2010)	10 African Countries	1970-2007	Cointegration Non-Casuality Test	Positive in Angola, Kenya, Cote d'Ivoire, Senegal, Liberia and South Africa
Basu and Guariglia (2007)	119 developing countries	1970-1999	GMM estimator	Positive in industry sector. Negative in agricultural sector.
Ulla et al. (2011)	Pakistan	1979-2009	Two Stage Least Square (2SLS) Technique	Positive in industry sector. Negative in agricultural sector. Capital accumulation and technological transfer are statistically insignificant.
Mathiyazhagan (2005)	India	1990-1991 and 2000-2001	Panel co-Integration (PCONT) Test	No cointegration between FDI and sector output, labour productivity and sector exports of some sectors.
Posu et al. (2007)	Nigeria	1970-2003	Ordinary Least square (OLS)	Positive on growth of mining and quarrying, and the transportation and communication sectors. Negative on growth agriculture, forestry, and fishery sector.

Javorcik (2004)	Lithuania	1996-2000	Ordinary Least Square (OLS)	Positive for manufacturing sector
Massoud (2008)	Egypt	1974-2005	Instrumental Variables Technique Two Stage Least Squares (TSLS)	Positive in manufacturing and service sector growth. Negative in agricultural growth.
Khaliq and Noy (2007)	Indonesia	1997-2006	Fixed Effect Methodology	Positive in mining and quarrying.
Alfaro (2003)	47 OECD countries	1981-1999	Cross-section Regression	Positive in manufacturing sector. Negative in primary sector. Uncertain in services sector.
Mazenda (2014)	South Africa	1980-2010	Johansen Cointegration and Vector Error Correction Model (VECM)	Negative
Moolman et al., (2006)	South Africa	1970-2003	Cointegration techniques	Positive
Fedderke and Romm (2004)	South Africa	1960-2002	Johansen Cointegration and Vector Error Correction Model	Positive, but crowds out domestic investment.

			(VECM)	
Chakraborty and Nunnenkamp (2008)	India	1987-2000	Panel Cointegration Framework and Granger Causality.	Positive manufacturing sector, inconclusive for service sector, negative effect on agricultural sector
Cipollina et al. (2012)	14 manufacturing industries for developed and developing countries	1992-2004	General Methods of Moments (GMM) Estimator	Positive effect, stronger effect on capital intensive and technological advance industries.
Fadhil et al (2012)	Qatar	1990-2009	Vector Autogressive (VAR), impulse response and Granger Causality Test	Negative effect.
Hassen and Anis (2012)	Tunisia	1975-2009	Johansen Cointegration test and Vector Error Correction Modelling. (VECM)	Positive effect.
Debab and Mansoor (2011)	Greece	1970-2009	Johansen Cointegration Test and Granger Causality Test	Positive effect.

Ghosh Roy and Van de Berg (2006)	U.S	1970-2000	Simultaneous-Equation Model (SEM)	Positive effect.
Debab and Mansoor (2011)	Bahrain	1990-2009	Ordinary Least Square (OLS)	Positive effect.
Vongvichith (2012)	Laos	1980Q1-2010Q4	Johansen Cointegration Test and the Vector Error Correction Modeling (VECM)	Positive effect.
Kim and Bang (2008)	Ireland	1975-2006	Augmented Aggregate Production Function Model, Granger Causality	Positive long-run and short-run relationship exists. Bi-directional causality.
Alshehry (2015)	Saudi Arabia	1970-2012	Johansen Cointegration Test and Granger Causality Test	Positive long-run and short-run relationship exists. Bi-directional causality from FDI to economic growth.
Georgantopoulos and Tsamis (2011)	Greece	1970-2009	Johansen Cointegration Test and Granger Causality Test	Positive long-run relationship exists. Bi-directional causality from economic growth to FDI.
Rabiei and Masoudi (2012)	Eight Islamic developing	1980-2009	Estimated generalised	Positive effect.

	countries D8		least squares method (EGLS)	
Dlamini and Fraser (2010)	South Africa agricultural	1994-2006	Error Correction Method (ECM) and the Granger Causality Test	Long-run relationship exists. Bi-directional causal relationship, agricultural growth attracts FDI, but FDI does nothing for agricultural growth.
Mebratie and Bedi (2011)	South Africa	2003-2007	Ordinary Least Square and Fixed-Effects Estimates	No evidence of spill-over effects from FDI to labour productivity in South African firms.
Cipollina et al. (2012)	14 manufacturing industries in developing and developed countries	1992-2004	GMM Estimator Method	Positive effect, more robust in capital intensive and technological advanced sectors.

3.4 Conclusion

In summary, it is obvious from the theoretical and empirical literature review that FDI has diverse effects on economic growth in both developed and developing countries. Theoretical literature reports on the behaviour of multinational firms and the motive behind investing in foreign countries. Macroeconomic theories, like the OLI eclectic paradigm, state that the success of international production is determined by three factors, namely ownership-specific advantage, location-specific advantage and internalisation advantage (Dunning 1976). Before then, Vernon

(1966) developed the product life cycle theory to show the stages that a product undergoes in international production. The model stipulates that for FDI to occur, it takes four stages of product life of the new product, namely innovation, growth, maturity and decline. The oligopolistic reaction hypothesis (see section 3.2.2) explains why firms follow competing firms to foreign markets. The hypothesis states that the decision of one firm to invest in a foreign country results from increased advantages and chances for competing firms to invest in the same foreign market (Knickerbocker 1973). Neuhaus (2006) describes the direct transmission channel of FDI on economic growth to show that capital accumulation and technology transfer can have a long-term effect. According to theory, firms have four motives to decide to produce abroad, namely natural resource seeking, market seeking, efficiency seeking and strategic asset seeking (Dunning 1993).

Empirical studies have been shown to have mixed perceptions about the effect of FDI on economic growth. Studies done in developing countries have mostly shown that FDI could enhance economic growth, but only under certain conditions, for example the availability of education, existing stock of capital and sustainable economic growth. Some studies state that FDI tends follow countries that have well-developed financial markets and economic growth, meaning that FDI will cause growth and growth will also attract FDI. Sectoral studies proved that FDI inflows would affect different sectors in different ways, where a number of authors found the sector that usually does not benefit from the inflow of FDI to be the agricultural sector. By contrast, the manufacturing sector benefits positively from multinationals. The main finding of the empirical review was that FDI theory was for the most part focused on macroeconomic level, and not so much on microeconomic level, where the effect is usually investigated according to overall economic growth, and not according to individual sectors or industries.

Given the above background analysis, it is indicated that there are some sectoral studies on FDI and economic growth, mostly in Asian countries like China, Pakistan and India, but there are still limited studies on African countries. In South Africa, studies based on sectoral analysis are still rare, which provided the motivation for this study.

CHAPTER FOUR:

THEORETICAL FRAMEWORK, METHODOLOGY

AND DATA ANALYSIS

4.1 Introduction

This chapter presents the theoretical framework, methodology and data analysis adopted in this study. Sections 2 and 3 explain in detail the theoretical and empirical framework. Section 4 presents a detailed discussion of the methodology and techniques utilised. Section 5 presents an analysis of the data used in the study, and section 6 concludes the chapter.

4.2 Theoretical framework

The theoretical framework that reinforced the methodology of this study was based on the new partial equilibrium FDI-growth model by Neuhaus (2006) discussed in the previous chapter (see 3.2.8). It is a partial equilibrium, as it did not include the domestic capital sector, but only considered all capital and technology transfers produced by foreign firms. According to Neuhaus (2006), the FDI-growth model is intended to explain the effect FDI has on the economic growth of the host country, and the way in which this affects technological progress in the economy. Neuhaus (2006) described the model to be the Solow type growth model, because the model includes elements of technological change that was initiated in the endogenous models of capital deepening.

The theoretical framework intends to describe the transition of a developing country to an industrialised country as a result of the inflow of FDI. This framework is of interest as an enhanced model from the 1990s endogenous FDI-growth models. It not only concentrates on the second-round transmission channel of FDI on economic growth, but also oversees the immediate effects FDI has on economic growth, through Greenfield investments and ownership participation. According to Neuhaus (2006), there is no other model that describes both the direct and indirect transmission channel of FDI on economic growth (as discussed in 3.2.8. This framework fits well for a study on the effect of FDI on sector growth in South Africa. Neuhaus

(2006) adapted this framework to 13 transitioning European countries. The study revealed that FDI was not only highly significant, but also that it was on a high scale.

According to Neuhaus (2006), the new FDI-growth model was motivated by literature where growth was positively affected by FDI through capital accumulation and technological opportunity, which ultimately enhanced growth of the host country. Neuhaus (2006) states that the spillover effect of FDI occurs when a new foreign firm arrives with new developmental ideas for technological advancement for local firms . This technological know-how is adopted by domestic firms to improve products and create better ones, and that is seen as the relevant channel for the long-term effect of FDI on economic growth (Neuhaus 2006). Firstly, the FDI-growth model explains the role of capital deepening in aggregate output. Using the production function with the assumption that there is a single firm producing a homogenous product, the function is presented as:

$$Y(t) = AL^{t-\alpha}K(t)^{\alpha} \tag{4.1}$$

The function entails that Y(t) is the output produced at time t at constant efficiency A and with labour L, plus the existing capital of K(t), α is output elasticity. Capital deepening means that only capital stock can be used to show the process. The different changes of capital over a period can be depicted by:

$$K(t) = \left\{ \sum_{j=1}^{N(t)} \left[q^{kj(t)} . X_j(t) \right]^{\alpha} \right\}^{1/\alpha} \tag{4.2}$$

The capital equation shows that at time *t,* capital stock is made up of *j=1*,….,N*(t)* different types of capital goods. The physical amount of capital *j* that is used in the production process will be shown by $X_j(t)$, and the quality state of the capital *j* will be denoted by $q^{kj(t)}$. In the equation, $q^{kj(t)}$ simply shows the value the capital stock can add to the production process, k shows the highest quality rank at which a particular capital stock j can be available. The capital variety *j* in a developing country shown by kj will be less compared to the available capital variety at a global level, which can be denoted by kj^*. When the quality in variety of capital increases at

global level, then it will also improve for individual firms, resulting in a change in *q*, and meaning that kj^* will increase by one to $kj^* + 1$. This means that there is an improvement in the quality level for capital stock *j*, and that the variety quality brought in by foreign firms is always higher than any other, which can result in even more than one benefit for the variety of quality available to a domestic individual firm. Every time a foreign firm introduces a new type of capital product, which is available at quality *k*, then the overall *N(t)* increases. In the case of the improvement of quality for the existing capital stock, only $kj(t)$ will increase, but *N(t)* remains the same (Neuhaus 2006).

The model took ideas of both Romer (1990) and Aghion and Howitt (1992), and combined these to evolve into this growth model. The Romer (1990) model was all about capital accumulation through increasing capital stock, and Aghion and Howitt (1992) supported the idea of capital deepening by improving the quality of the different capital varieties. In combining these two types of capital deepening models, Neuhaus (2006) states that capital stock *j* is independent of the quantity added by another capital stock j^*. This means that it is not possible for *j* to replace or complement j^*. Hence, it can be shown by inserting equation 4.2 into 4.1, which will be the central equation of the model, that capital stock affects aggregate production and ultimately growth (Neuhaus 2006). The equation is presented as follows:

$$Y(t) = AL^{1-\alpha} \sum_{j=1}^{N(t)} \left[q^{kj(t)} . X_j(t) \right]^{\alpha} \tag{4.3}$$

Neuhaus (2006) called equation (4.3) the "direct transmissions channel", where FDI could have an effect on the economic growth of a host country through capital deepening. Neuhaus further extended the model to show that through the indirect transmission channel, the technological advancement of FDI could affect economic growth through technological progress. Technological progress could have two types of effect on economic growth. One is the effect through the invention of new varieties of capital, and the other is the improvement of existing varieties of capital. After a while, when a country has accumulated enough capital stock, it needs to move on to improving the quality of the varieties of capital stock, which come from the introduction of new technologies that foreign firms introduce. Neuhaus (2006) states that, for a

developing country to move from developing to industrialised, it requires a permanent inflow of FDI into the country. The positive effect of technological processes will depend on the amount and the duration of FDI inflow. Neuhaus further states that a developing country could emerge as an industrialised country under the condition that it attracts a permanent inflow of FDI.

4.3 Empirical framework

The present study followed the new FDI-growth model as a foundation of the econometric model. Neuhaus (2006) studied the effect of FDI on economic growth on 13 transitional countries in Central and Eastern Europe. Following the growth model of Mankiw, Romer and Weil (1992) and Bassanini, Scarpetta and Hemmings (2001), they successfully introduced human capital into the Solow growth model. Neuhaus (2006) introduced FDI into the growth model to explain the effect of FDI on economic growth. FDI is not yet another variable in the model, but replaces the human capital variable; therefore, the model is an augmented version of the Mankiw et al. (1992) growth model. The theory considers that the positive spillovers of FDI could enhance economic growth through human capital and technology enhancement. Since then, FDI has been successfully integrated into the growth model. Mankiw et al. (1992) used the following production function:

$$Y(t) = K(t)^{\alpha} H(t) \beta \big(A(t)L(t)\big)^{1-\alpha-\beta} \tag{4.4}$$

where Y(t) is aggregate output, *K(t)* is domestic capital stock, *H(t)* is human capital, *L(t)* is labour input and *A(t)* has two components. The first component can be a measure for the state of the economy and can be measured by different variables like inflation, trade openness and government size. The second component is a reflection of exogenous technological progress. Output elasticities are denoted by α and β. The assumption of the model is that all technological progress is labour-augmenting; any enhancement of technology affects aggregate output in the same effect as an increase in labour. This model does not only show the change in the domestic and foreign capital, but also shows the change that exogenous technological progress has on capital stocks. The model entails that if there is no technological progress, there will not be growth, and just a mere capital accumulation (Neuhaus 2006). After replacing human capital H(t), the new production function can be written as follows:

$$Y(t) = K_d(t)^{\alpha} K_f(t)^{\beta} (A(t)L(t))^{1-\alpha-\beta} \quad (4.5)$$

where $K_d(t)$ is domestic capital stock and $K_f(t)$ is foreign capital stock. However, the empirical model of this study is underlined by the theoretical framework discussed above. The effect of FDI inflow was, however, tested on three key sectors (i.e. services, industry and agricultural sector) of the South African economy. In line with empirical framework and studies, the three models to be estimated are expressed in logarithms as follows:

$$\ln\_AGDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 \ln\_FCF_t + \beta_3 \ln\_OPEN_t + \beta_4 \ln\_REER_t + \beta_5 \ln\_INF_t + e_t \quad (4.6)$$

$$\ln\_IGDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 \ln\_FCF_t + \beta_3 \ln\_OPEN_t + \beta_4 \ln\_REER_t + \beta_5 \ln\_INF_t + e_t \quad (4.7)$$

$$\ln\_SGDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 \ln\_FCF_t + \beta_3 \ln\_OPEN_t + \beta_4 \ln\_REER_t + \beta_5 \ln\_INF_t + e_t \quad (4.8)$$

where sectoral growth is denoted by GDP for the three key sectors in South Africa, FDI is the foreign direct investment inflows, gross capital formation (FCF) is used as a proxy for domestic investment, EXP is the level of exports, and CPI represents inflation, $\beta_0, \beta_1 – \beta_4$ are parameters to be estimated, whereas e_t is a stochastic error term to be independently and identically distributed. Three variables are expected to have a positive relationship with sector growth except for inflation (CPI), which could have an ambiguous effect on growth (GDP). It is expected that FDI has a positive relationship with growth as seen in many empirical studies (Balasubramanyam et al. 1996, Fedderke & Romm 2004), but a few found that FDI has no effect on growth (Yu & Liu 2011). According to Sen (2011), FDI has a positive effect on service sector growth, but studies found that FDI usually does very little to the growth of the agricultural sector (Posu et al. 2010; Ullah et al. 2011). According to the empirical studies, exports and gross capital formation have a significant effect on economic growth, whereas overly high inflation is found to have a negative effect on growth (Carkovic & Levine 2002). All the variables will be defined and discussed in detail in the data analysis section of the chapter (see 4.5).

4.4 Methodology and estimation techniques

The framework described above was analysed using the Johansen (1988) cointegration technique. Following the three most important steps of the Johansen approach, the first step was to test for the order of integration of the variables in order to determine the data generating process. Second, the approach specifies the vector autoregressive (VAR), and thirdly, it tests for cointegration in the VAR. With the amount of cointegration detected in the VAR, the study proceeded to estimate long-term parameters using the VECM. For forecasting the long-term relationships and detecting response of shocks among the variables, the generalised impulse response function (GIRA) and the variance decomposition analysis were carried out. All the above procedures are discussed in depth in the following sub-sections.

4.4.1 Unit root test

The first step of any time series analysis is to carry out a unit root (order of integration) test, since the data generating process of the variables is not known. A graphical inspection of the variables is presented, and this could indicate whether the variables are stationary or non-stationary. In addition, the study employed both the augmented Dickey–Fuller (ADF) test (1979) and the Phillips–Perron (PP) test (1988) to test for unit root. The ADF test is based on critical values that test for the presence of unit root in variables, since most macroeconomic time series data shows some kind of a random walk or a trend or trends. The ADF testable equation is:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i-1}^{p} \beta_i \Delta Y_{t-1} + e_{1t} \tag{4.9}$$

The null hypothesis of unit root testing is that there exists a unit root H_0:($\gamma = 0$), and the alternative hypothesis is that there is no unit root H_0:($\gamma < 0$). The test is based on using critical values to test for unit root by running a simple random walk regression on the above equation. The objective is to find out whether γ is equal to 1, which means there is no unit root. Estimating the above equation, the test produces the computed tau *(t)* against the critical t statistics. The t statistic consists of the coefficients of the dependable variables, which is a division of γ coefficients by the error term. If the t statistics is greater than the computed sample values, then

the null will be rejected. The lag length of the terms is determined by the Akaike information criterion (AIC) or the Schwartz Bayesian criterion. The equation for the Phillips–Perron (PP) test (1988) is stated as:

$$\Delta Y_t = \beta_{2t-1} + \rho\left(t - \frac{T}{2}\right) + \sum_{i-1}^{m} \rho_i \, \Delta Y_{t-i} + e_{2t} \qquad (4.10)$$

For both equations (4.9 and 4.10), Δ is the first difference operator and e_{1t} and e_{2t} are covariance stationary random error terms. The birth of the PP test was to improve on the weakness of the ADF test, which assumes that residual errors are statistically independent and have a constant variance. Therefore, the difference between the two tests is that the PP test allows error disturbances to be weakly dependent and heterogeneously distributed. Thereafter, to achieve stationarity of the data, the data must be differenced before proceeding with the specification of the VAR. To proceed, the data must have order of integration as one I(1). Macroeconomic data usually becomes stationary at first differencing, not assuming that it can never need to be differenced more than once to be stationary (Har, Teo & Yee 2008).

4.4.2 Vector autoregressive (VAR) analysis

Vector autoregressive (VAR) is specified with the assumption that the variables are stationary (Enders 2004). The intention of the analysis is to check the interrelation of variables in order to forecast. This approach is established on a statistic that at times it is not easy to tell the difference between endogenous and exogenous variables, which is to analyse the liner interdependence among variables. For instance, in VAR, variable X is not related only to its own lagged value, but also to the lagged value of variable Y and vice versa. In accordance with Enders (2004), to illustrate the VAR analysis, we can consider a simple bivariate equation:

$$\begin{bmatrix} X_t \\ Y_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} - \begin{bmatrix} b_{12} \\ b_{21} \end{bmatrix} \begin{bmatrix} Y_t \\ X_t \end{bmatrix} + \begin{bmatrix} \beta_{11} \, \beta_{12} \\ \beta_{21} \, \beta_{22} \end{bmatrix} \begin{bmatrix} X_{t-1} \\ Y_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{xt} \\ \varepsilon_{yt} \end{bmatrix} \qquad (4.11)$$

Under the assumption that X_t and Y_t are stationary, the error terms ε_{xt} and ε_{yt} are white-noise disturbances with standard deviations of σ_x and σ_t respectively, and ε_{xt} and ε_{yt} are uncorrelated white-noise disturbances. The above equation is not the reduced VAR equation; it is called the

primitive VAR or structural VAR (Enders 2004). Premultiplication by B^{-1} can allow us to obtain the reduced VAR model in a standard form to be:

$$Z_t = A_0 + \beta_1 z_{t-1} + e_t \tag{4.12}$$

The reduced VAR may be rewritten in an equivalent form as:

$$\begin{bmatrix} X_t \\ Y_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{bmatrix} a_{11}\ a_{12} \\ a_{21}\ a_{22} \end{bmatrix} \begin{bmatrix} X_{t-1} \\ Y_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \tag{4.13}$$

where a_{i0} is an element of i of the vector A_0 and a_{ij} is the element in row i and column j of matrix A_1. Lastly, e_{it} is the i element of e_t. The primitive VAR cannot be estimated as X_t is correlated to the error term ε_{yt} and Y_t is correlated to the error term ε_{xt}. Therefore, the estimation will use the reduced VAR. A standard estimation requires the repressors to be uncorrelated with the error terms. According to Enders (2004), identification of a model from the primitive equation is done by using the recursive system established by Sims (1980). In such case, one can impose a restriction on the primitive system, namely that b_{12} is equal to zero, and then the imposed restriction means B^{-1} is given by:

$$B^{-1} = \begin{bmatrix} 1 & -b_{12} \\ 0 & 1 \end{bmatrix} \tag{4.14}$$

Then, by using OLS to estimate, the outcome will show the results of the parameters from equation (4.13). After the restriction, $e_1 = \varepsilon_{xt} - b_{12}\varepsilon_{yt}$ and $e_2 = \varepsilon_{yt}$ will become $e_{1t} = \varepsilon_{xt}$ and $e_{2e} = -b_{12}\varepsilon_{yt} + \varepsilon_{yt}$. The restriction has an assumption that Y_t does not have a contemporaneous on X_t, while X_t affects Y_t sequence with a one-period lag. For the error terms ε_{yt} and ε_{xt}, both their shocks affect the contemporaneous value of X_t, but only ε_{yt} shocks the contemporaneous value of Y_t. As a result, the observed values of e_{2t} are completely attributed to the pure shock of the Y_t sequence. In that way, the restriction can be used to describe any econometric model identified. Decomposition of residuals in a triangular form of this kind is called the Choleski decomposition (Enders 2004).

The reduced *n*-equation VAR for equations (4.6), (4.7), and (4.8) estimated in this study is re-specified as:

$$X_t = A_O + A_1 x_{t-1} + A_2 x_{t-2} + \ldots + A_p x_{t-p} + e_t \quad (4.15)$$

where x_t= (*n.1*) vector of all n variables in the VAR

A_o= *(n.1*) vector of intercepts

A_i= *(n.n)* matrices of coefficients

e_t= *(n.1)* vector of error terms

Therefore for three models, the variables are shown in the vector X_t:

$$X_t = [ln\_AGDP \;\; FDI \;\; ln\_GFC \;\; ln\_OPEN \;\; ln\_REER \;\; ln\_INF] \quad (4.16)$$

$$X_t = [ln\_IGDP \;\; FDI \;\; ln\_GFC \;\; ln\_OPEN \;\; ln\_REER \;\; ln\_INF] \quad (4.17)$$

$$X_t = [\, ln\_SGDP \;\; FDI \;\; ln\_GFC \;\; ln\_OPEN \;\; ln\_REER \;\; ln\_INF] \quad (4.18)$$

In Choleski decomposition, all elements above the principal diagonal must be equal to zero (Enders 2004). The ordering of variables in this way means that the first variable responds to its own shock, and that the second variable responds to the first variable, as well as the shock of itself. The last variable in the equation responds contemporaneously to all other variables, as well as to the shock of itself.

4.4.3 Cointegration analysis

As mentioned earlier (see 4.4), this study followed the Johansen cointegration approach (Johansen 1988) in order to establish the long-term cointegration relationship among the variables. After ascertaining that at least one variable was integrated at order one I(1), the cointegration test was carried out following the Johansen (1988) procedure of a maximum likelihood approach. Cointegration refers simply to the existence of a long-term relationship between non-stationary variables that became stationary after being differenced. This means that

variables X_t and Y_t are integrated at order one I(1), while having a linear combination after regression. The cointegration concept was introduced by Granger (1981), and from there, it was further expanded in many other studies such as the Engle and Granger (1987). The present study used the Johansen cointegration instead of the Engle–Granger method (Engle and Granger 1987) to allow multiple cointegration vectors, which yield more robust test results. After differencing the variables to ensure stationarity, one may regress the following equation to establish a long-term relationship between variable X_t and Y_t;

$$Y_t = \beta_1 + \beta_2 X_t + u_t \tag{4.19}$$

The Johansen test is designed to determine the number of cointegrating vectors *r* in the vector autoregressive model (VAR) statistically, where the method formulas are highly mathematical, going beyond econometrics (Johansen 1988). Testing of the null hypothesis $r = 0$ against $r \geq 1$ is carried out to determine if there is at least one cointegrating relationship between variables. If the null hypothesis is accepted, it can be concluded that there are no cointegrating relationships or common trends amongst variables. The Johansen procedure relies mostly on the relationship between the rank of a matrix and its characteristic roots. The objective of Johansen cointegration is to decompose $\prod$, which specifies estimates of α and β by using a procedure called a reduced rank regression, shown by:

$$\prod = \alpha\beta \tag{4.20}$$

According to Johansen (1988), the matrix $\prod$ contains information about the long-run relationships between the variables in the vector, where α shows the speed adjustment coefficients and β is the matrix of the long run coefficients. The number of cointegrating vector k x k matrices with rank r can be determined by the test statistics and the trace statistics. The test statistics rely on the maximum eigenvalues. This test orders the largest eigenvalues in a descending order, as well as if they are significantly different from zero. If the rank of $\prod$ equals one, then there is cointegration. To specify for cointegration, the equation will be:

$$\lambda \max(r, r+1) = -TIn(1 - \lambda_{r+1}) \tag{4.21}$$

where λmax(r,r+1) is the likelihood ratio test statistic, *r* is the number of cointegration vectors, T is the sample size, and λ_r is the estimated value for the *i*th ordered eigenvalue from the ∏ matrix. The trace statistic relies on the likelihood ratio test through the trace of the matrix. The trace statistics can be specified from the following equation:

$$\lambda_{trace}(r) = -\Gamma \sum_{i=r+1}^{n} In(1 - \lambda_{r+1}) \tag{4.22}$$

The null hypothesis of the trace statistics is that the number of cointegrating vectors is less than or equal to r. After estimating the α and β, then the Johansen method allows the inclusion of possible linear restrictions, as this will allow testing for specific hypotheses regarding various economic theories and predictions. Thus, the last action of the Johansen method is to test for linear restrictions in the cointegrating vector (Brooks 2002).

4.4.4 Vector error correction model (VECM)

With the detection of an existence of cointegration in the VAR, estimation of the VECM can take place. This model shows both long run equilibrium and short run dynamics. The dynamics can be estimated by using the following equation:

$$\Delta Y_t = \beta_1 \Delta X_t + \beta_2 (Y_{t-1} - \gamma_{xt-1}) + u_t \tag{4.23}$$

The coefficient that implies the long-run relationship between variables *X* and *Y* is *xt-1*, while the error correction term is $Y_{t-1} - \gamma_{xt-1}$. γ, where γ shows the long run relationship between *X* and *Y*, while β_1 shows the short-run erm relationship between the variables. According to the error correction model, variable *Y* must change between t-1 and t as an outcome of changes in the values of the dependent variable *X* between t-1 and t. Any change in variable *Y* will also be the reason for part correction to any disequilibrium at time t. The analysis of error correction is based on the examination of the coefficient of the error correction terms, corresponding to the first variable in the cointegrating equation (Mazenda 2012). To examine the relationship between cointegration and the error correction is to study the properties of the VAR model specified in

equation (4.11). To illustrate by using the bivariate model, the error correction model can be show by:

$$\begin{bmatrix}\Delta X_t \\ \Delta Y_t\end{bmatrix} = \begin{bmatrix}a_{10} \\ a_{20}\end{bmatrix} + \begin{bmatrix}a_{11}\ a_{12} \\ a_{21}\ a_{22}\end{bmatrix}\begin{bmatrix}\Delta X_{t-1} \\ \Delta Y_{t-1}\end{bmatrix} + \begin{bmatrix}\delta_1 \\ \delta_2\end{bmatrix}[y_{t-1} - \beta x_{t-1}] + \begin{bmatrix}\varepsilon_{xt} \\ \varepsilon_{yt}\end{bmatrix} \quad (4.24)$$

where both error terms ε_{xt} and ε_{yt} are white-noise disturbances and may be correlated. Short- and long-run of the two variables X_t and Y_t change in response to stochastic shocks represented by ε_{xt} and $\varepsilon_{yt,}$ and also in response of the deviation from the long-run equilibrium. The long-run equilibrium is achieved when $Y_{t-1}=\beta x_{t-1}$. The short-run adjustments are represented by δ_1 and δ_2, which interpret the speed of adjusted parameters.

4.4.5 Diagnostic tests

Diagnostic tests involve testing the obtained residuals from the VAR or VECM. These tests are employed to check for the behaviour of cointegrated variables in the model, and they also test the residuals to verify the statistical significance of the fitted regressed model. The tests carried out are normality, heteroscedasticity, autocorrelation and AR inverse roots. In order to formulate a robust and well explainetary model, all these tests are needed to assess the goodness of fit of the model. The diagnostic tests include the test for normality using the Jarque–Bera test, autocorrelation using the Lagrange multiplier (LM) test, White's heteroscedasticity test, and the AR inverse roots graph.

4.4.5.1 Jarque–Bera test

The Jarque–Bera test is a test for normality, which tests the sample data for skewness and kurtosis. Kurtosis is a measure of the peak of the probability of a variable, and skewness is a measure of the asymmetry of the probability distribution of the variable about its mean. The null hypothesis is that the data sampled is normally distributed, and the alternative hypothesis is the sampled data is not normally distributed (Jarque & Bera 1980). The Jarque–Bera test statistic is defined as:

$$JB = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right) \quad (4.25)$$

where N is the sample size, S denotes the skewness and K denotes the kurtosis. The null hypothesis of normality will be rejected if the test statistic is greater than the chi-squared value (Gel & Gastwirth 2008).

4.4.5.2 Autocorrelation Lagrange multiplier (LM) test

The LM tests the existence of autocorrelation also knows as serial correlationwhich happens when error terms are correlated and cross-signals at times in the regression model. The null hypothesis holds that there is no serial correlation of any order up to p. The lag order of the test is not the same as that of the regressed model. The test statistic for the chosen lag order (m) is computed by running an auxiliary regression of the residuals (t μ) on the original right-hand explanatory variables and the lagged residuals (t−m μ).

4.4.5.3 White heteroscedasticity test

The present study used the popular test for heteroscedasticity, viz. the White test (1980). This test is regarded as popular when compared to other heteroscedasticity tests, where it takes a few assumptions into consideration. The test for heteroscedasticity assumes that the regressed model is linear and that the variance of the errors is constant across observations. The null hypothesis for the White test is homoscedasticity, where rejection of the null hypothesis indicates heteroscedasticity. After residuals have been obtained from the regression model, they are tested for regressed and for joint significance of the regression.

4.4.5.4 Inverted AR roots graph

The AR roots graph reports the inverse roots of the characteristics of the AR polynomial. The graph is a simple and important way to test the roots of the VAR or VECM model. The estimated VAR or VECM is stable if all roots have a modulus less than 1 and lie inside the unit circle. If any of the roots lies outside the circle, this shows that the VAR or VECM is not stable, which will make the forecast from the impulse response invalid and insignificant. After all the diagnostic tests, and with the assurance that the estimated model is valid and fit to explain the

relationship between variables, the impulse response and variance decomposition analysis can be performed.

4.4.6 Impulse response analysis

In macroeconomic modelling, impulse response analysis is used to describe how the economy reacts over time to exogenous impulses also known as shocks. Impulse response analyses trace out the responsiveness of the dependent variables in a VAR to shocks from each of the variables. Any shock or impulse to any of the variables does not only affect the variable, but also other endogenous variables. Therefore, reaction of the variables to the shocks will be observed by employing the impulse response analysis on the VECM, with the assumption that the model is stable.

Once again, in order to identify the impulse response it is necessary to impose a restriction on the model using the Cholesky decomposition. This will be done in way that a shock to a particular variable will affect that variable directly and will also be transmitted to other endogenous variables in the system.

4.4.7 Variance decomposition analysis

Useful forecasting information about the variables can be also be found by using the variance decomposition analysis method. Variance decomposition analysis is a measure of the proportion of the forecast error variance in a variable, which is explained by impulses or shocks in itself and other variables. Variance decomposition analysis shows the proportion of movements in the dependent variables that are due to their own shocks, against shocks to other variables.

4.5 Data analysis

The present study used annual time series data for the period 1970 to 2014. The data comprised secondary data collected from the World Bank, where verification of data was also done by comparing data from the primary source World Bank data with data from the SARB and Statistics South Africa (Stats SA). The three key sectors under investigation were industry, services and agriculture. The growth of these three sector is a division of the overall economic growth of South Africa.

In accordance to the database used, growth of the South African industry sector includes industries like manufacturing, mining, construction, electricity, water and gas. This sector makes the largest contribution to the South African GDP.

The services sector growth comprises of wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional and personal services, such as education, healthcare and real estate services. Also included are imputed bank service charges, import duties and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling (World Bank, 2015).

The agricultural sector growth includes forestry, hunting and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. This is usually the sector contributing the least among the three key sectors in South Africa.

FDI is the net inflows of investment to acquire a lasting management interest of 10 per cent or more of voting stock in an enterprise operating in an economy other than that of the investor. FDI is the sum of equity capital, reinvestment of earnings, other long-term capital and short-term capital as shown in the balance of payments (World Bank 2015). This series shows net inflows – that is, new investment inflows less disinvestment – in the reporting economy from foreign investors.

Gross capital formation, formerly known as gross domestic investment, is defined as outlays on additions to the fixed assets of the economy, plus net changes in the level of inventories. Fixed assets include land improvements, construction of roads, railways, hospitals, private residential dwellings, and commercial and industrial buildings.

Trade openness is a summation of exports and imports as a share of the GDP (World Bank 2015). Trade openness is usually used as a determinant variable of economic growth to show that open economies experience more growth than closed economies.

According to the World Bank, the real effect exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs (World Bank 2015).

Inflation as measured by the consumer price index (2010=100) reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (World Bank 2015). All data defined above is measured in real terms and the local currency (ZAR), and all data is expressed in natural logarithm, except for FDI variable as it contains negative values.

4.6 Conclusion

This chapter explicated the theoretical framework and methodology adopted in the present study. The chapter started with the theoretical framework adopted by the study, and highlighted the intention to follow the theoretical framework suggested by Neuhaus (2006), who developed the new FDI-growth model to show the effect of FDI through human capital on the economic growth of the recipient country. The present study followed the theoretical framework suggested by Neuhaus (2006) in the estimation of the three models, that show the effect FDI has on sectoral growth in South Africa. Given that sectors differ, the effect of FDI inflows cannot be treated as homogenous across all sectors. Furthermore, the chapter reported on the empirical methodology used in the study, starting with the explanation of unit root in macroeconomic data, and the way in which it is tested by using to famous augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. Following this, the construction of an unrestricted VAR and the Johansen cointegration method were discussed.

Using cointegration, the VECM model was analysed. Following the VECM, a brief discussion of diagnostic tests was presented. For the purposes of forecasting, and to assess the reaction of variables to shocks, a discussion on the variance decomposition and impulse response analyses were presented in 4..4.6 and 4.4.7. The last part of the chapter put forward analysis on the data employed in the three models, where the variables were cautiously selected in accordance to existing literature.

CHAPTER FIVE:

ESTIMATIONS AND ANALYSIS OF RESULTS

5.1 Introduction

The first section of this chapter presents discussions of all estimated results and findings from different tests. The second section of the chapter presents analyses of the results from the augmented Dickey–Fuller and Phillips–Peron tests for unit root in the variables. The third section presents the VAR and cointegration results from the Johansen cointegration test, carried out from the estimated VAR to show the long-term relationship among the selected variables. Results from analyses of the diagnostic tests executed on the VAR are also presented, in order to check for stability and normality. Section four presents an analysis of the long-term and short-term dynamics from the VECM, and section five presents the results of the impulse response analysis, and lastly, the forecasted results from variance decomposition.

5.2 Unit root tests

The present study followed the unit root test procedure discussed in the previous chapter. The first step to check for an indication of unit root is to use the graphical plots of variables. Graphical plots of variables are presented in Appendix A5. The graphs show a trend, suggesting the existence of unit root. Although the graphical method cannot be relied upon to check for unit root because of its limitations, the augmented Dicky–Fuller (ADF) and Philips–Peron (PP) tests were performed to investigate unit root in the series further. The results of the augmented Dicky–Fuller and Philips–Peron tests are reported below in Table 5.1. Both tests were carried out at levels with intercept, trend and intercept and neither intercept nor trend. The automatic lag selection by Swarz info criterion was 9.

Table 5.1: Unit root results

Variable	Model	ADF at level	PP at level
ln_igdp	Intercept	-1.838	-1.551
	Trend and intercept	-5.476*	-5.476*
	None	2.120**	1.977**
ln_sgdp	Intercept	0.100	-0.110

	Trend and intercept	-1.588	-1.374
	None	3.341*	7.724*
ln_agdp	Intercept	-0.899	-0.903
	Trend and intercept	-1.945	-2.076
	None	3.326*	3.267*
fdi	Intercept	0.611	-3.604*
	Trend and intercept	-5.610*	-5.582*
	None	1.438	-2.848*
ln_gcf	Intercept	0.320	0.018
	Trend and intercept	-0.966	-1.071
	None	1.904***	2.200**
ln_open	Intercept	-0.663	-0.902
	Trend and intercept	-2.073	-2.073
	None	-0.445	-0.447
ln_reer	Intercept	-0.934	-0.872
	Trend and intercept	-3.530**	-2.782
	None	-0.807	-0.983
ln_inf	Intercept	-2.541	-2.513
	Trend and intercept	-3.567**	-3.486***
	None	-0.410	-0.182

Source: Author's calculations from Eviews
*Note: *(**)[***] Significant at a 1(5)[10] % level*
Critical values at 1(5)[10]% are with intercept -3.588(-2.923)[-2.603], with trend and intercept -4.181(-3.516)[-3.188], and with neither trend nor intercept -2.619(-1.948)[-1.612].

Results from Table 5.1 show that most variables were not stationary at level. Therefore, cointegration can be performed to investigate the long-run relationship between variables.

5.3 VAR and cointegration analysis

In order to establish a long-term relationship among variables, the Johansen cointegration approach was followed. For the procedure to be carried out there was a need to determine the optimal lag length of the VAR. Various information criteria were used to determine the

maximum optimal lag length. In this study, three models were estimated for the agricultural, industry and services sector to establish the effect of FDI inflows on sectoral growth of South Africa. The Johansen cointegration test requires an estimation of VAR equation. The estimated VARs are presented in Appendix A5.1.2, A5.2.2, and A5.3.2 for three sector models. In the agricultural model, variables ln_agdp, fdi, ln_gcf, ln_open, ln_reer, and ln_inf are entered as endogenous variables, and a dummy variable as an exogenous variable, to account for structural breaks in the variables. In the industry model, all variables are entered as endogenous variables, while in the services model, there is an inclusion of the dummy variable as an exogenous variable.

5.3.1 Diagnostic tests

Diagnostic tests were carried out on the residuals to check the validity of the VAR. These tests were performed to validate that the fitted model was reliable and fit. To avoid biased results, the model had to be tested for serial correlation, heteroscedasticity, normality and stability. The four tests performed were White's heteroscedasticity test, Jarque–Bera's normality test, the Lagrange multiplier (LM) test and the stability test. Results from the three tests are reported in Table 5.2 below and the stability AR graphs are presented in the appendices (see Appendix A5.1.2.4, A5.2.2.4, A5.3.2.4):

Table 5.2: Diagnostic tests results

Test	Null hypothesis	Model	DF	t-statistic	Probability
LM test	No serial correlation	Agriculture industry services	36 36 36	46.55 46.91 42.93	0.15 0.11 0.20
Jarque–Bera	There is normal distribution	Agriculture industry services	12 12 12	269.38 27.27 368.90	0.0 0.0 0.0
White test	No conditional heteroscedasticity	Agriculture industry services	273 294 273	299.55 320.35 307.41	0.12 0.14 0.07

All three sectoral models were tested. The Lagrange multiplier (LM) test was used to test for serial correlation. The results from the test showed that at lag 12, there was no serial correlation in the estimated VARs. Since the probability was more than 0.10, we failed to reject the null hypothesis of no serial correlation. The Jarque–Bera test showed that residuals were not normally

distributed. This stemmed from the evidence that the p-values were low and equal to zero, with very high test statistics and, therefore, the residuals were not normally distributed and the null was rejected. However, Harris (1995) argues that non-normality is not a problem, as some variables are weakly exogenous. In the case of the three estimated models, the weakly exogenous variables were FDI, OPEN and REER.

The third test was the White (1980) test for heteroscedasticity with no cross-terms. All three models satisfied that the residuals were linear and that the variance of the errors was constant across observations. The p-values were acceptable over 0.05; therefore, we failed to reject the null. The last diagnostic test was the AR roots graph, where the three graphs showed that the eigenvalues existed inside the circles, and none lay outside the circle (see Appendix A5.1.2.4, A5.2.2.4, A5.3.2.4). It can be concluded from the stability check that the specified VARs were both stable and well specified. However, based on the above diagnostic tests of the VAR, cointegration was carried out to check for a long-term relationship among the variables. The Johansen cointegration results are reported and analysed in Table 5.2 below.

5.3.2 Johansen cointegration test results

Following the Johansen cointegration procedure, a long-run relationship among variables was tested from the estimated VARs of the three sectors. A summary of results of the cointegration tests are reported in Table 5.3, 5.4, and 5.5.

Table 5.3: Agriculture sector cointegration results

Null hypothesis H0	Alternative H1	Trace statistics	0.05% critical value	Max-Eigen statistics	0.05% critical values
R=0	R≤1	122.39*	95.75	46.84*	40.08
R≤1	R≤2	75.55*	69.82	30.94	33.88
R≤2	R≤3	44.61	47.86	28.36	27.58
R≤3	R≤4	16.24	29.80	11.68	21.13
R≤4	R≤5	4.5	15.49	4.26	14.26
R≤5	R≤6	0.31	3.84	0.30	3.84

Source: Author's calculations from Eviews 8.

** denotes rejection of the hypothesis at the 0.05 level*

Table 5.4: Industry sector cointegration results

Null hypothesis H0	Alternative H1	Trace statistics	0.05% critical value	Max-Eigen statistics	0.05% critical values
R=0	R≤1	104.99*	95.75	41.67*	40.08
R≤1	R≤2	63.29	69.82	28.39	33.88
R≤2	R≤3	34.89	47.86	17.43	27.58
R≤3	R≤4	17.46	29.80	10.03	21.13
R≤4	R≤5	7.43	15.49	7.40	14.26
R≤5	R≤6	0.03	3.84	0.03	3.84

Source: Author's calculations from Eviews 8.
** denotes rejection of the hypothesis at the 0.05 level*

Table 5.5: Services sector cointegration results

Null hypothesis H0	Alternative H1	Trace statistics	0.05% critical value	Max-Eigen statistics	0.05% critical values
R=0	R≤1	122.71*	95.75	51.17*	40.08
R≤1	R≤2	71.54*	69.82	30.03	33.88
R≤2	R≤3	41.51	47.86	24.10	27.58
R≤3	R≤4	17.41	29.80	12.59	21.13
R≤4	R≤5	4.81	15.49	4.68	14.26
R≤5	R≤6	0.14	3.84	0.14	3.84

Source: Author's calculations from Eviews 8.
** Denotes rejection of the hypothesis at the 0.05 level*

A summary of the cointegration results from the tables shows that cointegration was found among the variables in all sectors, which means that there was a long-term relationship among them. All three models indicated a linear deterministic trend, and were estimated under the assumption that there was intercept but no trend in the cointegrating equation in the VAR. The Johansen cointegration test used both the trace and Max-Eigen test statistics. These two test statistics can yield different numbers of cointegration among variables.

The agricultural and services models showed two cointegrating equations from the trace statistic and one cointegrating equation from the Max-Eigen statistics. The industry model showed one cointegrating equation from each of the trace and Max-Eigen statistics. With the complexity of explaining multiple cointegrating equations, this study adopted the Max-Eigen value statistics to estimate the VECM, since it has a more precise alternative hypothesis that pinned down the number of cointegrating vectors (Enders 2004). For this reason, it can be concluded that there was a long-term relationship among the variables, and the VECM model could be estimated to detect the long-term and short-term dynamics of these variables.

5.4 Long-run VECM results

The VECM model was specified after detecting the cointegration among variables. It specified the long- and short-run relationships, and used the coefficients to show the long-run effect among variables. In order to ensure convergence was achieved after iterations, cointegration restrictions were imposed to the parameter matrices as presented in equations 5.1 to 5.3.. With the adoption of one cointegrating equation, at least one restriction had to be imposed on the long run parameter. Therefore, the dependent variables (ln_agdp, ln_igdp, and ln_sgdp) were restricted to 1. The agriculture model had three restrictions $[\delta(1,1)=1, \chi(3,1)=0, \chi(5,1)=0]$, one in the long -run and two in the short-run. The services model also had three cointegrating restrictions $[\delta(1,1)=1, \chi(4,1)=0, \chi(5,1)=0]$. The industry model had four restrictions $[\delta(1,1)=1, \chi(3,1)=0, \chi(4,1)=0, \chi(5,1)=0]$. All the restrictions in the three models were binding, and satisfied the identification rank condition. The restrictions on the speed of adjustment (short-run) coefficients were the result of the insignificance effect the variables had on the short-run adjustments. The restrictions can be put in a matrix as follows:

$$\emptyset X_{t-1} = \chi\delta' X_{t-1} = \begin{bmatrix} \chi_{11} \\ \chi_{21} \\ 0 \\ \chi_{41} \\ 0 \\ \chi_{61} \end{bmatrix} = [1\ \delta_{21}\delta_{31}\delta_{41}\delta_{51}\delta_{61}] \begin{bmatrix} \ln\_agdp_{t-1} \\ FDI_{t-1} \\ \ln\_gcf_{t-1} \\ \ln\_open_{t-1} \\ \ln\_reer_{t-1} \\ \ln\_inf_{t-1} \end{bmatrix} \qquad (5.1)$$

$$\emptyset X_{t-1} = \chi\delta' X_{t-1} = \begin{bmatrix} \chi_{11} \\ \chi_{21} \\ \chi_{31} \\ 0 \\ 0 \\ \chi_{61} \end{bmatrix} = [1\ \delta_{21}\delta_{31}\delta_{41}\delta_{51}\delta_{61}] \begin{bmatrix} \ln\_igdp_{t-1} \\ FDI_{t-1} \\ \ln\_gcf_{t-1} \\ \ln\_open_{t-1} \\ \ln\_reer_{t-1} \\ \ln\_inf_{t-1} \end{bmatrix} \quad (5.2)$$

$$\emptyset X_{t-1} = \chi\delta' X_{t-1} = \begin{bmatrix} \chi_{11} \\ \chi_{21} \\ 0 \\ 0 \\ 0 \\ \chi_{61} \end{bmatrix} = [1\ \delta_{21}\delta_{31}\delta_{41}\delta_{51}\delta_{61}] \begin{bmatrix} \ln\_sgdp_{t-1} \\ FDI_{t-1} \\ \ln\_gcf_{t-1} \\ \ln\_open_{t-1} \\ \ln\_reer_{t-1} \\ \ln\_inf_{t-1} \end{bmatrix} \quad (5.3)$$

A summary of the long-run parameters is reported in Tables 5.6, 5.7, and 5.8.

Table 5.6: Agriculture normalised long-run estimates

Dependent variable is ln_agdp	
Independent variables	Coefficient
C	11.89
fdi	-2.63E-11 (-5.22)
ln_gcf	0.94 (3.26)
ln_open	1.58 (2.43)
ln_reer	-2.62 (-7.21)
ln_inf	0.88 (6.24)

Source: Author's calculations from Eviews 8

Long-run estimates of the agricultural sector showed that FDI had a negative long-run relationship with the growth of the agriculture sector. The result showed that R1 billion (translated from -2.63E-11) units increase in FDI, decrease the agricultural GDP by 0.03 per cent. Empirical studies found that FDI tended to be insignificant for the growth of agriculture, because FDI inflows had little spillover potential for the sector. Theories on the relationship between FDI and growth are usually formulated for the manufacturing industry (Alfaro 2004). On the other hand, an increase of 1 per cent in gross fixed capital formation (domestic investment) would increase the sector's GDP by 0.94 per cent. This is a significant effect on the

agriculture sector, as it relies on the input of land; therefore, the development and purchase of land can grow the output of the sector. South Africa is committed to trade agreements with countries like the United States in exporting their agricultural products; therefore, the development of the agriculture sector is important.

Empirical evidence has shown that open economies will experience higher economic growth than closed economies. The results for the long -run showed that a percentage increase in the rate of openness would increase the GDP of the agriculture sector by 1.58 per cent. South Africa has seen significant growth in trade after 1994. The country exports agricultural products like fruits, wool, cotton, grain and more to countries like the United Kingdom, the Netherlands and Zimbabwe. These are the top three countries to which South Africa exports its products. Results show that the real effective exchange rate has a negative long-run relationship with growth of the agriculture sector. An increase of 1 per cent in the real effective exchange rate (real depreciation of the ZAR) will decrease the growth in the sector by 2.62 per cent in the long-run. A strong currency may reduce export competiveness of the sector, but would increase the value for money when importing goods and services. The long-standing Balassa–Samuelson hypothesis by Balassa (1964) and Samuelson (1964) individually argued that there is a positive relationship with the appreciation of the real effective exchange rate and economic growth. Many empirical studies, such as Kalyoncu et al. (2008) concur with the hypothesis that depreciation has a negative effect on output and employment.

Further to this, the results of the VECM depicted that agriculture growth had a long-run significant relationship with inflation. In contradiction of inflation relative to growth theories, some evidence has found that high inflation could be positive for economic growth. Keynes (1935), however, claims that some inflation is necessary to prevent the paradox of thrift in the economy, meaning that when consumers' income rises, their savings may rise faster than will consumption, and that will decrease the aggregate demand and eventually economic growth. Since output in the agricultural sector is seasonal, short-run disturbances will mostly determine the supply curve in the sector. Therefore, farmers may be attracted to produce more output as prices increase. Given this, the results indicate that an increase of 1 per cent in inflation could lead to an increase of 0.88 per cent in the GDP of the sector.

Table 5.7: Industry normalised longrun estimates

Dependent variable is ln_igdp	
Independent variables	Coefficient
C	20.60
fdi	1.11E-11 (6.26)
ln_gcf	0.15 (1.78)
ln_open	-0.93 (-3.68)
ln_reer	0.50 (2.99)
ln_inf	-0.25 (-3.55)

Source: Author's calculations from Eviews 8.

Results from Table 5.7 above for the industry sector model reported that FDI had a significant long-run relationship with the GDP of the sector, implying that a R1 billion unit increase in FDI would increase the industry GDP by 0.011 per cent. South Africa has seen growth in the automobile industry, one of the largest industries to contribute to the GDP. Most of these car manufacturers are multinationals like Volkswagen, BMW and Peugeot. Therefore, FDI has played a positive role in the growth of the industry sector. A domestic investment increase of 1 per cent would cause a 0.15 per cent increase in the GDP of the industry sector. The implication of this positive effect is imperative for the industry sector. Improvement and purchase of equipment, land and construction of roads is important to the development and growth of the industry sector.

In contrast to empirical literature, the rate of openness has a negative effect on the GDP of industry. This shows that an increase of about 1 per cent in the level of openness would result in a decrease of about 0.93 per cent in the level of the GDP. However, evidence has shown that trade provides growth opportunities but also exposes them to external shocks. Rodrik (1997) argues that open economies are subject to external shocks and they are vulnerable to output volatility. Rodrik further notes that most open economies have large governments that are able to handle the shocks, but that this might not work for developing economies.

Real effective exchange rate had a positive effect according to the long-run results, showing that an increase of 1 per cent would cause an increase of 0.5 per cent in the GDP of the industry

sector. The depreciation of the rand has a positive effect in growing the economy of the industry sector. The industry sector will export more and show increased competitiveness with other countries. Alternatively, the deprecation of the rand increases the cost of imports, and also increases input cost of locally produced goods that depend on imported inputs. Therefore, the relationship between real effect exchange rate and growth can be either positive or negative.

Inflation proved to have a negative effect on the sector in the long-run, by showing results of a percentage increase to cause a decrease in the GDP of the industry sector by 0.25 per cent. Unstable and high inflation declines business confidence of a country, as businesses cannot be sure what their product prices and costs will be, due to the volatile inflation. In addition to this, foreign investors will be discouraged when trying to find a new market and finding that prices will be high; thus, both domestic and foreign manufacturers will have less competitive advantage. South Africa has set out an inflation targeting strategy as part of their monetary policy tool, to target inflation between 3 and 6 per cent. The inflation targeting strategy has been successful in keeping the inflation rate in target for the past few years, and therefore it is best to keep inflation low and positive for the economy. The industry sector is the second largest sector in South Africa that depends on export and imports, as well as multinationals. Growing business confidence in the sector requires the sector to be kept healthy for more growth, which is necessary for keeping key macroeconomic variables in place.

Table 5.8: Services normalised long-run estimates

Dependent variable is ln_sgdp	
Independent variables	Coefficient
C	12.91
fdi	1.43E-11 (6.10)
ln_gcf	0.46 (4.32)
ln_open	-1.23 (-3.73)
ln_reer	0.50 (2.34)
ln_inf	-0.42 (-4.80)

Source Author's calculations from Eviews 8.

Results for the services sector indicated that FDI had a significant long-run effect on the GDP of the services sector. Results showed that R1 billion units increase in FDI would increase the GDP of the services sector by 0.014 per cent. The benefit of FDI in the services sector has been positive for the country, since the South African economy started to move away from the primary sector towards the tertiary sector. This sector is also the largest recipient of FDI among all three key sectors in South Africa, as FDI has caused a spillover of managerial skills and technology to the services sector. Services offered by the services sector play a role as inputs in both the industry and agriculture sectors. Therefore, the increase in FDI in the services sector will not only benefit the growth of the services sector, but will spill over to the other sectors too.

An increase of 1 per cent in domestic investment will cause a 0.46 per cent increase in the GDP of the services sector. An economy uses accumulated capital stock together with labour force to provide goods and services, and increase production. Therefore, an increase in gross fixed capital formation will grow the services sector by increasing national income, and ultimately economic growth. Further to this, the results from the long-run estimates showed that trade openness had a negative relationship with the growth of the services sector. The results indicate that a 1 per cent increase would decrease the sector's GDP by 1.23 per cent. The results are not supported by theory that trade openness leads to an increase in growth. However, results like this can mean that trade openness will not benefit the services sector in the long-run.

Real effective exchange rate has a positive effect according to the long-run results. This entails that 1 per cent increase in real exchange rate will cause an increase of 0.5 per cent in the sector's GDP. Currency depreciation works well for exports, as they will increase and induce growth. Inflation shows a negative effect on the long-run GDP for the sector. An increase of 1 per cent in inflation would cause a decrease of 0.42 per cent in the GDP of the service sector. High inflation is not ideal for growth in the services sector, where an increase in prices will lead to less demand for services.

In consolidation of the long-run estimates, FDI attested to have a positive relationship with sectoral growth for industry and services. However, FDI had a negative long-run effect on agricultural growth, which is similar to empirical studies that found the effect of FDI on agricultural sector to be insignificant. Developing economies have started to rely less on the primary sector, and are moving to the secondary and tertiary sectors as a base for economic

growth. Theory states that FDI would have a positive effect on growth, but Alfaro (2003) states that this differs from sector to sector, and most empirical studies found that FDI has little or no effect on agricultural growth. However, the positive effect of FDI on industry and services growth shows that foreign investors are moving their motive to invest from resource seeking to market seeking. Industry and services proved to have bigger markets in the economy by growing faster than the agriculture sector over the years. The speed of adjustment (short-run estimates) coefficients are presented in Table 5.9 below.

Table 5.9: Speed adjustment and short-run results

Agriculture model		**Industry model**		**Services model**	
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
ln_agdp	-0.05 (-1.49)	ln_igdp	-0.03 (-1.61)	ln_sgdp	-0.02 (-1.12)
fdi	-1.23 (-1.59)	fdi	1.16 (5.15)	fdi	6.69 (3.97)
ln_gcf	0	ln_gcf	0	ln_gcf	-0.00 (-0.04)
ln_open	0	ln_open	0	ln_open	0
ln_reer	-0.04 (-1.66)	ln_reer	0	ln_reer	0
ln_inf	0.36 (4.14)	ln_inf	-0.47 (-1.37)	ln_inf	-0.68 (-3.11)

Source: Author's calculations from Eviews 8.

The purpose of speed adjustment is to show the dynamic adjustment of the variables towards the long-run equilibrium. In the present study, restrictions were imposed on the short-run adjustment coefficients based on their significance effect in the long-run adjustments. The agriculture model showed that GDP would be corrected by about five per cent per year, so as to restore equilibrium. The negative sign in the table above shows that GDP will move closer towards equilibrium. The industry and service GDP would be corrected by three and two per cent per year, respectively. All speed adjustments are significant, with the negative t-values. Short-run restrictions were imposed on variables that were taken to have an insignificant effect on growth in the short run. FDI has a positive significant relationship with sector GDP in the industry and services, but has a negative effect on the agriculture sector GDP. A similar case as in the long-

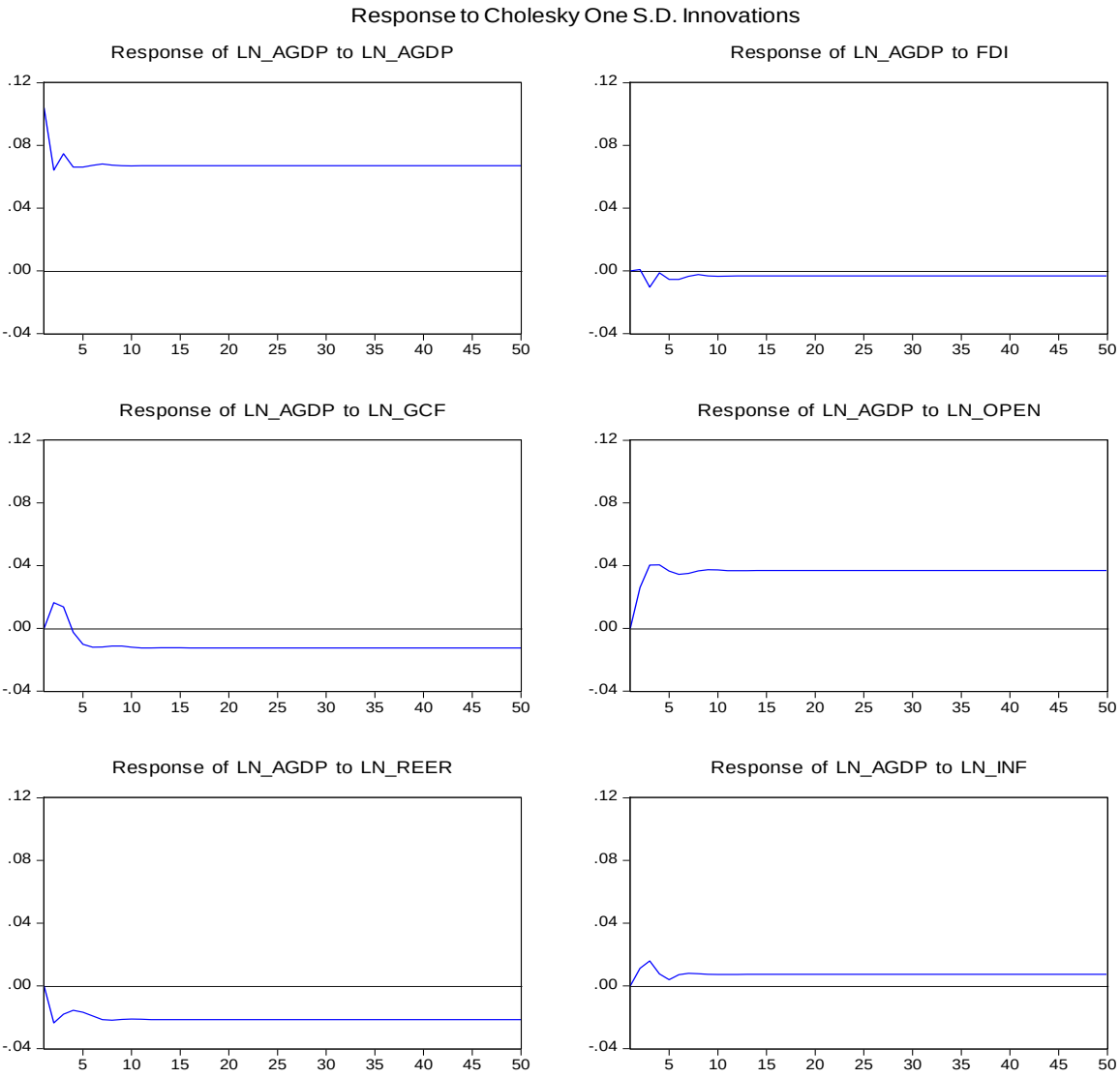
run, it was evident from results of the short run that FDI had a significant effect on the agriculture GDP, but it had a negative effect on the industry and services sector.

5.5 Impulse response analysis

The intention of the present study was to investigate the effect that FDI inflow had on sectoral GDP in South Africa at the time of the research. The impulse response was conducted to see how GDP in the three sectors reacted to shocks from the dependent variables. Only responses of the GDPs (agriculture, industry and services) to shocks from the independent variables are reported in Figures 5.1, 5.2 and 5.3. All impulse responses confirm the results from the short-run findings.

The period of the impulse response is 50 years. The impulse response results of the agricultural sector model (Figure 5.1 below) show that one period standard deviation (SD) shock on GDP had a positive permanent impact on itself by an average of 0.07 SD. The shock seems to start above 0.08 SD, then becomes less than 0.08 SD after the second year. Thereafter it proves to be steady throughout the entire period. FDI shock to agricultural GDP depicts a negative impact of less than 0.01 SD from the second year onwards. This is comparable to the long-run results. The possible explanation could be that economies – including South Africa – are moving towards secondary and tertiary sectors for more economic growth. This could prove what empirical studies have put out, namely that FDI does not really have any effect on the growth of the agricultural sector. Domestic investment shock reports a positive response of almost 0.01 SD for the first three periods, and declines to a negative of about 0.01 SD from the fourth year onward. Openness and inflation shocks have a permanent positive effect on agriculture GDP. Trade openness works well for the agricultural sector, as it is one of the objectives of South Africa to attract international investors to the country's agricultural, forestry and fisheries products. However, real exchange rates have a permanent negative effect on agriculture GDP over the entire period. One period SD shock on agriculture GDP from inflation results in a positive steady response of 0.02 SD from the second period, but then falls to 0.01 SD for the rest of the period.

Figure 5.1 Agriculture impulse responses

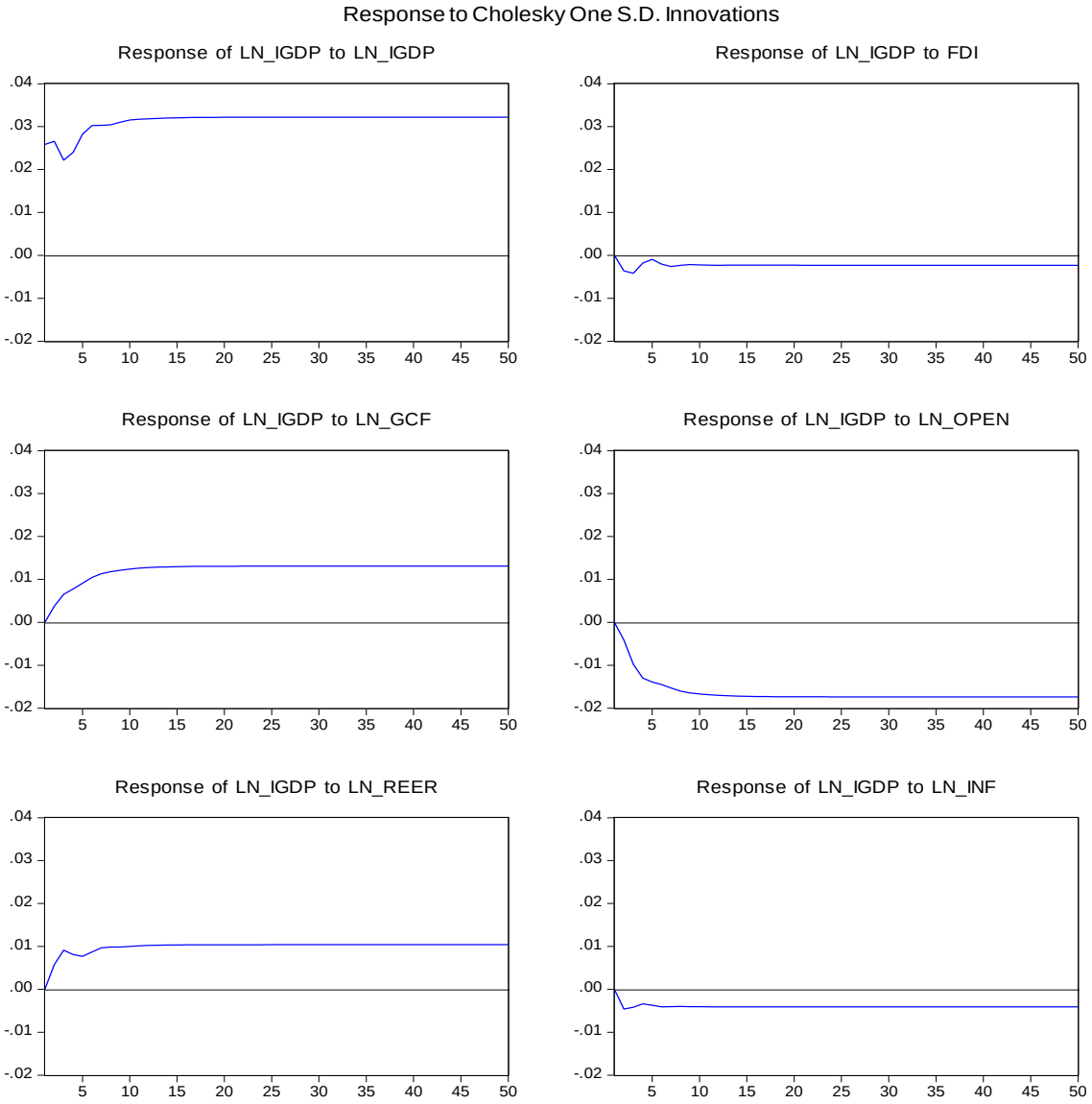


Source: *Author's own compilation using Eviews*

The impulse response from the industry model (Figure 5.2 below) depicts that one period SD shock on industry GDP had a positive and permanent effect on itself by over 0.02 SD over the 50-year period. As the industry sector is the biggest sector in South Africa, the significant response is not surprising, as the industry sector contributes most to the GDP. FDI shock has a negative response on industry GDP of less than 0.01 SD. This contradicts the long-run adjustments results, which say that FDI will impact the GDP in the industry sector positively.

Domestic investment and the real exchange rate have a positive and permanent effect on industry GDP over the entire period. One period shock in domestic investment has an enduring positive effect on industry GDP with a little over 1 SD. Openness, however, negatively affects industry GDP, with 0.02 SD over the 50-year period. One period SD shock on industry GDP from inflation results in a negative permanent response of less than 1 SD, starting from the first year.

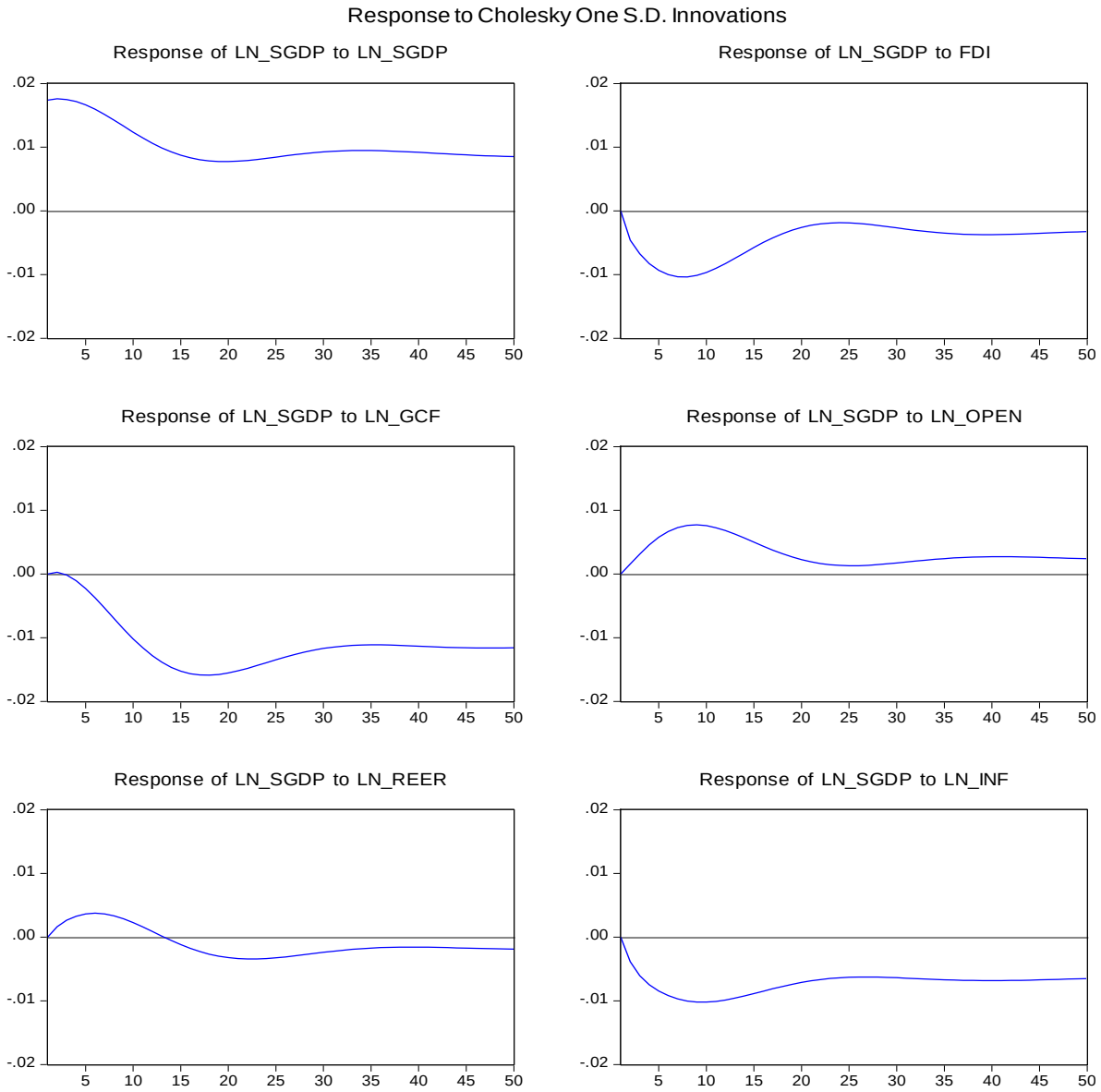
Figure 5.2 Industry impulse responses



Source: *Author's own compilation using Eviews*

The services sector results are presented below in Table 5.3. The results show that services GDP responds positively to itself. It begins at 1.8 SD, and declines to less than 0.01 SD after 15 years, becoming steady throughout the period. In contradiction to the long-run results, FDI negatively impacts on service GDP negatively, with negative 0.01 SD from year 8 and picks up to negative 0.002 SD from the 20th year. Domestic investment shock is reported to cause a negative response from service GDP over the period. Declining from 0 to almost -0.02 SD after 17 years, it becomes steady at -0.015. A SD shock in openness has a positive effect on the service GDP, rising from 0 to almost 0.01 SD, until the 7th year, and then starts to decline to 0.002 SD going forward. Service GDP has mixed responses to a one period shock in real exchange rate. It starts with positive responses, and then becomes negative from the 14th year. Lastly, inflation has a negative and permanent effect on service GDP over the entire period.

Figure 5.3 Services impulse responses



Source: *Author's own compilation using Eviews*

5.6 Variance decomposition

Variance decomposition is an analysis that provides a way of assessing the significance of shocks on variables. It shows the proportion of the variable movements in a sequence from shocks from itself and shocks from other variables. The results of the variance decomposition can be found in Tables 5.10, 5.11 and 5.12 below. The results show the proportion of the forecast

error variance in the sectoral GDP being described by its own shocks and shocks from independent variables.

Table 5.10: Agriculture variance decomposition

Period	S.E.	LN_AGDP	FDI	LN_GCF	LN_OPEN	LN_REER	LN_INF
1	0.104036	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.128768	90.17338	0.004523	1.620819	4.094008	3.356247	0.751022
3	0.157036	83.23437	0.444154	1.851948	9.347110	3.584093	1.538328
4	0.176044	80.35837	0.358789	1.494227	12.73390	3.640396	1.414323
5	0.192714	78.83486	0.379446	1.526873	14.23236	3.803699	1.222770
6	0.208464	77.81233	0.392581	1.634788	14.89929	4.100587	1.160425
7	0.223655	76.90434	0.365090	1.705329	15.39816	4.489363	1.137726
8	0.237868	76.02313	0.332728	1.730533	15.98441	4.817122	1.112081
9	0.251245	75.25709	0.315181	1.750685	16.54640	5.046609	1.084037
10	0.263910	74.64404	0.303733	1.792844	16.98631	5.213643	1.059430

The variance decomposition is for a period of 10 years. In the agriculture model, agriculture GDP explains 74 per cent of itself after a period of 10 years. In accordance to the impulse response, it is evident that FDI explains less than 1 per cent of the sector's GDP over the 10-year period. This is similar to the impulse response results that show FDI has very little effect on agriculture GDP. Domestic investment explains 1.79 per cent of agriculture GDP over the 10-year, period. Openness exerts about 17 per cent, making it the most significant variable that explains the variations in agriculture GDP. This means that trade openness proves to be a significant determinant to the agriculture growth. All independent variables combined explain about 21 per cent of the forecast error variance. The most significant explanatory variable is the real exchange rate recording explaining about 5 per cent over the 10-year period. It starts at 3 per cent, and gradually rises to 5 per cent. Inflation explains the variance of agriculture GDP by 1 per cent throughout the period of 10 years.

Table 5.11: Industry variance decomposition

Period	S.E.	LN_IGDP	FDI	LN_GCF	LN_OPEN	LN_REER	LN_INF
1	0.025857	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.038407	93.28933	0.900442	0.961603	1.164351	2.248123	1.436155
3	0.047152	84.04008	1.389851	2.545396	5.060270	5.221119	1.743287
4	0.055745	78.63847	1.100429	3.765131	9.027142	5.853254	1.615574
5	0.065239	76.18257	0.824127	4.696408	11.13696	5.658945	1.500988
6	0.074743	74.39996	0.703927	5.535520	12.25092	5.669856	1.439822
7	0.083574	72.65232	0.659981	6.274461	13.15379	5.873325	1.386124
8	0.091803	71.21577	0.610556	6.853967	13.95592	6.026015	1.337766

9	0.099636	70.16315	0.564160	7.297754	14.58053	6.096238	1.298166
10	0.107120	69.36331	0.530741	7.655386	15.04093	6.143234	1.266399

According to the results from Table 5.11, the industry model's variance decomposition shows that industry GDP explains 69 per cent of itself. As in the agriculture model, openness contributes a large portion of about 15 per cent forecasts error variance to industry GDP. FDI is significantly low in the industry model, by only explaining less than a percentage to the variation of industry GDP. Openness explains about 15 per cent of variation in industry GDP. This is close to the variation it causes to agriculture GDP. Domestic investment explains 7 per cent, while the real exchange rate explains 6 per cent of the variations in industry GDP. The results suggest that domestic investment and the real exchange rate variance decomposition play a significant role in forecasting the growth of the industry sector. Inflation explains 1 per cent over the whole period of 10 years. This is similar to the variance decomposition of inflation from agriculture sector.

Table 5.12: Services variance decomposition

Period	S.E.	LN_SGDP	FDI	LN_GCF	LN_OPEN	LN_REER	LN_INF
1	0.017382	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.025556	93.64904	3.264240	0.012936	0.379283	0.406492	2.288011
3	0.032524	86.70834	6.314396	0.009909	1.160952	0.919263	4.887141
4	0.038856	80.27805	8.975784	0.078218	2.195509	1.359713	7.112728
5	0.044695	74.55661	11.15087	0.318013	3.321838	1.693611	8.959064
6	0.050099	69.49122	12.87253	0.811541	4.419201	1.911638	10.49387
7	0.055097	65.01009	14.17249	1.614194	5.407249	2.019706	11.77627
8	0.059709	61.04131	15.08737	2.752252	6.239537	2.033289	12.84624
9	0.063961	57.51876	15.65837	4.223816	6.895029	1.973875	13.73015
10	0.067881	54.38401	15.93135	6.001501	7.371028	1.865548	14.44656

In the service model, service GDP only explains itself by 54 per cent over the 10-year period. All explanatory variables account for almost 46 per cent of the variations in the service GDP. FDI contributes a larger amount of the variance of about 16 per cent. This result shows that FDI plays an important role in forecasting future growth in the services sector compared to the agriculture and industry sectors. Domestic investment shows that, after ten years, about 6 per cent of service GDP forecasts error variations. Openness explains 7 per cent of the forecast error variances. Furthermore, changes in real exchange rate explain 1.86 per cent of the variation in service GDP.

Lastly, in the services model, inflation explains a significant 14 per cent of the forecast variation of service GDP.

5.7 Conclusion

This chapter reported the empirical results of the effect FDI has on growth of the agriculture, services and industry sector in South Africa. The chapter comprised eight sections. The chapter started with an analysis of the unit root test results of the augmented Dickey–Fuller and Phillips–Perron test. Both tests revealed that variables were not stationary at level, but became stationary at first difference.

Following the unit root tests, VAR models were estimated and diagnostic test were performed on them to check the fitness of the models. Diagnostic tests revealed that residuals of the estimated VARs were robust. The cointegration test was performed on the estimated VARs to find long-running relationships between the variables. The test showed that there was cointegration and that there was a long-run relationship among variables. With evidence that there is cointegration, the VECM was estimated to detect the short-run and long-run dynamics. According to the results, FDI seemed to have a positive effect on the services and industry sectors, but a negative effect on the agricultural sector. Thereafter, impulse response analysis and variance decomposition were performed. Most of the impulse response analysis results had the correct signs and confirmed the VECM results, whereas FDI explained a small percentage of growth in agriculture and industry, but a sizable and significant percentage in the services sector.

CHAPTER SIX:

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter provides the conclusion and policy recommendations of the study. The chapter offers a short summary of all the chapters included in the study. The second part will reflect a discussion of policy implications and recommendations from the results reached in the study. The last section will put forward limitations of the study and areas for further research.

6.2 Summary of the study

The purpose of this study was to investigate the effect of FDI in sectoral growth in South Africa for the period 1970–2014. The three key sectors included in the study were agriculture, industry and the services sector. The significance of investigating the effect of FDI on sectoral growth was that there limited studies have so far been conducted on the effect FDI inflows have on growth of different sectors in South Africa.

Trend analysis of FDI inflows showed that developing countries are increasingly attracting more FDI compared to developed countries. Africa's share of the global FDI inflows persists in a very low contribution compared to other regions. However, FDI inflows into South Africa has been increasing over the past 20 years, having its highest recordings in 2001 and 2008. Europe has been the number 1 country for FDI into South Africa for decades. Multinationals in South Africa are drawn to the services sector, more than other sectors.

This study used Neuhaus's (2006) new FDI-growth model as a blueprint to show the effect FDI has on economic growth on three sectors. The theoretical framework proved that FDI could affect economic growth through human capital. The study used econometric techniques to follow the Johansen approach to analyse the long-run and short-run effect of FDI on sectoral growth in South Africa. Unit root tests were performed using the augmented Dicky–Fuller and Philips–Peron tests, and variables were found not to be stationary at level. Variables became stationary after being differenced once. As the Johansen approach requires, three VAR equations were

estimated for agriculture, industry and the services. The Johansen cointegration test was performed on the estimated VARs to check for long-term relationships. Results established that there was a long-term relationship between variables. Cointegration restrictions were imposed on the parameter matrices to ensure convergence. The VECM models were specified for long-and short-run estimates after discovering cointegration among variables.

Results from the econometric analysis showed that, at the time of the research, FDI had a negative long-run relationship with growth of the agriculture sector. The results for industry sector revealed that FDI would increase growth in the sector. Growth of the services sector would increase when there is an increase in FDI in the long -run. Diagnostic tests performed on the estimated VARs proved the VARS to be stable and normal.

6.3 Policy implications and recommendations

The analysis of trends revealed that FDI inflows into South Africa had been growing slightly over the past two decades, and the inflows were mostly from the United Kingdom. At the time of the research, the top three recipients of FDI in the country were the financial, mining and manufacturing sectors. The trend analysis suggested that FDI in South Africa is moving away from being resource seeking to market and efficiency seeking. According to Dunning (1993), multinationals that engage in efficiency-oriented FDI tend to be experienced, large and diversified, which can be good for a developing country like South Africa to attract big investors. As is known, FDI has a different effect on the three key sectors of South Africa, where the analysis showed that multinationals have been drawn to sectors that possess large markets as well as potential for efficient production and logistics in South Africa, such as the services and industry sectors.

A number of empirical studies found that FDI inflows have an insignificant effect on the growth of the agriculture sector. Despite this, it is proclaimed that multinationals in the agriculture sector could contribute to enhancing export promotion. FDI and trade are known to be complements of each other; hence, an increase in FDI in a sector would induce export growth and employment in that sector. An increase in employment by attracting FDI in a sector would assist in reaching the first of the Millennium Development Goals (MDGs), in which South Africa took part with a

number of other nations in order to reduce poverty, amongst other goals. However, results from the present study concluded that FDI had an insignificant relationship with growth in the agriculture sector, both in the long run and the short-run. This can be attributed to the fact that the agriculture sector has less potential in gaining from what FDI offers to grow the economy, namely technology, and spillovers. FDI inflows into South Africa are mostly concentrated in the manufacturing and the services sectors. Nevertheless, the agriculture sector could benefit from the increase of FDI through the other sectors. Agro-processing subsector products are inputs in the manufacturing sector, where the growth of the agro-processing sector will be a positive growth for the agriculture sector.

On the other hand, a sector like industry would benefit substantially from an increase in FDI inflows. The industry sector is the second largest receiver of FDI in South Africa out of all three key sectors. Subsectors include manufacturing, mining, construction, electricity, water and gas. These subsectors have attracted Greenfield investments in abundance in the past years. The new endogenous growth model by Neuhaus (2006) states that FDI Greenfield investment could have a positive effect on growth through the transmission channel, by stating that foreign companies directly use new advanced production technologies, and if these new technologies are used in the intermediate production process of capital, they can improve the existing capital stock by increasing it or improving the quality of the capital in the host country. New, advanced technology for the industry sector would increase its economic growth.

The services sector is the number 1 recipient of FDI, not only in Africa, but also in South Africa. The growth in FDI inflows into the sector has played a role in making the sector to contribute more than 60 per cent towards the overall GDP for some time. In that regard, the sector's growth makes South Africa even more desirable to potential investors. Mergers and acquisitions like that between Barclays and Absa in 2012, was a big inflow, which elevated the services sector.

South Africa needs to keep robust bilateral investment treaties with the United Kingdom, since that country is the main source of FDI inflow into the country. Lowering taxes imposed on businesses and relaxing exchange rate regulations would encourage investors to invest in South Africa. As FDI flows into different sectors and has a different effect on the sectors, it is recommended to have incentives tailored for these different sectors. For now, South Africa has incentives offered in manufacturing and the film industry for foreign investors, a few of which

could be developed for other subsectors in the services sector, as it is the largest recipient of FDI. Existing multinationals need aftercare and reassurance to keep their investment in the country, so there can be less disinvestment and more FDI inflow across South African borders.

6.4 Limitations of the study and areas for further research

This study had limitations with respect to availability of recent data of sectoral FDI in South Africa, making recent trend analysis a challenge. Annual data on econometric estimations was therefore used rather than using quarterly data as it is more frequently reported than annual data. However, quarterly data was not available for some of the variables included in the study. Future research might investigate the effect of FDI stock in subsectors in the industry and services sectors, such as the telecommunications and manufacturing sectors.

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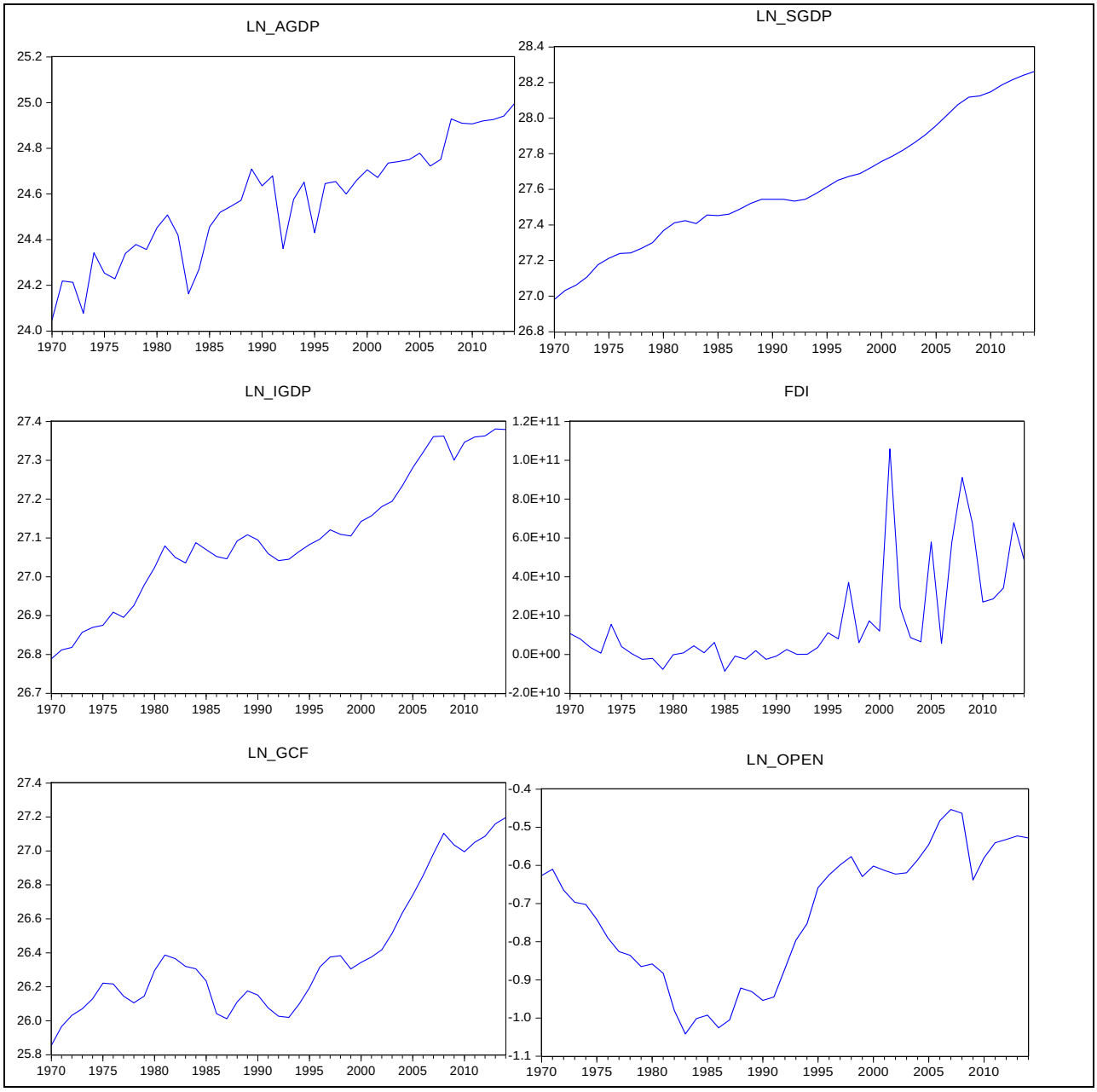
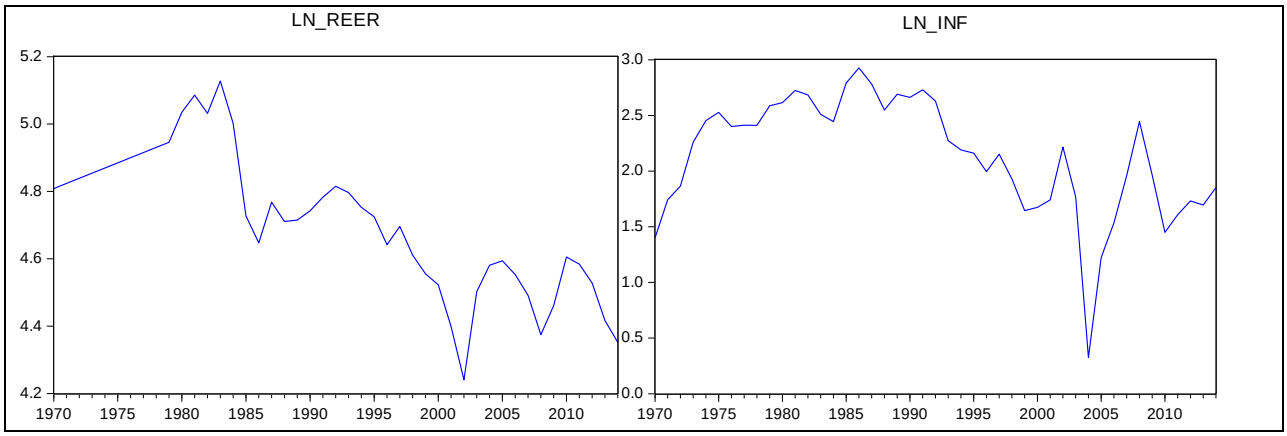
APPENDIX A: Econometric analysis

A5 Graphical Plots





A5.1 Agriculture Model

A5.1.1 VAR

Vector Autoregression Estimates
Date: 09/10/15 Time: 10:54
Sample (adjusted): 1971 2014
Included observations: 44 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LN_AGDP	FDI	LN_GCF	LN_OPEN
LN_AGDP(-1)	0.464524	2.39E+09	0.085390	0.074325
	(0.15258)	(2.8E+10)	(0.09720)	(0.06531)
	[3.04448]	[0.08479]	[0.87849]	[1.13809]
FDI(-1)	-5.06E-13	-0.147119	-2.84E-13	-2.39E-13
	(9.5E-13)	(0.17573)	(6.1E-13)	(4.1E-13)
	[-0.53292]	[-0.83717]	[-0.46916]	[-0.58777]
LN_GCF(-1)	0.190411	3.07E+10	0.911452	-0.042759
	(0.09477)	(1.8E+10)	(0.06037)	(0.04056)
	[2.00920]	[1.75058]	[15.0971]	[-1.05414]
LN_OPEN(-1)	-0.161185	5.49E+10	0.248551	0.816704
	(0.19543)	(3.6E+10)	(0.12450)	(0.08365)
	[-0.82475]	[1.51993]	[1.99638]	[9.76341]
LN_REER(-1)	-0.411040	-2.27E+10	0.085709	-0.046879
	(0.17651)	(3.3E+10)	(0.11244)	(0.07555)
	[-2.32875]	[-0.69627]	[0.76225]	[-0.62052]
LN_INF(-1)	-0.007145	-7.19E+08	-0.040595	-0.064353
	(0.04807)	(8.9E+09)	(0.03063)	(0.02058)
	[-0.14863]	[-0.08092]	[-1.32554]	[-3.12747]
C	10.00469	-6.99E+11	0.134739	-0.468079
	(3.10059)	(5.7E+11)	(1.97521)	(1.32711)
	[3.22671]	[-1.21877]	[0.06821]	[-0.35271]

DUM_A	-0.035170	-1.88E+09	0.010628	0.006097
	(0.03736)	(6.9E+09)	(0.02380)	(0.01599)
	[-0.94147]	[-0.27236]	[0.44661]	[0.38135]
R-squared	0.843062	0.572404	0.973479	0.946869
Adj. R-squared	0.812547	0.489260	0.968322	0.936538
Sum sq. resids	0.388887	1.33E+22	0.157821	0.071244
S.E. equation	0.103935	1.92E+10	0.066211	0.044486
F-statistic	27.62723	6.884504	188.7721	91.65282
Log likelihood	41.59714	-1099.900	61.43738	78.93514
Akaike AIC	-1.527143	50.35911	-2.428972	-3.224325
Schwarz SC	-1.202744	50.68350	-2.104574	-2.899926
Mean dependent	24.57518	1.70E+10	26.40270	-0.729716
S.D. dependent	0.240057	2.69E+10	0.372007	0.176590
Determinant resid covariance (dof adj.)		9.83E+09		
Determinant resid covariance		2.95E+09		
Log likelihood		-854.3075		
Akaike information criterion		41.01398		
Schwarz criterion		42.96037		

A5.1.2 Diagnostic Tests

A5.1.2.1 Lagrange multiplier (LM) Test

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/03/15 Time: 12:31
Sample: 1970 2014
Included observations: 44

Lags	LM-Stat	Prob
1	71.62549	0.0004
2	36.98242	0.4234
3	42.12843	0.2229
4	33.97162	0.5654
5	47.84403	0.0896
6	44.64476	0.1529
7	27.73455	0.8365
8	42.09169	0.2240
9	44.30062	0.1613
10	35.08637	0.5119
11	36.43104	0.4486
12	44.55006	0.1551

Probs from chi-square with 36 df.

A5.1.2.2 Normality Test

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 09/03/15 Time: 12:33
Sample: 1970 2014
Included observations: 44

Component	Skewness	Chi-sq	df	Prob.
1	-0.070949	0.036914	1	0.8476
2	1.740962	22.22695	1	0.0000
3	-0.146986	0.158437	1	0.6906
4	0.217251	0.346119	1	0.5563
5	0.263999	0.511098	1	0.4747
6	-2.252073	37.19345	1	0.0000
Joint		60.47296	6	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	3.451400	0.373564	1	0.5411
2	9.125477	68.78936	1	0.0000
3	3.542688	0.539935	1	0.4625
4	2.773383	0.094151	1	0.7590
5	3.301859	0.167051	1	0.6827
6	11.70542	138.9381	1	0.0000
Joint		208.9021	6	0.0000

Component	Jarque-Bera	df	Prob.
1	0.410478	2	0.8145
2	91.01631	2	0.0000
3	0.698372	2	0.7053
4	0.440270	2	0.8024
5	0.678150	2	0.7124
6	176.1315	2	0.0000
Joint	269.3751	12	0.0000

A5.1.2.3 White Heteroscedasticity Test

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 09/03/15 Time: 12:33
Sample: 1970 2014
Included observations: 44

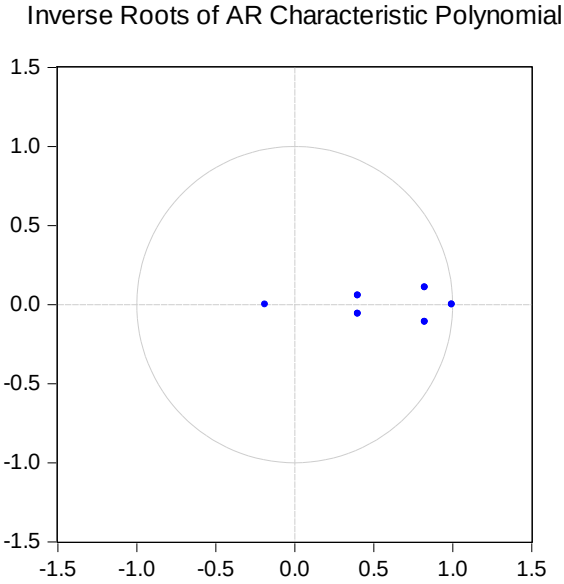
Joint test:

Chi-sq	df	Prob.
299.5490	273	0.1293

Individual components:

Dependent	R-squared	F(13,30)	Prob.	Chi-sq(13)	Prob.
res1*res1	0.271245	0.858929	0.6003	11.93476	0.5330
res2*res2	0.253115	0.782063	0.6722	11.13705	0.5993
res3*res3	0.341417	1.196336	0.3287	15.02237	0.3060
res4*res4	0.360853	1.302892	0.2651	15.87755	0.2558
res5*res5	0.450985	1.895636	0.0728	19.84332	0.0992
res6*res6	0.185771	0.526514	0.8896	8.173939	0.8321
res2*res1	0.406431	1.580134	0.1468	17.88297	0.1620
res3*res1	0.187649	0.533064	0.8851	8.256536	0.8265
res3*res2	0.456405	1.937549	0.0663	20.08182	0.0932
res4*res1	0.318100	1.076519	0.4137	13.99642	0.3741
res4*res2	0.322921	1.100616	0.3954	14.20855	0.3593
res4*res3	0.467418	2.025331	0.0544	20.56637	0.0820
res5*res1	0.472543	2.067438	0.0495	20.79190	0.0771
res5*res2	0.400666	1.542738	0.1593	17.62932	0.1721
res5*res3	0.340314	1.190477	0.3325	14.97383	0.3090
res5*res4	0.459251	1.959890	0.0630	20.20703	0.0902
res6*res1	0.404555	1.567884	0.1508	17.80042	0.1652
res6*res2	0.272965	0.866423	0.5934	12.01046	0.5268
res6*res3	0.321978	1.095871	0.3990	14.16701	0.3622
res6*res4	0.492402	2.238610	0.0337	21.66570	0.0608
res6*res5	0.424140	1.699690	0.1128	18.66215	0.1340

A5.1.2.4 AR Roots Graph



A5.1.3 Johansen Cointegration Test

Date: 09/03/15 Time: 12:21
Sample (adjusted): 1972 2014
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend
Series: LN_AGDP FDI LN_GCF LN_OPEN LN_REER LN_INF
Exogenous series: DUM_A
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.663590	122.3927	95.75366	0.0002
At most 1 *	0.513021	75.54744	69.81889	0.0162
At most 2	0.482919	44.60744	47.85613	0.0978
At most 3	0.237904	16.24653	29.79707	0.6948
At most 4	0.094229	4.564173	15.49471	0.8532
At most 5	0.007149	0.308517	3.841466	0.5786

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.663590	46.84528	40.07757	0.0075
At most 1	0.513021	30.94000	33.87687	0.1078
At most 2 *	0.482919	28.36091	27.58434	0.0397
At most 3	0.237904	11.68236	21.13162	0.5792
At most 4	0.094229	4.255655	14.26460	0.8314
At most 5	0.007149	0.308517	3.841466	0.5786

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

A5.1.4 VECM

Vector Error Correction Estimates
Date: 08/27/15 Time: 11:19
Sample (adjusted): 1972 2014
Included observations: 43 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1, A(3,1)=0, A(5,1)=0
Convergence achieved after 290 iterations.
Restrictions identify all cointegrating vectors

LR test for binding restrictions (rank = 1):

Chi-square(2)	3.960676
Probability	0.138023

Cointegrating Eq:	CointEq1
LN_AGDP(-1)	1.000000
FDI(-1)	2.63E-11 (4.2E-12) [6.27550]
LN_GCF(-1)	-0.936806 (0.18999) [-4.93076]
LN_OPEN(-1)	-1.580421 (0.58343) [-2.70885]
LN_REER(-1)	2.621259 (0.38376) [6.83054]
LN_INF(-1)	-0.880654 (0.15444) [-5.70210]
C	-11.89210

Error Correction:	D(LN_AGDP)	D(FDI)	D(LN_GCF)	D(LN_OPEN)	D(LN_REER)	D(LN_INF)
CointEq1	-0.096008 (0.05043) [-1.90371]	-4.01E+10 (1.0E+10) [-3.97439]	0.000000 (0.00000) [NA]	0.016460 (0.01761) [0.93455]	0.000000 (0.00000) [NA]	0.303752 (0.14265) [2.12930]
D(LN_AGDP(-1))	-0.382437 (0.14278) [-2.67858]	-2.66E+09 (3.2E+10) [-0.08405]	-0.007718 (0.08509) [-0.09070]	-0.065216 (0.05844) [-1.11598]	0.137875 (0.10274) [1.34195]	-0.045137 (0.42807) [-0.10544]
D(FDI(-1))	1.57E-12 (9.6E-13) [1.62833]	0.048965 (0.21349) [0.22935]	-7.92E-14 (5.7E-13) [-0.13809]	-3.38E-13 (3.9E-13) [-0.85853]	-8.55E-13 (6.9E-13) [-1.23522]	-2.51E-12 (2.9E-12) [-0.87007]
D(LN_GCF(-1))	0.067388 (0.24201) [0.27846]	6.73E+10 (5.4E+10) [1.25293]	0.404867 (0.14422) [2.80723]	-0.288085 (0.09905) [-2.90837]	0.140276 (0.17415) [0.80549]	0.475430 (0.72558) [0.65524]
D(LN_OPEN(-1))	0.463593 (0.35709) [1.29824]	6.99E+10 (7.9E+10) [0.88268]	0.396880 (0.21281) [1.86495]	0.473274 (0.14616) [3.23805]	-0.844976 (0.25697) [-3.28826]	1.298698 (1.07064) [1.21301]
D(LN_REER(-1))	-0.134585 (0.21302) [-0.63178]	-2.54E+08 (4.7E+10) [-0.00538]	0.301879 (0.12695) [2.37793]	0.141478 (0.08719) [1.62262]	0.139026 (0.15329) [0.90693]	-1.844157 (0.63868) [-2.88744]
D(LN_INF(-1))	-0.037459 (0.05472) [-0.68459]	-2.62E+10 (1.2E+10) [-2.15749]	0.018195 (0.03261) [0.55797]	-0.012741 (0.02240) [-0.56891]	0.001360 (0.03938) [0.03454]	-0.127814 (0.16406) [-0.77909]
C	0.045237 (0.02117)	-8.98E+08 (4.7E+09)	0.022154 (0.01261)	0.008883 (0.00866)	-0.022851 (0.01523)	-0.075040 (0.06346)

	[2.13725]	[-0.19129]	[1.75631]	[1.02541]	[-1.50028]	[-1.18247]
DUM_A	-0.072994	-5.58E+08	-0.011164	0.010893	0.026349	0.138733
	(0.03558)	(7.9E+09)	(0.02120)	(0.01456)	(0.02560)	(0.10666)
	[-2.05185]	[-0.07075]	[-0.52658]	[0.74809]	[1.02928]	[1.30069]
R-squared	0.348126	0.426458	0.436159	0.419058	0.448170	0.372145
Adj. R-squared	0.194744	0.291506	0.303490	0.282366	0.318328	0.224414
Sum sq. resids	0.367999	1.81E+22	0.130695	0.061650	0.190562	3.307984
S.E. equation	0.104036	2.31E+10	0.062000	0.042582	0.074865	0.311919
F-statistic	2.269662	3.160089	3.287585	3.065705	3.451648	2.519076
Log likelihood	41.34448	-1082.039	63.60151	79.75640	55.49372	-5.869839
Akaike AIC	-1.504394	50.74602	-2.539605	-3.290995	-2.162498	0.691620
Schwarz SC	-1.135771	51.11464	-2.170982	-2.922372	-1.793875	1.060244
Mean dependent	0.018041	9.48E+08	0.028600	0.001908	-0.010973	0.002553
S.D. dependent	0.115936	2.74E+10	0.074289	0.050266	0.090676	0.354183

Determinant resid covariance (dof adj.)	5.64E+09
Determinant resid covariance	1.38E+09
Log likelihood	-819.7777
Akaike information criterion	40.91989
Schwarz criterion	43.37738

A5.2 Industry model

A5.2.1 VAR

Vector Autoregression Estimates
Date: 09/10/15 Time: 11:01
Sample (adjusted): 1971 2014
Included observations: 44 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LN_IGDP	FDI	LN_GCF	LN_OPEN	LN_REER	LN_INF
LN_IGDP(-1)	1.005960	-2.73E+10	0.119861	0.070863	0.010197	0.014409
	(0.02321)	(1.8E+10)	(0.06001)	(0.04064)	(0.08255)	(0.29437)
	[43.3463]	[-1.52185]	[1.99734]	[1.74356]	[0.12354]	[0.04895]
FDI(-1)	-1.11E-13	-0.143087	-2.28E-13	-2.12E-13	-1.35E-12	3.78E-12
	(2.2E-13)	(0.17229)	(5.8E-13)	(3.9E-13)	(7.9E-13)	(2.8E-12)
	[-0.49901]	[-0.83052]	[-0.39470]	[-0.54284]	[-1.69584]	[1.33486]
LN_GCF(-1)	-0.007722	3.73E+10	0.879098	-0.056558	0.017509	-0.120910
	(0.02361)	(1.8E+10)	(0.06106)	(0.04136)	(0.08399)	(0.29953)
	[-0.32701]	[2.04514]	[14.3967]	[-1.36761]	[0.20846]	[-0.40367]
LN_OPEN(-1)	-0.022932	4.42E+10	0.266933	0.818329	0.100505	-0.578278
	(0.04461)	(3.4E+10)	(0.11536)	(0.07813)	(0.15868)	(0.56588)
	[-0.51402]	[1.28257]	[2.31388]	[10.4739]	[0.63337]	[-1.02191]
LN_REER(-1)	0.023122	-3.99E+10	0.052778	-0.089425	0.830537	0.718320
	(0.02575)	(2.0E+10)	(0.06659)	(0.04510)	(0.09160)	(0.32665)
	[0.89786]	[-2.00820]	[0.79255]	[-1.98279]	[9.06707]	[2.19904]
LN_INF(-1)	-0.031903	-2.06E+09	-0.036621	-0.062338	0.068139	0.504121
	(0.01130)	(8.7E+09)	(0.02923)	(0.01980)	(0.04021)	(0.14339)
	[-2.82212]	[-0.23649]	[-1.25276]	[-3.14874]	[1.69461]	[3.51574]

R-squared	0.979312	0.553478	0.973815	0.946699	0.846319	0.673523
Adj. R-squared	0.976590	0.494725	0.970370	0.939685	0.826098	0.630566
Sum sq. resids	0.023304	1.39E+22	0.155819	0.071472	0.294821	3.749238
S.E. equation	0.024764	1.91E+10	0.064035	0.043369	0.088082	0.314109
F-statistic	359.7623	9.420428	282.6447	134.9856	41.85302	15.67882
Log likelihood	103.5201	-1100.853	61.71822	78.86476	47.68937	-8.255279
Akaike AIC	-4.432730	50.31151	-2.532646	-3.312035	-1.894972	0.647967
Schwarz SC	-4.189431	50.55480	-2.289348	-3.068736	-1.651673	0.891266
Mean dependent	27.10854	1.70E+10	26.40270	-0.729716	4.707656	2.157584
S.D. dependent	0.161852	2.69E+10	0.372007	0.176590	0.211220	0.516786

Determinant resid covariance (dof adj.)	3.81E+08
Determinant resid covariance	1.58E+08
Log likelihood	-789.9175
Akaike information criterion	37.54170
Schwarz criterion	39.00149

A5.2.2 Diagnostic tests

A5.2.2.1 Langrange Multiplier (LM) Test

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/02/15 Time: 14:26
Sample: 1970 2014
Included observations: 43

Lags	LM-Stat	Prob
1	52.46926	0.0374
2	54.51716	0.0246
3	30.31598	0.7353
4	52.20179	0.0395
5	43.36178	0.1862
6	37.25167	0.4113
7	35.71528	0.4820
8	33.44221	0.5909
9	45.20506	0.1398
10	44.56652	0.1547
11	33.51187	0.5875
12	46.90962	0.1053

Probs from chi-square with 36 df.

A5.2.2.2 Normality Test

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 09/02/15 Time: 14:29

Sample: 1970 2014
Included observations: 43

Component	Skewness	Chi-sq	df	Prob.
1	-0.690010	3.412147	1	0.0647
2	0.824295	4.869480	1	0.0273
3	-0.211528	0.320667	1	0.5712
4	0.085837	0.052804	1	0.8183
5	-0.055608	0.022161	1	0.8817
6	-0.592414	2.515171	1	0.1128
Joint		11.19243	6	0.0826

Component	Kurtosis	Chi-sq	df	Prob.
1	2.832023	0.050554	1	0.8221
2	5.545016	11.60481	1	0.0007
3	2.864831	0.032735	1	0.8564
4	3.019457	0.000678	1	0.9792
5	2.194052	1.163781	1	0.2807
6	4.342092	3.227168	1	0.0724
Joint		16.07973	6	0.0133

Component	Jarque-Bera	df	Prob.
1	3.462701	2	0.1770
2	16.47430	2	0.0003
3	0.353402	2	0.8380
4	0.053482	2	0.9736
5	1.185942	2	0.5527
6	5.742338	2	0.0566
Joint	27.27216	12	0.0071

A5.2.2.3 White Heteroscedasticity Test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 09/02/15 Time: 14:32
Sample: 1970 2014
Included observations: 43

Joint test:

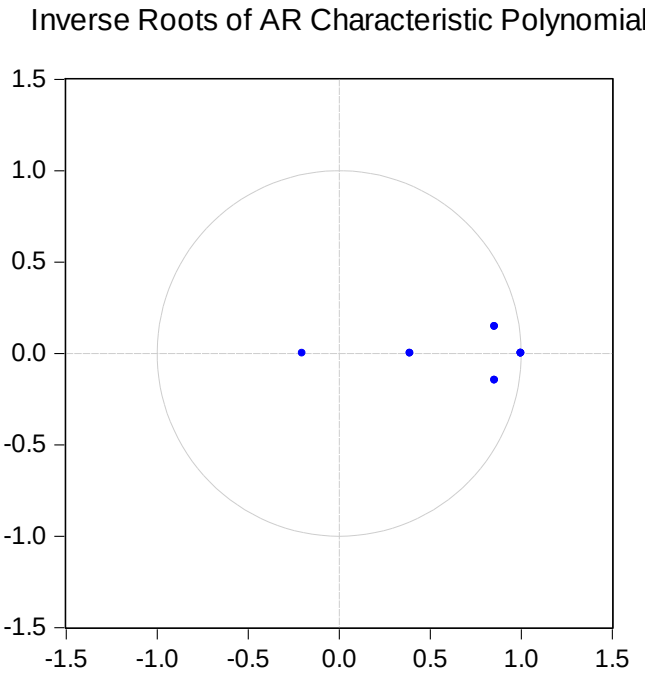
Chi-sq	df	Prob.
320.3487	294	0.1394

Individual components:

Dependent	R-squared	F(14,28)	Prob.	Chi-sq(14)	Prob.
res1*res1	0.208285	0.526162	0.8966	8.956268	0.8338

res2*res2	0.148644	0.349194	0.9791	6.391704	0.9556
res3*res3	0.470404	1.776464	0.0952	20.22738	0.1231
res4*res4	0.253518	0.679235	0.7746	10.90128	0.6938
res5*res5	0.400667	1.337041	0.2481	17.22867	0.2442
res6*res6	0.660262	3.886889	0.0011	28.39127	0.0126
res2*res1	0.155211	0.367454	0.9739	6.674057	0.9465
res3*res1	0.208378	0.526458	0.8964	8.960247	0.8336
res3*res2	0.488565	1.910568	0.0705	21.00831	0.1014
res4*res1	0.221846	0.570187	0.8653	9.539396	0.7950
res4*res2	0.411348	1.397595	0.2183	17.68798	0.2214
res4*res3	0.320291	0.942435	0.5296	13.77250	0.4668
res5*res1	0.431262	1.516556	0.1690	18.54426	0.1831
res5*res2	0.310885	0.902275	0.5660	13.36807	0.4978
res5*res3	0.532408	2.277237	0.0310	22.89356	0.0620
res5*res4	0.407329	1.374553	0.2293	17.51515	0.2298
res6*res1	0.260962	0.706222	0.7501	11.22138	0.6686
res6*res2	0.685895	4.367290	0.0004	29.49347	0.0090
res6*res3	0.286751	0.804072	0.6582	12.33031	0.5798
res6*res4	0.283961	0.793143	0.6685	12.21031	0.5894
res6*res5	0.730697	5.426576	0.0001	31.41997	0.0048

A5.2.2.2 AR Roots Graph



A5.2.3 Johansen Cointegration Test

Date: 09/02/15 Time: 14:22
Sample (adjusted): 1972 2014
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend

Series: LN_IGDP FDI LN_GCF LN_OPEN LN_REER LN_INF
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.620533	104.9536	95.75366	0.0100
At most 1	0.483302	63.28710	69.81889	0.1486
At most 2	0.333397	34.89437	47.85613	0.4536
At most 3	0.207936	17.45525	29.79707	0.6064
At most 4	0.158089	7.431406	15.49471	0.5280
At most 5	0.000742	0.031899	3.841466	0.8582

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.620533	41.66651	40.07757	0.0328
At most 1	0.483302	28.39273	33.87687	0.1960
At most 2	0.333397	17.43912	27.58434	0.5424
At most 3	0.207936	10.02384	21.13162	0.7424
At most 4	0.158089	7.399507	14.26460	0.4430
At most 5	0.000742	0.031899	3.841466	0.8582

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

A5.2.4 VECM

Vector Error Correction Estimates
Date: 09/02/15 Time: 14:25
Sample (adjusted): 1972 2014
Included observations: 43 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1, A(3,1)=0, A(4,1)=0, A(5,1)=0
Convergence achieved after 34 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):
Chi-square(3) 2.596912
Probability 0.458031

Cointegrating Eq:	CointEq1
LN_IGDP(-1)	1.000000
FDI(-1)	-1.11E-11
	(1.8E-12)
	[-6.26023]

LN_GCF(-1)	-0.145208 (0.08135) [-1.78493]
LN_OPEN(-1)	0.929056 (0.25239) [3.68101]
LN_REER(-1)	-0.496864 (0.16611) [-2.99119]
LN_INF(-1)	0.246235 (0.06945) [3.54542]
C	-20.59830

Error Correction:	D(LN_IGDP)	D(FDI)	D(LN_GCF)	D(LN_OPEN)	D(LN_REER)	D(LN_INF)
CointEq1	-0.034342 (0.02124) [-1.61711]	1.16E+11 (2.2E+10) [5.15208]	0.000000 (0.00000) [NA]	0.000000 (0.00000) [NA]	0.000000 (0.00000) [NA]	-0.469352 (0.34377) [-1.36532]
D(LN_IGDP(-1))	0.104731 (0.20363) [0.51431]	2.45E+11 (1.6E+11) [1.48971]	0.633451 (0.47112) [1.34455]	-0.294615 (0.34003) [-0.86643]	-0.624075 (0.59474) [-1.04932]	6.624788 (2.29513) [2.88645]
D(FDI(-1))	-2.45E-13 (2.3E-13) [-1.06581]	0.144387 (0.18526) [0.77938]	2.14E-13 (5.3E-13) [0.40331]	2.84E-14 (3.8E-13) [0.07413]	-8.92E-13 (6.7E-13) [-1.33007]	6.40E-13 (2.6E-12) [0.24708]
D(LN_GCF(-1))	0.022580 (0.06806) [0.33179]	2.57E+10 (5.5E+10) [0.46841]	0.295878 (0.15745) [1.87917]	-0.239382 (0.11364) [-2.10650]	0.293270 (0.19877) [1.47546]	-0.495674 (0.76704) [-0.64622]
D(LN_OPEN(-1))	-0.002907 (0.11361) [-0.02559]	-1.12E+11 (9.2E+10) [-1.22385]	0.207091 (0.26286) [0.78785]	0.483834 (0.18972) [2.55032]	-0.875730 (0.33183) [-2.63911]	0.566164 (1.28054) [0.44213]
D(LN_REER(-1))	0.091067 (0.04975) [1.83037]	-2.06E+10 (4.0E+10) [-0.51446]	0.283868 (0.11511) [2.46611]	0.200160 (0.08308) [2.40928]	0.108279 (0.14531) [0.74515]	-1.612391 (0.56076) [-2.87536]
D(LN_INF(-1))	-0.011448 (0.01274) [-0.89866]	-2.09E+10 (1.0E+10) [-2.03143]	0.006252 (0.02947) [0.21213]	-0.014929 (0.02127) [-0.70181]	0.026267 (0.03721) [0.70598]	-0.239889 (0.14358) [-1.67078]
C	0.012313 (0.00468) [2.62844]	-3.17E+09 (3.8E+09) [-0.83807]	0.012669 (0.01084) [1.16896]	0.013943 (0.00782) [1.78251]	-0.007171 (0.01368) [-0.52409]	-0.088871 (0.05280) [-1.68320]
R-squared	0.234636	0.517740	0.459647	0.385184	0.421984	0.435814
Adj. R-squared	0.081563	0.421288	0.351577	0.262221	0.306381	0.322976
Sum sq. resids	0.023400	1.52E+22	0.125251	0.065245	0.199604	2.972531
S.E. equation	0.025857	2.09E+10	0.059821	0.043176	0.075518	0.291427
F-statistic	1.532837	5.367843	4.253214	3.132513	3.650277	3.862320
Log likelihood	100.5845	-1078.312	64.51634	78.53794	54.49694	-3.570949
Akaike AIC	-4.306254	50.52616	-2.628667	-3.280835	-2.162648	0.538184
Schwarz SC	-3.978589	50.85382	-2.301002	-2.953169	-1.834983	0.865849
Mean dependent	0.013199	9.48E+08	0.028600	0.001908	-0.010973	0.002553

S.D. dependent	0.026980	2.74E+10	0.074289	0.050266	0.090676	0.354183

Determinant resid covariance (dof adj.)	1.19E+08
Determinant resid covariance	34613020
Log likelihood	-740.1505
Akaike information criterion	36.93723
Schwarz criterion	39.14897

A5.3 Services model

A5.3.1 VAR

Vector Autoregression Estimates
Date: 09/01/15 Time: 10:02
Sample (adjusted): 1971 2014
Included observations: 44 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LN_SGDP	FDI	LN_GCF	LN_OPEN	LN_REER	LN_INF
LN_SGDP(-1)	0.987596	1.78E+10	0.161803	0.229839	-0.345762	-0.526349
	(0.02621)	(2.9E+10)	(0.09723)	(0.05651)	(0.12086)	(0.46872)
	[37.6823]	[0.61797]	[1.66416]	[4.06699]	[-2.86092]	[-1.12295]
FDI(-1)	-1.22E-13	-0.131853	-2.25E-13	-9.64E-14	-1.56E-12	2.90E-12
	(1.6E-13)	(0.17380)	(5.9E-13)	(3.4E-13)	(7.3E-13)	(2.8E-12)
	[-0.76905]	[-0.75864]	[-0.38375]	[-0.28308]	[-2.13424]	[1.02681]
LN_GCF(-1)	-0.003674	1.82E+10	0.827151	-0.183852	0.240917	0.333306
	(0.02268)	(2.5E+10)	(0.08413)	(0.04890)	(0.10458)	(0.40560)
	[-0.16201]	[0.72996]	[9.83123]	[-3.75952]	[2.30362]	[0.82176]
LN_OPEN(-1)	0.043811	6.49E+10	0.308422	0.924509	-0.114373	-0.978880
	(0.03441)	(3.8E+10)	(0.12767)	(0.07421)	(0.15869)	(0.61546)
	[1.27307]	[1.71489]	[2.41581]	[12.4586]	[-0.72071]	[-1.59047]
LN_REER(-1)	0.002406	-9.22E+09	0.153738	0.090057	0.480184	0.192291
	(0.03026)	(3.3E+10)	(0.11227)	(0.06525)	(0.13955)	(0.54121)
	[0.07951]	[-0.27699]	[1.36942]	[1.38011]	[3.44098]	[0.35530]
LN_INF(-1)	-0.014636	5.06E+08	-0.030640	-0.049345	0.037616	0.442627
	(0.00824)	(9.1E+09)	(0.03057)	(0.01777)	(0.03800)	(0.14737)
	[-1.77615]	[0.05584]	[-1.00227]	[-2.77704]	[0.98989]	[3.00341]
C	0.522728	-8.62E+11	-0.311386	-1.867092	5.482541	5.223710
	(0.42965)	(4.7E+11)	(1.59392)	(0.92646)	(1.98128)	(7.68398)
	[1.21663]	[-1.82413]	[-0.19536]	[-2.01530]	[2.76717]	[0.67982]
DUM_A	-0.000703	-2.33E+09	0.012005	0.004002	0.030193	0.149181
	(0.00593)	(6.5E+09)	(0.02199)	(0.01278)	(0.02733)	(0.10600)
	[-0.11865]	[-0.35805]	[0.54598]	[0.31317]	[1.10472]	[1.40741]
R-squared	0.997868	0.576807	0.974845	0.962285	0.879438	0.697073
Adj. R-squared	0.997454	0.494520	0.969954	0.954952	0.855996	0.638170
Sum sq. resids	0.010877	1.32E+22	0.149689	0.050572	0.231285	3.478796
S.E. equation	0.017382	1.91E+10	0.064483	0.037480	0.080153	0.310859
F-statistic	2407.276	7.009664	199.3067	131.2199	37.51465	11.83434

Log likelihood	120.2841	-1099.673	62.60122	86.47490	53.02921	-6.608224
Akaike AIC	-5.103824	50.34875	-2.481874	-3.567041	-2.046782	0.664010
Schwarz SC	-4.779426	50.67315	-2.157476	-3.242643	-1.722384	0.988408
Mean dependent	27.63072	1.70E+10	26.40270	-0.729716	4.707656	2.157584
S.D. dependent	0.344457	2.69E+10	0.372007	0.176590	0.211220	0.516786

Determinant resid covariance (dof adj.)	98921309
Determinant resid covariance	29674868
Log likelihood	-753.1276
Akaike information criterion	36.41489
Schwarz criterion	38.36128

A5.3.2 Diagnostic tests

A5.3.2.1 Lagrange Multiplier (LM) test

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/01/15 Time: 10:13
Sample: 1970 2014
Included observations: 44

Lags	LM-Stat	Prob
1	76.61281	0.0001
2	57.15936	0.0139
3	44.72758	0.1509
4	36.82651	0.4305
5	43.71998	0.1764
6	37.63440	0.3943
7	28.34714	0.8146
8	39.65940	0.3101
9	44.95917	0.1454
10	35.24700	0.5042
11	50.37056	0.0564
12	42.92892	0.1985

Probs from chi-square with 36 df.

A5.3.2.2 Normality test

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 09/01/15 Time: 10:22
Sample: 1970 2014
Included observations: 44

Component	Skewness	Chi-sq	df	Prob.
1	0.459777	1.550227	1	0.2131
2	1.856664	25.27947	1	0.0000
3	-0.867199	5.514922	1	0.0189
4	-0.048264	0.017082	1	0.8960

5	-0.290248	0.617789	1	0.4319
6	-2.624965	50.52991	1	0.0000
Joint		83.50940	6	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	3.160933	0.047482	1	0.8275
2	9.455662	76.40522	1	0.0000
3	4.396654	3.576180	1	0.0586
4	3.167293	0.051310	1	0.8208
5	3.807984	1.196869	1	0.2739
6	13.55148	204.1118	1	0.0000
Joint		285.3889	6	0.0000

Component	Jarque-Bera	df	Prob.
1	1.597709	2	0.4498
2	101.6847	2	0.0000
3	9.091102	2	0.0106
4	0.068392	2	0.9664
5	1.814657	2	0.4036
6	254.6417	2	0.0000
Joint	368.8983	12	0.0000

A5.3.2.3 White heteroscedasticity test

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 09/01/15 Time: 10:23
Sample: 1970 2014
Included observations: 44

Joint test:

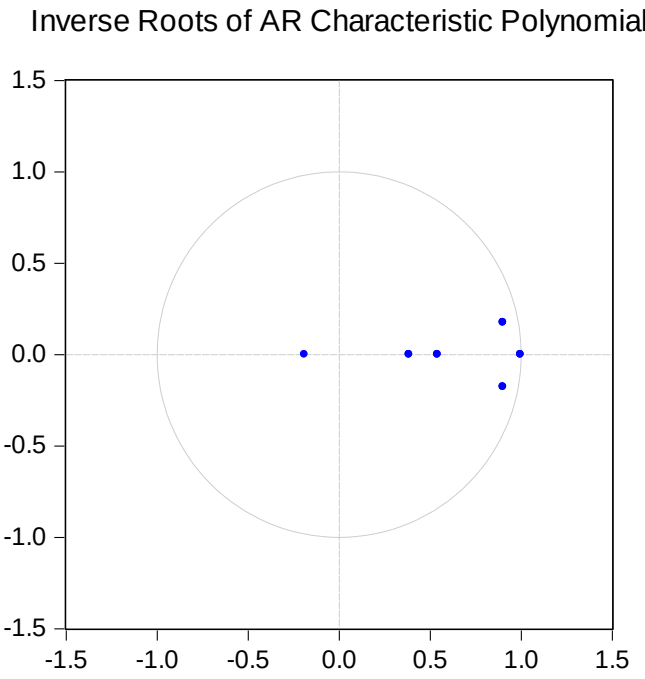
Chi-sq	df	Prob.
307.4129	273	0.0745

Individual components:

Dependent	R-squared	F(13,30)	Prob.	Chi-sq(13)	Prob.
res1*res1	0.325182	1.112033	0.3870	14.30801	0.3525
res2*res2	0.228108	0.681964	0.7646	10.03674	0.6909
res3*res3	0.295900	0.969816	0.5008	13.01962	0.4463
res4*res4	0.481317	2.141443	0.0419	21.17793	0.0695
res5*res5	0.384765	1.443219	0.1974	16.92965	0.2025
res6*res6	0.204194	0.592126	0.8410	8.984544	0.7741
res2*res1	0.253748	0.784684	0.6697	11.16490	0.5970
res3*res1	0.201647	0.582874	0.8483	8.872471	0.7825
res3*res2	0.313907	1.055836	0.4298	13.81192	0.3872
res4*res1	0.278119	0.889084	0.5726	12.23723	0.5083
res4*res2	0.218693	0.645938	0.7963	9.622485	0.7245

res4*res3	0.381722	1.424760	0.2053	16.79577	0.2088
res5*res1	0.142406	0.383198	0.9649	6.265842	0.9359
res5*res2	0.281547	0.904335	0.5587	12.38805	0.4961
res5*res3	0.356339	1.277566	0.2792	15.67890	0.2669
res5*res4	0.564610	2.992592	0.0065	24.84283	0.0242
res6*res1	0.254757	0.788873	0.6658	11.20933	0.5933
res6*res2	0.267245	0.841646	0.6164	11.75879	0.5475
res6*res3	0.333913	1.156858	0.3551	14.69217	0.3270
res6*res4	0.578835	3.171617	0.0044	25.46875	0.0200
res6*res5	0.373105	1.373452	0.2289	16.41660	0.2274

A5.3.2.3 AR roots graph



A5.3.3 Johansen Cointegration

Date: 09/01/15 Time: 10:06
Sample (adjusted): 1972 2014
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend
Series: LN_SGDP FDI LN_GCF LN_OPEN LN_REER LN_INF
Exogenous series: DUM_A
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.695805	122.7146	95.75366	0.0002
At most 1 *	0.502611	71.54087	69.81889	0.0362

At most 2	0.429119	41.51038	47.85613	0.1729
At most 3	0.253847	17.40565	29.79707	0.6100
At most 4	0.103056	4.814205	15.49471	0.8282
At most 5	0.003191	0.137445	3.841466	0.7108

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.695805	51.17368	40.07757	0.0019
At most 1	0.502611	30.03049	33.87687	0.1345
At most 2	0.429119	24.10474	27.58434	0.1311
At most 3	0.253847	12.59144	21.13162	0.4905
At most 4	0.103056	4.676760	14.26460	0.7819
At most 5	0.003191	0.137445	3.841466	0.7108

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

A5.3.4 VECM

Vector Error Correction Estimates
Date: 09/01/15 Time: 10:10
Sample (adjusted): 1972 2014
Included observations: 43 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1, A(4,1)=0, A(5,1)=0
Convergence achieved after 66 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):
Chi-square(2) 4.927313
Probability 0.085123

Cointegrating Eq:	CointEq1
LN_SGDP(-1)	1.000000
FDI(-1)	-1.43E-11
	(2.3E-12)
	[-6.09511]
LN_GCF(-1)	-0.459766
	(0.10639)
	[-4.32153]
LN_OPEN(-1)	1.225421
	(0.32846)
	[3.73078]
LN_REER(-1)	-0.497482
	(0.21266)

	[-2.33935]
LN_INF(-1)	0.417428
	(0.08688)
	[4.80470]
C	-12.90997

Error Correction:	D(LN_SGDP)	D(FDI)	D(LN_GCF)	D(LN_OPEN)	D(LN_REER)	D(LN_INF)
CointEq1	-0.015651	6.69E+10	-0.001412	0.000000	0.000000	-0.682314
	(0.01396)	(1.7E+10)	(0.03497)	(0.00000)	(0.00000)	(0.21893)
	[-1.12142]	[3.96761]	[-0.04039]	[NA]	[NA]	[-3.11653]
D(LN_SGDP(-1))	0.371231	2.42E+11	1.808810	-0.047459	-0.010673	6.754098
	(0.22533)	(2.8E+11)	(0.67926)	(0.52900)	(0.91594)	(3.37998)
	[1.64752]	[0.86510]	[2.66293]	[-0.08972]	[-0.01165]	[1.99826]
D(FDI(-1))	-1.47E-13	-0.053127	2.15E-13	1.15E-13	-8.39E-13	-2.55E-12
	(1.6E-13)	(0.19284)	(4.7E-13)	(3.7E-13)	(6.3E-13)	(2.3E-12)
	[-0.94524]	[-0.27550]	[0.45912]	[0.31588]	[-1.32712]	[-1.09544]
D(LN_GCF(-1))	-0.004633	4.65E+10	0.081041	-0.272724	0.232251	-1.256552
	(0.06144)	(7.6E+10)	(0.18520)	(0.14424)	(0.24974)	(0.92158)
	[-0.07541]	[0.61011]	[0.43757]	[-1.89083]	[0.92998]	[-1.36348]
D(LN_OPEN(-1))	0.059467	-3.15E+10	0.292027	0.388146	-1.066677	2.911555
	(0.07666)	(9.5E+10)	(0.23108)	(0.17996)	(0.31160)	(1.14985)
	[0.77577]	[-0.33179]	[1.26375]	[2.15682]	[-3.42325]	[2.53211]
D(LN_REER(-1))	0.058011	-2.04E+10	0.287305	0.183539	0.064086	-1.728764
	(0.03662)	(4.5E+10)	(0.11038)	(0.08596)	(0.14884)	(0.54925)
	[1.58431]	[-0.44916]	[2.60290]	[2.13512]	[0.43057]	[-3.14752]
D(LN_INF(-1))	0.004987	-1.88E+10	-0.002166	-0.020118	0.014864	-0.301432
	(0.00956)	(1.2E+10)	(0.02882)	(0.02245)	(0.03887)	(0.14343)
	[0.52154]	[-1.58489]	[-0.07516]	[-0.89623]	[0.38242]	[-2.10162]
C	0.019753	-6.75E+09	-0.024199	0.009314	-0.020645	-0.252818
	(0.00690)	(8.6E+09)	(0.02079)	(0.01619)	(0.02804)	(0.10346)
	[2.86399]	[-0.78892]	[-1.16390]	[0.57522]	[-0.73639]	[-2.44371]
DUM_A	-0.003801	-2.02E+09	-0.002881	0.008527	0.020387	0.224452
	(0.00660)	(8.2E+09)	(0.01990)	(0.01550)	(0.02683)	(0.09901)
	[-0.57584]	[-0.24731]	[-0.14481]	[0.55028]	[0.75984]	[2.26696]
R-squared	0.267647	0.422982	0.535650	0.384846	0.433262	0.494167
Adj. R-squared	0.095328	0.287214	0.426391	0.240103	0.299911	0.375148
Sum sq. resids	0.011844	1.82E+22	0.107634	0.065281	0.195710	2.665082
S.E. equation	0.018664	2.31E+10	0.056265	0.043818	0.075869	0.279973
F-statistic	1.553209	3.115460	4.902576	2.658835	3.249051	4.151990
Log likelihood	115.2235	-1082.169	67.77538	78.52611	54.92057	-1.223602
Akaike AIC	-4.940627	50.75206	-2.733739	-3.233773	-2.135841	0.475516
Schwarz SC	-4.572003	51.12068	-2.365115	-2.865150	-1.767217	0.844140
Mean dependent	0.028615	9.48E+08	0.028600	0.001908	-0.010973	0.002553
S.D. dependent	0.019623	2.74E+10	0.074289	0.050266	0.090676	0.354183

Determinant resid covariance (dof adj.)	58362575
Determinant resid covariance	14262551
Log likelihood	-722.0126
Akaike information criterion	36.37268
Schwarz criterion	38.83017