THE EFFECT OF SECTORAL FOREIGN DIRECT INVESTMENT ON SECTORAL GROWTH AND SECTORAL EMPLOYMENT IN SOUTH AFRICA

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"The LORD is the everlasting God, the Creator of the ends of the earth. He will not grow tired or weary, and his understanding no one can fathom. He gives strength to the weary and increases the power of the weak. Even youths grow tired and weary, and young men stumble and fall; those who hope in the LORD will renew their strength. They will soar on wings like eagles; they will run and not grow weary; they will walk and not be faint" (Isiah 40:28-31)

DECLARATION

Except for the references specifically indicated in-text, and such help has been acknowledged, this thesis is wholly my own work and has not been submitted to any other University or Higher Education Institution.

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ABSTRACT

Over several decades past, developing countries have received increased amounts of Foreign Direct Investment (FDI). This form of investment has been welcomed because of the perceived benefits attached to it. FDI is seen as an important driver of economic development for many nations. For South Africa specifically, GDP growth rates have remained less than required, unemployment rates have reached staggering levels, poverty and inequality levels are increasing and the list goes on. Considering the perceived benefits of FDI, one may argue that FDI can play a crucial role in reducing the mentioned challenges facing the nation, however, only if directed to initiatives contributing to growth and employment. The 2015 Investment Policy Framework for Sustainable Development includes an action menu promoting investment in sectors relating to the achievement of the Sustainable Development Goals (SDGs). Therefore, this study is aimed at investigating the relationship between sector FDI and sector growth in addition to investigating the effect of sector FDI on sector employment over the period 2000Q1 to 2016Q4 for six of South Africa's economic sectors. The reason for such a study is based on the premise that developing nations such as South Africa lack sound trade and industrial policies favorable to foreign investors. This then leads to the nation failing to attract higher volumes of FDI which could be used to address structural challenges facing the country. It is therefore important to identify sectors in which FDI has resulted in growth and employment so that when policies are considered, the right FDI is targeted.

A comprehensive review of existing theoretical and empirical literature showed that FDI does result in economic growth for developed and developing countries, although FDI crowds out domestic investment in the short run. Literature on the effect of FDI on employment showed diverse effects. Some studies found FDI to increase employment overall, other studies found FDI to increase employment only during periods of restructuring and some studies found FDI to result in job losses. For South African sectors, the present study finds that the financial services sector receives the highest volume of South African FDI, followed by the mining and quarrying sector and the manufacturing, however, FDI in all six sectors under study is associated with increased growth and employment. This finding suggests that the financial services sector has received increased volumes of FDI as a result of financialization of the South African economy. It is this increased FDI in the financial services sector that is directed to income redistribution from the real sector to the finance sector.

This study employed econometric techniques and methods of analysis to investigate the relationship between sector FDI and sector growth, and the effect of sector FDI on sector employment. Panel

cointegration tests were conducted for all six sectors included in the study to establish if long run equilibrium relationships exist among integrated variables. The Johansen-Fisher panel cointegration test revealed that there is evidence of cointegration in four of the six sectors. Since cointegration was established, the study proceeded to perform the Dumitrescu-Hurlin panel causality analysis and estimate a Panel Vector Error Correction Model (VECM). Results from the causality analysis found a unidirectional causality relationship between FDI and GDP growth, while the panel VECM found FDI to have a significant effect on growth in all sectors. The Seemingly Unrelated Regression (SUR) model employed to investigate the effect of FDI on employment found FDI to have an insignificant effect on employment in all sectors included, although the signs of the coefficients suggest that FDI is associated with increased employment and rising wages is associated with increased productivity growth.

Since this study finds that FDI is associated with increased GDP growth in all six sectors under study, policy makers should devise strategies to attract FDI in sectors such as the transportation, storage and communication sector and the electricity, gas and water sector as FDI in these sectors are associated with increased growth however, they receive very low levels of FDI. There are a number of reasons for this, therefore, government institutions and policy makers should investigate the reasons for these low levels of FDI inflows into these sectors so that they can devise further strategies to address these reasons and perhaps attract higher levels of FDI into these sectors. Spillover benefits play a major role in host nations participating in FDI therefore, prior to entering into bilateral treaty agreements, policy makers should ensure that foreign investors are compelled to create jobs, offer training and qualifications *etc.* through their investments so that some of the SDGs can be achieved. Additionally, this study finds a positive, statistically insignificant relationship between FDI and employment. FDI may not have a significant relationship on employment due to jobless growth and capital-intensive growth rather than labor-intensive growth. Such a situation calls for government intervention. Skills shortage is a rising problem in South Africa; therefore, investors choose to employ advanced technologies rather than people. Under such circumstances, governments are encouraged to invest resources into skills development so that human capital are not completely replaced by technology.

ACRONYMS AND ABBREVIATIONS

ANC:	African National Congress
ASGISA:	Accelerated and Shared Growth Initiative for South Africa
BITs:	Bilateral Investment Treaties
BOP:	Balance of Payments
CEEC:	Central and Eastern European Countries
ECT:	Error Correction Term
EPWP:	Expanded Public Works Programme
ERP:	Economic Recovery Programme
EU:	European Union
FDI:	Foreign Direct Investment
FGLS:	Feasible Generalized Least Squares
FOI:	Foreign Other Investment
FPI:	Foreign Portfolio Investment
G8:	Group of eight highly industrialized nations
GDP:	Gross Domestic Product
GEAR:	Growth, Employment and Redistribution
GFC:	Global Financial Crisis
GFCF:	Gross Fixed Capital Formation
ICOR:	Incremental Capital Output Ratio
IFI:	International Financial Institution
IMF:	International Monetary Fund
LDC:	Least Developed Country
M&A:	Mergers and Acquisitions
MDG:	Millennium Development Goal
MNE:	Multinational Enterprise
MTSF:	Medium Term Strategic Framework
NDP:	National Development Plan
NGP:	New Growth Path
NPC:	National Planning Commission
OLS:	Ordinary Least Squares
PDM:	Panel Data Model
QES:	Quarterly Employment Statistics
RDP:	Reconstruction and Development Programme
SAP:	Structural Adjustment Programme
SAPS:	South African Police Service
SARB:	South African Reserve Bank
SDG:	Sustainable Development Goal
SMME:	Small, Medium and Micro Enterprise
StatsSA:	Statistics South Africa
SUR:	Seemingly Unrelated Regression
VAR:	Vector Autoregression
VECM:	Vector Error Correction Model

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CHAPTER 1

INTRODUCTION

1.1. CONTEXT OF THE RESEARCH

Economic thinkers for decades have grappled with the relationship between investment and growth. Earlier theories on this relationship include the Harrod-Domar Growth Model. According to Solow (1988:307), the Harrod-Domar model asserts that savings is a critical element of steady growth. Essentially, the idea of the Harrod-Domar model is that a nation should accumulate savings and channel these savings to investment which will then result in steady growth rates (Solow, 1994:46).

Rodrik and Subramanian (2009) argue against the Harrod-Domar model. The authors explain that literature on financial globalization favors the idea of developing nations being savings-constraint and that foreign aid may be used to boost investment which then leads to long-run growth. The authors argue that this is not true for developing countries and that these countries are rather investment constrained (Rodrik and Subramanian, 2009:127). The key issue here is that regardless of these two conditions (savings-constrained and investment-constrained), private investment rates are expected to be low. Rodrik and Subramanian (2009) essentially state that developing nations do not get sufficient investment either because investors are unwilling to invest in developing economies since entrepreneurs may be unable to finance profitable projects at reasonable costs or because there might be finances available, but entrepreneurs do not see profitable investment opportunities.

Related to the Harrod-Domar growth model is the “Big Push” theory. According to Guillaumont and Jeanneney (2007:1), the big push theory is based on the concept of the poverty trap. The idea of the big push theory is that lower-income economies face structural challenges that constrain their ability to achieve steady growth. As a result, these economies require massive investment so that they can direct finance to interdependent sectors of the economy which can then result in growth (Easterly, 2006; Guillaumont and Jeanneney, 2007). The main argument with this theory is that low-income nations need to be pushed out of a trap and if they are not pushed out then they will be unable to escape the trap and will achieve very low growth rates (Collier, 2006; Easterly, 2006; Guillaumont and Jeanneney, 2007).

Closely related to the same ideas as Harrod-Domar and Big Push is the Solow Growth model. According to Romer (2006:9) “output (Y), capital (K), labor (L) and “knowledge” or the “effectiveness of labor”

(A)" are the four variables that the Solow Growth model focuses on. The model asserts that at any time, some amounts of K, L and A are available and when combined, Y is produced. That is, the long-run level of output per a worker is associated directly to the economy's investment rate (Holtz-Eakin, 1992:3). A key feature of this model is the steady-state concept. The idea of the Solow model is that growth is achieved as output changes over time and this is done only when inputs are changed (i.e. adjusting variables K, L and A). However, this growth cannot continue indefinitely because at some point (steady state), per capita output will stay constant.

Endogenous growth models on the other hand place technology, human capital and institutions at the center of growth (Romer, 1990; Pack, 1994; Romer, 1994). For instance, Romer (1994) argues that technological innovation is at the heart of economic growth because previous centuries depended on manual labor for production, however modern technology allows for the use of the same raw materials as the past but now converting these materials using new technology has become sophisticated. Endogenous growth models include the same or similar variables and ideas as the previously mentioned models; however, they advocate for more focus to be placed on technology, human capital and institutions (Pack, 1994; Romer, 1994). Rodrik and Subramanian (2009) also advocate for these factors (technology, human capital and institutions) as a means to overcome investment constraints blocking developing economies from experiencing steady growth.

Over the years developing countries have seen an increase in Foreign Direct Investment (FDI) inflows. These countries view FDI as an important tool in their endeavors for economic development, however only a limited number of developing countries receive this form of investment (Noorbakhsh *et al.*, 2001:1594; Adams, 2009: 178). According to Dunning (2002:282-285), resource access, market access, efficiency gains and strategic asset acquisition are the four main reasons motivating foreign firms to participate in FDI and these motives arguably play a crucial role for the growth of a nation.

In a country such as South Africa, policies developed and implemented by government institutions may constrain the state's ability to effectively contribute to the achievement of steady and high levels of growth and the creation of employment (Aliber, 2003). Under such circumstances, FDI can play a crucial role if directed towards initiatives that contribute to growth and employment (e.g. education, healthcare, infrastructure *etc.*). The 2015 Investment Policy Framework for Sustainable Development (UNCTAD, 2015) consists of several significant principles specifically for policymaking that serve as criteria for

policymakers when developing and altering investment policies. One of the criteria includes an action menu for the promotion of investment in sectors related to sustainable development goals (SDGs). The sectors identified in the 2015 investment policy framework for sustainable development that are key for sustainable development in developing economies are: basic infrastructure (e.g. roads, rails, power stations *etc.*); food security (agriculture, rural development *etc.*); climate change, health and education (UNCTAD, 2015). According to UNCTAD (2015:20), these are sustainable development related sectors.

A recent study conducted by Awunyo-Vitor and Sackey (2018) attempted to determine a relationship between FDI inflows to the agricultural sector and economic growth in Ghana. The authors found that FDI has a significant positive relationship to agricultural sector growth and overall economic growth in Ghana (Awunyo-Vitor and Sackey, 2018).

In a study by Adams (2009:178) and Walsh and Yu (2010:3), the authors emphasize that despite evidence on FDI resulting in growth and development being partially conclusive, policymakers around the world have the impression that FDI is highly likely to result in long-run growth and development as opposed to various forms of available capital flows. Noorbakhsh *et al.* (2001) and Walsh and Yu (2010) explain that while capital flows are more often portfolio flows, FDI provides various other aspects that host nations can make use of, such as foreign technology transfer and management skills. Another key point expressed by policymakers is that FDI flows are less volatile in comparison to capital flows and with relation to employment, policymakers believe that FDI is associated with increased employment creation (Noorbakhsh *et al.,* 2001:1594; Walsh and Yu, 2010: 3).

Abor and Harvey (2008) investigate the effect that FDI has on employment creation and wages in Ghana. Abor and Harvey (2008:214) explain that while employment creation through FDI may be a benefit, it may also be associated with unemployment because advanced technological innovation makes human capital less necessary. Abor and Harvey (2008) postulate that with relation to employment, the role of FDI is likely to be effective in the context of skill mix, quality and through labor movement as opposed to the amount of jobs it can create. Noorbakhsh *et al.* (2001), Reiter and Steensma (2010) and De Schutter *et al.* (2013) have all concluded that the primary role of FDI is not simply to increase employment creation but rather to make use of quality skilled labor, which then improves output, therefore allowing for more job opportunities since industries will grow.

FDI research in South Africa is most often conducted at an aggregated level where overall FDI flow effects are examined on employment and economic growth respectively. Considering the action menu for the promotion of investment in sectors related to SDGs, it is necessary to disaggregate FDI by sector to gain more insight into how growth dynamics evolve. It then also becomes important to understand how FDI evolved over the years, i.e. which sectors attract FDI and what has been its impact on sector growth and sector employment. This study therefore aims to determine if FDI can be used as a tool for increased growth and employment creation. As such, if FDI influences employment and growth, government should be persuaded to formulate policies that attract quality FDI as well as higher volumes of FDI into specific sectors that are aligned with sustainable development.

1.2. OBJECTIVES OF RESEARCH

The main goal of the research is:

To determine the effect of sector FDI on sector growth and employment in South Africa.

To achieve this goal, the following sub goals will be addressed:

1.2.1. The relationship between sectoral FDI and sectoral growth in South Africa.

1.2.2. The effect of sectoral FDI on sectoral employment in South Africa

1.3. METHODS, PROCEDURES, TECHNIQUES AND ETHICS

Essentially, the study uses panel data and therefore Panel Data Models (PDM's) will be used to achieve the main goal of the research. PDM's are being used more often as it has proven to produce more efficient and more reliable estimates (Abdul Hadi *et al.,* 2018:10).

To address sub goal 1: Relationship between sector level FDI and sector growth in South Africa, a PDM will be used, i.e. Panel Vector Error Correction model. The dependent (key) variable is quarterly sector annualized GDP growth (GDPG). The independent (explanatory) variables are quarterly sector FDI as a percentage of GDP (FDI), quarterly sector foreign other investments as a percentage of GDP (FOI), quarterly sector foreign portfolio investments as a percentage of GDP (FPI), and quarterly sector gross fixed capital formation as a percentage of GDP (GFCF),

To address sub goal 2: Effect of sectoral FDI on sectoral employment in South Africa, a Feasible Generalized Least Squares (FGLS) model will be employed. The dependent (key) variable is change in sector share in total employment (SSinTE). The independent (explanatory) variables are change is

quarterly sector FDI per worker (FDIperW), the growth rate of sector share in total employment (GQTE), and quarterly sector earnings per worker (WperW).

No ethics application form was submitted using the Ethical Review Application System (ERAS) for publicly available data as the study involved low risk desktop research.

1.4. DATA AND DATA COLLECTION

The study relies on secondary data from the South African Reserve bank (SARB) quarterly bulletins for various quarters and Statistics South Africa (Stats SA). Quarterly sector FDI data, quarterly sector FOI data, quarterly sector FPI data and quarterly sector GFCF data are obtained from the SARB quarterly bulletins over the period 2000Q1 to 2016Q4. The identified sectors receiving FDI according to the central bank that are included in this study are: mining and quarrying; manufacturing; electricity, gas and water; transport, storage and communication; finance, insurance, real estate and business services; and community, social and personal services. Quarterly sector employment data, quarterly sector earnings of employees' data and quarterly sector growth data are obtained from Stats SA for the period 2005Q1 to 2016Q4.

1.5. RESEARCH DESIGN

The study follows a quantitative research method and falls within a positivist research paradigm as the goal is to obtain objective evidence on the relationship between sectoral FDI, sectoral growth and sectoral employment.

1.6. ORGANIZATION OF STUDY

This study is comprised of six chapters. Chapter 1 introduces the study and provides motivation for conducting the study. Chapter 2 provides a discussion of the behavior of key variables of the study during various policy regimes in South Africa. Chapter 3 provides a comprehensive review of theoretical and empirical literature. Chapter 4 presents a discussion of the variables included in the study and the proposed methodologies to be employed for the achievement of the objectives of the study. Chapter 5 reports the results obtained from employing econometric techniques. Chapter 6 concludes the study by providing a summary of the study and providing policy implications and recommendations as well as conclusions, limitations of the study and areas for future research.

CHAPTER 2

THE SOUTH AFRICAN CASE

2.1. INTRODUCTION

Policy regimes in South Africa play a crucial role in the behavior of FDI, growth and employment because policies developed and implemented during these regimes are aimed at significantly increasing all three variables. This chapter provides an overview of the various policy regimes post-apartheid and their intended plans on influencing FDI, growth and employment in South Africa. Additionally, this chapter provides an insight on the behavior of these variables at a national level and at a sector level. As such, section 2.2. provides a discussion on five policy regimes in South Africa. Section 2.3. and 2.4. looks at the behavior of FDI, growth and employment at the national level and at the sector level respectively. Lastly, section 2.5. produces a table showing the averages of the three variables during each of the five regimes.

2.2. POLICY REGIMES IN SOUTH AFRICA

Munyeka (2014:249) explains that the post-apartheid era of South Africa demonstrates that macroeconomic stability is not enough for growth and additionally, while prudent fiscal and monetary policies are certainly necessary, they are also not sufficient in generating sustained growth. Fourie (2013:1) argues that pursuing higher economic growth is one policy objective and strategy that the global economy agree is extremely important. Fourie (2013:1) explains that economic growth is measured by real GDP. Fourie (2013:1) and Munyeka (2014:249) explain that higher economic growth is seen as the main solution to any country's structural problems such as unemployment, poverty and inequality. The idea is that once a nation is able to grow its core economy, the formal sector grows, jobs become available, people are able to participate in the economy and afford their living costs. This however is easier said than done. According to Fourie (2013:1), since 1994, all policies developed and implemented in South Africa stress the need for high growth rates in GDP. These policies include the Reconstruction and Development Programme (RDP) of 1994, the Growth, Employment and Redistribution programme (GEAR) of 1996, the Accelerated Shared Growth for South Africa (ASGISA) of 2006, the New Growth Path (NGP) of 2010 and the National Development Plan (NDP-2030) of 2013.

The need for changing policies over the last 25 plus years is directly associated with changes in leadership (e.g. change in Presidents) and inevitable changes in the global economy. For instance, Munyeka (2014:249) attributes the 2007/8 global economic financial crisis (GFC) and the entrance of Jacob Zuma as president of South Africa as being responsible for the move to the NGP. The author also attributes the growing presence of China and India in international trade and the entrance of Cyril Ramaphosa as president of South Africa as the shift to NDP-2030.

According to Munyeka (2014:249), considering that South Africa is a developing nation that lags behind the more developed nations in terms of innovation technology and education *etc.*, the South African nation's macroeconomic policies on growth, employment, and poverty and inequality reduction have been stronger than ever because they are part of a wider effort to mobilize resources and transform them in a manner that positively impacts on economic development.

2.2.1 Reconstruction and Development Programme (RDP)

According to Fourie (2019:386), the Reconstruction and Development Programme (RDP) was enacted during the term of President Nelson Mandela in 1994 and was a prime social development policy initiative. According to the White paper by the Government Gazette (1994:7) and Wessels (1999:236), RDP "is a framework for integrated and coherent socio-economic progress". RDP looked to marshal human resources together with all other available resources of the country and use them to eradicate all residual results of apartheid (Aliber, 2003:475). The goal of RDP was to build a democratic nation that does not discriminate against race and gender *etc.* (Government Gazette, 1994:7; Aliber, 2003:475). The objective of RDP was to transform South Africa through the development of strong, stable democratic institutions that will ensure all citizens are represented and participate in the economy irrespective of their demographics, and ultimately creating an environment that will ensure sustainable growth and development without destroying or harming the natural *environment* (Government Gazette, 1994:7). According to Fourie (2019:386), RDP essentially followed an approach sustaining that growth can be achieved through redistribution.

At the time of implementing RDP, the motivation for a policy of its caliber was derived from the bitter history of South Africa which was dominated by colonialism, racism, apartheid, gender discrimination and repressive labor practices (Government Gazette, 1994:7). The RDP framework also argued that the required level of economic growth could be achieved if people earned a living wage and through this could sustain themselves and their families (Aliber, 2003:475; Munyeka, 2014:249).

RDP was supported by majority of the nation because it promised democracy within the South African society and this democracy would result in achieving economic potential of the country which would then translate into job provision and a more equitable distribution of income and wealth in addition to providing basic needs for all South Africans (Munyeka, 2014:249).

2.2.2 Growth, Employment and Redistribution (GEAR)

The Growth, Employment and Redistribution (GEAR) initiative is associated with President Thabo Mbeki. Although Mbeki became president in 1999, GEAR was implemented in 1996 (Fourie, 2019:386). Compared to RDP, GEAR had a narrower focus and was a macroeconomic policy initiative that aimed at stimulating employment creation through increasing growth (Munyeka, 2014:250; Fourie, 2019:386). The GEAR policy aimed at achieving faster growth to provide for social needs, a smaller government deficit, tighter monetary policy, stability in the exchange rate and liberalization of international trade *etc.* (Aliber, 2003:475; Fourie, 2019:386-387).

According to Gelb (2007:1), GEAR represented a neo-liberal framework that reflected away from the then existing RDP strategies. Aliber (2003:475) and Gelb (2007:2) argue that the key difference between GEAR and RDP is that the main aims or goals of GEAR were almost simply an afterthought of RDP. That is, GEAR places the macroeconomic dimension at the core of policy framework while it was only an aspect in RDP. GEAR places much focus on the informal sector and unregulated activities as these were seen as a large creator of employment (Fourie, 2019:387). Both RDP and GEAR, however, recognize the informal sector as an integral part of the economy (Fourie, 2019:387). According to Munyeka (2014:250), GEAR aimed at ensuring very strong economic development through expanding employment and redistributing income and socioeconomic opportunities favoring the poor. Additionally, the GEAR policy framework highlighted key goals that included economic growth of 6% by 2020, a less than 10% inflation rate, the increase in the economically active population should be less than employment growth, the current account deficit on the balance of payments (BoP) should remain between 2% and 3%, and the budget deficit should not exceed 4% of GDP (Treasury, 1996).

Of the stated targets of the GEAR policy, reducing the fiscal deficit was the only objective achieved (Aliber, 2003:476). Real GDP averaged around 2.3% as opposed to the targeted 4.2% (Aliber, 2003:476). The era of GEAR also experienced jobless growth with a net job loss of 800 thousand compared to the targeted 1.3 million accumulated creation of jobs (Aliber, 2003:476). As FDI compensates for low

domestic savings, the assumption of GEAR was that FDI would rise substantially, however, capital outflows surpassed FDI inflows from 1994 until the end of the GEAR regime (Aliber, 2003:476). It became a topic for debate whether GEAR caused unfortunate developments, or GEAR was not properly implemented or if the country would have been left worse off without GEAR (Aliber, 2003:476). Service delivery under the GEAR era was a cause for celebration. Although it was slow, policies of GEAR did result in millions of South Africans having access to proper water and sanitation, better housing and access to electricity (Aliber, 2003:475).

2.2.3 Accelerated and Shared Growth Initiative for South Africa (ASGISA)

Almost a decade after RDP and GEAR, ASGISA distinguishes itself from both its predecessors by strongly emphasizing on projects that are specific to growth enhancement. According to Fourie (2019:388), ASGISA aimed to halve poverty and unemployment by 2014. Through labor-absorbing economic activities and initiatives that that ensure benefits of growth are equally shared, ASGISA aimed to significantly reduce poverty and inequality (The Presidency, 2007:4). Essentially, ASGISA was a continuation of GEAR (Munyeka, 2014:250), however, prior to the enactment of ASGISA, the Expanded Public Works Programme (EPWP) of 2004 was an important initiative to tackle unemployment and poverty through public employment on mostly infrastructure related projects (Fourie, 2019:387).

ASGISA came about soon after in 2006 and Mbeki referred to it as the development of a second economy. The objective of ASGISA include capturing the existence and plight of those on the boarders of the economy such as the unemployed poor, working poor, formal and informal self-employed people and small enterprises and cooperatives (Fourie, 2019:387). ASGISA focused on creating employment in infrastructure and the anticipated result was higher growth. This component of ASGISA focused on the second economy. Ideally, this meant that strategies that would result in critical interventions for sustainable development and empowering the poor must be developed. This would then mainstream them into the first economy through supporting self-employed people, cooperation's and small enterprises (Fourie, 2019:388). The ultimate goal of ASGISA was to create and grow 300 thousand viable small enterprises that would create one million jobs over a five-year period (Fourie, 2019:388). From assessing the capabilities of the South African economy, a two-phase growth target was set of 4.5% or higher annual growth between 2005 and 2009 (phase one) and at least 6% growth rate of GDP between 2010 and 2014 (phase two) (The Presidency, 2007:4).

The concept of ASGISA was heavily criticized because it implied that the first and second economy were disconnected from each other and created a kind of dual economy. However, developers of the policy assured the nation and its associates that the two economies were inextricably linked (Fourie, 2019:388). ASGISA was a policy that focused on improving the position of the marginalized population and eventually eliminating the second economy. The expected outcome from implementing ASGISA was an economy with a number of viable and sustainable economic enterprises that had high growth prospects for local economies in addition to creating quality jobs and ensuring higher incomes for sole entrepreneurs, employees and their families (Fourie, 2019:389). Despite having an exceptionally thorough research programme and having to report to The Presidency (while GEAR reported to National Treasury), by 2009 ASGISA lost momentum which may be attributed to a change in ANC leadership.

2.2.4 New Growth Path (NGP)

Since Jacob Zuma became president of South Africa, the New Growth Path (NGP) was the first major policy initiative to be implemented in 2010. Just like all the previous policy initiatives, NGP also placed emphasis on job creation. The NGP framework is aimed at growth enhancement, job creation and reducing inequality (EDD, 2010:6-7). The NGP identified strategies that will ensure growth of South Africa in a more equitable and inclusive manner without ignoring the attainment of the nation's development agenda (Fourie, 2019:391). Jacob Zuma stated that NGP represents a vision to place job creation and decent work at the heart of economic policy (EDD, 2011:2). According to EDD (2010:7) and Munyeka (2014:250), NGP is a labor-intensive policy which emphasizes the importance of the development state in promoting the decent work agenda. NGP falls within the regime that involves a growing consensus to create more and better jobs as a driving mechanism to fight poverty and inequality and to address the underdevelopment of rural areas (EDD, 2010:12).

Since the enactment of NGP, the objective was to create five million jobs between 2010 and 2020 through ensuring an annual increased growth rate of between 4%-7% (Fourie, 2019:392). Investment in infrastructure was central to NGP as it was believed to be a critical driver of jobs for the entire economy (EDD, 2010:27). Other areas of priority relating to job creation involved partnerships between the public and private sectors include the agricultural sector, mining sector, manufacturing sector, and tourism and other high-level services (EDD, 2010:29-30). Unlike ASGISA and GEAR, the NGP does not focus much on the informal sector or on a second economy for job creation but rather focuses on formal sector employment (Fourie, 2019:393). The decent work agenda was also central to NGP for both formal and

informal sectors, and promotes formalizing of informal employment in cases where workers do not receive benefits of formal employment such as a formal employment contract, pension fund, medical aid and housing allowance benefits *etc.*(Fourie, 2019:392).

The NGP framework outlines a number of job drivers (areas where jobs can certainly be created) as part of the growth initiative (EDD, 2010:27-36). Majority of new jobs were forecasted to exist in the private sector. According to Fourie (2019:394), the vision of NGP was founded largely upon the idea of large-scale, high value industrial economic projects and takes the shape of a first economy-based approach. It is evident that the absence of an informal sector and second economy from the NGP policy framework reflect dynamics of anti-ASGISA and it is arguably the critiques of ASGISA that were responsible for removing the marginalized economy from being a central component of NGP (Fourie, 2019:395).

2.2.5 National Development Plan (NDP)-2030

The National Development Plan (NDP) is a complete shift away from previous policies discussed and was implemented during the era of President Jacob Zuma. In 2010, the president appointed an independent and diverse group of experts from a number of organizations that would be known as the National Planning Commission (NPC). According to NPC (2012:24), the aim of NDP is to eliminate poverty and reduce inequality by the year 2030. The vision of NDP is to develop and reshape the country (Fourie, 2019:396), through achieving full employment, decent work and sustainable livelihoods (Munyeka, 2014:250) as a means of ensuring improved living conditions for all the people of the country. The NPC compiled a report in 2011 that demonstrated the achievements and shortcomings of the country since 1994. The report found that the government failed to implement policies and did not have partnerships with key stakeholders which resulted in slow progress (NPC, 2012:25).

After identifying the challenges, the NPC met with a number of stakeholders (public citizens, parliament, national departments, state-owned enterprises *etc.*) and discussed a plan of action, that is the NDP-2030 (NPC, 2012:25). NDP is not simply an economic plan but rather a societal development plan (Fourie, 2019:396). The overarching goals of NDP is the reduction of unemployment to 6% by increasing employment creation, and significantly reducing poverty and inequality by 2030 (Fourie, 2019:397). To achieve this, NDP estimates GDP growth needs to be about 5.4%. NDP postulates that GDP growth may be achieved through an increase in exports (to increase income) and through growing the domestic services sectors (for employment growth) (Fourie, 2019:397).

Unlike NGP, NDP places much focus on small and medium firms (SMMEs) for employment creation. According to NPC (2012:119), SMMEs are forecasted to create 90% of new jobs by 2030. Additionally, they are expected to be service-orientated and as such, they are expected to provide services to large domestic firms, including export-linked domestic firms (NPC, 2012:119). As with NGP, NDP is subject to scrutinization for neglecting the informal sector and the second economy. As such, the NDP economy is formal sector orientated. Fourie (2019:407) explains that the informal sector is almost forgotten post-ASGISA, yet it provides about 2.5 million jobs for people and it is a vitally important economic feature in the townships where 40% of the South African population reside.

2.3. AT A NATIONAL LEVEL

Relating to GDP growth rates, Fourie (2013:2) explains that GDP growth rates required to sustain and reduce unemployment to acceptable levels are relatively high. As per the Medium-Term Strategic Framework (MTSF), the required GDP growth rate is approximately 4.5% while ASGISA estimated it should be 6% or more, the NGP framework estimate it should be between 4% and 7% while NDP-2030 estimate it should be precisely 5.4% (Fourie, 2013:2). Unfortunately, South Africa's growth performance has been very far from these levels for many years (Fourie, 2013:2). The author explains that growth rates have been 2.7%, 3.5% and 3.8% in 2013, 2014 and 2015 respectively. Prior to this, the post-freedom decade of 1994 to 2004 saw growth average 3% and reached about 5% by 2005 (The Presidency, 2007:2). At the time of implementing the NDP in 2013, Fourie (2013:2) explains that a significant gap existed between the desired/required growth rate and the actual growth rate while unemployment remained stagnant at around 25% under the narrow definition and 30% under the broad definition of unemployment.

Looking at employment, Bhorat *et al.* (2014:3-4) asserts that the period from 2000 to 2008 showed GDP and employment to have a positive relationship. Accordingly, a 1% increase in GDP was associated with a 0.69% increase in employment. However, post GFC (2008-2012), a 1% increase in GDP was associated with a 0.16% reduction in employment. Such results imply that South Africa needs extremely high levels of growth to adequately address poverty and unemployment problems in the country. As a result of the GFC, South Africa lost more than one million jobs and by the third quarter of 2010, unemployment in the country was at an all-time high of about 25.5%. This implies that economic difficulties that occur globally have a sharp and relatively long-lasting impact in the labor market of South Africa.

Bhorat *et al.* (2014:11) asserts that investment is key in driving structural transformation. Accordingly, during the late apartheid period, capital stock investment dropped to extremely low levels. This was evident in Gross Fixed Capital Formation (GFCF) falling to a very low level of equilibrium to approximately 15% of real GDP. Post-apartheid, it took GFCF roughly 10 years to begin to rise (Bhorat *et al.*, 2014:11). This constrained growth in numerous ways. One way being electricity shortages that surfaced in 2008 causing investors to hold back on investing in energy intensive economic activities (Bhorat *et al.*, 2014:11). By 2009 and 2010, investment grew to about 20% of real GDP yet began to decline once again, however not to extreme levels as during the apartheid era.

FDI, arguably being a key driver of economic growth has shown to increase in South Africa. According to Bezuidenhout (2015:2), of the SADC region countries, South Africa is a major recipient of Greenfield FDI. Compared to the rest of SADC, South Africa is one of two countries (the second being Tanzania) that receive the most diversified investments. That is, South Africa receives Greenfield FDI in more than 25 of its economic sectors. According to Wöcke and Sing (2013:3), the trajectory of South African FDI has followed an upward trend after the first democratic election in 1994. FDI inflows to South Africa have shown to increase between 1997 (FDI = R81 billion) and 2010 (R1016 billion). The vast amounts of FDI came from the United Kingdom (UK), the Netherlands, Germany and Switzerland (Sandrey, 2013:92-93). Following the Asian Financial Crisis of 1997, in 2000 FDI inflows to South Africa were modest and were estimated to be around US$887 million and 2001 saw a further increase of about US$6.8 billion. However, 2003 and 2004 proved to be a very volatile period as FDI inflows declined to less than US$800 million. This volatility was attributed to rand exchange rates when the rand lost about 37% of its value against the U.S. dollar. Another reason for this volatility was a result of investors withdrawing funds from developing countries immediately after the 9/11 terrorist attacks on the U.S. (Wöcke and Sing, 2013:4). The year 2011 saw South Africa record its lowest FDI to GDP ratio of 32% compared to four developing countries, namely, Poland, Malaysia, Hungary and Chile. Although during the same year South Africa was the second largest recipient of FDI on the African continent (Wöcke and Sing, 2013:3). According to Wöcke and Sing (2013:4), South Africa managed to get this rank because investors feared political turmoil of their recipient countries (e.g. Egypt and Libya), and therefore needed to move their investments elsewhere on the continent.

2.4. AT A SECTOR LEVEL

Bhorat *et al.* (2014:4) explain that employment growth follows GDP growth. Considering Fourie (2013) providing evidence of slow growth (or actual growth considerably lower than required growth), one can conclude that employment might have declined over the years. Bhorat *et al.* (2014:4) examined employment estimates over the years from 2001 to 2012. The authors found that during this period, primary sector employees lost their jobs. During this period, more than 500 thousand people were left unemployed from the agricultural sector and about 200 thousand people were left unemployed from the mining sector (Bhorat *et al.*, 2014:4). The same period saw the manufacturing sector experience lackluster growth, however, employment in the sector increased by over 100 thousand jobs over the 11-year period (Bhorat *et al.* 2014:4). Consequently, the manufacturing sector lost 1.8% of its share in total employment. As this was the period of global financialization, not surprising, the tertiary sector (which includes financial services and community services) experienced the highest growth rate in employment as the financial services sector created 782 thousand jobs while the community services sector created about one million jobs (Bhorat *et al.*, 2014:4). In 2001, the community services sector was responsible for employing 18% of the total workforce and the growth performance of the sector accounted for more than 40% of increased employment (Bhorat *et al.*, 2014:4).

Following the GFC and an unstable regulatory environment, many employees were retrenched in the mining sector and a number of shafts were closed down. The sector took a further hit in August 2012 when the South African Police Service (SAPS) opened fire on protesting miners at Lonmin Platinum mine in Marikana. This led to further loss of jobs and more shafts closing down. However, then Minister of Finance Pravin Gordhan promised investors that policies would be revised to ensure a safe investment climate and a stable regulatory environment.

According to IDC (2019:8), the tertiary sector (specifically finance and business areas) created more than 238 thousand jobs between 2010 and 2018, while some industries in the secondary sector (specifically construction and trade) created about 170 thousand jobs and the primary sector (specifically mining) created about 27 thousand jobs. The community services sector, transport sector and manufacturing sector experienced job losses. IDC (2019:8) explains that the decline in employment intensity of the economy over time is rather concerning and considering the large number of new entrants into the country's job market, economic expansion needs to move at a much faster pace to create more jobs.

According to Wöcke and Sing (2013:4), South African history shows that the natural resource sector of the nation has mainly attracted FDI, more specifically mining thereafter followed by manufacturing and trailing behind were the services sectors. Important to note is that there were significant differences in amounts of FDI received between mining and manufacturing and then between manufacturing and the services sectors. In 2001 and 2010, the mining sector accounted for a third of total FDI in South Africa (Wöcke and Sing, 2013:5). As much as this may seem positive, Wöcke and Sing (2013:5) explain that the decade starting 2000 was characterized by increased global demand for commodities and a third of total FDI for the mining sector is evidence of slow growth. This was a consequence of a difficult and constraining regulatory and investment environment for the nation. The result was South Africa missing out on a commodity boom more than once. The mining sector took a knock between 2001 and 2008 because of the debate on nationalizing the mining industry and the introduction of a mining windfall tax on some commodities. As such, the mining sector of South Africa declined by 1% while the global mining industry grew by close to 5% during the period 2001 to 2008. Despite the occurrence of negative events, FDI stock in the mining and quarrying industry more than doubled from US$15 billion to US$35 billion over the period 2001-2009 (Wöcke and Sing, 2013:5).

FDI inflows to the manufacturing sector grew from US$11 billion in 2001 to about US$29 billion in 2008. This was a result of a number of MNEs expanding their business activities in South Africa. These MNEs included Daimler AG (injected US$290 million) and BMW (injected close to US$290 million). Besides capital flows, South Africa has a well-developed automotive manufacturing industry (which includes Ford, VW, Toyota and Nissan) and these industries not only account for valuable export earnings and employment creation but it is an important area for technology transfer spillover benefits to South African related and supporting industries (e.g. original equipment manufacturing parts). New MNEs since then include Nestle, Tata and Heineken (Wöcke and Sing, 2013:7).

As with employment, the services sector accounts for the largest share of FDI in South Africa compared to the primary and secondary sectors. Between 2001 and 2009, FDI in the services sector increased from US$19 billion to US$40 billion. The largest FDI activity in the tertiary sector occurs in the financial services. The financial services sector of South Africa is highly developed and encompasses deep, specialized skills and an impressively sophisticated regulation environment (Wöcke and Sing, 2013:7).

More recently there has been an increase in infrastructure driven FDI by MNEs from Europe, India and the U.S. The South African government and other governments have increased investment in

infrastructure in their respective countries and this has been followed by MNEs building their presence in South Africa through infrastructure investment (Wöcke and Sing, 2013:8).

Relating to sector growth, the mining sector had entered into a technical recession in 2011 as the sector experienced negative growth for three consecutive quarters. Seasonally adjusted rates showed growth to be -4.2%, -4.2% and -17% in the first, second and third quarters respectively (Wöcke and Sing, 2013:5). According to IDC (2019:10), real GDP in the manufacturing sector has been characterized by weak growth between 2010 and 2018 due to a difficult domestic economic environment, increased operational costs and the global trading environment becoming increasingly challenging to participate in. Most sub-sectors of the manufacturing sector (e.g. those producing television sets and radios, electrical machinery, textiles, clothing, leather and footwear *etc.*) have experienced a fall in production volume whilst other sub-sectors (e.g. those producing transport equipment, food and beverages) have experienced increased production levels. IDC (2019:10) notes that poor performance in some of the sub-sectors are related to load-shedding, higher electricity costs, lowered domestic demands and high global risks.

2.5. SECTOR GROWTH, EMPLOYMENT AND FDI WITHIN REGIMES

Table 1 shows the average growth, employment and FDI in each sector of the South African economy during GEAR, ASGISA, NGP and NDP-2030.

Table 1: Sector growth, employment and FDI

SECTOR	VARIABLES	POLICY REGIMES			
		GEAR 1996-2004	ASGISA 2006-2009	NGP 2010-2012	NDP-2030 2013-2016
Mining and Quarrying	Real GDP (R'millions)	235254	234595	226995	229211
	Employment	Not Available	492500	512667	482188
	FDI (R'millions)	48819	220864	307442	409645
Manufacturing	Real GDP (R'millions)	280503	359904	368537	382088
	Employment	Not Available	1281938	1158000	1163375
	FDI (R'millions)	51923	158316	241478	279476
Electricity, Gas and Water	Real GDP (R'millions)	57128	67886	68550	66808
	Employment	Not Available	55438	59333	60000
	FDI (R'millions)	5	29	29	604
Transport, Storage and Communication	Real GDP (R'millions)	144737	218390	236709	259213
	Employment	Not Available	356875	365333	451063
	FDI (R'millions)	5791	12641	60505	142579

Finance, Insurance, Real Estate and Business services	Real GDP (R'millions)	315036	491350	543789	597531
	Employment	Not Available	1822813	1810917	2058938
	FDI (R'millions)	63820	154864	224670	572773
Community, Social and Personal Services	Real GDP (R'millions)	421730	515048	573735	626728
	Employment	Not Available	2077187.5	2307333.333	2548937.5
	FDI (R'millions)	143	526	571	1387

Source: Author's own calculations derived from data taken from SARB and StatsSA
Note: *Employment data not available prior to 2005*

2.6. CONCLUSION

It is evident in this chapter that despite developing and implementing a number of strategic policies during different eras, South Africa is still struggling with increasing growth to required levels, increasing employment creation and reducing poverty and inequality. This chapter provided an overview of the various policy regimes post-apartheid and their intended plans on influencing FDI, growth and employment in South Africa. Additionally, this chapter provided an insight on the behavior of these variables at a national level and at a sector level. Clearly, the tertiary sector seems to be outperforming the primary and secondary sectors since the sector accounts for the highest growth and FDI inflows. Although the primary sector seems to employ a larger number of employees, the sector is not as skills intensive as the tertiary sector which then questions if simply aiming to create more jobs is the solution to the South African problem.

CHAPTER 3

LITERATURE REVIEW

3.1. INTRODUCTION

This chapter provides an overview of theoretical and empirical literature on the relationship between FDI, growth and employment. The first section of the chapter outlines the theoretical literature review which provides an overview of the existing foundations of investment and growth. The section further looks at the theory underlining FDI. The second section of the chapter provides an overview of empirical literature and is divided into four components: the first component is the relationship between FDI, growth and employment; the second component is the relationship between FDI, growth and employment in Africa; the third component is the relationship between FDI, growth and employment in South Africa and the fourth component is the relationship between FDI, growth and employment at the sector level.

3.2. THEORETICAL LITERATURE REVIEW

This section reviews the theory of Investment and Growth as well as the theory underlining foreign direct investment.

3.2.1. Theory of Investment and Growth

There are several theories that attempt to explain the possible relationship between investment and growth. This section reviews the Harrod-Domar Growth Model, The Big Push Theory, the Solow-Growth Model and Endogenous Growth Models.

a) Harrod-Domar Growth Model

Adofu (2010:11) explains that the Harrod-Domar Growth Model is a traditional economic growth model which assumes that labor is in unlimited supply, however capital accumulation constrains output growth. Consequently, investment drives capital accumulation, and capital accumulation is attained through savings (i.e. savings=investment). Therefore, for nations with low savings rates, desired investment is not achieved thus leading to disequilibrium in product markets and therefore slow rates of economic growth.

According to Solow (1988:307), Roy Harrod and Evsey Domar answered the question of when an economy may achieve steady growth at a constant rate. To that, their answer would be that a constant growth rate is achieved when the national savings rate is equal to the product of the capital-output ratio and the effective growth rate of labor force where the national savings rate is a portion of income saved. The idea here is that an economy should possess sufficient plant and equipment to meet the available supply of labor such that labor does not appear to be in shortage or in surplus thus creating unemployment (Solow, 1988:307). Should this equilibrium relationship not occur, or should the economy deviate slightly from its natural growth rate, Sato (1964:380) and Solow (1988:307) state that the consequence is either rising unemployment or prolonged inflation. However, they argue that there is no automatic force built into such a system to ensure adjustment back to equilibrium.

The Harrod-Domar growth model places savings as a central component to achieve steady growth. Eltis (1987:1) postulates that increasing output through increasing capital in the form of investment from savings will result in growth. As such, Eltis (1987:1) proposes that this relationship is reflected as:

$$Growth(g) \equiv \frac{Investment\ (I)}{output\ (Y)} \div C \qquad (eq.3.1)$$

Defining C as the capital-output ratio. According to Sato (1964:380), Solow (1988:307) and Easterly (1999:424), the main criticism of the Harrod-Domar growth model is the assumption that the savings rate, labor force growth rate and capital-output ratio variables are constant, whereas realistically these variables are likely to change over time and are more or less independent of each other. Additionally, savings depend on preferences, the growth rate of the labor force depends on demographics and sociological factors, and the capital-output ratio depends on the technology employed.

Easterly (1999) explains that at the time of this study, International Financial Institutions (IFIs) such as The World Bank and International Monetary Fund (IMF) still made use of the Harrod-Domar model despite major criticisms against it. However, these institutions used the modified version of the Harrod-Domar model referred to as the two-gap model. There are two important features in the model. The first is that to achieve a given growth rate, investment requirements are calculated as a portion of the growth rate which is termed “incremental capital output ratio” (ICOR). And the second is that Foreign Aid requirements are obtained from identifying the gap between investment requirements and available private finance plus domestic savings. This gap is referred to as “financing gap” (Easterly, 1999:424).

Regarding the investment and growth relationship, Easterly (1999) attempted to establish if there is a fixed, short run linear relationship between investment and growth. For 138 countries, with ten or more observations on growth and lagged investment, Easterly (1999:432) found that the two-gap model fitted only one country, thus concluding that a linear relationship between investment and growth in the two-gap model, does not have empirical validity. This leads to the question then of why is the model still relevant and still used? Easterly (1999:436) explains that the model is useful for calculating financial aid requirements and is convincing to stakeholders that investment is necessary for growth. This helps financial aid agencies with the distribution of aid to recipient countries. Easterly (1999:436) also argues that the model is widely used because ideologically it is what "everyone else" is using.

b) Big- Push Theory

The idea of identifying the financing gap in the two-gap model gave birth to another line of conceptualization which became known as the Big Push Theory. According to Easterly (2006:290) and Guillaumont and Jeanneney (2007:2), it is inevitable that poor countries or least developed countries (LDCs) get caught up in a poverty trap and as such they need a Big Push through increased investment to takeoff. Collier (2006:189-194) however states that Africa has become the poorest region because of globalization and therefore the African continent needs a Big Push to escape not just a single poverty trap, but rather four development traps. The author identifies these traps as the conflict trap, the corruption trap, primary commodity trap and fractionalized society trap. Easterly (2006:290) explains that during the year 2005, Big Push initiatives were key for the achievement of the eight Millennium Development Goals (MDGs) and it was argued that it is possible to escape poverty traps by investing in basic areas such as public administration, human capital, infrastructure, electricity, water and sanitation *etc.* Easterly (2006:291) explains that a Big Push to LDCs could accelerate growth because it would bridge the financing gap. Guillaumont and Jeanneney (2007:1) argue that besides bridging financing gaps, poverty trapped countries can be pushed out of a stagnant trap which will be impossible to do so without financial aid. Following this, Guillaumont and Jeanneney (2007:3) explain that the idea of the Big Push has been heavily critiqued because it is not as simple as providing aid, there are other important aspects to consider.

First, Guillaumont and Jeanneney (2007) argue that there isn't evidence to support the existence of poverty traps both at macro and micro level. Four to five decades ago, many countries that were described as low-income nations were able to significantly grow and move up from the low level without financial aid and therefore being a low-income country does not necessarily translate into getting caught in a trap

(Guillaumont and Jeanneney, 2007:3). They argue that it is structural problems (e.g. poverty, inequality and unemployment) that interact with each other and make sustained growth unlikely achievable. Secondly, aid effectiveness and misuse of aid comes into question. Guillaumont and Jeanneney (2007:4) find that financial aid is not effective for all low-income countries, but aid does promote growth in countries that are likely to be highly affected by positive exogeneous shocks. According to Guillaumont and Jeanneney (2007:4), successful aid processes are identified when they lead to self-sustained growth and a weaker aid-growth relationship since it reflects a nation's ability to combat their structural difficulties. That is, during the beginning of a growth phase, countries require high aid inflows and thereafter they require decreased levels of aid. This was found to be true for some LDCs like Botswana, however the critique of this aspect stems from the fact that aid effectiveness is not positive for all LDCs because they have different initial conditions when accessing financial aid. For instance, human capital could be better in one LDC compared to another and/or human capital could have been supported by some other aid which makes it easier for one country to move out of a poverty trap than another (Guillaumont and Jeanneney, 2007:4-5).

Collier (2006:189) argues that while currently assistance to Africa is in the form of financial aid and that financial aid to Africa should be increased, it is unlikely that this on its own will help achieve much. Rodrik and Subramanian (2009:114) argue that developing countries are investment constrained. Meaning that there are various factors restricting investment and this hinders growth prospects (recall the Harrod Domar Growth Model: savings=investment=growth). According to Rodrik and Subramanian (2009:114-115), one such restriction is through the real exchange rate. The authors argue that once the domestic currency of host nations appreciate following capital inflows, profits on investments are reduced because the value of the investment has now reduced. Therefore, investors become skeptical to invest, thus further constraining investment. Rodrik and Subramanian (2009:115) state that capital inflows do boost consumption, however, the impact of these inflows on investment and growth are indeterminate or the impact may be negative. According to Collier (2006:190-195), the African continent diverged away from the global economy because the opportunities afforded to them were inferior to that of other regions and therefore the continent could not keep up with the rest so it fell behind and found itself in four development traps which Collier (2006:195) believes can be escaped through a Big Push. Collier (2006:195) states that the Big Push should not only be in the form of finance but rather it should also include other external resources such as various types of FDI so that it can finance domestic capital

accumulation, it can raise the standard of living and it shows private investors that the nation is not going in the same negative direction as it was in the past.

c) Solow's Neoclassical Growth Model

The Solow-Growth Model (commonly referred to as the Neoclassical Growth Model) was developed during the 1950s by Robert Solow and postulates that the level of output per worker has a direct link to the investment rate of an economy (Holtz-Eakin, 1992:1). Pack (1994:55) states that the model takes the form of a Cobb-Douglas function and as such the standard production function in the Solow-Growth Model is:

$$Y = Ae^{\mu t}K^{\alpha}L^{1-\alpha} \qquad (eq.3.2)$$

Where Y represents GDP, K is capital stock including both human and physical capital, L represents unskilled labor and A is a constant that reflects the rate at which technology evolves (Pack, 1994:55). In the above formula, α indicates the GDP percentage growth rate resulting from a one percent increase in capital (Pack, 1994:55). When α is less than one, it means there exists diminishing returns to both capital and labor. In this neoclassical model, investment (reflected by increases in savings) will cause additional growth for a period, but as the capital to labor ratio increases, marginal product of capital declines and the economy adjusts back to its steady-state where output, capital and labor grow at the same rate. The annual productivity improvement rate (represented by μ) shows the growth in income per worker and can be interpreted as knowledge improvement (e.g. organization routine, better inventory management *etc.*) or other changes that may not require knowledge incorporation in equipment (Pack, 1994:56).

A key prediction of the Solow-Growth model is that all economies with the exact investment and labor force growth rates converge to an identical steady-state for output per worker and at that point no additional labor should be added to production or the consequence is the economy facing diminishing returns (Holtz-Eakin, 1992:1). According to Easterly (1999:429), Robert Solow extended the Harrod-Domar Growth Model to address the shortcomings of the model by including labor as an explanatory variable of economic growth and by proposing that the output-capital ratio is an endogenous variable. Under the Solow-Growth model, it is assumed that a nation's population grows at a constant rate (g), consumers in an economy save a proportion of their income (s) and all firms in an economy have access to and use the same technology for production that takes in capital and labor as inputs. The model also assumes that output will increase by the same rate as the increase in capital stock and labor. That is, the

model assumes constant returns to scale (Solow, 1994:47-49). According to Easterly (1999:429), in the steady-state, technical progress that increases effectiveness of labor leads to the capital-output ratio being constant and as such, in the steady-state, the level of output will be a function of investment.

In applying the Solow-Growth model, Holtz-Eakin (1992:4) suggested a Cobb-Douglas function:

$$Y_t = K_t^{\alpha}(\Phi_t L_t)^{1-\alpha} \qquad (eq.3.3)$$

Where Y_t represents output, K_t represents capital input, Φ_t represents a technical efficiency index and L_t represents labor inputs. In the above model, $\Phi_t L_t$ represents the labor-augmented technical progress.

As in the Harrod-Domar growth model, once again Easterly (1999:429) proposes deriving a constant ICOR in the steady-state. In this case the ICOR is defined as the ratio of the rate of investment to population growth and the labor-augmenting technical progress rate. According to Easterly (1999:429), if the ICOR is high it would mean that investment rate is high and population growth rate is low which is highly desired by many economies. The constant ICOR in the steady-state means that exogenous investment increase will increase growth but only temporarily because there is a transition happening from on steady-state to another. A high ICOR during this period means that the investment rate is changing and not that investment is inefficient.

According to Mazenda (2014:105), for FDI, the Solow Growth Model suggests that FDI should enable host countries to achieve higher levels of investment than their domestic savings permit, thus enhancing capital formation. Solow's theory therefore would suggest that FDI will have a potential beneficial impact on output growth, but this is only true for the short run. The long run impact would be that the host nation converges to its steady-state growth rate considering the concept of diminishing marginal returns to physical capital (Mazenda, 2014:105). At this point it would seem as if there was no FDI inflow which then means that the country cannot expect a permanent impact on economic growth.

d) Endogenous Growth Models

According to Romer (1994:3), endogenous growth models emphasize that economic growth is the endogenous outcome in an economic system and not the outcome of exogenous forces. Romer (1990: s72) argues that technological change is at the heart of economic growth and should be treated as endogenous. Romer (1990) presents a model that resembles the Solow-Growth model with endogenous technological change. The author argues that technological change occurs because people act

intentionally when responding to market incentives and that technological change acts as an incentive for non-stop capital accumulation and as such, capital accumulation along with technological change led to much of the increase in output per hour worked (Romer, 1990: s72). The defining characteristic of technology is that different methods for working with and transforming raw materials are used as compared to other economic goods and the cost associated with creating new methods is usually fixed because the method can be used continuously without incurring additional costs (Romer, 1990: s72).

Pack (1994:55) critiques endogenous growth theory for explaining actual growth based on the premise that the theory tests earlier growth models rather than endogenous theory itself. Pack (1994:55) also explains that the assumptions of endogenous growth theory is simply an expansion of existing growth theory and does not demonstrate any ability to develop a new framework that allows explanation of actual growth phenomena. For many endogenous growth theories, the main aspect is reflected in the following equation:

$$Y = AK \qquad (eq.\,3.4)$$

Where A represents all factors affecting technology and K represents both human and physical capital (Pack, 1994:56). Unlike the Solow-Growth model which assumes that diminishing returns to scale may occur if additional labor is included beyond the steady-state point, endogenous growth models assumes no diminishing returns through invoking some external factor that offsets any actions that may cause diminishing returns (Pack, 1994:56). Both physical and human capital investment is assumed to lead to increased productivity that will exceed private gain which leads to the belief that in endogenous growth models, if the investment rate increases then sustained growth is inevitable (Pack, 1994: 56).

Easterly (1999:429) explains that in an endogenous growth model, transferring a lump sum amount of aid will not affect the rate of investment, therefore recipient countries will choose not to increase their savings rate. However, according to Mazenda (2014:97), endogenous growth models assume that primary sources of growth for any nation are labor, human capital, physical capital and technological change. The author further explains that in the context of FDI, endogenous growth models highlight technological improvement, efficiency improvement and productivity improvement to ensure that the expected positive impact on economic growth from FDI is achieved. If there is no improvement in the mentioned variables, then FDI cannot generate increasing returns in production through positive externalities and production spillovers.

3.2.2. Theory of Foreign Direct Investment

According to Sandrey (2013:90), in a closed and open economy, investment is a noted fuel of economic growth. Sandrey (2013:90) further explains that in a closed economy the only form of investment available is domestic savings, however, an open economy allows foreign investment (liabilities of the host nation) to augment domestic savings and this total investment (domestic savings plus foreign investment) leads to growth. A category of foreign liabilities by the South African Reserve Bank (SARB) is Foreign Direct Investment (FDI).

FDI is defined as a type of investment that is intended to acquire long-term ownership and control in an enterprise that operates in a country excluding that of the investor (Kirti and Prasad, 2016:45; Jula and Jula, 2017:30; Erdal, 2018:28). Another definition of FDI is "the net inflow of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor" (Sandrey, 2013:90). Investors participating in FDI are referred to as Multinational Enterprises (MNEs). Fedderke and Romm (2006:740) state that for foreign investment to be defined as FDI, the criterion is that the investor is capable of significantly influencing activities within the enterprise of his investment. FDI is reflected in the Balance of Payments (BoP) and includes the sum of equity capital, reinvestment of earnings and other short-term and long-term capital (Sandrey, 2013:90). According to Kirti and Prasad (2016:45), MNEs seek incentives such as markets, comparative labor advantage in foreign countries and cheaper raw materials *etc.*

According to Kurtishi-Kastrati (2013:26), FDI is a fundamental component for open and successful economic systems and it is seen as a major mechanism for development. FDI has been recognized as having significant benefits for host nations that include technology spillovers, support for human capital formation, enhancing competition in the business environment, international trade integration, and enterprise development improvement (Kurtishi-Kastrati, 2013:26; Jula and Jula, 2017:30). The authors argue that these benefits along with contributions of FDI to social conditions lead to economic growth. Fedderke and Romm (2006:739) agree with this and explain that FDI should have an impact on long-run development rather than domestic investment alone because MNEs are mostly from technologically advanced countries and this means that recipient countries benefit through technology spillovers and knowledge transfers.

Erdal (2018:208) explains that, for developing economies, FDI is preferred in comparison to financial capital flows because it is more stable and is not easily affected by speculative attacks. FDI inflows to

developing economies showed its resilience during the South East Asia financial crisis of 1997/1998 when investors participating in FDI did not withdraw their investments like investors in portfolio investments and short-term capitals (Erdal, 2018:28).

a) Motives for undertaking FDI

There are four main motives driving foreign investors to participate in FDI and depending on the motivation for undertaking FDI, investors decide on the type of FDI. Dunning and Lundan (2008) and Gorynia *et al.* (2007) distinguish between the four types of FDI.

The first type is Natural Resource Seeking FDI. Foreign investors are likely to participate in this type of FDI if they require high quality natural resources that may cost less in foreign countries and may not be available in their own country. Foreign investors are motivated to participate in this type of FDI to ensure continuation of production in addition to increased profit levels and increased competition in the market that they operate. Within this category exists three types of resource seekers. Physical resource seekers look to secure natural resources (e.g. minerals, metals, agricultural goods *etc.*) at minimum costs. Human Capital resource seekers look for plentiful supply of cheap, unskilled and/or semi-skilled labor. The final resource seekers are those investors looking for superior technology capability, management skills and perhaps organizational skills.

The second type of FDI is Market Seeking FDI. Enterprises participating in market seeking FDI supply goods and services in markets of foreign countries or regions. Dunning and Lundan (2008:67-70) explain that often these enterprises would have supplied these goods via exports, however host nations may have imposed cost-raising barriers or markets may have grown and that has led to foreign firms opting for local production in the host nation. The purpose of market seeking FDI is to ensure sustainability in the markets that foreign investors service or to encourage and take advantage of new markets (Dunning and Lundan, 2008:70).

Efficiency seeking FDI is another type of FDI where foreign investors can take advantage of benefits available to them which may not be available in their domestic country (Dunning and Lundan, 2008:71). These benefits come in many forms. For instance, reduced costs from higher levels of production, risk diversification and available factors of production (land, labor, capital and entrepreneurship) for exploitation in the manufacturing sector *etc.*

The fourth type of FDI is Strategic Asset Seeking FDI. Here, both well established and new foreign investors engage in this type of FDI by acquiring assets of firms from abroad. The purpose of participating in this type of FDI is associated with the investors long term strategic future goals and objectives that are most likely to contribute to sustaining and advancing worldwide competition. While the more established firms are concerned with global or territorial strategies and new firms are concerned with obtaining competitive power in a market, the motive behind strategic asset seeking FDI is to augment foreign investors global portfolio of physical assets and human competencies (Dunning and Lundan, 2008:72). Strategic asset seeking FDI is similar to efficiency seeking FDI because both aim to gain from owning and controlling a diverse range of activities and capabilities of host nations.

Ultimately, the goal of enterprises is to benefit their stakeholders which include workers, managers and owners, since these stakeholders contribute to the efficient and effective functioning of the business and they need to be compensated. Therefore, the motives for FDI is important because it allows foreign firms to determine which type of FDI to undertake so that they maximize stakeholder benefits. It is important to note that MNEs are not restricted to choose one type of FDI to participate in, but rather they are able to combine individual characteristics of the different types of FDI. Also important to note is that over time, motivations for FDI by investors may change as foreign firms establish themselves in their respective markets and so their original motive for FDI may no longer be to simply acquire natural resources that are cheaper abroad but rather to improve their position in the markets that they operate.

b) Mode of Entry

Depending on the motives for undertaking FDI, Gorynia *et al.* (2007:137) explains that foreign firms will decide on one of three modes of entry. The first mode of entry is Green field investment which Gorynia *et al.* (2007:137) describe as the mostly preferred mode of entry for both foreign investors and recipient host nations because it allows firms in a certain market to change their strategies and size to satisfy the requirements of target markets. Green field investment occurs when a foreign investor sets up an entirely new economic entity in the host nation with their capital (Gorynia *et al.,* 2007:137). Host nations are extremely welcoming of green field investment since it is associated with new job creation, skills and technology transfer *etc.*

Mergers and Acquisitions (M&As) are another mode of entry which occurs when foreign investors acquire existing operations in host nations (Gorynia *et al*. 2007:138). From the name, two terms may need clarification. According to Gorynia *et al.* (2007:138), mergers refer to the combination of two

companies to form one company while acquisition occurs when one company takes over another company. Agosin (2008:3) and Cattaneo (2010:6) argue that mergers and acquisitions may not be largely beneficial for developing countries because they do not increase capital formation of the host country but rather, they transfer ownership to foreign investors.

Brown field investment, as explained by Gorynia *et al.* (2007:137), is a special form of acquisition that is a combination of green field investment and M&As. According to the authors, brown field investment occurs when a foreign investor purchases an existing business but replaces most (if not all) aspects of the business from its factors of production to the plant (Gorynia *et al.*, 2007:137-138). Therefore, the firm is redesigned and becomes a new organization.

c) Crowding In and Crowding Out of Domestic Investment

According to Agosin (2008:2), Crowding in (CI) and Crowding Out (CO) of domestic investment by MNEs are very important concepts because they have direct implications for the economic growth of host nations. CI of domestic investment refers to the case where the presence of MNEs stimulate new investment that would not have occurred in the absence of MNE activity, while CO of domestic investment refers to the case when the presence of MNEs displace domestic producers or discourages opportunities for them to invest. As such, it may be concluded that CO of domestic investment may have negative implications for economic growth and CI of domestic investment may positively affect economic growth. According to Agosin (2008:2), if MNE activity crowds out domestic investment or does not contribute to capital formation in the host country, then the benefits of FDI to recipient host nations is questionable especially because investment is arguably a key economic growth determinant.

d) Horizontal versus Vertical FDI

The effects of FDI on employment and growth in addition to other macroeconomic variables may depend on whether FDI is horizontal or vertical. According to Fedderke and Romm (2006:347), horizontal FDI occurs when MNEs have headquarters in their home country and have production plants in both their home country and abroad with the same products being produced in both locations. Vertical FDI occurs when MNEs separate production activities by having headquarters in their home country and production plants in different foreign countries that produce different intermediate and final goods (Fedderke and Romm, 2006:347).

3.3. EMPIRICAL LITERATURE REVIEW

This section explores the empirical literature on the relationship between FDI, Growth and Employment.

3.3.1. Foreign Direct Investment, Growth and Employment

Kurtishi-Kastrati (2013) examined the effects of FDI on various host nation economies using qualitative analysis. Kurtishi-Kastrati (2013) examined these effects by identifying the most important channels through which FDI significantly and exceptionally impacts economic growth and ultimately leads to economic development. The first channel identified is resource-transfer. According to Kurtishi-Kastrati (2013:27), FDI positively contributes to the host economy through supplying capital, technology and management that may not be available in the absence of MNEs and such transfer is noted to stimulate economic growth of host countries.

Another important channel is the employment channel. According to Kurtishi-Kastrati (2013:28), FDI has both direct and indirect employment effects. The author explains that some countries are capital scarce but labor abundant and, in such nations, FDI has had highly prominent impacts. The author further explains that direct employment creation arises when MNEs employ several citizens in the host nation and indirect employment arises when investment by MNEs in local businesses lead to job creation due to business growth for example (Kurtishi-Kastrati, 2013:28). According to Kurtishi-Kastrati (2013:28), Toyota invested in France during the late 1990s via FDI and as such 2000 direct jobs were created and a further 2000 jobs were created in supporting industries.

A third channel through which FDI can lead to economic growth is via international trade. According to Kurtishi-Kastrati (2013:29), depending on the motive for investment, FDI can contribute greatly to economic growth through trading with other nations. For instance, output from efficiency seeking FDI is intended for export, as such FDI is likely to increase exports of host nations. Competition is also a channel through which FDI affects economic growth. According to Kurtishi-Kastrati (2013:31), the presence of MNEs has a great impact on economic growth because it encourages domestic competition which leads to increased productivity, lower prices and resource allocation efficiency.

Kurtishi-Kastrati (2013:31) explains that as much as FDI effects seem promising, they may also be detrimental to the economic growth of host nations. FDI means that foreign investors own and control businesses in host nations. A number of years ago, African political leaders were against FDI because MNEs stripped African countries of their natural resources through FDI activity for their own gain and

the African countries gained nothing in return (Bezuidenhout and Kleynhans, 2015:94). Kurtishi-Kastrati (2013:32) and Jula and Jula (2017:30) explain that FDI could also lead to domestic nations reducing research and development, reducing competition, crowding-out domestic firms and reduced employment. FDI did not have great effects for employment in the case of Japan and the United States (U.S.). Kurtishi-Kastrati (2013:32) explains that during the 1990s, Japan undertook FDI in auto companies in the U.S. Jobs were created in these companies, however more than the equivalent amount of jobs were lost in U.S. owned auto companies. In the Republic of Macedonia, low economic growth reflected by high unemployment called for restructuring through FDI. In the short run, unemployment decreased but the overall effect was no job creation at all (Kurtishi-Kastrati, 2013:32). Regarding competition, MNEs may have greater economic power compared to local competitors and could result in local businesses being unable to keep up with the competition and thus close down which may lead to the creation of monopolies (Kurtishi-Kastrati, 2013:33).

Technological diffusion has arguably played a key role in the achievement of economic growth for developed and developing nations (Borensztein *et al.,* 1997:116). According to Kurtishi-Kastrati (2013:27), technology transfer can either be incorporated in the production process (e.g. oil refinement) or in the product itself (e.g. personal computers). Growth rates of developing nations depend much on the state of technology of the domestic nation and as such, Borensztein *et al*. (1997:16) explain that economic growth of a developing country is dependent on the degree of adoption and implementation of new technologies being used in already developed countries. As much as the spreading of technology can take place through various channels (i.e. importing high technology products, adopting foreign technology *etc.*), a major channel for technology diffusion is FDI by MNEs since it allows developing nations to access advanced technologies (Borensztein *et al.*, 1997:116). Using an endogenous growth approach, Borensztein *et al.* (1997:117) empirically examined the role of FDI in the process of technology diffusion and economic growth in developing countries. In their analysis, the main determinant of long-term growth rate of income is the rate of technological progress. Using cross country-regressions, Borensztein *et al.* (1997:118) test the effect of FDI on economic growth for 69 developing countries that receive FDI from industrialized countries over the 20 years prior to the study being undertaken. The authors found that FDI has a positive overall effect on economic growth, however the degree of this effect depends on availability of human capital stock in the host country (Borensztein *et al.*, 1997:123). As such, if the level of human capital of a developing nation is low, FDI then has a negative impact.

Over the last decades, unexpected increases in global FDI has been causing dramatic changes in the labor markets of developed and developing countries (Hale and Xu, 2016:1). Considering FDI causes an inflow of capital and technology to the host nation and as such affects the demand and supply of labor, and the composition of labor, employment, productivity and wages, Hale and Xu (2016) study the effects of FDI on these components for the host nation. Importantly, labor market effects differ for developing and developed countries, therefore the method of analysis used in this thesis differ for the both types of countries. One important differentiation is the analysis between direct effects and spillover effects. Abor and Harvey (2008) and Hale and Xu (2016) explain that direct effects on target firms are deliberate, internal effects by foreign investors and in most cases, these are expected effects from decision making procedures, while spillover effects are external and can be positive or negative. If the spillover results in a positive externality, then it is likely that domestic firms may devise policies that attract FDI (Abor and Harvey, 2008:215; Hale and Xu, 2016:2).

Hale and Xu (2016) surveyed 30 papers which were published in academic journals between 1995 and 2015. These papers empirically analyzed FDI effects on various aspects of the labor market. Although all papers focus on the effects of FDI on the labor market, they do differ in terms of FDI measures employed, aggregation level, outcome variables, econometric methods and analysis, time and country samples. Hale and Xu (2016:3) find that many of the 30 surveyed papers focus on wages, employment and inequality in the labor market and almost all of the papers place emphasis on separating advanced country effects from developing country effects. This is because both sets of nations have different existing skill composition of their labor forces, each have different reasons motivating their participation in FDI, and the technological gap between countries sending FDI and those receiving FDI is larger for North-South FDI (Hale and Xu, 2016). These are important as they could lead to potentially different effects of FDI for the labor market. Interestingly, Hale and Xu (2016:3) find that FDI-employment literature suggests that both developed and developing nations experience a rise in wages as a result of FDI, but most importantly for developing countries, FDI has a positive effect on employment. Unsurprisingly, FDI has been found to result in increased inequality.

Hale and Xu (2016:4) noticed that studies which focused on employment effects looked at employment of target firms or industries but did not account for spillover effects. This is no surprise as the authors explain that FDI studies differ on the dimension of aggregation level, industries, regions, or firms analyzed within the host country (Hale and Xu, 2016:4). The aforementioned differences are important

since they result in the various types of FDI effects that can be identified. For instance, aggregated FDI analysis, that is overall FDI at country level, regional level or industry level, is excellent at capturing overall effects while firm level or industry level FDI analysis can generally identify direct and spillover effects (Hale and Xu, 2016:4). The downfalls are that aggregated FDI is unable to distinguish between direct effects on target firms and external spillover effects on firms competing with target firms or general spillover effects. Regarding firm/industry level FDI, the downfall is that it might not be able to measure the magnitude of overall FDI impact (Hale and Xu, 2016:4).

Following this, FDI-employment literature focusing on employment of target firms or industries concludes that employment for developed economies might go up or down while for developing economies, employment certainly goes up (Hale and Xu, 2016:4). This comes as no surprise. FDI literature suggests that developing nations aim to attract FDI because of the benefits to the host nation. One of these benefits is the improvement in productivity which is associated with firms growing and therefore requiring more workers, that is increased employment (Hale and Xu, 2016:5).

Contrasting Hale and Xu (2016), Jude and Silaghi (2016) argue that the overall impact of FDI on employment is very difficult to entangle. The authors argue that during the decade of the nineties (following the economic crisis), although Central and Eastern European Countries (CEEC) experienced rapid output growth, there was still a high level of job losses. The countries experienced high FDI inflows and the expectation was that this FDI would play a key role in restructuring the economy through capital and technology transfer while maintaining and creating employment (Jude and Silaghi, 2016:33). However, this was not the case, as people still lost their jobs, therefore FDI assisted with growth generation but did not create or maintain jobs. In fact, FDI caused mass destruction for host nations as foreign investors replaced domestic suppliers by imported inputs and as a result of competition from more productive foreign firms, domestic firms were forced to downsize or close shop (Jude and Silaghi, 2016:33).

Analyzing FDI effects on employment is dynamic as there are several channels that must be considered. A key factor when looking at FDI and employment is the mode of entry. According to Jude and Silaghi (2016:34), new employment creation through FDI is one of the benefits of FDI and more so, greenfield investment supposedly has the highest potential for employment creation since it creates jobs that previously did not exist. One aspect we cannot ignore is that FDI may negatively affect employment due to their higher efficiency in the use of labor. For instance, MNEs are owners of certain assets which may

be intangible but are productivity enhancing and as such, once these assets are transferred to host nations, it may require less labor per unit of output (Jude and Silaghi, 2016:34). Another component worth addressing is the notion that FDI can influence the labor demand of domestic firms. For instance, the entrance of FDI may be associated with having competition effects because this entry may crowd-out domestic firms and therefore industries receiving FDI may be negatively affected (Jude and Silaghi, 2016: 34). Another effect of FDI on the labor market are spillover effects from MNE's sourcing labor locally. This is because domestic suppliers are encouraged to produce higher quality inputs (Jude and Silaghi, 2016:34).

Using a dynamic panel framework, Jude and Silaghi (2016) investigated the impact of FDI on aggregate employment in the CEEC. To do this, the authors anticipate that the role of FDI extends to capital and labor accumulation in addition to how efficient the use of FDI is for the host nation. This is key for such a study since FDI may potentially influence total factor productivity via transfer of technology and since employment is dependent on productivity, the expectation is that FDI must influence host nation employment (Jude and Silaghi, 2016). First, Jude and Silaghi (2016) construct a simple model of labor demand. The authors consider that since FDI has shown to improve the efficiency of labor use, it is viable to construct a labor demand function such that total factor productivity is a function of FDI. The variables controlled for in this function include real output, capital stock and number of employees of the host nation. Thereafter, using panel data techniques, Jude and Silaghi (2016:37) analyze employment determinants in CEEC. To refine their analysis, the authors introduced additional determinants to their labor demand model. Arguably, job creation and job losses in CEEC depended on economic restructuring accompanied by institutional change and therefore Jude and Silaghi (2016:37) introduced governance and enterprise restructuring index which was a proxy for a variable of progress in transition. The purpose of such a variable was to capture any structural changes that affect CEEC during the period of study, that is 1995-2012. They also included growth rate of exports and imports of employment since the degree of trade openness for any nation may cause changes in the labor intensity of host nation production (Jude and Silaghi, 2016). Given that CEEC have a comparative advantage in labor-intensive industries, it is likely that higher imports may reduce employment and higher exports may cause job creation.

Covering 20 countries over the period of 18 years, the study includes both European Union (EU) member countries and non-EU member countries. Unlike prior studies on CEEC where industry level data was used in national and cross-country panels, Jude and Silaghi (2016:38) look at the entire economy. The

problem faced with this data is that there is lack of disaggregated wage and FDI data for countries that are non-leading in the CEEC, and therefore macroeconomic level data had to be used. Output growth was found to be the main determinant of employment dynamics in the CEEC while wages did not seem to matter (Jude and Silaghi, 2016:40). Following the issue of growth and job losses in the nineties, Jude and Silaghi (2016:40) find no evidence of jobless growth. The study uses two forms of estimations to examine the effect of FDI on employment. The first is fixed effects and the second Generalized Method of Moments (GMM). One of the objectives of the study was to investigate the long-run impact FDI has on employment and since this meant including a lagged dependent variable to find long-run elasticities, GMM is the appropriate method of estimation (Jude and Silaghi, 2016:38). As such, results from the fixed effects estimation concluded that FDI has no effect on employment in the short-run and GMM estimation found that FDI has negative effects on employment in the long-run. Further, Jude and Silaghi (2016:40) concluded that increased FDI inflows lead to job losses. From the constructed labor demand function, Jude and Silaghi (2016:41) found that the main determinant of employment creation was economic restructuring.

3.3.2. Foreign Direct Investment, Growth and Employment in Africa

As noted earlier, African governments were skeptical about the benefits of FDI on the host nation for valid reasons such as: it allows foreign investors to influence and/or control host nations (Abor and Harvey, 2008). However, there seems to be a movement towards attracting FDI by African countries because of the benefits it is perceived to have (Abor and Harvey, 2008:213) and because it provides capital inflows to fast track economic development in developing countries (Bezuidenhout and Kleynhans, 2015:94). Among the benefits of FDI (superior technology, capital formation *etc.*), for a developing nation like Ghana, employment creation may be a critical benefit of FDI (Abor and Harvey, 2008:213). During the time of the study by Abor and Hervey (2008), Ghana exhibited high unemployment rates and the nations estimated unemployment was approximately 20%. Therefore, the purpose of the study by Abor and Harvey (2008) was to establish if FDI inflows can play a significant role in generating employment in Ghana.

Substantial economic policy changes have been one of the methods that the Ghanaian government has utilized in gaining access to FDI for the purpose of private sector development, regional integration and good governance (Abor and Harvey, 2008:214). The Ghanaian work environment is an enabling one, but the missing piece is job creation. Consistent with Hale and Xu (2016), Abor and Harvey (2008)

emphasize that while FDI inflows may play a crucial role for employment generation, it may also play a key role in the displacement of jobs through superior technological advances that may replace the need for human capital. The study by Abor and Harvey (2008) focuses on the relationship between FDI and employment in Ghana's manufacturing sector over the period 1992-2002 because the manufacturing sector of Ghana receives bulk of the nation's FDI inflows.

Like the case of Jude and Silaghi (2016), where the authors indicated that FDI was useful for employment during restructuring processes, Abor and Harvey (2008) explain that FDI was central for Ghana's Economic Recovery Program (ERP) which began in 1983. The impact of FDI on total formal employment in Ghana has shown to be positive for quality and skill level of workers (Abor and Harvey, 2008:215). Since 1994, FDI has reportedly been responsible for creating a cumulative total of 76350 jobs in Ghana during the period 1995-2002 and of this total, 71635 were Ghanaian people. Regarding the relationship between FDI and employment, Abor and Harvey (2008:215) identify two broad channels through which FDI may potentially create employment. The first is that foreign investors may directly create employment through establishing subsidiaries in the host nation or they could expand existing subsidiaries. Secondly, employment may be generated indirectly through forward and backward linkages or via distributors and suppliers. Indirect job creation however may depend on the industry. Abor and Harvey (2008:215) explain a key argument and that is, in the case where foreign and domestic capital do not perfectly substitute each other, an increase in FDI will undoubtedly cause an increase in the demand for labor in developing countries. Depending on the motives for FDI, if FDI is allocated to a labor-intensive production environment, it would generate high levels of employment because, for countries that are export-orientated and have low-cost labor, the FDI impact is higher employment opportunities. Although jobs could be created through improved efficiency and competing firms restructuring their organizations, jobs may also be lost if investors choose to disinvest, close down their subsidiaries in host nations, protect their activities through laws, change parent company strategies or restructure firms which they have acquired in host nations.

In their study, Abor and Harvey (2008:217) examine FDI effects on employment and wage levels by estimating a simultaneous panel regression model. The dependent variables that are controlled for in the model are employment and wage, where the independent variables controlled for in the employment model include productivity, profitability, wages, location and sub-sector (Abor and Harvey, 2008:218). The results from the employment model suggest a significantly positive relationship between FDI and

employment. This suggests that greater FDI flows to firms lead to the employment of more staff which therefore means that foreign investors owning and controlling higher percentages of firms in host nations show higher levels of employment (Abor and Harvey, 2008:219). The authors do find that highly productive firms tend to employ less people and rather choose to employ technology-intensive methods of production.

Adofu (2010:10) explains that one of the most strategic factors in the achievement of economic growth in any country is investment as the result is always increased productivity. Following the theory of the Harrod-Domar growth model, Nigeria is one of the LDCs that struggle with capital accumulation required for increased investment. Adofu (2010:11) attributes this to low savings levels in the country, which is caused by social factors (high poverty and unemployment *etc.*) and low levels of entrepreneurial spirit between local businessmen *etc.* Adofu (2010:11) describes Nigeria as a monoculture economy because of the country's high dependence on their oil sector. Adofu (2010:11) further explains that a nation with oil as its only source of foreign exchange will always be deficient with investment accumulation. The savings and foreign exchange gap resulting from the aforementioned situation in Nigeria eventually contributes to a widening gap between actual domestic investment and investment required to speed up economic growth and as such capital from foreign investors (i.e. FDI) is regarded as a means to bridge the gap (Adofu, 2010:11).

The Nigerian government has given prominence to FDI because they believe it will accelerate the nations growth (Adofu, 2010:11). Similar to Abor and Harvey (2008) and Jude and Silaghi (2016), Adofu (2010:11) states that the Nigerian government introduced a Structural Adjustment Programme (SAP) where FDI would be used for growth acceleration for Nigeria. SAP was implemented in 1986 and since then Nigeria has received high FDI inflows but there is still cause for concern as to whether FDI is effective for growth stimulation in Nigeria (Adofu, 2010:12).

Adofu (2010) examined the impact of FDI on Nigeria's economic growth using OLS regression technique. The study by Adofu (2010) addresses the shortfall of data measurement, specifically, the way GDP is expressed. The author states that previously, GDP was not expressed in real terms as it should have to ensure more accurate results since real GDP is adjusted for inflation (Adofu, 2010:11). For the period 1986-2004, the explanatory variables controlled for in the regression are FDI, exchange rate and total domestic savings and the dependent variable controlled for is GDP which is a proxy for economic growth. The results show that for Nigeria, about 28% of the growth in GDP is attributed to FDI inflows

over the period 1986-2004, and that GDP and FDI do not have a statistically significant relationship (Adofu, 2010:13). Following these findings, Adofu (2010:13) states that it is possible to gain the desired impact of FDI on economic growth in Nigeria, but this would entail Nigerian government improving the macroeconomic environment of the country.

Bezuidenhout (2009) analyzes the role of FDI and financial aid to growth and human development in Southern Africa through panel estimations. This study comes after the G8 countries announced their intention to increase financial aid to Africa by US$25 billion annually (Bezuidenhout, 2009: 314). According to Bezuidenhout (2009:314), this caused much debate about the role of financial aid and other foreign capital flows in poor country development. Bezuidenhout (2009) found that FDI and growth are negatively related while financial aid and growth have no relationship.

3.3.3. Foreign Direct Investment, Growth and Employment in South Africa

There is very limited FDI research available for South Africa, however it is a crucial subject topic for the nation because taking a wide look at the country shows much turmoil. Masipa (2014:18) elaborates on this notion explaining that the two decades prior to 2014, unemployment and slow economic growth have been two of the greatest problems facing the South African nation. Considering growth and employment being serious structural problems facing the nation, Masipa (2014:18) states that deriving and implementing a policy that is directly associated with sustained growth and job creation would be gladly welcomed by the public and to this regard, FDI has been named one of the core sources for sustained growth since it entails increasing exports and creating jobs in developing countries. For developing countries like South Africa, Masipa (2014:18) mentions that benefits include technology transfer, increase in domestic competition, creation of jobs and supplementation of domestic investment. These are referred to as positive and direct spillovers/externalities (Abor and Harvey, 2008; Hale and Xu, 2016). Masipa (2014:18) notes that FDI may assist in alleviating some socio-economic problems such as poverty and unemployment and this is a further reason why FDI may be important for South Africa and other developing countries.

The study conducted by Masipa (2014) focused on determining whether a long run relationship exists between FDI, GDP and employment in South Africa. In addition, Masipa's (2014) study seeks to determine the direction of causality between the mentioned variables over the period 1990 to 2013. This type of study is vitally important for South Africa because the results will provide a clear picture as to whether FDI should be a policy for long-term growth and job creation in South Africa (Masipa, 2014:19).

Masipa (2014:19) gives a very important reason for conducting such a study on a single country. The author explains that when attempting to obtain information on how FDI affects economic growth and employment and the extent to which FDI affects economic growth and employment, it is difficult to do so for multiple host countries and obtain results for each country individually in one study because these effects differ from one country to another (Masipa, 2014:19).

The study by Masipa (2014) applied econometric techniques to determine the impact of FDI on economic growth and employment in South Africa where economic growth is represented by GDP growth. Masipa (2014) estimated a Vector Error Correction Model (VECM) to determine if a long run relationship exists among variables. One of the methods employed for such a study was testing for cointegration among integrated variables. The results from the cointegration test shows that FDI has a positive and significant impact on both economic growth and employment in South Africa (Masipa, 2014:24). This suggests a long run relationship does exist between FDI, economic growth and employment. Relating to causality, Masipa (2014:26) found that FDI Granger-caused GDP growth and employment. This means that should South Africa depend on FDI to progress on economic growth, the country's policies should be aimed at attracting FDI. Masipa (2014:26) states that FDI should be used to support the existing development initiatives of the country. These initiatives include inequality reduction and poverty alleviation.

Mazenda (2014:95) suggests that FDI is one of the main reasons for sustained growth in developing countries, however from the viewpoint of the host nation, two welfare implications may occur which may be reflected on economic growth of the host nation. For instance, if FDI shows to have a positive impact on growth, host nations are encouraged to offer tax incentives, infrastructure subsidies, import duty exemptions *etc.*to foreign investors as a means of attracting FDI. But, should FDI show to negatively affect economic growth then the host country is encouraged to implement precautionary measures to discourage and restrict FDI flows (Mazenda, 2014:95). For South Africa specifically, Mazenda (2014:95) states that FDI seems to be capital intensive (thus requiring more machinery and equipment rather than labor) and there has been a shift in the nation's growth structure from accumulating factors of production to efficiency gains (e.g. reducing labor costs and employing technology). This suggests that South Africa places great importance on technology and skills transfer as positive spillovers from FDI. According to Mazenda (2014:96), the goals of implemented macroeconomic policies (RDP, GEAR, ASGISA and NGP) have not been realized and these goals place

growth and employment creation at the forefront. As such, Mazenda (2014:96) believes FDI is very necessary for the country.

The study by Mazenda (2014) is underpinned by endogenous growth model theory and thus uses labor input, capital input, total factor productivity and total production as variables to develop an augmented production function: $Q = AL^{\alpha}K^{\beta}$ where Q is the output or total production, L is the labor input, K is capital input, A is total factor productivity, α is the output elasticity for labor and β is the output elasticity for capital. As α and β are determined by technology, output elasticity measures how output responds to changes in labor or capital used in production (Mazenda, 2014:97).

For the study, the production function model is modified such that real GDP growth is the dependent variable and is a function of FDI, domestic investment, the real exchange rate and foreign debt (Mazenda, 2014:97). Mazenda (2014) used econometric techniques to establish the effect of FDI on economic growth in South Africa over the period 1980 to 2010. These techniques include estimating a VECM and testing for the existence of cointegration. Additionally, Mazenda (2014:98) estimated a Vector Autoregression (VAR) model and used Impulse Response and Variance Decomposition analysis to determine how and in which direction real GDP growth moves or responds to shocks from independent variables. Using pairwise-correlation analysis, Mazenda (2014:99) finds that an increase in both FDI and domestic investment results in an increase in economic growth. The author also finds that depreciation in the exchange rate discourages investment by foreign investors which leads to low levels of economic growth. The VECM suggests that FDI has a negative long run relationship with real GDP while domestic investment has a positive long run relationship with real GDP. Taking into consideration that the period of study includes the years of the GFC, it is inevitable that these findings are inconsistent with theory suggesting FDI results in economic growth (Mazenda, 2014:101). The long run positive relationship between domestic investment and real GDP growth is consistent with theory that implies that domestic investment makes available more credit from the financial sector. Mazenda (2014:105) concludes that overall, in the long run, FDI does not show to have a reliable impact on economic growth, however the results of the impulse response show that in the short term FDI positively impacts economic growth although it crowds out domestic investment.

Fedderke and Romm (2006:739) explain that the investment rate in South Africa is concerning and the one solution would be to augment domestic investment expenditure with foreign investment. However, since South Africa's growth structure has shifted from factor accumulation to efficiency gains, FDI has

gotten much attention because it could potentially result in technology and skills transfer both directly and through spillovers. The study by Fedderke and Romm (2006) employs a spillover model to analyze the growth impact of FDI. The study uses aggregated South African data for the period 1956-2003. Estimating a VECM, the variables controlled for in the analysis include real GDP, total employment, private sector fixed capital stock, real FDI liabilities and the corporate tax rate (Fedderke and Romm, 2006:750). The authors found that FDI has a positive impact on growth for South Africa. It was also found that South Africa benefits positively from technology spillovers from foreign and domestic capital. FDI was found to crowd-out domestic investment, however the impact is restricted to the short-run and therefore does not affect economic growth negatively. Empirically, the results confirmed that FDI has a positive spillover effect on capital and labor, which then positively affects long-run output for South Africa (Fedderke and Romm, 2006:758). Ramadhan *et al.* (2016) examined the effects of FDI on GDP for Mozambique and South Africa since the authors believe that FDI for these two countries result in accelerated growth. The authors employed Ordinary Least Squares (OLS) regression analysis. In their study, Ramadhan *et al.* (2016) controlled for GDP as the dependent variable, and total labor force, human capital and GFCF as explanatory variables. For South Africa, the results found FDI to have a negative and statistically significant relationship with economic growth, however total labor force had a positive and statistically significant relationship with economic growth (Ramadhan *et al.*, 2016:185-186).

A study by Seyoum *et al.* (2015) examined the possible Granger-Causal links between FDI and economic growth for 23 African countries over the period 1970 to 2011. The authors employed the lag augmented VAR (LA-VAR) method using panel data. For South Africa, the authors found unidirectional causality from FDI to economic growth.

3.3.4. Sector Foreign Direct Investment, sector growth and sector employment

Recently, researchers are increasingly looking at sector level FDI and its effect on sectors rather than the historical researched aggregated FDI methods. According to Erdal (2018:28), sector level data is expected to disentangle the relationship between FDI and macroeconomic variables, therefore allowing a more thorough insight into the sectors that should have access to more FDI inflows and the sectors that should not receive as much FDI because it has little to no impact on the micro and macro economy. Alfaro (2003:1) argues that sector FDI analysis is important because the benefits of FDI vary greatly across sectors.

Jula and Jula (2017) constructed a panel data model with time specific effects and cross section specific effects to examine the impact of FDI on the sectoral structure of employment in Romania. The study used data covering the period 2003-2015 for 11 industries including Agriculture, forestry and fishing; Mining; Manufacturing; Electricity, natural gas and water; Construction and real estate; Trade; Accommodation and food services; Transportation; Information technology and communications; Financial intermediation and insurance; Professional, scientific, technical and administration activities and support services; and Other activities (Jula and Jula, 2017:36). The employment data used covered the period 1996-2015.

The authors construct and test a panel data model on total employment that is made up of both public and private employment ownership. As this is a sectoral analysis, there was the possibility of joint sectoral effects in time, therefore the model was estimated using the Seemingly Unrelated Regressions (SUR) method which corrects for period heteroskedasticity and general correlation of observations (Jula and Jula, 2017:36). For the study, Jula and Jula (2017:32) estimated the Growth Rate of Industry Share in Total Employment. For this, if a_0 is an intercept coefficient and a_2 is a slope coefficient in the following model:

$$r_{i,t}^{s} = a_0 + (a_2)_i . (1 - r_{L,t})_{ri,t}^{FDI} + T_t + v_{it} \qquad (eq. 3.5)$$

Then according to the above model, if $a_{2,i}$ is greater than zero, growth in sector FDI inflows leads to increased employment in industry *i* and if $a_{2,i}$ is less than zero then growth in sector FDI inflows leads to increased productivity in industry *i* . However, if $a_{2,i}$ equals zero then growth in sector FDI inflows is not associated with changes in employment in industry *i* (Jula and Jula, 2017:33-34). In the above equation, the $a_{2,i}$ coefficient examines FDI impact of a specific industry on the growth rate of industry share in total employment where the effect is weighted by the growth rate on total employment (Jula and Jula, 2017:37).

The results show that for the Agriculture, forestry and fishing; Manufacturing; Accommodation and food services sectors, the effect of FDI on productivity improvement was superior than for the effect on employment growth. For the Construction and real estate; Trade; Transportation; Information technology and communications; Financial intermediation and insurance; Professional, scientific, technical and administration activities and support services, the effect of FDI on employment growth is greater than for productivity improvement (Jula and Jula, 2017:39). Regarding public sector

employment, Jula and Jula (2017:39) found that with the exception of Trade and Transportation sectors, all other industries experienced job losses and/or high productivity gains as a result of FDI.

Kirti and Prasad (2016) studied the impact of FDI on employment generation and GDP growth in India. The study looks at the sectors accounting for the highest levels of FDI inflows in India. According to Kirti and Prasad (2016:45), most of FDI inflows are distributed to capital-intensive industries including the services sector and the construction development sector. The services sector in India, which accounts for about 17.18% of total FDI includes Financial, banking, insurance, non-financial/business, outsourcing, research and development and courier services. The construction development sector of India accounts for about 9.76% of FDI inflows (Kirti and Prasad, 2016:45). Although not a large recipient of Indian FDI inflows, the agricultural sector of the country employs 50% of total employment and the sector receives about 0.32% of total FDI inflows. Agricultural sector FDI has led to steady growth in the sector. FDI in the agricultural sector has had a negative impact on employment because when FDI inflows to the sector increased, labor productivity depleted and the result was unemployment (Kirti and Prasad, 2016:45-46). The authors argue that for labor productivity to improve in the agricultural sector, capital-intensive production technology should be employed through FDI channels (Kirti and Prasad, 2016:45).

The industrial sector of India has received 4.96%, 3.88% and 4.17% of total FDI inflows in its automobile, power, and fertilizers *etc.* sectors respectively and the result was an 18% contribution to employment in India. The services sector of India took a large hit during the recent GFC and as such, FDI inflows to the sector reduced but employment in the sector remained relatively stable. Indian GDP was growing at a rate of 8% during the period 2004-2006 and this led to large FDI inflows to the services sector and the sector was flooded with skilled labor from all over the country, however, the financial crisis later led to a large reduction in exports and the sector could not afford the labor costs thus leaving many people unemployed. In this instance, FDI had an indirect, negative effect on employment (Kirti and Prasad, 2016:46).

A recent study by Erdal (2018) empirically analyzed the relationship between sectoral FDI and macroeconomic variables in both the long-run and short-run in Turkey over the period 2005-2016 using quarterly data. The author employed econometric techniques to analyze the relationship. For the long run, the author employs cointegration analysis and for the short run Error correction models (ECM) are employed. Most often, FDI interacts with macroeconomic variables like the real exchange rate, real

GDP, openness of the economy and real interest rates (Erdal, 2018:33). The Johansen test for cointegration reveals that cointegration does exist between the aforementioned variables, that is, a long run relationship is evident among FDI inflows, the real exchange rate, real GDP, real interest rates and openness of the economy (Erdal, 2018:35). Since GDP is a proxy for economic growth, Erdal (2018:38) finds a positive and statistically significant relationship between FDI inflows and real GDP in the financial services sector, however, for the other variables, the author found a negative and statistically significant relationship between FDI inflows and real GDP. The estimated ECM revealed that all variables are indeed cointegrated. The ECT_{t-1} coefficient supports cointegration if ECT_{t-1} is negative and statistically significant and empirically, the ECT_{t-1} for all sectors except information and communication are negative and statistically significant which confirms that variables are cointegrated.

Looking specifically at the Financial Sector, Eller *et al.* (2006) examined the impact of Financial Sector FDI (FSFDI) on economic growth through the efficiency channel. The authors estimated a panel data model over the period 1996-2003 for 11 CEEC. The purpose of the study focusing on the financial sector is because of the positive relationship the financial sector may have with economic growth and higher growth rates are reflected when investment to GDP ratios are high. The focus of the efficiency channel is because efficient allocation of resources has been noted to contribute to economic growth (Eller *et al.*, 2006:301). Therefore, the study by Eller *et al.*, (2006) examines the effect of foreign bank entry on economic growth through efficiency channels. Bank efficiency has shown to increase when ownership and control changes in CEEC. At the micro level, bank efficiency gains include managerial efficiency improvements and the realization of economies of scale (Eller *et al.*, 2006:301). According to the authors, FSFDI transfers superior management skills, bank management systems and technology to target banks. At the macroeconomic level, efficiency gains include better risk diversification, lower transaction costs and better allocation of available financial resources to high-production projects that affect welfare and stability (Eller *et al.*, 2006:301). If a banking sector is highly efficient, it means low credit and/or higher deposits which enhance investment activity and stimulate economic growth.

For CEEC, financial markets show extremely high levels of foreign ownership and therefore it is very important to examine if FSFDI causes micro level structural changes and if this translates into spillover efficiency gains for the financial sector and overall economy (Eller *et al.*, 2006:302). To do this, Eller *et al.* (2006:308) estimate a fixed effects static panel data model to examine the behavior of the financial sector through FSFDI across 11 CEEC. The results show a hump-shaped relationship between FSFDI

and economic growth, suggesting that M&A activity in the financial sector contributes to higher economic growth after two years. However, beyond this point, FSFDI stimulates growth depending on higher human capital stock (Eller *et al.*, 2006:316). The authors also find that beyond a certain threshold point, FSFDI crowds-out local physical capital and this hampers with economic growth. Since the authors found a non-linear relationship between FSFDI and economic growth, it is important for the countries financial sector to spice up competition to ensure it is more efficient (Eller *et al.*, 2006:316).

Bezuidenhout and Grater (2016) investigated the link between the tourism sector of African countries and inward FDI of tourism. The motivation for focusing on the tourism sector is that it is seen as a fast-growing sector with high potential for employment generation. The goal of the study was to determine whether increased inward FDI in Africa's tourism sector translates into substantial growth in tourism. The authors found that the tourism sector of some African countries does not receive much FDI, however, they do find a strong positive relationship between tourism and FDI.

3.4. CONCLUSION

This chapter reviewed the theoretical and empirical literature on the relationship between FDI, growth and employment. Theoretical literature suggests that investment should lead to economic growth, however, the empirical literature found mixed results. Some studies found a positive relationship between FDI and growth and FDI and employment while some studies did not find any relationship and some studies found negative relationships. The results not only vary from country to country, but they also vary across sectors. Variables also play a crucial role in the concluding results as they cause FDI to respond in a specific way for one sector and/or country compared to the other.

From the literature discussed, one may conclude that analyzing FDI impacts and relationships is a complex task as the variables involved are not easily available. For instance, studies by Hale and Xu (2016) and Abor and Harvey (2008) place emphasis on measuring the effect of FDI on economic growth through spillover effects. Both studies refer to the difficulty in measuring spillover effects and therefore proxy variables are necessary, although proxy variables are also difficult to determine. Econometric models have been effective in drawing crucial conclusions relating to the relationship between FDI, GDP and employment.

This study will follow a similar approach to Masipa (2014) by using causality techniques to determine whether a long run relationship exists between FDI and growth and further explores the direction of causality by employing the Dumitrescu-Hurlin Panel Causality Analysis. This has shown to be the most appropriate technique according to the literature. Additionally, estimating a Vector Error Correction Model to explore the relationship between FDI and growth showed to be the most popular in the literature and as such will be employed in this study, however, a Panel Vector Error Correction Model will be most appropriate considering the study uses a panel data set.

Considering that FDI research is limited in South Africa, exploring the relationship between FDI and employment (objective 2) is difficult. At first glance, the general labor demand function and the endogenous growth model appeared to be most popular in the literature, however in the South African case, obtaining the necessary data, measuring capital and obtaining proxies for factors of production would be a long and complex task. As this is a half thesis, replicating the model by Jula and Jula (2017) showed to be the appropriate option considering the available data.

CHAPTER 4

DATA DESCRIPTION AND METHODOLOGY

4.1. INTRODUCTION

This chapter presents the data, data sources and methods employed to achieve the two sub-goals of the study. The chapter begins with an overview of the variables used in the study. The econometric estimation techniques are discussed thereafter. These techniques include causality analysis, the estimation of a panel VECM model and the estimation of a SUR model. Prior to this, preliminary tests such as panel unit root tests and cointegration tests are discussed.

4.2. DATA DESCRIPTION AND VARIABLE DEFINITION

The study uses quarterly sector data on six of South Africa's economic sectors for a 16-year period spanning 2000Q1 to 2016Q4. The time period of the study was chosen based on data availability. As South Africa was a transitional economy during the early 1990s, Jude and Silaghi (2016:38) argue that the period of the 1990s should be avoided for such a study to avoid some of the erratic behavior in macroeconomic variables due to economic turmoil of transitional economies during the transition era.

The sample consists of panel data covering the Mining and quarrying sector; Manufacturing sector; Electricity, gas and water sector; Transport, storage and communication sector; Finance, insurance, real estate and business services sector; and Community, social and personal services sector, of the South African Economy.

Quarterly data on Foreign Direct Investment (FDI), Foreign Other Investment (FOI), Foreign Portfolio Investment (FPI) and Gross Fixed Capital Formation (GFCF) for each sector for the period 2000Q1-2016Q4 was obtained from various quarterly bulletins of the South African Reserve Bank (SARB). Quarterly data on real Gross Domestic Product (GDP) for each sector for the period 2000Q-2016Q4 was obtained from Statistics South Africa (StatsSA). Quarterly data on employment and average earnings per worker for each sector for the period 2005Q1 to 2016Q4 was obtained from various Quarterly Employment Statistics (QES) publications from StatsSA. Literature suggests trade openness as a key variable for the relationship between FDI and growth, however there is very limited data at sector level for the sectors under study and therefore trade openness has been excluded from the study. The variables,

description and/or measurement of variables, data source and time period of data collected are presented in Table 2.

Table 2: Variable Description

Name	Denoted by	Description	Time Period	Source
Sector Annual Growth Rate of GDP	GDPG	The rate that actual GDP grows from one year to the next where GDP is the value of all final goods and services produced during a period by a sector/industry (Erdal, 2018:34)	2000Q1-2016Q4	StatsSA www.statssa.co.za
Sector Foreign Direct Investment (% of GDP)	FDI	Net inflows into various sectors from foreign investors denoted as a percentage of GDP Variable is expected to have a positive impact on economic growth (Iddrisu *et al.*, 2015:246) FDI is made up of long-term and short-term capital in addition to equity capital and reinvested earnings (SARB various quarterly bulletins)	2000Q1-2016Q4	SARB various quarterly bulletins. International Economic Relations statistical tables www.resbank.co.za
Sector Foreign Other Investment (% of GDP)	FOI	Made up of investment inflows from IMF, long-term loans, short-term loans and trade finance and deposits from foreign investors (SARB, various quarterly bulletins)	2000Q1-2016Q4	SARB various quarterly bulletins. International Economic Relations statistical tables www.resbank.co.za
Sector Portfolio Investment (% of GDP)	FPI	Made up of debt and equity securities from foreign investors (SARB, various quarterly bulletins)	2000Q1-2016Q4	SARB various quarterly bulletins. International Economic Relations statistical tables www.resbank.co.za
Sector Gross Fixed Capital Formation at constant prices (% of GDP)	GFCF	GFCF (formerly gross domestic investment) is essentially investment in various assets, e.g. machinery, plant, equipment, buildings, railways and roads. Variable is expected to have a positive impact on growth (Iddrisu *et al.*, 2015:246; SARB various quarterly bulletins)	2000Q1-2016Q4	SARB various quarterly bulletins. National Accounts statistical tables www.resbank.co.za
Sector Employment (Thousands)	e_i	Total number of people employed in a sector during a quarter (StatsSA, 2016)	2005Q1-2016Q4	StatsSA various QES publications www.statssa.co.za

Average Quarterly Earnings per worker (R'thousands)	WperW	Total quarterly gross earnings of an individual before deductions. Calculated by dividing total gross earnings per sector in a quarter by the corresponding total number of employees during the quarter (StatsSA, 2016)	2005Q1-2016Q4	StatsSA QES publications www.statssa.co.za

Note: For this study, quarterly data has been used in estimations despite general definitions given in table 2.

4.3. ECONOMETRIC ESTIMATION TECHNIQUES

As there are two objectives in this study, two models will be estimated, i.e. Panel Vector Error Correction (VECM) model and a Feasible Generalized Least Squares panel data model (FGLS). Prior to this, descriptive data analysis will be conducted to describe characteristics of variables that are highly important. These statistics are calculated from a sample of data and include the mean, median, maximum, minimum, standard deviation, and skewness and kurtosis, of a series (Brooks, 2014:61-68). Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) unit root tests for stationarity will be conducted to avoid spurious regression results. The Johansen-Fisher panel test for cointegration will be conducted to establish if a long run relationship exists between variables. According to Ajaga and Nunnenkamp (2008:7) and Brooks (2014:551), cointegration shows that causality exists in at least one direction, and therefore the Dumitrescu Hurlin panel causality test will be employed to establish direction of causality. For the FGLS model, six individual regressions will be estimated through the method of Seemingly Unrelated Regression (SUR) analysis.

4.3.1. Descriptive Statistics

Summary statistics or descriptive statistics are used to describe economic and financial series (Brooks, 2014:61). The measure of central tendency (mean) is the average value of a series and is thought to measure the typical value of an economic series. The average may also be calculated by determining the mode (value that appears more than other values) and the median (middle value in a series that is arranged in ascending order) values of a series (Brooks, 2014:63). Measures of spread is a feature of a series that show the dispersion of values. The range, which is the difference between the largest value and the smallest value of a series, is a measure of dispersion, in addition to the more reliable semi-interquartile range or quartile deviation measure of spread (Brooks, 2014:64). The standard deviation (square root of variance) is the most preferred measure of spread because it contains the same units as the variable under analysis for dispersion and the information expressed from this measure includes all available data points (Brooks, 2014:65).

Since most samples do not follow a normal distribution (i.e. mean and variance of a series cannot adequately describe the series), the "higher moments" of a series can be used to fully characterize the series. Brooks (2014:66) describes the first moment of a distribution as the mean and the second moment of a distribution as the variance while the skewness and kurtosis of a series are the third and fourth moments respectively. According to Brooks (2014:66), skewness determines the shape of the distribution and it measures the extent of asymmetry around the mean. Kurtosis measures the thickness of the tails of a distribution and the highest point (peak) of the series at the mean (Brooks, 2014:66). Relating to skewness, a positively skewed distribution reflected by a long right-hand tail means that majority of the data are bunched over to the left and this means that the ordering will follow, mean>median>mode. The opposite is true for a negatively skewed distribution while zero skewness is associated with a normally distributed or symmetric series (Brooks, 2014:66). Relating to kurtosis, if the coefficient of kurtosis is equal to the value 3, then the series is normally distributed and is said to be mesokurtic. Fatter/thicker tails in a distribution are referred to as leptokurtic and they are highly peaked at the mean while thinner tails and less peaked at the mean are referred to as platykurtic distributions (Brooks, 2014:67).

4.3.2. Panel Unit Root Tests

Conventional single equation unit root tests such as the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests have low power when dealing with modest sample sizes such as panel data sets (Ajaga and Nunnenkamp, 2008:6; Brooks, 2014:547). Maddala and Wu (1999:631) and Ageliki *et al.* (2013:8) explain that unit root tests for panel data have higher power than that of individual time series data when distinguishing the null hypothesis of a unit root from the alternative hypothesis indicating stationarity. Stationarity of a series is highly important to avoid spurious regression results. According to Ageliki *et al.* (2013:8), spurious regressions are unable to fulfil their intended purposes of policy recommendations, obtaining accurate information and drawing correct conclusions *etc.* This study employs the Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) tests for unit root in panel data. According to Ageliki *et al.* (2013:8), these tests are the most popular tests for unit root testing in a panel data setting and the difference between the two tests is that the former is based on the assumption of homogeneity in autoregressive coefficient dynamics for all panel members and the latter makes an allowance for heterogeneity in all the panel data dynamics.

a) Levin, Lin and Chu (LLC) unit root test

The Levin, Lin and Chu (herein referred to as LLC) panel unit root test was developed in 2002 and it is based on the following equation:

$$\Delta y_{i,t} = \alpha_i + \theta_t + \delta_i t + \rho_i y_{i,t-1} + \sum \alpha_i \Delta y_{t-1} + v_{i,t} \qquad (eq.\ 4.1)$$
$$t = 1,2,\dots,T; i = 1,2,\dots,N.$$

Where α_i allows for entity-specific effects and θ_t allows for time-specific effects. The model allows for all series to separate both the deterministic trends through $\delta_i t$ and the lag structure to account for autocorrelation in Δy (Brooks, 2014:548). The null and alternative hypotheses for the test are:

H_0: the series has a unit root (non-stationary); $\rho_i \equiv \rho = 0$

H_1: the series does not have a unit root (stationary); $\rho < 0$

According to Brooks (2014:548), should the null be rejected, the conclusion is that "a significant proportion of the cross-sectional units are stationary". According to Brooks (2014:548) and Serfraz (2018:9), the LLC unit root test may not be very helpful because it does not provide information on the number of stationary series and there is no theory to support the assumption of all the series having the same autoregressive dynamics.

b) Im, Pesaran and Shin (IPS) unit root test

The Im, Pesaran and Shin (herein referred to as IPS) was developed in 2003 intending to address the shortfall of LLC mentioned at the end of the previous paragraph (Brooks, 2014:549). According to Nell and Zimmerman (2011:3), IPS is not as restrictive as LLC. The test is based on the same equation as LLC (eq. 4.1), however IPS proposes a different approach to the null and alternative hypotheses:

H_0: All series in the panel have a unit root (non-stationary); $\rho_i = 0$

H_1: A proportion of the series in the panel do not have a unit root (stationary) and the remaining proportion of the series has a unit root (non-stationary); $\rho_i < 0$

To obtain the statistic for IPS, separate unit root tests for each series in the panel must be conducted. This is done by obtaining ADF test (t) statistics for each series and thereafter obtaining their cross-sectional average which is then transformed into a standard normal variate under the null hypothesis of the existence of a unit root in all the series (Brooks, 2014:549). One of the major shortfalls of this test is that it may have low power when N is large and T is small. Under such circumstances, the preferred approach may be LLC (Brooks, 2014:549). It is important to note that both the LLC and IPS of the series

should be integrated of order one, i.e. $I(1)$, as this is a necessary condition for the cointegration test (Serfraz, 2018:9). This means that the series should be stationary after being differenced once.

4.4. PANEL COINTEGRATION TESTS

According to Brooks (2014:547), cointegration tests are essentially an extension of unit root tests. Although panel unit root testing is very matured, modelling panel cointegration is still in an infant phase (Brooks, 2014:551). According to Pedroni (1997:1), Örsal (2009:1) and Brooks (2014:551), the cointegration concept was introduced by Clive Engle and Robert Granger in 1987 and refers to the existence of a long run relationship between integrated variables of a series. According to Ajaga and Nunnenkamp (2008:7), while cointegration implies that variables in a series move together in the long run, the absence of cointegration means that no long run equilibrium relationship exists and as such they wander away from each other.

Engle and Granger (1987:252) propose error-correcting models that indicate the speed of adjustment back to equilibrium of variables that stray away from their long run equilibrium. Although shocks may cause them to deviate from this equilibrium, these variables will revert to equilibrium in the short run (Engle and Granger, 1987:252). Cointegration is the necessary condition for this to be true and Pedroni (1999:655) describes cointegration as the state when variables are individually $I(1)$, and therefore the linear combination of these variables are said to be stationary. Essentially, Engle and Granger (1987) propose a cointegration test for time-series data that examines the residuals of a spurious regression where the pretest requirement is that variables are $I(1)$, and if this is not true (i.e. residuals are $I(0)$), then cointegration among variables does exist. If no cointegration of variables exists, then the residuals will be $I(1)$.

Following the work by Engle and Granger (1987), Örsal (2009) explains that two types of cointegration tests exists. They are residual-based or single equation cointegration tests and maximum-likelihood-based tests or systems cointegration tests (Örsal, 2009:1). The main idea of residual-based tests is to test if a unit root exists in the residuals of a cointegrating regression equation. The null hypothesis under such tests is that no cointegration exists and therefore one would fail to reject the null if a unit root in the residuals is evident. The opposite is true for the alternative hypothesis and should the null be rejected, it means there is no evidence of a unit root and that there is a cointegrating relationship between the dependent and independent variables of a regression equation (Örsal, 2009:7). Maximum-likelihood-based tests are essentially an extension of Johansen's multivariate cointegration tests for panel data. The

one advantage of using such a test when compared to residual-based tests is that one can determine the number of cointegrating relationships among various variables in a series whereas residual-based tests assume that if there is evidence of cointegration, then there is just a single cointegrating relationship between variables (Örsal, 2009:7). Additionally, the results of maximum-likelihood-based tests do not depend on the variables chosen for necessary normalization of the cointegrating vector (Örsal, 2009:7).

For panel data, Hoang (2010) describes Pedroni's (1999, 2004), Kao's (1999) and the Johansen Fisher (1999), tests as the most popular cointegration tests. Both Pedroni's and Kao's tests are residual-based, and the Johansen Fisher test is a maximum-likelihood-based test. According to Brooks (2014:551), Pedroni's and Kao's cointegration tests are based on the Engle-Granger (1987) two-step cointegration tests. Pedroni (1999:656; 2004:599) extends the Engle-Granger (1987) model to allow for cointegration tests for panel data. The method by Pedroni (1999;2004) proposes a method that tests for the null hypothesis of no cointegration for multiple regressors. According to Pedroni (1999:654), cointegration in heterogenous panels were very limiting due to lack of critical values available to multivariate regressions that were more complex as compared to bivariate regressions. Pedroni (1999) develops a model that addresses this issue by describing a method to provide appropriate critical values for multivariate regressions. The first step to computing the necessary test statistics for the null of no cointegration is to obtain regression residuals from the hypothesized cointegrating regression that may take the general form of:

$$y_{i,t} = a_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots + \beta_{Mi} x_{Mi,t} + e_{i,t} \qquad (eq.\,4.2)$$

$$\text{For } t = 1, \dots, T; i = 1, \dots, N; m = 1, \dots, M$$

Where T is the number of observations over time; N is the number of individual members in the panel and M is the number of explanatory variables in the regression. The idea here is that there will be N different equations because there are N different members of the panel and each equation will have M regressors (Pedroni, 1999:656). According to Brooks (2014:551), the residuals obtained from (eq. 4.2) are used to determine the order of integration of each group of variables by subjecting the obtained residuals to separate DF or ADF type tests. Pedroni (1999:657) proposes two alternative hypotheses that might be possible. The first is a homogeneous alternative where:

$$H_1: \rho_i = \rho < 1$$

And the second is a heterogeneous alternative where:

$$H_1: \rho_i < 1$$

The first alternative refers to all autoregressive dynamics having the same stationary process and the latter alternative refers to dynamics of individual test equations following a different stationary process (Pedroni, 1999:657).

Using these results, the second step involves constructing test statistics. Pedroni (1999:657) derives seven test statistics that may be used. The author explains that four of the seven test statistics are based on pooling within dimension and the remaining three are based on pooling between dimension. Essentially, the former involves estimators that effectively pool autoregressive coefficients across different members for estimated residuals to be tested for unit roots, and the latter involves estimators that average individually estimated coefficients for each member. According to Brooks (2014:551), these test statistics are constructed based on standardized versions of usual t-ratios from:

$$u_{i,t} = \rho_i u_{i,t-1} + \sum_{j=1}^{p_i} \psi_{i,j} \Delta u_{i,t-j} + v_{i,t} \qquad (eq.4.3)$$

The standardizing process refers to whether $(eq.4.3)$ would include an intercept or a trend and the value of M. The test statistics are individually asymptotically standard normally distributed (Pedroni, 1999:658).

Kao (1999) follows the same approach as Pedroni (1999) and extends the Engle-Granger (1987) framework, however Kao (1999) imposes more restrictions compared to Pedroni (1999). For instance, Pedroni (1999:656) allows for heterogeneity in intercept and trend coefficients across cross-sections whereas Kao (1999:11) only allows for intercept coefficients to vary while slope coefficients are restricted to remaining fixed across cross-sections. Both Pedroni (1999) and Kao (1999) employ DF or ADF tests on residuals for each group of variables to determine if they are $I(1)$. According to Pedroni (1999:658), if there is no cointegration, one fails to reject the null which states that residuals from all the test regressions are unit root processes, i.e. $H_{1:}\, \rho_i = 1$.

Pedroni (1999) and Kao (1999), being residual-based tests do not determine the number of cointegrating relationships, therefore, for the purpose of this study, a maximum-likelihood-based test is the appropriate test and considering that Hoang (2010), Ageliki *et al.* (2013) and Serfraz (2018) identified the Johansen Fisher panel cointegration test as most popular of the maximum-likelihood-based tests, it is the cointegration test that will be employed in this study.

4.4.1. Johansen-Fisher Panel Cointegration Test

The Johansen Fisher panel cointegration test is conducted to determine if a long run equilibrium relationship exists between integrated variables in the series. At first, in 1932, Fisher derived a combined test to test for cointegration, that would use results from particular independent tests. Following this, in 1999, Maddala and Wu proposed an alternative approach that would use Fisher's results and Johansen test results from individual cross-sections to test for panel cointegration and this test is now referred to as the Johansen Fisher panel cointegration test (Arlt and Mandel, 2014:279). This test collects and aggregates probability (p) values of individual maximum-likelihood cointegration test statistics from the Johansen test and since it is a non-parametric test, the assumption of homogeneity in coefficients in non-existent (Ageliki *et al.*, 2013:9). The hypothesis for the test is as follows:

H_0: no cointegration between integrated variables in the series

H_1: cointegration exists between integrated variables in the series

The Johansen technique is employed to each group of the series separately and thereafter p-values of individual maximum-likelihood cointegration tests are collected and aggregated. If π_i denotes the p-value from the Johansen test for individual cointegration in a cross-section i, then the null hypothesis for a panel follows:

$$-2\sum_{i=1}^{N}\log(\pi_i) \rightarrow \chi^2 2N \qquad (eq.\,4.4)$$

Where χ^2 values are based on p-values for Johansen's cointegration trace test and maximum eigen value tests.

4.5. PANEL VECTOR ERROR CORRECTION MODEL

The cointegration test can indicate whether variables of a series are cointegrated and have long run relations, however they do not assist with direction of causality. Therefore, Engle and Granger (1987) and Ageliki *et al.* (2013) propose estimating a two-step panel-based Vector Error Correction Model (VECM), that may be used to conduct Granger causality tests on the relationship between FDI and growth. According to Engle and Granger (1987:254), cointegrated series have an error correction model (ECM) because cointegration and ECMs are closely related. Engle and Granger (1987:254) describe the idea of ECMs as the correction of proportionate disequilibrium from one period, being corrected in the consecutive period. According to Ageliki *et al.* (2013:10) and Lee (2013:487), the Error Correction Term (ECT) is an indication of the long run equilibrium relationship between variables and measures the extent

that observed variables at $t-1$ wander away from their long run equilibrium. Assuming that variables are cointegrated, any deviation away from equilibrium at $t-1$ will likely cause changes to the values of variables in the next period attempting to force deviated variables back to their long run equilibrium (Ageliki *et al.*, 2013:10). According to Engle and Granger (1987:254), a general ECM in terms of a backshift operator (B) can be represented by:

$$A(B)(1-B)_{xt} = \gamma z_{t-1} + u_t \qquad (eq.\,4.5)$$

Where u_t denotes a stationary multivariate disturbance with $A(0) = I$, $A(1)$ has all finite elements, $z_t = a'x_T$ and $\gamma \neq 0$. The model suggests that the previous period disequilibrium is an explanatory variable. If one wants to determine the gradual adjustment back to a new equilibrium, it is possible to rearrange the terms so that any set of lags of z can be written in this form $(eq.\,4.5)$. The model does not account for exogeneity of a subset of variables and a is an unknown parameter vector and not a constant term.

Following this, the procedure for the two-step estimator by Engle and Granger (1987) is as follows:
Step 1: Estimate the parameters of the cointegrating vector.
Step 2: Use the estimated parameters in error correction form.
According to Engle and Granger (1987:260), both steps may be performed using single equation least squares, and consistent results for all parameters are achieved. The two-step estimator is convenient since dynamics need to be specified only once the error correction structure is estimated (Engle and Granger, 1987:260). In the context of single equation approaches, Ageliki *et al.* (2013:10) explains that homogeneity exists between cross-section units for long run relationships while the dynamics of short run relationships are cross-section specific.

In estimating a panel VECM, this study follows Lee (2013), Mahembe and Odhiambo (2015) and Mahmoodi and Mahmoodi (2016), and estimates a general form error correction form:

$$\Delta lnY_{i,t} = a_{i,y} + \sum_{k=1}^{n-1} \theta_{i,k} \Delta lnX_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,k}\, \Delta lnY_{i,t-k} + \lambda_i ECT_{i,t} + u_{i,t} \qquad (eq.\,4.6)$$

Where $Y_{i,t}$ is the observed dependent variable for sector i at time t (t denotes 1,2,3,…,n observations); Δ is the difference operator; a is a constant deterministic component; θ is a short run adjustment coefficient; ECT is the lagged residual obtained from the long run cointegrating relationship; λ measures the speed of adjustment of values of variables back to long run equilibrium; u represents a stationary random error term with a mean equal zero; k is the lag length; and $n-1$ is the maximum lag length.

Considering the variables in the model for FDI and growth include GDPG, FDI, FOI, FPI and GFCF, the empirical model is presented following Engle and Granger's (1987) two-step estimator VECM:

$$\Delta GDPG_{i,t} = a_{1i} + \sum_{k=1}^{n-1} \theta_{i,0}\, \Delta GDPG_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,1}\, \Delta FDI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,2}\, \Delta FOI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,3}\, \Delta FPI_{i.t-k} + \sum_{k=1}^{n-1} \theta_{i,4}\, \Delta GFCF_{i.t-k} + \lambda_{1,i} ECT_{t-1} + u_{1,t} \quad (eq.4.7)$$

$$\Delta FDI_{i,t} = a_{2i} + \sum_{k=1}^{n-1} \theta_{i,0}\, \Delta FDI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,1}\, \Delta GDPG_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,2}\, \Delta FOI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,3}\, \Delta FPI_{i.t-k} + \sum_{k=1}^{n-1} \theta_{i,4}\, \Delta GFCF_{i.t-k} + \lambda_{2,i} ECT_{t-1} + u_{2,t} \quad (eq.4.8)$$

$$\Delta FOI_{i,t} = a_{3i} + \sum_{k=1}^{n-1} \theta_{i,0}\, \Delta FOI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,1}\, \Delta GDPG_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,2}\, \Delta FDI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,3}\, \Delta FPI_{i.t-k} + \sum_{k=1}^{n-1} \theta_{i,4}\, \Delta GFCF_{i.t-k} + \lambda_{3,i} ECT_{t-1} + u_{3,t} \quad (eq.4.9)$$

$$\Delta FPI_{i,t} = a_{4i} + \sum_{k=1}^{n-1} \theta_{i,0}\, \Delta FPI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,1}\, \Delta GDPG_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,2}\, \Delta FDI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,3}\, \Delta FOI_{i.t-k} + \sum_{k=1}^{n-1} \theta_{i,4}\, \Delta GFCF_{i.t-k} + \lambda_{4,i} ECT_{t-1} + u_{4,t} \quad (eq.4.10)$$

$$\Delta GFCF_{i,t} = a_{5i} + \sum_{k=1}^{n-1} \theta_{i,0}\, \Delta GFCF_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,1}\, \Delta GDPG_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,2}\, \Delta FDI_{i,t-k} + \sum_{k=1}^{n-1} \theta_{i,3}\, \Delta FOI_{i.t-k} + \sum_{k=1}^{n-1} \theta_{i,4}\, \Delta FPI_{i.t-k} + \lambda_{5,i} ECT_{t-1} + u_{4,t} \quad (eq.4.11)$$

Ageliki *et al.* (2013:11) and Lee (2013:487) explain that the appropriate lag length and appropriate model specifications may be determined by minimized Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC). The expectation is that ECT_{t-1} for all the models should be negative but taken in their absolute values and they should be between zero and one. As noted earlier, the purpose of this lagged error correction coefficient is to capture the speed of adjustment back to long run equilibrium due to short term disturbances resulting in values deviating away from this equilibrium. If the lagged error term shows to be statistically significant, it reiterates that a long run relationship exists between variables and that all explanatory variables Granger cause dependent variables over time (Ageliki *et al.*, 2013:12). Therefore, to identify the source of causation, the significance of independent variable coefficients ($\theta_{i,t}$) should be tested. For instance, in ($eq.4.7 - 4.11$), the coefficients of $\Delta GDPG_{i,t-k}$, $\Delta FDI_{i,t-k}$, $\Delta FOI_{i,t-k}$, $\Delta FPI_{i,t-k}$ and $\Delta GFCF_{i,t-k}$ should be tested. Short run causality in ($eq.4.7$) for instance would be tested under the following hypotheses:

H_0: FDI Granger causes real GDP, $\theta_{i,1} = 0, \forall_{ik}$

H_1: FDI does not Granger cause real GDP, $\theta_{i,1} \neq 0, \forall_{ik}$

According to Ageliki *et al.* (2013:12), long run causality is also important and is detected by testing if the speed of adjustment coefficient ($\lambda_{i,t}$) is significant. Therefore:

$$H_0: \lambda_{i,t} = 0 \ \ \forall_{ik}$$

$$H_1: \lambda_{i,t} = 0 \ \forall_{ik}$$

Strong causality tests may also be conducted through joint tests that include the coefficients of independent variables and the respective $ECTs$ of each equation. This form of causality test detects the

variables that bear the burden of short run adjustments necessary to revert to long run equilibrium after a shock to the system (Ageliki *et al.*, 2013:12).

4.6. FEASIBLE GENERALIZED LEAST SQUARES PANEL MODEL

To address objective two, that is the effect of sectoral FDI on sectoral employment, this study employs a structural analysis method as Jula and Jula (2017). Jula and Jula (2017) propose analyzing the change in industry structures using Seemingly Unrelated Regressions (SUR) method of analysis. According to the authors, SUR in a panel data framework corrects for heteroskedasticity and general correlation of observations (Jula and Jula, 2017:36). While Jula and Jula (2017) develop a methodological framework to analyze the growth rate of industry share in total employment and the change in industry share in total employment, this study is focused on the latter. That is to examine if FDI increases, decreases or does not affect sector share in total employment (see appendix for model development). Following Jula and Jula (2017), before estimating the PDM, several variables need to be understood (see appendix).

Based on the theoretical relationships (see appendix), empirically, the following linear PDM may be estimated:

$$\Delta s_{i,t} = \alpha_0 + \alpha_1(s_{i,t-1})(r_{L,t}) + \alpha_{2,i}\left(\frac{1}{E_{t-1}}\right)\Delta X_{i,t} + \alpha_{3,i}\left(\frac{1}{E_{t-1}}\right)\Delta Y_{i,t} + \mu_i + T_t + v_{it} \qquad (eq.4.12)$$

$$\sum_i s_{i,t} \leq 1, t = 1,2,\dots,T$$

Where:

$t =$ time period;

$i =$ sector (cross section variables);

$s_{i,t-1} =$ share of sector i in total employment in the previous period;

$\Delta X_{i,t} =$ change in variable X of sector i in the current period;

$\Delta Y_{i,t} =$ change in variable Y of sector i in the current period;

$r_{L,t} =$ quarterly rate of change of total employment;

$\mu_i =$ (fixed or random) cross-section specific effects that are time-invariant;

$T_t =$ (fixed or random) time specific effects that are cross-section invariant;

$v_{it} =$ are individual errors for variables among themselves and independent of each other;

$\alpha_0 =$ homogeneity intercept coefficient independent of i and t; and

$a_1, a_2$and $\alpha_3 =$ are the slope coefficients.

According to the PDM, the results should indicate that if:

- $\alpha_{2,i} > 0$, then the growth in variable X in sector i leads to an increase in employment in sector i;
- $\alpha_{2,i} < 0$, then growth in variable X in sector i leads to increased productivity in sector i; and
- $\alpha_{2,i} = 0$, then growth in variable X in sector i is not associated with change in employment in sector i.
- $\alpha_{3,i} > 0$, then the growth in variable Y in sector i leads to an increase in employment in sector i;
- $\alpha_{3,i} < 0$, then growth in variable Y in sector i leads to increased productivity in sector i; and
- $\alpha_{3,i} = 0$, then growth in variable Y in sector i is not associated with change in employment in sector i.

Following this, for this study, the PDM for estimating the change of industry share in total employment (that is $\Delta s_{i,t} = s_{i,t} - \Delta s_{i,t-1}$) as a result of quarterly sector FDI and quarterly average earnings of employees (WperW) in each sector is as follows:

$$\Delta s_{i,t} = \alpha_0 + \alpha_1(s_{i,t-1})(r_{L,t}) + \alpha_{2,i}\left(\frac{1}{E_{t-1}}\right)\Delta FDI_{i,t} + \alpha_{3,i}\left(\frac{1}{E_{t-1}}\right)\Delta WperW_{i,t}\mu_i + T_t + v_{it} \qquad (eq.4.13)$$

Where $\Delta FDI_{i,t}$ and $\Delta WperW_{i,t}$ are the dynamics of FDI and earnings of employees associated with sector i in the time period t respectively, that is:

$$\Delta FDI_{i,t} = FDI_{i,t} - FDI_{i,t-1} \qquad (eq.4.14)$$

and

$$\Delta WperW_{i,t} = WperW_{i,t} - WperW_{i,t-1} \qquad (eq.4.15)$$

4.7. CONCLUSION

This chapter provided a description of the variables selected for this study in addition to the methods of estimation to achieve the two goals of the study. The aim of the study is to examine the effect of FDI on sector growth and sector employment. To address both goals, panel unit root tests that must be conducted on all variables to ensure regression results are not spurious were discussed. Cointegration tests were also discussed to establish if integrated variables have a long-run equilibrium relationship. For the relationship between FDI and growth, the panel VECM model was discussed as a means of determining causality and direction of causality between FDI and growth. For the relationship between FDI and employment, Seemingly Unrelated Regression (SUR) method of analysis was discussed.

CHAPTER 5

ESTIMATION AND RESULTS

5.1. INTRODUCTION

This chapter implements the methodologies discussed in chapter 4 and presents and discusses the results obtained in the study. The chapter comprises eight sections including the introduction. The next section presents a graphical analysis of trends in sector FDI, sector GDP and sector employment as well as summary statistics of the variables in the model. Section three provides the results and a discussion of the two panel unit root tests while the fourth section reports on the results of the panel cointegration test. The fifth section presents the results and provides a discussion of the causality tests and panel VECM. Section six addresses the second objective of the study and presents the results and a discussion of the SUR model estimated. Section seven provides a discussion on the results of the two estimated models and how they relate to existing literature while section eight concludes the chapter.

5.2. DESCRIPTIVE DATA ANALYSIS

Descriptive data analysis involved graphically analyzing the variables under study by assessing their behavior during the period under study. This section also includes summary statistics of all key variables in the study.

5.2.1. Graphical Analysis of sector FDI, sector GDP and sector Employment

Graphical analysis was used to analyze trends in sector FDI, sector GDP and sector employment for the six economic sectors of South Africa. Figure 1 shows growth trends in sector FDI, sector GDP and sector employment for the mining and quarrying sector (graph 1), manufacturing sector (graph 2), electricity, gas and water sector (graph 3), transport, storage and communication sector (graph 4), finance, insurance, real estate and business services sector (graph 5), and community, social and personal services sector (graph 6).

Figure 1: Trends in Sector FDI, Sector GDP and Sector Employment
Source: Author's calculations from Eviews 10

Figure 1 shows that for all six sectors, GDP growth was constantly fluctuating and had no upward or downward trend. FDI in the mining and quarrying sector (graph 1) increased significantly between 2000Q1 and 2001Q1, thereafter FDI began to decrease and there have been no significant changes in FDI growth dynamics since. Employment growth in the sector remained relatively low. FDI in the manufacturing sector (graph 2) showed slight increases over the period under study, however there does not seem to be significant FDI inflows into the sector nor does there seem to be high levels of increased employment growth.

Figure 1 shows that during the years of the GFC, GDP growth in the manufacturing sector and electricity, gas and water sector (graph 3) was around -20%, the mining and quarrying sector experienced negative growth constantly and the remaining sectors experienced slight negative growth rates at most twice, under the period of study. The transport, storage and communication sector (graph 4) shows to have received increased FDI inflows when the sector experienced increasing levels of GDP growth until the era of the GFC when GDP growth showed to decrease. There was a significant increase in FDI inflows into the sector between 2010Q1 and 2011Q1, however by 2011Q2, FDI inflows into the sector decreased and there have only been slight increases in FDI since. Employment growth in the sector seems to move in the same direction as FDI and growth, i.e. employment increases when FDI and GDP growth increases and vice versa.

FDI in the finance, insurance, real estate and business services sector (graph 5) showed to increase regularly and employment growth increased as FDI increased. Like all other sectors, GDP growth in the community, social and personal services sector (graph 6) has been volatile, while FDI growth has been steady until 2013Q2 when the sector showed a significant increase in FDI inflow, however by the beginning of 2014, FDI growth was negative. FDI grew after, however by 2016, growth in FDI became negative once again.

5.2.2. Summary statistics of key variables

Summary statistics for model 1 and model 2 are given in Table 3 and Table 4 respectively. Brooks (2014:66-67) states that the Jarque-Bera (JB) test is essentially a normality test. The JB test measures whether the skewness and kurtosis of a set of sample data match a normal distribution. Since the JB test statistics for all variables in model 1 and model 2 are far from zero and their respective probability values are significantly low, the null hypothesis of normal distribution is rejected, and this indicates that the

sample data are not normally distributed. The values for the skewness and kurtosis also provide evidence of non-normality in the sample data. It may be observed from the variables of model 1 that GDPG has a mean of 2.178, FDI has a mean of 0.363, FOI has a mean of 0.142, FPI has a mean of 0.396 and GFCF has a mean of 0.055. Observing the variables of model 2 reveals that sector share in total employment (SSinTE) has a mean of 0.123, quarterly growth rate of total employment (GQTE) has a mean of 0.007, FDIperW has a mean of 0.184 and wages per worker (WperW) has a mean of 49.448.

Table 3: Summary statistics for model 1: FDI and GDP growth

STATISTIC	GDPG	FDI	FOI	FPI	GFCF
MEAN	2.178	0.363	0.142	0.396	0.055
MEDIAN	1.767	0.238	0.065	0.288	0.037
MAXIMUM	30.400	1.950	1.594	1.888	0.373
MINIMUM	-24.200	0.000	0.003	0.050	0.007
STD.DEV.	6.290	0.467	0.217	0.324	0.065
SKEWNESS	-0.477	1.723	3.389	1.536	3.185
KURTOSIS	6.885	5.567	16.331	5.154	13.671
JARQUE-BERA	272.035	314.025	3802.545	239.314	2625.787
PROBABILITY	0.000	0.000	0.000	0.000	0.000
SUM	888.702	148.162	57.905	161.511	22.548
SUM SQ. DEV.	16102.65	88.670	19.143	42.754	1.707
OBSERVATIONS	408	408	408	408	408

Source: Author's calculations from Eviews 10

Table 4: Summary statistics for model 2: FDI and employment

STATISTIC	SSinTE	GQTE	FDIperW	WperW
MEAN	0.123	0.007	0.184	49.448
MEDIAN	0.093	0.004	0.099	46.111
MAXIMUM	0.292	0.113	0.977	140.565
MINIMUM	0.006	-0.022	0.0002	18.786
STD.DEV.	0.096	0.020	0.233	21.865
SKEWNESS	0.311	3.295	1.655	1.315
KURTOSIS	1.556	17.411	5.111	5.243
JARQUE-BERA	29.665	3013.239	184.931	143.338
PROBABILITY	0.000	0.000	0.000	0.000
SUM	35.540	1.986	52.944	14240.89
SUM SQ. DEV.	2.630	0.118	15.635	137206.3

OBSERVATIONS	288	288	288	288

Source: Author's calculations from Eviews 10

5.3. PANEL UNIT ROOT TESTS

As discussed in the previous chapter, prior to estimating the models, all variables of both models are subjected to unit root tests for stationarity to avoid spurious regression results. The FDI, FOI, FPI and GFCF variables were transformed into their respective logarithmic forms. These were the only variables in the model that could be transformed. According to Brooks (2014:34), transforming variables into their log form overcomes the problem of heteroskedasticity by rescaling the data to ensure a more constant variance. Additionally, transforming variables into log form makes the distribution appear more normal or symmetric (Brooks, 2014:34). The results from the LLC panel unit root test for stationarity are given in Table 5 and the results from the IPS panel unit root test for stationarity are given in Table 6. Both tests were carried out at levels with an intercept and thereafter with an intercept and a trend. Variables that were found to be non-stationary in levels were differenced once.

Both tests found GDPG and GQTE to be integrated of order zero or I(0) at the 1% level of significance (LoS). Results for FDI were found to be inconsistent for both tests. LLC concluded that FDI is I(1) at the 1% LoS with an intercept and with an intercept and a trend, however, IPS found FDI to be I(1) at the 1% LoS with an intercept but I(0) at the 5% LoS with an intercept and a trend. GFCF was found to be I(1) at the 1% LoS for IPS but for LLC results were inconsistent. The variable was found to be I(0) at the 10% LoS with an intercept but I(1) at the 1% LoS with an intercept and a trend. The results for FDIperW were also inconsistent for both tests. LLC concluded that FDIperW is I(1) at the 1% LoS with an intercept and with an intercept and a trend, whereas, IPS found FDIperW to be I(1) at the 1% LoS with an intercept and a trend but I(0) at the 5% LoS with an intercept only. Relating to WperW, both LLC and IPS found the variable to be I(1) with an intercept only at the 1% LoS, but I(0) with an intercept and a trend at the 5% and 1% LoS for LLC and IPS, respectively. All remaining variables were found to be I(1).

Table 5: Results for the Levin, Lin and Chu (LLC) unit root test

VARIABLE	MODEL SPECIFICATION	LLC (levels)		LLC (first differences)		ORDER OF INTEGRATION
		t-stat	result	t-stat	result	
GDPG	Intercept	-3.0275***	stationary			I(0)

	Intercept & Trend	-3.1617***	stationary			
FDI	Intercept	-0.6418	non-stationary	-12.0362***	stationary	I(1)
	Intercept & Trend	-0.8060	non-stationary	-13.0897***	stationary	
FOI	Intercept	1.6150	non-stationary	-11.9850***	stationary	I(1)
	Intercept & Trend	0.1134	non-stationary	-13.0075***	stationary	
FPI	Intercept	1.0624	non-stationary	-12.2933***	stationary	I(1)
	Intercept & Trend	1.4658	non-stationary	-12.7890***	stationary	
GFCF	Intercept	-1.4986*	stationary			I(0)
	Intercept & Trend	-0.4008	non-stationary	-13.1306***	stationary	I(1)
SSinTE	Intercept	-0.8710	non-stationary	-8.4761***	stationary	I(1)
	Intercept & Trend	0.6167	non-stationary	-8.5775***	stationary	
GQTE	Intercept	-16.723***	stationary			I(0)
	Intercept & Trend	-16.518***	stationary			
FDIperW	Intercept	-0.8679	non-stationary	-21.008***	stationary	I(1)
	Intercept & Trend	-0.9260	non-stationary	-21.431***	stationary	
WperW	Intercept	-1.1880	non-stationary	-18.403***	stationary	I(0)
	Intercept & Trend	-2.0273**	stationary			I(1)

Source: Author's calculations from Eviews 10

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

Table 6: Results for the Im, Pesaran and Shin (IPS) unit root test

VARIABLE	MODEL SPECIFICATION	IPS (levels)		IPS (first differences)		ORDER OF INTEGRATION
		t-stat	result	t-stat	result	
GDPG	Intercept	-6.2074***	stationary			I(0)
	Intercept & Trend	-6.1281***	stationary			
FDI	Intercept	-0.0555	non-stationary	-11.9304***	stationary	I(1)
	Intercept & Trend	-2.1275**	stationary			I(0)

FOI	Intercept	0.3327	non-stationary	-12.2741***	stationary	I(1)
	Intercept & Trend	0.3425	non-stationary	-12.5845***	stationary	
FPI	Intercept	2.4848	non-stationary	-12.9195***	stationary	I(1)
	Intercept & Trend	1.3834	non-stationary	-12.6067***	stationary	
GFCF	Intercept	1.0338	non-stationary	-13.4957***	stationary	I(1)
	Intercept & Trend	-1.0153	non-stationary	-12.7239***	stationary	
SSinTE	Intercept	0.6761	non-stationary	-8.2687***	stationary	I(1)
	Intercept & Trend	1.5001	non-stationary	-7.2907***	stationary	
GQTE	Intercept	-15.290***	stationary			I(0)
	Intercept & Trend	-14.633***	stationary			
FDIperW	Intercept	-1.7146**	stationary			I(0)
	Intercept & Trend	-1.2423	non-stationary	-17.305***	stationary	I(1)
WperW	Intercept	-0.3549	non-stationary	-16.435***	stationary	I(1)
	Intercept & Trend	-1.8994***	stationary			I(0)

Source: Author's calculations from Eviews 10

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

5.4. PANEL COINTEGRATION TEST

Since at least 80% of the variables for model 1 were found to be integrated of order one, the next step is to establish if a long run equilibrium relationship exists among the variables in the model. The study employs the Johansen-Fisher cointegration test procedure which involves determining the optimal lag length and estimating a Vector Autoregression (VAR) equation. According to Brooks (2014:552), although the prerequisite for the Johansen cointegration test is that all variables are I(1), it is possible to include both I(0) and I(1) variables provided that not less than 80% of the variables are I(1). The idea here is that variables with different orders of integration may also have long run equilibrium relationships. The maximum optimal lag length was determined using various information criteria (see appendix). The information criteria determine the optimal lag length that will eliminate serial correlation in residuals and establish the deterministic trend assumptions for the VAR model. Relating to the results

from the various information criterion, LR determines the optimal lag length to be 8 and AIC, SC, FPE and HQ determine the lag length to be 1 (see appendix). From the previous chapter, the endogenous variables for the VAR model include GDPG, FDI, FOI, FPI and GFCF. As such the estimated model is:

Model 1: $GDPG = f(LogFDI, LogFOI, LogFPI, LogGFCF)$

Table 7 provides a summary of cointegration test results for two possible models that may be estimated according to the contrasting lag length determination. Model a provides results for the number of cointegrating vectors according to LR (i.e. including 8 lags) and Model b provides results for the number of cointegrating vectors according to AIC, SC, FPE and HQ (i.e. including 1 lag). According to Brooks (2014:386), assumption 1 and 5 are unconventional and rarely used in practice, therefore they are not explored for this study. A decision is made according to the trace test and max-eigen value test producing consistent results. According to the results for 'Model a', assumption 2 provides evidence of two cointegrating vectors while assumptions 3 and 4 provide evidence of 1 cointegrating vector. The results show that for 'Model b', assumptions 3 and 4 produce one cointegrating vector while the trace test and max-eigen value test produce inconsistent results for assumption 2. Therefore, 'Model b' shows to be the appropriate model under the assumption of a stochastic linear trend (assumption 3) in the series.

Table 7: Summary of cointegration test

	1	**2**	**3**	**4**	**5**
DATA TREND	**NONE**	**NONE**	**LINEAR**	**LINEAR**	**QUADRATIC**
TEST TYPE	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Model a					
Trace	2	2	1	1	1
Max-Eigen	2	2	1	1	1
Model b					
Trace	2	1	1	1	1
Max-Eigen	2	2	1	1	1

Source: Author's calculations from Eviews 10

Table 8 provides the results from the Johansen-Fisher cointegration test. According to Brooks (2014:390), the null hypothesis of no cointegration between integrated variables is rejected when the probability values for the trace statistic and the max-eigen values are less than 10% and the point where the null is not rejected shows the number of cointegrating equations. Assessing the results from Table 8, the null hypothesis under the assumption of no cointegration between integrated variables is rejected when the number of cointegrating equations is zero and at most 1 since their respective trace statistics

and max-eigen values are statistically significant (i.e. probability values < 10%). For the possibility of at most 2 cointegrating equations, the null hypothesis is not rejected because the probabilities of the trace test and max-eigen value are significantly greater than 10% and therefore the conclusion is that there are at most 1 cointegrating equation according to the Johansen-Fisher test for cointegration.

Table 8: Number of cointegrating equations

NO. OF COINTEGRATING EQUATIONS	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	59.40	0.0000	52.11	0.0000
AT MOST 1	20.76	0.0540	27.23	0.0072
AT MOST 2	4.884	0.9618	5.920	0.9201
AT MOST 3	3.883	0.9855	3.128	0.9946

Source: Author's calculations from Eviews 10

Since Table 8 only provides information of overall cointegration among integrated variables in the model at the 10% level of significance, it is essential to analyze if there are long run equilibrium relationships among the variables in each sector. Following the Johansen-Fisher cointegration test, Tables 8.1. to 8.6. summarizes the results from the cointegration test for each sector.

Table 8.1: Mining and Quarrying sector cointegration results

NULL HYPOTHESIS (H0)	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	104.4786	0.0000	47.5267	0.0007
AT MOST 1	56.9519	0.0056	37.8409	0.0017
AT MOST 2	19.1110	0.4850	15.7043	0.2426
AT MOST 3	3.4068	0.9454	3.1106	0.9391

Source: Author's calculations from Eviews 10

Table 8.2: Manufacturing sector cointegration results

NULL HYPOTHESIS (H0)	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	73.6041	0.0242	41.5693	0.0050
AT MOST 1	32.0348	0.6102	15.9034	0.6740
AT MOST 2	16.1314	0.7030	11.4606	0.6013
AT MOST 3	4.6707	0.8427	4.5609	0.7959

Source: Author's calculations from Eviews 10

Table 8.3: Electricity, Gas and Water sector cointegration results

NULL HYPOTHESIS (H0)	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	92.7987	0.0003	48.3063	0.0005
AT MOST 1	44.4924	0.1000	31.7833	0.0136

AT MOST 2	12.7091	0.9044	5.8852	0.9851
AT MOST 3	6.8239	0.5982	4.6445	0.7859

Source: Author's calculations from Eviews 10

Table 8.4: Transport, Storage, and Communication sector cointegration results

NULL HYPOTHESIS (H0)	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	69.1001	0.0570	32.2392	0.0774
AT MOST 1	36.8609	0.3541	17.9197	0.5018
AT MOST 2	18.9412	0.4971	11.7176	0.5757
AT MOST 3	7.2236	0.5518	4.8280	0.7634

Source: Author's calculations from Eviews 10

Table 8.5: Finance, Insurance, Real Estate and Business services sector cointegration results

NULL HYPOTHESIS (H0)	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	61.4266	0.1941	29.9071	0.1386
AT MOST 1	31.5195	0.6385	20.2262	0.3257
AT MOST 2	11.2933	0.9537	7.3891	0.9370
AT MOST 3	3.9042	0.9111	3.5378	0.9046

Source: Author's calculations from Eviews 10

Table 8.6: Community, Social and Personal Services sector cointegration results

NULL HYPOTHESIS (H0)	TRACE STATISTIC	PROBABILITY	MAX-EIGEN VALUE	PROBABILITY
NONE	62.9370	0.1565	27.1060	0.2577
AT MOST 1	35.8310	0.4049	18.2236	0.4766
AT MOST 2	17.6074	0.5951	10.7877	0.6685
AT MOST 3	6.8197	0.5987	6.7769	0.5159

Source: Author's calculations from Eviews 10

The results from the cointegration test reveal that long run equilibrium relationships do exist among variables in four of the six economic sectors (i.e. Mining and Quarrying; Manufacturing; Electricity, Gas and Water; and Transport, Storage, and Communication). There is no evidence of cointegration in the Finance, Insurance, Real Estate and Business services sector and Community, Social and Personal Services sector. The models were estimated under the assumption that there was an intercept but no trend in the cointegrating equation in the VAR. As with the results from Table 8, the Johansen-Fisher technique uses trace test statistics and max-eigen value test statistics to establish the number of cointegrating equations in each sector. The test recommends rejecting of the hypothesis at the 5% level. It is possible that the two test statistics may yield contrasting results.

Results of both test statistics are consistent and reveal that in the Mining and Quarrying sector, and the Electricity, Gas and Water sector there is one cointegrating equation. In the Manufacturing sector, and

Transport, Storage and Communication sector there are no cointegrating equations. Since Table 8 provides results showing evidence of overall cointegration among variables and cointegration has been established in four sectors, the next step is to estimate a Panel Vector Error Correction Model (VECM).

5.5. PANEL VECM AND CAUSALITY TESTS

The previous section found that overall, the variables of the model have long run equilibrium relationships and that the variables for four sectors have long run equilibrium relationships, and therefore are cointegrated, as such the study proceeded to analyze the long-term dynamics and short-term dynamics of the variables by estimating a Panel VECM. Prior to estimating the VECM, the Pairwise Dumitrescu-Hurlin Panel Causality Test was conducted to establish the direction of causality between variables.

5.5.1. Dumitrescu-Hurlin Panel Causality Analysis

Table 9 summarizes the results from the Pairwise Dumitrescu-Hurlin Panel Causality test (see appendix). The Dumitrescu-Hurlin causality test is essentially a panel version of the popular Granger Causality test. The test uses Wbar test statistics (standardized version of Zbar test statistics) which are average test statistics from running standard Granger causality regressions for each cross section (Eviews 10 users guide, 2017:1011). The null hypothesis of no homogeneous causality is rejected at the 10% level.

Table 9: Dumitrescu Hurlin Panel Causality Results

NULL HYPOTHESIS	WBAR-STATISTIC	ZBAR-STATISTIC	PROBABILITY
FDI does not homogeneously cause GDPG	4.04570	2.25293	0.0243
GDPG does not homogeneously cause FDI	1.13957	-1.06318	0.2877
FOI does not homogeneously cause GDPG	6.04303	4.55201	0.0000
GDPG does not homogeneously cause FOI	1.84653	-0.05337	0.8000
FPI does not homogeneously cause GDPG	7.29866	5.98982	0.0000
GDPG does not homogeneously cause FPI	0.89961	-1.33769	0.1810
GFCF does not homogeneously cause GDPG	2.85446	0.90080	0.3677
GDPG does not homogeneously cause GFCF	0.84559	-1.39954	0.1616
FOI does not homogeneously cause FDI	2.33070	0.29598	0.7672
FDI does not homogeneously cause FOI	3.33232	1.43891	0.1502
FPI does not homogeneously cause FDI	2.47866	0.46482	0,6421
FDI does not homogeneously cause FPI	1.84101	-0.26279	0.7927
GFCF does not homogeneously cause FDI	6.78483	5.37849	0.0000
FDI does not homogeneously cause GFCF	2.02372	-0.05431	0.9567
FPI does not homogeneously cause FOI	4.60904	2.90995	0.0036

FOI does not homogeneously cause FPI	3.65182	1.81385	0.0697
GFCF does not homogeneously cause FOI	3.12543	1.21109	0.2259
FOI does not homogeneously cause GFCF	1.32133	-0.85478	0.3927
GFCF does not homogeneously cause FPI	2.43531	0.42084	0.6739
FPI does not homogeneously cause GFCF	3.29570	1.40607	0.1597

Source: Author's calculations from Eviews 10

The results of the causality test conclude that there is a unidirectional causality relationship between FDI and GDPG. That is, the results of the test found that FDI homogeneously causes GDPG however, GDPG does not homogenously cause FDI. The *a priori* expectation was that there would be a bidirectional causality relationship between FDI and GDPG. Additionally, the results also reveal unidirectional causality between FOI and GDPG; and FPI and GDPG. Interestingly, GFCF was found to homogeneously cause FDI which was an *a priori* expectation as literature on FDI suggests that GFCF is one of the key variables attracting foreign investors. Bidirectional causality exists between FPI and FOI. Therefore, it was found that FPI homogeneously causes FOI and FOI homogeneously causes FPI.

5.5.2. Panel VECM Analysis

The results from the Pairwise Dumitrescu-Hurlin panel causality test only provides information on causality and direction of causality but does not provide critical information such as long-run and short-run dynamics. Therefore, the panel VECM model was estimated and has two important components, i.e. the target equation (showing short run dynamics) and the cointegrating equations (long run model). Tables 10 summarizes the long-run estimates and Table 11 summarizes the speed of adjustment (ECT_{t-1}) coefficient and short-run estimates from estimating the panel VECM. From section 5.4., it was established that there is one cointegrating equation and as such the panel VECM results below report estimates for the equation.

Table 10: Long run estimates

INDEPENDENT VARIABLE	COEFFICIENT	T-STATISTIC
Cointegrating Equation - DEPENDENT VARIABLE: ΔGDPG		
C	-1.3934	
$GDPG_{t-1}$	-0.9490	-12.7789
FDI_{t-1}	-0.3542	-2.8515
FOI_{t-1}	-0.5045	-1.6253
FPI_{t-1}	2.0836	4.2622
$GFCF_{t-1}$	0.1918	0.4310

Source: Author's calculations from Eviews 10

Table 11: Speed of adjustment and short run estimates

INDEPENDENT VARIABLE	COEFFICIENT	T-STATISTIC
Cointegrating Equation - DEPENDENT VARIABLE: ΔGDPG		
C	0.0436	0.1322
ECT_{t-1}	-0.9490	-12.7789
$\Delta GDPG_{t-1}$	-0.0586	-1.1326
ΔFDI_{t-1}	0.0294	0.0203
ΔFOI_{t-1}	-2.6835	-1.5484
ΔFPI_{t-1}	-2.1222	-1.0098
$\Delta GFCF_{t-1}$	0.2927	0.0985

Source: Author's calculations from Eviews 10

In the long run (Table 10), previous period FDI and FPI have a statistically significant relationship with GDPG. The results show that a 1% increase in previous period FDI is associated with a decrease of 0.35% in current GDPG, while a 1% increase in FPI is associated with a 2.08% increase in current GDP growth. Although not significant, a 1% increase in FOI results in a 0.5% decrease in GDPG and a 1% increase in GFCF is associated with a 0.19% increase in GDPG.

As explained in Chapter 4, the speed of adjustment coefficient (ECT_{t-1}) shows the dynamic adjustment of the variables towards long-run equilibrium following shocks that caused variables to deviate away from their equilibrium. Also explained in chapter 4 is that results from the panel VECM indicate that should a true cointegrating relationship exist between variables, the ECT_{t-1} coefficient should be negative and statistically significant. From Table 11, the speed of adjustment coefficient is negative and statistically significant at the 1% level, suggesting a true cointegrating relationship between FDI and growth rate of GDP. The above model shows that GDPG is corrected by about 94% per quarter and the negative sign of the coefficient indicates that GDPG will move closer to equilibrium. The ECT_{t-1} of -0.9409 shows a very high speed of adjustment back to equilibrium and posits that 94.9% of the discrepancy between the long run and the short run value of GDP growth will be corrected in the following quarter.

As noted, in the long run, previous period FDI is significant in explaining GDP growth, however in the short run this is not the case. In the short run, FDI is not statistically significant, however, FDI does result in increased GDPG by about 0.02%. Just like FDI, all other explanatory variables, including previous period GDPG are insignificant in the short run. Despite this, it is still noteworthy to analyze their effect. Therefore, a 1% increase in previous period GDPG causes current GDPG to decrease by about 0.06%

while a 1% increase in FOI is associated with a decrease in GDPG of approximately 2.68%. A 1% increase in FPI results in a decrease in GDPG of about 2% while a 1% increase in GFCF is associated with a 0.29% increase in GDPG.

5.5.3. Diagnostics for Panel VECM

Diagnostic tests were conducted on the residuals of the panel VECM to ensure that residuals are well behaved. Table 12 presents the results from the diagnostic tests for serial correlation, normality and heteroskedasticity.

Table 12: Diagnostic test results for Panel VECM

TEST	NULL HYPOTHESIS	TARGET MODEL	STATISTIC	PROBABILITY
Autocorrelation LM test	No serial correlation	ΔGDPG	0.692493	0.7591
Cholesky (Lutkrpohl) Normality test	Residuals are normally distributed	ΔGDPG	51386.84	0.0000
White Heteroskedasticity	No conditional heteroskedasticity	ΔGDPG	381.8716	0.7896

Source: Author's calculations from Eviews 10

The results for autocorrelation show a high probability value (p-value = 0.7591), therefore the null of no serial correlation is not rejected and the conclusion drawn is that the residuals of the model are not serially correlated, indicating that the panel VECM model is efficient and the estimated parameters of the model are not biased. The Cholesky normality test was conducted to establish if residuals are normally distributed. The p-value is very low (0.0000), therefore the null hypothesis is rejected at the 1% level and the conclusion drawn is that residuals are not normally distributed. According to Brooks (2014:434), non-normality does not pose a problem as parameter estimates will remain consistent. The White test for heteroskedasticity including cross terms was conducted. The p-value is 0.7896, therefore the null hypothesis is not rejected, and the conclusion is that there is no evidence of conditional heteroskedasticity. As such, residuals are homoscedastic. The diagnostic test results conclude that the model is efficient, appropriate and unbiased, suggesting that the results of the model are reliable.

5.6. FEASIBLE GENERALIZED LEAST SQUARES MODEL

The previous chapter explained that the second objective of the study (the effect of sectoral FDI on sectoral employment in South Africa) will be achieved through estimating a Seemingly Unrelated Regression (SUR) model as Jula and Jula (2017). Besides the SUR framework correcting for heteroskedasticity, it also takes the form of a structural analysis that provides information on how the

sector share in total employment changes as a result of increasing/decreasing FDI and wages from quarter to quarter. The results of the SUR model are presented in Table 13.

Table 13: SUR test results

SECTOR	VARIABLE	COEFFICIENT	T-STATISTIC	PROBABILITY
	$[(s_{i,t-1})(r_{L,t})]$ (represented by the α_1 coefficient)	-0.156016	-3.641084	0.0003
Mining and Quarrying	ΔFDI	0.029711	0.753261	0.4514
	ΔWAGES	-0.000165	-0.469650	0.6387
Manufacturing	ΔFDI	0.030008	0.754038	0.4509
	ΔWAGES	-0.000074	-0.208418	0.8349
Electricity, Gas and Water	ΔFDI	0.029139	0.741280	0.4586
	ΔWAGES	-0.000203	-0.576987	0.5640
Transport, Storage, and Communication	ΔFDI	0.028307	0.714939	0.4748
	ΔWAGES	-0.000180	-0.510409	0.6098
Finance, Insurance, Real Estate and Business services	ΔFDI	0.030736	0.764143	0.4449
	ΔWAGES	-0.000122	-0.337806	0.7356
Community, Social and Personal Services	ΔFDI	0.035102	0.874823	0.3838
	ΔWAGES	-0.000188	-0.505750	0.6131

Source: Author's calculations from Eviews 10

According to the results of the SUR model (see appendix), only the α_1 coefficients are significant at the 1% level and all other coefficients were found to be insignificant. The influence of growth rate of total employment $(r_{L,t})$ at change of the sector's share in total employment, mediated by the sector's initial share (represented by the α_1 coefficients) suggests that the growth rate of employment brought about by the initial share of sector employment plays a crucial role in the change in the structure of sector employment (i.e. sector share in total employment).

As all values of $\left(\frac{1}{E_{t-1}}\right)$ are positive, the signs of the $\alpha_{2,i}$ and $\alpha_{3,i}$ coefficients reveal the direction of FDI and wage influence on the change in employment structure by sector. According to Table 13, the results show that for all six economic sectors, the $\alpha_{2,i}$ coefficients are greater than zero, suggesting that growth in FDI in each sector leads to an increase in employment in the specific sector although the results suggest that this increase is very small and is insignificant. This means that FDI in these sectors results in increased employment rather than productivity growth. In comparison to FDI, wages have the opposite effect. The results show that for all six economic sectors, the $\alpha_{3,i}$ coefficients are less than zero, implying that growth in wages is associated with increased productivity and not increased employment. This does

make economic sense as increased productivity leads to higher wages since economic theory suggests that labor is rewarded in line with changes in its marginal productivity.

5.6.1. Diagnostics for SUR

Diagnostic tests were conducted on the residuals of the SUR model to examine the behavior of the residuals and the model overall. Table 14 presents the results from conducting diagnostic tests for joint significance, autocorrelation and normality.

Table 14: Diagnostic test results for SUR

TEST	NULL HYPOTHESIS	STATISTIC	PROBABILITY
Wald Test	No evidence of joint significance	0.795770	1.0000
Cholesky (Lutkrpohl) Normality test	Residuals are normally distributed	1534.424	0.0000

Source: Author's calculations from Eviews 10

The Wald test was conducted to determine if intercept coefficients are jointly equal to zero (i.e. jointly significant). The chi-squared test statistic (0.795770) and high probability value (1.0000) suggest that the null hypothesis is not rejected and therefore the conclusion is that intercept coefficients are not jointly significant. This essentially means that there is no variation in outcome across the six sectors, i.e. all sectors under study experience an increase in employment levels through increased FDI inflows. The Cholesky Normality test suggests that residuals of the model are not normally distributed. As mentioned in section 5.5.3., non-normality is not a problem as parameter estimates will remain consistent. Relating to model reliability, the benefit of estimating a SUR model is that the model corrects for heteroskedasticity (therefore no diagnostic test for heteroskedasticity available). Additionally, the main idea of the SUR is to transform the standard Generalized Least Squares (GLS) model so that error terms become uncorrelated, therefore ensuring that the residuals of the model are not serially correlated. As such, the results from the estimated SUR model are reliable.

5.7. DISCUSSION OF FINDINGS

The present study aimed at investigating the relationship between sector FDI and sector growth, and the effect of sector FDI on sector employment. There are a number of empirical studies that have focused on these mentioned relationships. The study explores various empirical literature by reviewing studies conducted globally (Borenztein et al., 1997; Kurtishi-Kastrati, 2013; Hale and Xu, 2016; Jude and Silaghi, 2016), those conducted for African countries (Abor and Harvey, 2008; Bezuidenhout, 2009; Adofu, 2010), those conducted for South Africa (Fedderke and Romm, 2006; Masipa, 2014; Mazenda,

2014), and those conducted for various sectors (Eller et al., 2006; Bezuidenhout and Grater, 2016; Kirti and Prasad, 2016; Jula and Jula, 2017; Erdal, 2018).

From the structural analysis (SUR model), the present study found that FDI leads to increased levels of employment in all sectors under study (mining and quarrying; manufacturing; electricity, gas and water; transport, storage, and communication; finance, insurance, real estate and business services; community, social and personal services), although not by a large amount. Jula and Jula (2017) find this to be true in Romania for the construction and real estate sector; transportation sector; information technology and communications sector; financial information and insurance sector; professional, scientific, technical and administration activities sector; and support services sector. Kurtishi-Kastrati (2013) however, posit that FDI reduces employment because of innovation technology. The present study did find that employment levels in all sectors are reduced when wages rise, and employers opt for technology augmented FDI to increase productivity rather than to grow their labor force. Theoretically, there is some logic in this aspect as increasing the labor force when wages rise seems illogical and the sounder decision would be to reduce the labor force. It is important to consider Solow's growth theory here. Should employers increase their labor force in an attempt to increase production and afford an increased labor force with the higher wages, eventually there will be the occurrence of diminishing marginal returns after a steady-state point and the excess labor will be a waste of resources. Such a situation puts a nation like South Africa in a worse position because the country is currently battling with high unemployment rates and therefore using FDI to improve production without increasing employment seems like a solution that tackles one problem (increasing GDP) whilst causing another problem (increasing unemployment).

As already mentioned, the present study found that FDI improves productivity. Hale and Xu (2016) draw the same conclusion, however, the authors find this to be a benefit since improved productivity is associated with firms growing and therefore employment being created. The present study, however, offers a contrasting view. The results of the study do not dispute that FDI creates employment, however, it is more in line with Abor and Harvey (2008) and Jude and Silaghi (2016) who argue that foreign investors providing FDI possess intangible assets that enhance production. Foreign investors therefore opt to transfer these assets to host nations, thus reducing the amount of human capital needed. As such, these assets are often a once off cost but can be used indefinitely whereas human labor is a regular cost

to firms. Once again it becomes somewhat a “tug-of-war” because higher production through advanced technologies grows the economy leading to economic growth, yet it leaves many people unemployed.

Relating to economic growth, this study, like Masipa (2014) and Mazenda (2014) find a unidirectional causality relationship from FDI to GDP growth. The difference, however, is that Masipa’s (2014) study and Mazenda’s (2014) study are conducted at an aggregated level whereas this study is conducted at a sector level. This study therefore found cointegration in the mining and quarrying; manufacturing; electricity, gas and water; transport, storage, and communication sectors; suggesting that FDI influences GDP growth in these four sectors. The VECM results validate the cointegration results and concludes that FDI does lead to increased GDP growth, however, only in the long run. This does make economic sense as FDI agreements are long-term agreements and since most times, investment occurs not only through monetary transfer but also through setting up new entities and/or technology transfers *etc.* the effect of such an investment is only realized after a long period and therefore increased FDI may have little to no impact until the objective of the investment is reached (e.g. green field investment where a new factory building is complete and fully operational two years after the BIT agreement was signed and in force). A true cointegrating relationship between FDI and GDP was also confirmed from the VECM results as the speed of adjustment coefficient was negative and statistically significant. This is of crucial important because both variables are susceptible to shocks in the economic system. The speed of adjustment coefficient therefore posits that GDP growth will revert to its long run equilibrium. As such, hypothetically, should an investor withdraw his/her investment instantly (e.g. because of exchange rate volatility), other investors are likely to follow and therefore the effect of FDI on GDP growth will be significantly different from usual. The speed of adjustment coefficient (negative) suggests that eventually, after some time, GDP growth will react to increased FDI as it initially does. Bezuidenhout (2015), however, finds a negative and statistically significant relationship between FDI and economic growth in the SADC countries while, for South Africa specifically, Fedderke and Romm (2006) find that FDI has a positive and statistically significant impact on economic growth.

Since this study found FDI to increase GDP growth and employment, it is important for the South African government and policy makers to devise policies and/or alter existing policies to attract higher volumes of the correct FDI in these six sectors that show evidence of FDI leading to growth and employment. Additionally, this study, similar to Masipa (2014) concludes that FDI should be a policy for long term growth and job creation. FDI should not just be used during restructuring of economies or

for big events like the 2010 FIFA world cup in South Africa because in such instances, FDI then only creates employment for a short period. This study, along with Masipa (2014) and Mazenda (2014) conclude that FDI should be a key tool for attaining growth and employment objectives in South Africa as macroeconomic policies (e.g. RDP, GEAR, ASGISA, and NGP) on their own have not been able to realize the growth and employment objectives of the nation on their own.

5.8. CONCLUSION

This chapter reported empirical results of the relationship between sector FDI and sector growth (objective 1) and the effect of sector FDI on sector employment (objective 2) in six of South Africa's economic sectors. The chapter consisted of seven sections (excluding conclusion). The chapter commenced with a graphical analysis of sector FDI, sector GDP and sector employment, in addition to providing summary statistics of the variables in the model. The chapter then proceeded to provide an analysis of two panel unit root tests (LLC and IPS) for stationarity. Results of the unit root tests found GDP growth and quarterly growth of total employment to be stationary in levels while all other variables were integrated of order one. Since at least 80% of the variables were I(1), the study proceeded to conduct panel cointegration tests for each sector to determine if a long run equilibrium relationship exists between the variables in the model. Results from the Johansen-Fisher cointegration test found evidence of overall cointegration. Looking at the individual sectors, cointegration was established in the mining and quarrying; manufacturing; electricity, gas and water; and transport, storage, and communication sectors. This further confirms the *a priori* expectation of the study, that there is a long run equilibrium relationship between FDI and GDP growth.

The Dumitrescu-Hurlin Panel Causality test was conducted and a panel VECM was estimated to establish direction of causality and long and short run dynamics of the relationships, respectively. A unidirectional causality relationship from FDI to GDP growth was established. The *a priori* expectation, however, was that there is bidirectional causality between FDI and GDP growth. Results from the estimated VECM produced a negative and statistically significant speed of adjustment coefficient which is proof of a true cointegrating relationship between FDI and GDP growth. This validates the results of the Johansen-Fisher cointegration test, that is there is a long run equilibrium relationship between FDI and GDP growth. Additionally, the speed of adjustment coefficient is consistent with theory (negative and statistically significant), suggesting that GDP growth will revert closer to its equilibrium point after deviating away from this equilibrium because of shocks in the system.

A SUR model was estimated to address the second objective of the study (effect of FDI on employment). The results from the SUR model show that FDI increases employment levels in all six sectors under study, although not by a large amount. The results showed a positive, statistically insignificant relationship between FDI and employment. The SUR model also revealed that employment levels are reduced, and productivity levels are increased when wages rise. Suggesting that firms opt to employ advanced technologies to increase production rather than human labor. Diagnostic tests were also performed for the panel VECM and SUR models to examine the behavior of residuals in the models. Both models were found to be appropriate and produce reliable results as there was no evidence of serial correlation or heteroskedasticity. Both models do show evidence of non-normality in the dataset, however, theoretically, non-normality does not pose a problem to econometric models such as the ones estimated in this study. The final section of this chapter provided a discussion on the findings of the estimated models and their relation to existing literature.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1. INTRODUCTION

This chapter concludes the study by providing a review of the previous chapters and presenting some conclusions, policy recommendations and areas for further research. The next section presents a summary of the study. Section three presents some insightful conclusions of the study. Section four identifies the policy implications and provides some recommendations while section five outlines the limitations of the study and provides recommendations of areas for future research on the same or a similar topic.

6.2. SUMMARY OF THE STUDY

The purpose of this study was to investigate the relationship between sector FDI and sector growth, and the effect of sector FDI on sector employment in six of South Africa's economic sectors from 2000Q1 to 2016Q4 using a quarterly panel data set. The study relied on secondary data from the SARB and StatsSA

South Africa, being a developing country has developed and implemented a number of policies over the years during various policy regimes to address extreme structural difficulties facing the nation (e.g. poverty, unemployment and inequality). FDI is arguably a very important tool that can drive economic growth as it not only provides monetary capital, but also creates jobs, transfers innovation technology and is associated with positive externalities in the form of spillovers *etc.* As such foreign investors consider investing in countries with favorable policies and stable political environments. Therefore, it is an important feature of this study that the behavior of FDI was examined during four critical policy regimes (i.e. GEAR, ASGISA, NGP and NDP). The key variables of the study include FDI, GDP and employment, therefore the behavior of these variables were examined at a national level and at sector level since the focus of the study was on the sectors of the economy.

The study proceeded to review theoretical and empirical literature. Since FDI is ultimately investment and the study aimed at analyzing the relationship between FDI and growth, it was important to look at the theory underlying investment and growth. Four such theories were reviewed in this regard (Harrod-Domar growth theory, big push theory, Solow growth and endogenous growth theory). Investors have

the choice of deciding between natural resource seeking FDI, market seeking FDI, efficiency seeking FDI and strategic asset seeking FDI, although they are not restricted to one of these. As such host nations and their investors must ensure mutual benefits. That is, host nations must identify abundant resources that investors are in need off and use this to attract the right FDI. Following this, investors may decide between three modes of entry (green field, mergers and acquisitions and brown field). Green field FDI is arguably the mostly preferred, especially for developing nations because it involves setting up an entirely new entity in the host nation.

Prior to estimating the econometric models discussed in chapter 4, all variables were tested for stationarity using the LLC and IPS panel unit root tests. Following this, using a panel cointegration and panel VECM framework to examine the relationship between FDI and economic growth within six sectors of the South African economy, the FDI-growth model was estimated. The variables included in the model for each sector included GDP growth, foreign direct investment, foreign other investment, foreign portfolio investment and gross fixed capital formation. Thereafter, employing a feasible generalized least squares model framework to examine the effect of FDI on employment within the six sectors, the SUR model was estimated. Variables of the model included sector share in total employment, growth rate of total employment, FDI per worker and wages per worker. Major conclusions from estimating most appropriate models considering the type of available data used in this thesis are briefly discussed in the next section.

6.3. CONCLUSIONS OF STUDY

At a glance, the study found that despite significant growth in FDI, GDP did not reach required levels and employment rose significantly overall. FDI grew rapidly in the manufacturing sector, mining sector and services sector, however employment creation only increased in the manufacturing and services sector and not the mining sector (although this could be attributed to other factors).

The Johansen-Fisher panel cointegration test revealed that overall, long run equilibrium relationships do exist among the variables in all six sectors. Examining each sector individually, true cointegrating relationships between FDI and GDP growth were established in the mining and quarrying; manufacturing; electricity, gas and water; transport, storage, and communication sectors; suggesting that FDI influences GDP growth in these four sectors, however, graphical analysis revealed that of the sectors under study, the transport, storage and communication sector and electricity, gas and water sector receive the least amount of FDI. As the focus of the study was on FDI and growth, the Dumitrescu-Hurlin panel

causality test revealed unidirectional causality between the two variables. That is, FDI causes growth in GDP. This validates the findings of the cointegration test. The VECM results conclude that FDI does have a positive, statistically significant relationship with GDP growth, however this is true only for the long run. As both variables are susceptible to shocks in the economy, the speed of adjustment coefficient was found to be negative and statistically significant, suggesting that should GDP growth deviate away from its long run equilibrium, the variable will revert back to this equilibrium from the subsequent quarter.

The SUR results found that growth in FDI is associated with increased employment, although by a very small amount and growth in wages is associated with increased productivity. This shows to be economically viable as increased FDI could mean more jobs (if green field investment) or simply more monetary resources available to afford more human capital. Rising labor costs however force foreign investors and/or employers to employ advanced technologies rather than human capital.

As the ultimate goal of this study was to establish if FDI could be used as a tool to drive growth and employment. If this was found to exist, then countries should find methods of attracting the correct FDI suitable to their needs. This study therefore concludes that FDI does have a positive relationship with GDP growth and employment in six of South Africa's economic sectors, and as such the South African government is encouraged to use more resources to attract higher volumes of the correct FDI to these six sectors. Although graphical analysis did show that the mining and quarrying sector, and manufacturing sector do receive a large portion of total FDI in South Africa, more effort needs to go into attracting FDI into the transport, storage and communication sector and the electricity, gas and water sector.

6.4. POLICY IMPLICATIONS AND RECOMMENDATIONS

Sectoral disentanglement of FDI revealed that in South Africa, there is a shift away from natural resource seeking and market seeking FDI to efficiency seeking FDI as the financial sector has seen increasing volumes of FDI inflows compared to the other sectors. Policies devised in South Africa should thus focus on targeting efficiency seeking investors without ignoring other forms of investments. Important to note is that these isn't a complete shift away from natural resource seeking FDI and market seeking FDI because it is evident that the mining and quarrying sector and manufacturing sector also receive high volumes of FDI. However, GDP and employment in both these sectors are significantly low compared to the community, social and personal services sector which receives the least amount of FDI.

Since the results of this study found FDI to be associated with increased growth and employment, it is a good idea for recipients of FDI to make full use of the benefits derived from FDI to ensure improvement in structural challenges facing the nation.

As mentioned throughout the study, FDI is associated with a number of spillover benefits, therefore South African policy makers should ensure that when signing bilateral investment treaties (BITs) (especially with investors from developed countries), these investors are compelled to create jobs, offer training and qualifications and especially ensure that South Africa can eventually transform its own natural resources into finished goods as opposed to selling them and purchasing them back at much higher prices because they are now processed/transformed.

Empirical literature emphasizes on trade openness and favorable exchange rates as a means to attract FDI, however, policy makers must ensure that liberalized and favorable trade laws do not allow foreign investors the ability to possess extreme levels of power over the nation so that we wind up losing benefits and control over the resources of the country. Empirical literature also, in most cases, find FDI to increase employment and improve GDP growth in a number of sectors, therefore, attracting higher volumes of the correct FDI may lead to increased employment which may then contribute to the achievement of the SDGs.

6.5. LIMITATIONS OF STUDY AND AREAS FOR FURTHER RESEARCH

The major limitation of this study and other empirical studies is limited data availability. As this study aimed at analyzing FDI effects in various sectors, FDI data for a number of sectors was not available. Additionally, South African sector FDI data is not available on a reliable data base. Further to this, sector data relating to some variables were either incomplete or unavailable, therefore a number of sectors had to be excluded from the study. For instance, trade openness, producer price index (PPI) and exchange rate data are important for FDI studies, however trade openness data is available for selected sectors and very little quarterly data is available. There also isn't any prior research conducted where the PPI (or a proxy for PPI) and exchange rate (or a proxy for exchange rate) variables are used in a study such as this.

As this study could not include all economic sectors of the South African economy, there is a gap for further research to be conducted on other sectors of the economy. Perhaps individual sectors (e.g. agricultural sector) on their own may be analyzed. There is also a gap for further research to be conducted

on sector level determinants of FDI. Most studies look at country specific determinants of FDI, however, in conducting this study, it became evident that like countries are different and possess various resources that attract foreign investors, so are sectors. As such, research should be conducted by looking at specific determinants that individual sectors possess which could attract FDI to these sectors.

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APPENDIX

1. MODEL 1

Lag Length Criteria

VAR Lag Order Selection Criteria
Endogenous variables: AGDPG LOGFDI LOGFOI LOGFPI LOGGFCF
Exogenous variables: C
Date: 01/23/20 Time: 20:07
Sample: 2000Q1 2016Q4
Included observations: 346

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3216.853	NA	84.27126	18.62343	18.67901	18.64556
1	-541.0667	5258.770	1.87e-05*	3.300964*	3.634470*	3.433767*
2	-530.5259	20.41138	2.03e-05	3.384543	3.995971	3.628016
3	-516.2590	27.21423	2.16e-05	3.446584	4.335934	3.800726
4	-500.3846	29.82184	2.28e-05	3.499333	4.666605	3.964145
5	-477.2838	42.72994	2.31e-05	3.510311	4.955505	4.085792
6	-462.1981	27.46804	2.44e-05	3.567619	5.290735	4.253770
7	-448.0378	25.37406	2.61e-05	3.630276	5.631314	4.427096
8	-418.1430	52.70469*	2.54e-05	3.601983	5.880942	4.509472

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

Number of cointegrating relationships

Date: 01/25/20 Time: 03:25
Sample: 2000Q1 2016Q4
Included observations: 340
Series: AGDPG LOGFDI LOGFOI LOGFPI LOGGFCF
Lags interval: 1 to 8

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	2	1	1	1
Max-Eig	2	2	1	1	1

Date: 01/25/20 Time: 03:24
Sample: 2000Q1 2016Q4
Included observations: 382
Series: AGDPG LOGFDI LOGFOI LOGFPI LOGGFCF
Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	1	1	1	1
Max-Eig	2	2	1	1	1

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

Results from Cointegration test

Johansen Fisher Panel Cointegration Test
Series: AGDPG LOGFDI LOGFOI LOGFPI LOGGFCF
Date: 01/23/20 Time: 20:21
Sample: 2000Q1 2016Q4
Included observations: 408
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	59.40	0.0000	52.11	0.0000
At most 1	20.76	0.0540	27.23	0.0072
At most 2	4.884	0.9618	5.920	0.9201
At most 3	3.883	0.9855	3.128	0.9946
At most 4	11.39	0.4960	11.39	0.4960

* Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
Hypothesis of no cointegration				
1	104.4786	0.0000	47.5267	0.0007
2	73.6041	0.0242	41.5693	0.0050
3	92.7987	0.0003	48.3063	0.0005
4	69.1001	0.0570	32.2392	0.0774
5	61.4266	0.1941	29.9071	0.1386
6	62.9370	0.1565	27.1060	0.2577
Hypothesis of at most 1 cointegration relationship				
1	56.9519	0.0056	37.8409	0.0017
2	32.0348	0.6102	15.9034	0.6740
3	44.4924	0.1000	31.7833	0.0136
4	36.8609	0.3541	17.9197	0.5018
5	31.5195	0.6385	20.2262	0.3257
6	35.8310	0.4049	18.2236	0.4766
Hypothesis of at most 2 cointegration relationship				
1	19.1110	0.4850	15.7043	0.2426
2	16.1314	0.7030	11.4606	0.6013
3	12.7091	0.9044	5.8852	0.9851
4	18.9412	0.4971	11.7176	0.5757
5	11.2933	0.9537	7.3891	0.9370
6	17.6074	0.5951	10.7877	0.6685
Hypothesis of at most 3 cointegration relationship				
1	3.4068	0.9454	3.1106	0.9391
2	4.6707	0.8427	4.5609	0.7959
3	6.8239	0.5982	4.6445	0.7859
4	7.2236	0.5518	4.8280	0.7634
5	3.9042	0.9111	3.5378	0.9046
6	6.8197	0.5987	6.7769	0.5159
Hypothesis of at most 4 cointegration relationship				
1	0.2962	0.5863	0.2962	0.5863
2	0.1098	0.7403	0.1098	0.7403
3	2.1794	0.1399	2.1794	0.1399
4	2.3955	0.1217	2.3955	0.1217
5	0.3664	0.5450	0.3664	0.5450
6	0.0428	0.8360	0.0428	0.8360

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

Panel Causality Tests

Pairwise Dumitrescu Hurlin Panel Causality Tests
Date: 01/23/20 Time: 20:27
Sample: 2000Q1 2016Q4
Lags: 2

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
LOGFDI does not homogeneously cause AGDPG	4.04570	2.25293	0.0243
AGDPG does not homogeneously cause LOGFDI	1.13957	-1.06318	0.2877
LOGFOI does not homogeneously cause AGDPG	6.04303	4.55201	5.E-06
AGDPG does not homogeneously cause LOGFOI	1.84653	-0.25337	0.8000
LOGFPI does not homogeneously cause AGDPG	7.29866	5.98982	2.E-09
AGDPG does not homogeneously cause LOGFPI	0.89961	-1.33769	0.1810
LOGGFCF does not homogeneously cause AG...	2.85446	0.90080	0.3677
AGDPG does not homogeneously cause LOGG...	0.84559	-1.39954	0.1616
LOGFOI does not homogeneously cause LOGFDI	2.33070	0.29598	0.7672
LOGFDI does not homogeneously cause LOGFOI	3.33232	1.43891	0.1502
LOGFPI does not homogeneously cause LOGFDI	2.47866	0.46482	0.6421
LOGFDI does not homogeneously cause LOGFPI	1.84101	-0.26279	0.7927
LOGGFCF does not homogeneously cause LOG...	6.78483	5.37849	8.E-08
LOGFDI does not homogeneously cause LOGG...	2.02372	-0.05431	0.9567
LOGFPI does not homogeneously cause LOGFOI	4.60904	2.90995	0.0036
LOGFOI does not homogeneously cause LOGFPI	3.65182	1.81385	0.0697
LOGGFCF does not homogeneously cause LOG...	3.12543	1.21109	0.2259
LOGFOI does not homogeneously cause LOGG...	1.32133	-0.85478	0.3927
LOGGFCF does not homogeneously cause LOG...	2.43531	0.42084	0.6739
LOGFPI does not homogeneously cause LOGG...	3.29570	1.40607	0.1597

Results from VECM

a) Long-run and short-run dynamics

Vector Error Correction Estimates
Date: 01/25/20 Time: 01:01
Sample (adjusted): 2000Q3 2016Q4
Included observations: 382 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
AGDPG(-1)	1.000000
LOGFDI(-1)	-0.354201
	(0.12422)
	[-2.85145]
LOGFOI(-1)	-0.504521
	(0.31041)
	[-1.62533]
LOGFPI(-1)	2.083561
	(0.48884)
	[4.26222]
LOGGFCF(-1)	0.191845
	(0.44510)
	[0.43101]
C	-1.393377

Error Correction:	D(AGDPG)	D(LOGFDI)	D(LOGFOI)	D(LOGFPI)	D(LOGGFCF)
CointEq1	-0.949047	-0.001334	-0.003574	-6.34E-05	-0.001975
	(0.07427)	(0.00313)	(0.00261)	(0.00215)	(0.00131)
	[-12.7789]	[-0.42648]	[-1.37184]	[-0.02944]	[-1.51177]
D(AGDPG(-1))	-0.058584	0.001860	0.001573	-0.000503	0.000797
	(0.05173)	(0.00218)	(0.00181)	(0.00150)	(0.00091)
	[-1.13259]	[0.85387]	[0.86714]	[-0.33545]	[0.87588]
D(LOGFDI(-1))	0.029398	-0.040575	0.041382	0.025303	-0.025826
	(1.44933)	(0.06103)	(0.05084)	(0.04201)	(0.02550)
	[0.02028]	[-0.66488]	[0.81399]	[0.60228]	[-1.01282]
D(LOGFOI(-1))	-2.683545	0.015194	-0.007669	0.003964	0.000371
	(1.73310)	(0.07297)	(0.06079)	(0.05024)	(0.03049)
	[-1.54841]	[0.20821]	[-0.12615]	[0.07890]	[0.01217]
D(LOGFPI(-1))	-2.122189	-0.043619	-0.015675	-0.047274	0.024452
	(2.10169)	(0.08849)	(0.07372)	(0.06092)	(0.03698)
	[-1.00975]	[-0.49291]	[-0.21262]	[-0.77597]	[0.66128]
D(LOGGFCF(-1))	0.292774	0.176996	-0.036763	0.076201	-0.100957
	(2.97222)	(0.12515)	(0.10426)	(0.08616)	(0.05229)
	[0.09850]	[1.41430]	[-0.35262]	[0.88445]	[-1.93060]
C	0.043637	0.042863	0.015465	0.031388	0.026492
	(0.33017)	(0.01390)	(0.01158)	(0.00957)	(0.00581)
	[0.13216]	[3.08316]	[1.33529]	[3.27959]	[4.56045]
R-squared	0.500241	0.010395	0.006924	0.004818	0.016700
Adj. R-squared	0.492245	-0.005438	-0.008966	-0.011105	0.000968
Sum sq. resids	14335.91	25.41609	17.63934	12.04601	4.437641
S.E. equation	6.182969	0.260339	0.216883	0.179228	0.108783
F-statistic	62.56028	0.656538	0.435739	0.302590	1.061502
Log likelihood	-1234.429	-24.41725	45.34572	118.1928	308.9274
Akaike AIC	6.499629	0.164488	-0.200763	-0.582161	-1.580771
Schwarz SC	6.571927	0.236786	-0.128465	-0.509863	-1.508473
Mean dependent	-0.057360	0.044214	0.015661	0.032893	0.023712
S.D. dependent	8.677006	0.259634	0.215917	0.178241	0.108836

Determinant resid covariance (dof adj.)	2.78E-05
Determinant resid covariance	2.53E-05
Log likelihood	-688.7503
Akaike information criterion	3.815447
Schwarz criterion	4.228580
Number of coefficients	40

Dependent Variable: D(AGDPG)
Method: Panel Least Squares
Date: 02/03/20 Time: 21:48
Sample (adjusted): 2000Q3 2016Q4
Periods included: 66
Cross-sections included: 6
Total panel (unbalanced) observations: 382
D(AGDPG) = C(1)*(AGDPG(-1) - 0.354200751853*LNFDI(-1) - 0.504521382867*LNFOI(-1) + 2.08356112513*LNFPI(-1) + 0.191845272137*LNGFCF(-1) - 1.39337725348) + C(2)*D(AGDPG(-1)) + C(3)*D(LNFDI(-1)) + C(4)*D(LNFOI(-1)) + C(5)*D(LNFPI(-1)) + C(6)*D(LNGFCF(-1)) + C(7)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.949047	0.074267	-12.77893	0.0000
C(2)	-0.058584	0.051726	-1.132590	0.2581
C(3)	0.029398	1.449334	0.020284	0.9838
C(4)	-2.683545	1.733103	-1.548405	0.1224
C(5)	-2.122189	2.101694	-1.009752	0.3133
C(6)	0.292774	2.972215	0.098504	0.9216
C(7)	0.043637	0.330173	0.132165	0.8949

R-squared	0.500241	Mean dependent var	-0.057360
Adjusted R-squared	0.492245	S.D. dependent var	8.677006
S.E. of regression	6.182969	Akaike info criterion	6.499629
Sum squared resid	14335.91	Schwarz criterion	6.571927
Log likelihood	-1234.429	Hannan-Quinn criter.	6.528311
F-statistic	62.56028	Durbin-Watson stat	2.026529
Prob(F-statistic)	0.000000		

a) Diagnostic Tests for VECM

VEC Residual Serial Correlation LM Tests
Date: 01/25/20 Time: 01:06
Sample: 2000Q1 2016Q4
Included observations: 382

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	19.76458	25	0.7591	0.789631	(25, 1361.1)	0.7591
2	24.97399	25	0.4638	0.999657	(25, 1361.1)	0.4639
3	17.76486	25	0.8522	0.709220	(25, 1361.1)	0.8522
4	38.84165	25	0.0382	1.562654	(25, 1361.1)	0.0382
5	30.54347	25	0.2046	1.225083	(25, 1361.1)	0.2046
6	24.37682	25	0.4977	0.975540	(25, 1361.1)	0.4977
7	23.11014	25	0.5711	0.924421	(25, 1361.1)	0.5712
8	54.26170	25	0.0006	2.195391	(25, 1361.1)	0.0006
9	20.57499	25	0.7161	0.822252	(25, 1361.1)	0.7161
10	33.51466	25	0.1187	1.345717	(25, 1361.1)	0.1187

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 01/25/20 Time: 01:07
Sample: 2000Q1 2016Q4
Included observations: 382

Component	Skewness	Chi-sq	df	Prob.*
1	-0.224299	3.203068	1	0.0735
2	6.252066	2488.623	1	0.0000
3	0.196206	2.450967	1	0.1175
4	1.122059	80.15735	1	0.0000
5	1.975810	248.5435	1	0.0000
Joint		2822.978	5	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	7.435355	313.1187	1	0.0000
2	56.55033	45643.24	1	0.0000
3	16.55776	2925.687	1	0.0000
4	11.58679	1173.582	1	0.0000
5	12.14528	1331.210	1	0.0000
Joint		51386.84	5	0.0000

Component	Jarque-Bera	df	Prob.
1	316.3217	2	0.0000
2	48131.86	2	0.0000
3	2928.138	2	0.0000
4	1253.740	2	0.0000
5	1579.753	2	0.0000
Joint	54209.82	10	0.0000

*Approximate p-values do not account for coefficient estimation

VEC Residual Heteroskedasticity Tests (Includes Cross Terms)
Date: 01/25/20 Time: 01:03
Sample: 2000Q1 2016Q4
Included observations: 382

Joint test:

Chi-sq	df	Prob.
381.8716	405	0.7896

Individual components:

Dependent	R-squared	F(27,354)	Prob.	Chi-sq(27)	Prob.
res1*res1	0.309704	5.882359	0.0000	118.3070	0.0000
res2*res2	0.026204	0.352806	0.9991	10.00985	0.9988
res3*res3	0.019411	0.259537	1.0000	7.414974	0.9999
res4*res4	0.032776	0.444290	0.9934	12.52037	0.9920
res5*res5	0.099116	1.442494	0.0742	37.86228	0.0801
res2*res1	0.126151	1.892755	0.0053	48.18974	0.0073
res3*res1	0.035892	0.488102	0.9865	13.71071	0.9839
res3*res2	0.007905	0.104466	1.0000	3.019621	1.0000
res4*res1	0.068008	0.956727	0.5296	25.97909	0.5198
res4*res2	0.029002	0.391603	0.9977	11.07870	0.9971
res4*res3	0.012289	0.163132	1.0000	4.694537	1.0000
res5*res1	0.222286	3.747424	0.0000	84.91343	0.0000
res5*res2	0.011323	0.150158	1.0000	4.325412	1.0000
res5*res3	0.013921	0.185090	1.0000	5.317650	1.0000
res5*res4	0.014665	0.195133	1.0000	5.601930	1.0000

2. MODEL 2

Model development: FDI and Employment

If s_i represents the share of sector i in total employment, then:

$$s_i = {}^{e_i}/_{E}$$

Where e_i is the total employment in sector i and E is total employment. Since each sector employment is greater than zero but less than total employment $(0 < e_i < E)$, then the industry share in total employment should be between zero and one $(0 < s_i < 1)$. The left-hand side of this inequality certifies that sector i is present and an active participant in the national economy ($e_i \neq 0$), and the right-hand side of the inequality eradicates the possibility of an economy consisting of only a single sector (Jula and Jula, 2017:31). If employment in sector i changes from $e_{i,t-1}$ to $e_{i,t-1} + \Delta e_{i,t}$ despite whether $\Delta e_{i,t}$ carries a positive or negative sign, then total employment of the economy changes from E_{t-1} to $E_t = E_{t-1} + \Delta E_t$. The share of industry in total employment changes from $s_{i,t-1}$ to $s_{i,t}$, where $s_{i,t}$ is now the new share if sector i in new total employment:

$$s_{i,t} = s_{i,t-1} + \Delta s_{i,t} = \frac{e_{i,t-1} + \Delta e_{i,t}}{E + \Delta E}$$

Since $e_{i,t-1} = s_{i,t-1}E_{t-1}$, it is possible to write:

$$\Delta s_{i,t} = \frac{e_{i,t-1} + \Delta e_{i,t}}{E_{t-1} + \Delta E_t} - s_{i,t-1} = \frac{\Delta e_{i,t} - s_{i,t-1}\Delta E_t}{E_{t-1} + \Delta E_t}$$

Additionally, if $r_{L,t}$ denotes the growth rate of total employment, then:

$$r_{L,t} = {}^{\Delta E_t}/_{E_{t-1}}$$

Given this, the above equation may be transformed:

$$\Delta s_{i,t} = \frac{e_{i,t-1}r_{i,t} - e_{i,t-1}r_{L,t}}{E_{t-1}(1 + r_{L,t})} = s_{i,t-1}\frac{r_{i,t} - r_{L,t}}{1 + r_{L,t}}$$

Therefore, the change in sector share in total employment is:

$$\Delta s_{i,t} = s_{i,t-1}\frac{r_{i,t} - r_{L,t}}{1 + r_{L,t}}$$

Where $s_{i,t-1}$ is the initial share of employment of sector i in total employment:

$$s_{i,t-1} = \frac{e_{i,t-1}}{E_{t-1}}$$

Here $e_{i,t-1}$ denotes employment in sector i in the previous period and E_{t-1} is total employment in the previous period. Additionally:

- $\Delta s_{i,t} = s_{i,t} - s_{i,t-1}$ is the change in sector share in total employment,
- $r_{i,t} = \frac{\Delta e_{i,t}}{e_{i,t-1}}$ is the growth rate of employment in sector i,
- $r_{L,t} = \frac{\Delta E_t}{E_{t-1}}$ is the growth rate of total employment.

Jula and Jula (2017:34) explain that approximates $1/(1 + r_{L,t}) \approx 1 - r_{L,t}$, are used to ensure that $\Delta s_{i,t} \approx s_{i,t-1}(r_{i,t} - r_{L,t})(1 - r_{L,t})$. Additionally, Jula and Jula (2017:34) state that if $r_{L,t}$ and $r_{i,t}$ are not very large, then $\Delta s_{i,t} \approx s_{i,t-1}(r_{i,t} - r_{L,t})$. As such,

$$\Delta s_{i,t} \approx -s_{i,t-1} r_{L,t} + \left(\frac{1}{E_{t-1}}\right) \Delta e_{i,t}$$

If X is the variable that affects the dynamics of employment in sector i from the previous period to the current period ($e_{i,t-1}$ to $e_{i,t}$), that is $\Delta e_{i,t} = f(X_{i,t}, V_{i,t})$ where $V_{i,t}$ are other factors. Then, considering that there is a linear relationship between change in size of $X_{i,t}$ ($\Delta X_{i,t}$) and sector employment dynamics $\left(\Delta e_{i,t}\right)$, the PDM would follow:

$$\Delta e_{i,t} = \lambda + \mu_i \Delta X_{i,t} + \zeta_i + \theta_t + u_{i,t}$$

Where λ is a homogeneity intercept coefficient that is independent of i and t; μ_i are slope coefficients; ζ_i represents cross-section specific effects (does not depend on time); θ_t are time specific effects (does not depend on cross sections); and $u_{i,t}$ are the individual error terms. Considering this, the model can be written as:

$$\Delta s_{i,t} \approx -s_{i,t-1} r_{L,t} + \left(\frac{1}{E_{t-1}}\right) (\lambda + \mu_i \Delta X_{i,t} + \zeta_i + \theta_t + u_{i,t}$$

Results from SUR

System: UNTITLED
Estimation Method: Seemingly Unrelated Regression
Date: 11/30/19 Time: 15:38
Sample: 2005Q1 2016Q3
Included observations: 282
Total system (unbalanced) observations 1602
Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	3.67E-05	0.000140	0.261520	0.7937
C(2)	-0.156016	0.042849	-3.641084	0.0003
C(3)	0.029711	0.039443	0.753261	0.4514
C(4)	-0.000165	0.000351	-0.469650	0.6387
C(5)	4.09E-05	0.000143	0.286914	0.7742
C(6)	-0.156161	0.043520	-3.588249	0.0003
C(7)	0.030008	0.039796	0.754038	0.4509
C(8)	-7.40E-05	0.000355	-0.208418	0.8349
C(9)	4.09E-05	0.000144	0.283523	0.7768
C(10)	-0.143063	0.043066	-3.321963	0.0009
C(11)	0.029139	0.039309	0.741280	0.4586
C(12)	-0.000203	0.000351	-0.576987	0.5640
C(13)	5.61E-05	0.000146	0.384336	0.7008
C(14)	-0.145823	0.043259	-3.370957	0.0008
C(15)	0.028307	0.039594	0.714939	0.4748
C(16)	-0.000180	0.000353	-0.510409	0.6098
C(17)	2.17E-05	0.000149	0.146190	0.8838
C(18)	-0.150286	0.043921	-3.421712	0.0006
C(19)	0.030736	0.040223	0.764143	0.4449
C(20)	-0.000122	0.000361	-0.337806	0.7356
C(21)	4.98E-05	0.000150	0.333320	0.7389
C(22)	-0.198608	0.070826	-2.804161	0.0051
C(23)	0.035102	0.040125	0.874823	0.3818
C(24)	-0.000188	0.000371	-0.505750	0.6131
Determinant residual covariance		9.81E-33		

Equation: CSSINTE(1)=C(1)+C(2)*LSSINTEGQTE(1)+C(3)*CFDIPERW(1)
+C(4)*CWPERW(1)
Observations: 282

R-squared	0.062155	Mean dependent var	-0.000115
Adjusted R-squared	0.052034	S.D. dependent var	0.002235
S.E. of regression	0.002176	Sum squared resid	0.001316
Durbin-Watson stat	2.058735		

Equation: CSSINTE(2)=C(5)+C(6)*LSSINTEGQTE(2)+C(7)*CFDIPERW(2)
+C(8)*CWPERW(2)
Observations: 276

R-squared	0.059558	Mean dependent var	-9.23E-05
Adjusted R-squared	0.049185	S.D. dependent var	0.002245
S.E. of regression	0.002189	Sum squared resid	0.001303
Durbin-Watson stat	2.077721		

Equation: CSSINTE(3)=C(9)+C(10)*LSSINTEGQTE(3)+C(11)
*CFDIPERW(3)+C(12)*CWPERW(3)
Observations: 270

R-squared	0.060950	Mean dependent var	-9.81E-05
Adjusted R-squared	0.050359	S.D. dependent var	0.002255
S.E. of regression	0.002198	Sum squared resid	0.001285
Durbin-Watson stat	2.088697		

Equation: CSSINTE(4)=C(13)+C(14)*LSSINTEGQTE(4)+C(15)
*CFDIPERW(4)+C(16)*CWPERW(4)
Observations: 264

R-squared	0.061507	Mean dependent var	-8.05E-05
Adjusted R-squared	0.050678	S.D. dependent var	0.002263
S.E. of regression	0.002205	Sum squared resid	0.001264
Durbin-Watson stat	2.091304		

Equation: CSSINTE(5)=C(17)+C(18)*LSSINTEGQTE(5)+C(19)
*CFDIPERW(5)+C(20)*CWPERW(5)
Observations: 258

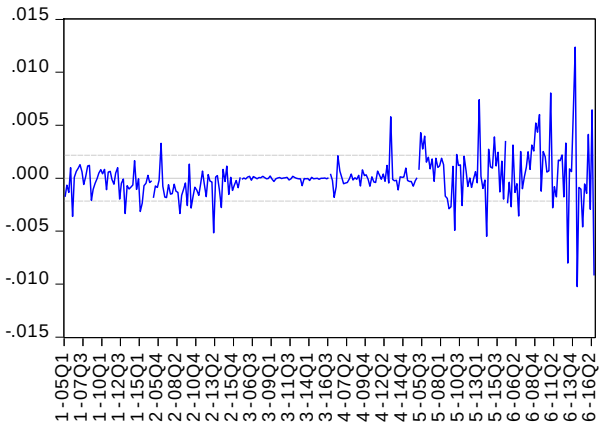
R-squared	0.061016	Mean dependent var	-0.000112
Adjusted R-squared	0.049925	S.D. dependent var	0.002263
S.E. of regression	0.002206	Sum squared resid	0.001236
Durbin-Watson stat	2.087376		

Equation: CSSINTE(6)=C(21)+C(22)*LSSINTEGQTE(6)+C(23)
*CFDIPERW(6)+C(24)*CWPERW(6)
Observations: 252

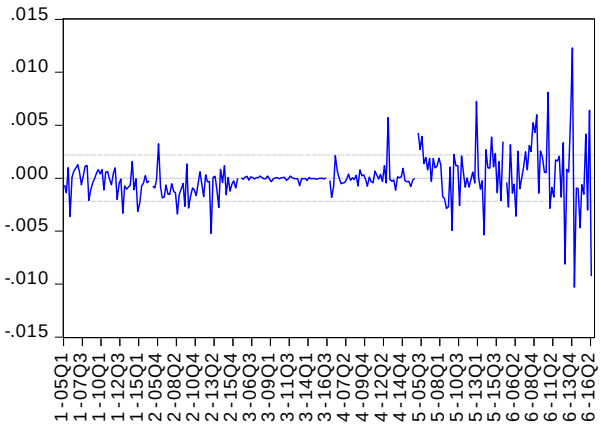
R-squared	0.041035	Mean dependent var	-6.97E-05
Adjusted R-squared	0.029434	S.D. dependent var	0.002234
S.E. of regression	0.002201	Sum squared resid	0.001201
Durbin-Watson stat	2.107444		

Residual Tests for SUR

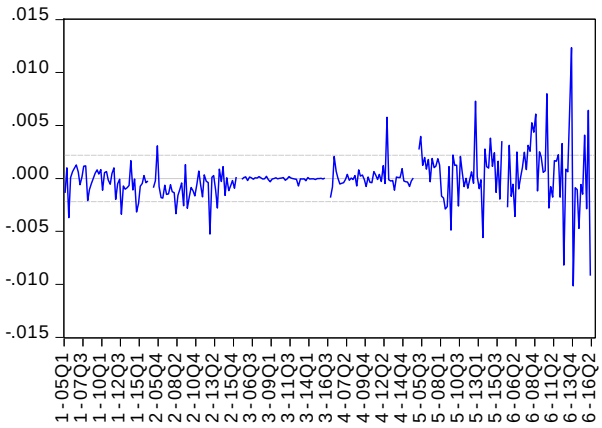
CSSINTE(1) Residuals



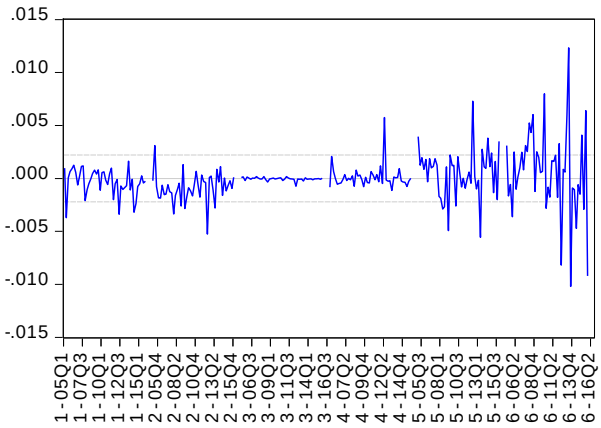
CSSINTE(2) Residuals



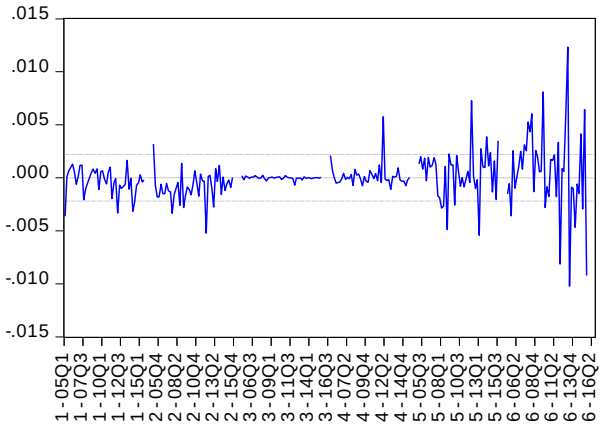
CSSINTE(3) Residuals



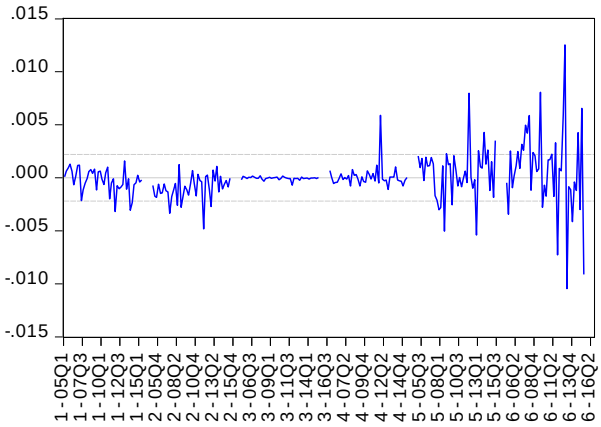
CSSINTE(4) Residuals



CSSINTE(5) Residuals



CSSINTE(6) Residuals



Wald Test Results

Wald Test:
System: {%system}

Test Statistic	Value	df	Probability
Chi-square	0.795770	20	1.0000

Null Hypothesis: C(1)=C(5)=C(9)=C(13)=C(17)=C(21), C(2)=C(6)=C(10)=C(14)=C(18)=C(22), C(3)=C(7)=C(11)=C(15)=C(19)=C(23), C(4)=C(8)=C(12)=C(16)=C(20)=C(24)

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) - C(21)	-1.31E-05	0.000199
C(5) - C(21)	-8.92E-06	0.000207
C(9) - C(21)	-8.95E-06	0.000209
C(13) - C(21)	6.22E-06	0.000193
C(17) - C(21)	-2.81E-05	0.000218
C(2) - C(22)	0.042593	0.083012
C(6) - C(22)	0.042448	0.083228
C(10) - C(22)	0.055545	0.082889
C(14) - C(22)	0.052785	0.082422
C(18) - C(22)	0.048322	0.083542
C(3) - C(23)	-0.005392	0.056068
C(7) - C(23)	-0.005095	0.056547
C(11) - C(23)	-0.005963	0.056172
C(15) - C(23)	-0.006795	0.056479
C(19) - C(23)	-0.004366	0.056791
C(4) - C(24)	2.28E-05	0.000512
C(8) - C(24)	0.000114	0.000517
C(12) - C(24)	-1.50E-05	0.000511
C(16) - C(24)	7.53E-06	0.000516
C(20) - C(24)	6.59E-05	0.000515

Restrictions are linear in coefficients.

System Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 01/06/20 Time: 15:10
Sample: 2005Q1 2016Q3
Included observations: 282

Component	Skewness	Chi-sq	df	Prob.
1	0.159877	1.201344	1	0.2731
2	0.238183	2.666366	1	0.1025
3	0.392909	7.255735	1	0.0071
4	0.162103	1.235037	1	0.2664
5	0.571700	15.36153	1	0.0001
6	0.456847	9.809314	1	0.0017
Joint		37.52933	6	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	1.703267	19.75782	1	0.0000
2	1.879409	14.75475	1	0.0001
3	2.573423	2.138121	1	0.1437
4	3.534133	3.352250	1	0.0671
5	9.580932	508.8768	1	0.0000
6	11.98232	948.0152	1	0.0000
Joint		1496.895	6	0.0000

Component	Jarque-Bera	df	Prob.
1	20.95916	2	0.0000
2	17.42112	2	0.0002
3	9.393856	2	0.0091
4	4.587286	2	0.1009
5	524.2383	2	0.0000
6	957.8245	2	0.0000
Joint	1534.424	12	0.0000