The Contribution of Foreign Direct Investment (FDI) on Employment and Economic Growth in South Africa: A Vector Autoregressive (VAR/VECM) Approach

Abstract

South Africa is a free market economy that promotes Foreign Direct Investment (FDI) in all sectors of the economy with the aim of accelerating economic growth and job opportunities. Several empirical works has yielded mixed and controversial results with regard to the effects of FDI on employment and economic growth in both developed and developing countries. The primary focus of the study is to investigate the contribution of FDI on employment and economic growth in the context of South African economy. The analyses of the study were carried out using the annual time series data, covering the period of 1980 to 2015. The macroeconomic variables used in the estimation process of the study include employment, FDI, GDP, inflation, trade openness and unit labour costs. The study employed secondary data from the South African Reserve Bank (SARB) and Statistics South Africa (StatsSA) database.

The study mainly used the VAR/VECM approach to conduct empirical analysis; however the study also employed single equation estimation techniques which include OLS, FMOLS, DOLS and CCR model as a supporting and confirmatory models to verify the results produced by the VAR/VECM model. This study provides strong evidence of a significant negative relationship between FDI and employment levels in the South African economy. The results also indicate that employment levels are highly influenced by an increase in the economic growth (GDP). Empirical analysis of the study suggest that employment effects of economic growth is highly positive and significant in South Africa's economy. Policy recommendations on this effect are given on the basis of empirical findings obtained from this particular research.

JEL: C32, E22, E24

Key words: Foreign Direct Investment, Employment & Economic growth.

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1. Introduction

Over the years, FDI has been positively and significantly contributing towards economic growth and development through job opportunities and technological transfer in many developing nations from the rest of the world; however the subject matter wishes to extend analysis on the effects of FDI on domestic employment and economic growth in the South African economy. Several studies indicate that FDI has played a very important role in promoting South Africa's economic growth and job creation as an important aspects of economic development. FDI serves as the source of expansion for business opportunities and also provide employment opportunities and increases the level of income for local citizens in the host country. FDI is the flow of capital from investor's country to an enterprise operating outside of the investor's country (Chinyelu, 2014). Foreign investors are keen to invest in South Africa due to the economic environment that is conducive enough to attract FDI into the economy; these include access to natural resources, quality infrastructure, and potential market size, financial markets, trade openness, economic and political stability.

The general economic argument of FDI states that inward FDI promotes growth and enhances employment levels of a host nation. Most studies (Mpanju, 2012; Carp, 2012; Huang & Ren, 2013; Chinyelu, 2014 and Tshepo, 2014) reveal that FDI effect on employment and economic growth has been favourable in most of developing nations. In contrast to this, some researchers among others found an inverse relationship between FDI and employment levels (Jenkins, 2006; Pinn et al., 2011; Wei, 2013 and Onimisi, 2014). Some researchers among others (Inekwe, 2013; Wei, 2013 and Okoro & Johnson, 2014) suggest that the FDI impact on economic growth and employment may differ across different economic sectors in which investors direct more investments.

According to the World Investment Report published by UNCTAD (2015), South Africa is the third largest recipient of FDI inflows in Africa, after Nigeria and Mozambique respectively, and the largest FDI provider in the continent. Globally, South Africa occupies 15th position among the most attractive economies for transnational companies. Foreign Direct Investment (FDI) from the developing world predominantly goes to South Africa, North Africa and oil-exporting countries (Department of Trade and Industry (DTI), 2015).

According to the report presented by the Department of trade and industry (2015), a total of 1 344 FDI projects were recorded from January 2003 to July 2015 into the South African economy. These FDI projects saw the South African economy recording a total capital investment of US$71.2 billion during this period. A total of 189 724 jobs were created by the inflow of these FDI projects during the period. The main sectors that attracted more of these FDI projects were particularly from software and information technology services; business services; financial and communications services; and industrial machinery, equipment and tools, respectively (DTI, 2015).

The Department of trade and industry (2015) presented a report of FDI in South Africa, stating that from January 2015 to July 2015, a total of US$3.31 billion FDI inflows were recorded and 5 037 jobs were created in the South African economy. South African FDI inflows from Sub-Saharan Africa recorded a total capital investment of US$2.08 billion and created 4 647 jobs between the period of January 2003 and July 2015. The key FDI sources for South Africa among others include United Kingdom (UK), United States of America (USA), Germany, Australia and India, respectively. Conversely, South African FDI outflows mainly go to the following top five destination countries, i.e. United Kingdom, Nigeria, Ghana, Zambia and United States of America, respectively. The top five invested and jobs creating sectors include metals, coal, oil and natural gas, food and tobacco, consumer products and communication, respectively. Over the years, South Africa has been able to maintain its position as the top FDI destination in Africa and a prolific investor in the African continent (DTI, 2015).

However, FDI may also have detrimental effects in the economy of the host nation. Pinn et al, (2011) assert that FDI can affect employment levels in three different scenarios. Firstly, inward FDI create job opportunities directly through the establishment of new businesses. Secondly, FDI can maintain employment level by acquiring existing firms. Lastly, FDI can decrease employment levels by withdrawing investments and shutting down local firms through intense competition (Pinn et al, 2011). Jenkins (2006) suggested that FDI may displace domestic investment in such a way that the net effect on employment is less than the number of people employed directly by FOEs. When FDI involves the acquisition of domestic firms instead of establishing new enterprises, in this

case domestic employment levels will stay the same, and if the foreign investor rationalizes the firm, employment levels are even more likely to decrease. Furthermore, employment opportunities that are created may be for relatively skilled labour rather than unskilled labour that are over-supplied in the labour market (Jenkins, 2006).

The issue of unemployment remains a fundamental socio-economic challenge in the 21st century in South Africa; unemployment rate has been vacillating around 25% for the past two decades with approximately half of the young people are completely jobless and possibly contributing to a lower economic growth rate (fluctuating around 3%) in the last two decades. In the Budget speech of 2015, the then Minister of Finance Pravin Gordhan stated that "unemployment remains our single greatest economic and social challenge. The government aims to prioritize measures that will generate employment opportunities in the economy. These include tax incentives for employment and investment, support for enterprise development, skills development and employment creation programmes" (National Treasury, 2015).

According to SARB (2015), only 40% of working-age South Africans is employed. It is estimated that to reduce unemployment rate to 10% in the year 2025, a number of 7.5 million jobs need to be created if the participation of labour force is 58%. If the labour force participation rate increases to the average of 65% for emerging market, South Africa would need to create a total of 10 million jobs (SARB, 2015).

The primary purpose of the study is to probe the subject matter by using econometric analyses to further investigate the contribution of FDI on employment levels in the South African economy from 1980-2015 by drawing on data from employment, FDI, Gross Domestic Product (GDP), inflation, trade openness and unit labour costs. This particular study contributes to the body of knowledge by assessing the short and long-run effects of FDI on employment in the South African economy. The study attempts to discover the nexus between FDI and employment levels in South Africa using a VAR/VECM model framework with the annual time series data extracted from the South African Reserve Bank (SARB) website and Statistics South Africa (StatsSA) statistical database.

The organization of this paper is made up of five sections. Section 1 introduces the paper with a clear background. Section 2 discusses both theoretical and empirical literature on

the link between FDI, employment and economic growth. Section 3 gives the discussion of the methodological framework as well as the estimation procedures applicable to assess this relationship. Section 4 deals with the presentation and discussion of the empirical findings. Finally, section 5 concludes the paper with some policy prescriptions.

2. Theoretical and Empirical Literature Review

2.1 Theoretical Literature

Ricardo (1821) formulated jobless growth theory which states that there is a negative relationship between investment, output expansion and job creation because capital investment is a perfect substitute for labour in the economy. Vernon (1966) proposed the production cycle theory in order to explain FDI flows from USA to Western Europe companies in the manufacturing industry. This theory asserts that four stages of product cycle that exist include innovation, growth, maturity and decline stage (Denisia, 2010). The life cycle theory may be used to analyse the relationship between the life cycle of a product and potential FDI flows. In the innovation stage, USA companies produce new unique products for domestic market and export the surplus in the foreign markets. This theory asserts that FDI flows are mostly observed in the maturity and declining stage (Denisia, 2010).

The theory of capital market is the oldest theory of FDI developed upon the Markowitz (1952) portfolio model. Capital market theory claims that FDI is mainly determined by the interest rates of the country (Das, 2007). Basically, this theory alludes on three different positions in which FDI are attracted in developing countries. The first one is that undervalued exchange rate ensures that host countries operate under lower production costs. The long-term investment of developing countries depends more on FDI rather than purchase of securities in the stock market since there are no organised securities that exist. The last position is that FDI allows control of host country's assets because there is limited information about securities of the host nation (Das, 2007).

The FDI-led growth hypothesis was formulated based on endogenous growth theory (Romer, 1994) which states that FDI are strongly associated with human capital, exports, technology transfer and capital. These factors have a significant impact in stimulating

economic growth through the inflow of FDI (Sunde, 2017). The spill-over-effects of knowledge and technology is certain if local firms have access in absorbing knowledge from foreign companies (Shakar and Aslam, 2015). These spill-over-effects are ought to bring about progress and improvement in level of productivity which will eventually lead to an increase in the economic growth.

2.1.1 The Determinants of Foreign Direct Investment

I. Labour Costs

Charkrabarti (2001) asserts that a wage rate indicates the cost of labour in the economy and has been one of the most controversial determinants of FDI in many different studies (Demirhan & Masca, 2008). Numerous studies suggest that labour costs have a statistically significant effect on FDI, more especially in labour-intensive industries that are more. Literally, countries with higher wages often discourage FDI while those with lowers wages attract inward FDI. Vijayakumar, Sridharan & Rao (2010) assert that higher costs of labour lead to higher production costs, thus leading to the limitation of FDI inflows. Hence, labour cost is expected to have a significant negative effect on inward FDI. Countries with cheap labour costs such as China are more able to attract a large scale of FDI inflows as compared to those with high costs of labour.

II. Trade Openness

The trade openness is computed as the ratio of net exports to GDP of the country as shown by the degree in which investment moves in and out of the country. Most of empirical literature supports the idea that a more open economy is more likely to attract large FDI into the economy. Therefore, trade openness is generally expected to positively and significantly affect FDI as the volume of trade increases (Vijayakumar, Sridharan & Rao, (2010). From the South African perspective, during the apartheid era, investment climate in the country was such that very little inward FDI was received during that time and the country was not much open to trade in the global market with several capital controls as restrictions and sanctions. When democracy prevailed in 1994, the capital controls were relaxed and opened to the international trade and hence FDI inflows started

to take place appropriately and more effectively to positively influence the economy of the country (Onyeiwu & Shrestha, 2004; Moreira, 2010 and Tintin, 2013).

III. Political Stability

A number of studies suggest that a country with a stable political environment attracts a large portion of FDI into the economy as compared to those with an unstable political environment. Political instability comprises of many different kinds of unpleasant events such as anti-government protests, corruption, political assassinations, changes in government cabinet and violent riots etc. These political instabilities automatically decreases the interest of foreign investors because of uncertainty they bring to the cost and profitability of investment (Moreira, 2010). A study conducted by Fedderke and Romm (2006) suggests that a stable political environment has a significant positive effect on FDI in South Africa.

IV. Availability of Natural Resources

The availability of natural resources in the country is one of the factors that are regarded as important determining factor of attracting foreign investments into the country. Many foreign investors usually invest in countries where there is easy access and transportation of production input such as raw materials and natural resources (Jenkins & Thomas, 2002 and Khachoo & Khan, 2012). Many developing countries have large capacity in natural resources such as oil and minerals, those countries are more favored by foreign investors because of lower costs of production. South Africa is one of the most developing countries that are blessed with abundant natural resources such as gold, agricultural products and other mineral resources; hence the country is able to attract large FDI inflows. Developing countries that are rich in natural resources such as South Africa, Nigeria and Angola are more able to attract large FDI into their economies (Akpan, Isihak, & Asongu, 2014).

V. Quality Infrastructure

Quality infrastructure plays an important role in attracting inward FDI in the economy, irrespective of which form of infrastructure. Asiedu (2002) asserts that a quality infrastructure stimulates productivity level of investment and enhances FDI. Investing in

economic infrastructure is the most important factor of investment climate reform strategy. Infrastructural facilities that promote FDI can be constructed by considering roads, ports, railways, electricity, water, transportation, telecommunications and institutional development (Vijayakumar, Sridharan & Rao, 2010). The manufacturing industry of the South African economy has proved to be the best in the world in many specialized sectors such as railways construction, equipment and machinery for mining industry and synthetic fuels, as a result the country has been able to attract the large portion of FDI that comes into Africa from the rest of the world (Asiedu, 2002 and Akpan, Isihak, & Asongu, 2014).

2.2 Empirical Literature

This section focuses on the discussion of empirical findings underpinning the link between FDI, employment and economic growth in South Africa and from the rest of the word. Numerous empirical studies have systematically evaluated the FDI effect on employment and economic growth from the global context however, very few studies have evaluated this relationship from the South African perspective. The empirical findings of recent studies have shown mixed and sometimes controversial (i.e. the impact of FDI differs across different sectors of the economy) results on this relationship. Hence this paper attempt to fill that gap and provide more empirical evidence in this regard.

Huang & Ren (2013) investigate the effect of Chinese investment on employment generation in the South African economy. The study used a survey from 16 Chinese enterprises located in Johannesburg to assess their impact on employment generation in the South African economy. The findings of the study indicate that Chinese firms increase job opportunities for both skilled and unskilled workers in the country. They suggested the importance of improving the investment enabling environment in order to expand the significant positive impact of Chinese firms on employment and growth of the country's economy. The findings of the survey also suggest strict labour laws and influential trade unions are vital components that ensure the employment quality of FOEs meets legal requirements of the country.

Wei (2013) tested the impact of FDI on employment levels using annual time series data from 1985-2011 in China. The findings reveal that there is negative and insignificant effect

of FDI on employment creation in the Chinese economy. The results also indicate that the effect of FDI on employment differs across different economic sectors. The impact of FDI on employment was found positive in the primary sector of the economy. The secondary sector of the economy exhibited an insignificant and negative effect of FDI on employment, although GDP had a strong positive impact on employment levels. FDI inflows were found negative and significant to promote employment creation while GDP had a positive impact on employment levels in the tertiary sector of the economy.

Onimisi (2014) examined the FDI effect on employment generation in Nigeria from 2002-2012. The empirical findings also indicated a negative effect of FDI on employment levels while GDP and interest rate are positively correlated with the employment levels, however, none of the explanatory variables were found significant to affect employment levels in Nigeria. The study suggests that a negative effect of FDI on employment levels calls for critical examination of these variables because FDI are established to bring about a positive significant effect on GDP and therefore it is also expected FDI also brings a reduction in the rate of unemployment in the country.

A study conducted by Tshepo (2014) assesses the FDI impact on growth and employment from 1990 to 2013 in South Africa. The study employed the Johansen Cointegration test to assess the long-run cointegrating relationship among variables in the model. The empirical results indicate a positive long-run relationship between FDI, GDP and employment levels in the South African economy. The findings also suggest that FDI is an important aspect that stimulates growth and employment levels in the economy of South Africa. Furthermore, the study was able to specify that human capital, return on investment, labour cost, labour disputes and corruption are important factors that influence inward FDI in the South African economy. The study suggests that it is imperative for South African government to put more emphasis on these factors to make the country a conducive environment for FDI to take place.

Kariuki (2015) examined factors that influence FDI inflows into African developing countries using annual data for 35 African countries from 1984-2010. The study firstly suggests that the inflows of FDI are important for African developing nations as they promote economic growth and development. The results estimation was obtained using

the fixed effects estimation model. The empirical results indicate that a commodity price index performance, a good performance of stock markets in developed countries, an increase in the infrastructural development of a country and an increase in trade openness all have a significant positive effect on inward FDI in African countries under consideration.

3. Methodological Framework

This section presents the methodology and estimation procedure that will be used to investigate the link between FDI, employment and economic growth in South Africa. The study is using an annual time series data running from the period of 1980-2015 thus giving us 36 observations, with the following variables: employment, FDI, GDP, inflation, trade openness and unit labour costs. All variables in monetary values are measured in terms of domestic currency, i.e. South African Rand. The time series data of all variables is extracted from two sources, i.e. South African Reserve Bank (SARB) website (www.resbank.co.za) and Statistics South Africa (StasSA) database website (http://www.statssa.co.za) through access to their online downloading facilities using the excel format. The study uses eviews9 statistical software package for the purpose of analysing data, and empirical estimation and analysis. All the series were transformed into natural logarithms and were found to be I(1) non-stationary variables, the unit roots results are not reported due to brevity but available upon request from the authors.

3.1 The Johansen VECM Methodology

The VECM representation is an advanced estimation technique because it allows one to differentiate between the short-run and long-run dynamic relationship between the variables in the system. The VECM is important to a VAR model because of its ability of imbedding an ECM term in the model. The VAR/VECM only employed three variables in the model due to plausible results and consistency with economic literature, however, the six variable of the model specification are utilised in the estimation of single equation method, and they produce plausible results in this regard. As previously mentioned, the short-run dynamics between FDI, employment and economic growth in the system will be assessed through the use of the following VAR model:

$$InY_t = \alpha_0 + \sum_{i=1}^{p} \Gamma_i \, InY_{t-i} + \varepsilon_t \qquad (1)$$

The above equation (1) represents a VAR, where $Y_t = EMP_t = (FDI_t, GDP_t)$ is a (3×1) column vector of three endogenous variables, i.e. employment, FDI and GDP. α_0 denotes a (3×1) vector of the constants, Γ_i is a (3×3) matrix of autoregressive coefficients regressors, p represents the order of VAR and the ε_t vector comprises composites of random shocks in the system. The cointegrating VAR equation will be converted into a VECM equation in order to apply the Johansen VECM methodology. Therefore, an appropriate Johansen (1990) VECM methodology is estimated to determine the notion of a long-run cointegrating relationship that exists between FDI and employment levels, and other variables in the model. Brooks (2013) asserts that VECM is an appropriate model that captures the long-run and short-run dynamic relationships among employed variables in the model. In this particular study, the VECM captures the long-run cointegrating relationship between employment, FDI and GDP as well as the short-run dynamics that are consistent with the long-run equilibrium. The VECM presentation of the study can be presented as follows:

$$\Delta InY_t = \mu + \Pi InY_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta InY_{t-i} + \varepsilon_t \qquad (2)$$

Where, InY_t denote $k \times 1$ vector of I(1) variables, μ_t is the coefficient of intercept, Π represents $k \times k$ long-run multiplier matrix and Γ_i represents $k \times k$ short-run coefficient matrices. The notation of p represents the order of VAR. μ_t represent innovations in the model. The VECM (Πy_{t-1} term) from the above equation can be expanded as follows:

$$\Pi y_{t-1} = \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \\ \alpha_{31} \end{bmatrix} (\beta_{11} \quad \beta_{12} \quad \beta_{13}) \begin{bmatrix} lemp \\ lfdi \\ lgdp \end{bmatrix}_{t-1} \qquad (3)$$

From the above equation (3), β_{11} represent a normalized equation. β_{12}, is the long-run elasticity coefficient for employment with respect to the effect of FDI on employment levels. β_{13}, is the long-run elasticity of employment with respect to the effect of GDP on

employment levels. The short-run adjustment coefficients that will be considered in this particular study can be expressed in the following ECM:

$$\varepsilon = (lemp - \beta_{12} fdi - \beta_{13} gdp)_{t-1} \quad (4)$$

From the above equation (4), let assume that employment levels increases by more than its cointegrating relationship in the previous period while FDI and GDP remains dictates, in the following period some or both variables will have to adjust in order to restore the long-run equilibrium relationship. The adjustment coefficient is therefore expected that $\alpha_{11} < 0$ since employment must decrease in the current period in order to restore the long-run equilibrium, while FDI and GDP must increase in the following period to adjust this long-run equilibrium relationship, i.e., $\alpha_{21} > 0$ and $\alpha_{31} > 0$.

3.2 The Single Equation Methods

This section gives a discussion of single equation models which include OLS, FMOLS, DOLS and CCR, since these models will also be employed as supporting and confirmatory models of a VAR/VECM approach. Cointegrating regression equations that are discussed in this section include FMOLS, DOLS and CCR model. As mentioned earlier, all single equation models are estimated using all six variables in the model specification due to plausible results and consistency with the economic literature.

3.2.1 Ordinary Least Squares (OLS) Model Estimation

The Ordinary least squares (OLS) regression is a linear estimation technique that can be employed to test for a single response variable recorded on an interval scale. The natural logarithmic presentation of variables in the OLS model with multiple explanatory variables as of this study can be written in the following form:

$$\Delta InEMP_t = \alpha_0 + \beta_1 InFDI_1 + \beta_2 InGDP_2 + \beta_3 INF_3 + \beta_4 TOP_4 + \beta_5 InLC_5 + \varepsilon_t \quad (5)$$

Where, $\Delta InEMP_t$ is a first differenced dependent variable, followed by stationary explanatory variables which include $InFDI_1, InGDP_2, INF_3, TOP_4, InLC_5$. α_0 is the constant coefficients, and ε_t is the error term. The logarithmic transformation was carried out only on variables with data on monetary values and indexes, i.e. employment, FDI, GDP and

unit labour costs. The data of inflation and trade openness was already in percentage form, hence they were not transformed into natural logarithm because they can be interpreted as elasticities.

3.2.2 Fully Modified Ordinary Least Squares (FMOLS) Model

The FMOLS model involves adjusting OLS long-run estimates in such a way that we overcome any form of biasness owing to serial correlation and endogeneity problems in OLS residuals (Phillips and Hansen, 1990 and Harris & Sollis, 2003). Consider the following (Y_t, X_t') vector process:

$$Y_t = X_t'\beta + D_t'\gamma_1 + \varepsilon_{1t} \qquad (6)$$

From the above equation (6), Y_t represents the dependent I(1) variable. X_t is a stochastic regressor as governed by $X_t = \Gamma_{21}' D_{1t} + \Gamma_{22}' D_{2t} + \varepsilon_{2t}$. Furthermore, $D = D_{1t}', D_{2t}'$ represents the deterministic trend of regressors and ε_{1t} is the error term with a zero mean and covariance (Ω). Therefore, the FMOLS can be presented as follows:

$$\hat{\theta}_{FMOLS} = \begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = \left[\sum_{t=1}^{T} Z_t Z_t'\right]^{-1} \left[\sum_{t=1}^{T} Z_t Y_t^{+} - T\begin{bmatrix} \hat{\lambda}12 \\ 0 \end{bmatrix}\right] \qquad (7)$$

From equation (7) $Z_t = (X_t' D_t')'$ and $Y_t^{+} = Y_t - \hat{\omega}_{12}\hat{\Omega}_{22}^{-1}\hat{\varepsilon}_2$indicates the transformed data. $\hat{\lambda}_{12}^{+} = \hat{\omega}_{12}\hat{\Omega}_{22}^{-1}\hat{\Lambda}_{22}$ represents the estimated bias correction term with the long-run covariance matrices $\hat{\Omega}$ and $\hat{\Lambda}$ and their respective elements that are computed through the use of $\varepsilon_t = (\hat{\varepsilon}_{1t}', \hat{\varepsilon}_{2t}')'$.

3.2.3 Dynamic Ordinary Least Squares (DOLS) Model

DOLS is a parametric model which clearly estimates the lagged first difference regressors (Saayman, 2010). This model suggests that the added value of lags (q) and leads (q) of ΔX_t reduces the long-run correlation between error terms (ε_{1t} and ε_{2t}) (Belke and Czudaj, 2010). The leads and lags of ΔX_t eliminate asymptotically any possible biasness due to endogeneity or serial correlation. The DOLS presentation can be written as follows:

$$Y_t = X_t'\beta + D_t'\gamma_1 + \sum_{j=-q}^{r} \Delta X_{t+j}'\delta + \varepsilon_{1t} \quad (8)$$

Where, the DOLS estimator is given by $\hat{\theta}_{DOLS} = (\hat{\beta}', \hat{\gamma}_1')'$. The number of leads and lags will be selected using the Akaike information criterion (AIC). Stock and Watson (1993) suggest that DOLS is more robust in data series with small observations as compared to other alternative long-run estimators, including those models proposed by Engle and Granger (1987), Johansen (1988) and Phillips and Hansen (1990).

3.2.4 Canonical Cointegrating Regressions (CCR) Model

The CCR model transforms variables into a cointegrating regression that removes the second-order bias of the OLS estimator. The transformation of the variables has the ability of eliminating endogeneity caused by the long-run correlation of Y_{1t} and Y_{2t} (Montalvo, 1995). From equation (6), the CCR presentation can be written as follows:

$$\hat{\theta}_{CCR} = \begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = \left[\sum_{t=1}^{T} Z_t^* \, Z_t^{*'} \right]^{-1} \sum_{t=1}^{T} Z_t^* \, Y_t^* \quad (9)$$

From equation (9), $Z_t^* = \left(X_t^{*'}, D_t'\right)', X_t^t = X_t - (\hat{\Sigma}^{-1}\hat{\Lambda}_2)'\hat{\varepsilon}_t$ and $Y_t^* = Y_t - \left[\hat{\Sigma}^{-1}\hat{\Lambda}_2\tilde{\beta} + \begin{bmatrix} 0 \\ \hat{\Omega}_{22}^{-1}\,\hat{\omega}_{21} \end{bmatrix}\right]'\varepsilon_t$ represents the transformed data. The coefficients of $\tilde{\beta}$ represents the estimates of the cointegrating equation that uses static OLS. $\hat{\Lambda}_2$ is the second column of $\hat{\Lambda}$ and $\hat{\Sigma}$ is the estimated contemporaneous covariance matrix of error terms. Montalvo (1995) asserted that CCR is similar to the FMOLS estimator, except that FMOLS only transforms the endogenous variable and corrects the OLS estimates in the regression of the modified Y_{1t}.

4. Empirical Analysis

The study utilise two unit root tests to determine if variables are stationary or not, and analyse the integration properties of data through the Augmented Dickey Fuller and Phillips Perron Tests. The graphical analysis of the data series in level form revealed that data series of almost every variable is non-stationary (i.e., have unit roots), however, after converting these variables into first difference, the series became stationary, i.e., I(1). The unit root results are not presented in this paper but can be available upon request from the researchers. Asterio and Hall (2016) asserts that determining the order of integration is extremely important as one proceed to estimating cointegration test.

Table 1: Summary of Cointegrating Test Assumptions

Date: 02/08/17 Time: 21:00
Sample: 1980 2015
Included observations: 34
Series: LEMP LFDI LGDP
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	1	1	0	0	0
Max-Eig	1	1	0	0	0

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

Table 1, shows five different assumptions that can be chosen with regard to the possible cointegratiion among the variables. The results show that cases 1 and 2 indicate that only one cointegrating relationship exists among the variables. However, in practice cases 1 and 5 are not plausible for macroeconomic time series data analysis. While case 3, 4 and 5 indicates no sign of cointegration. Therefore, case 2 provides stronger support for cointegration since both the trace and maximum statistics confirm one cointegrating relationship. Hence, the study proceed to estimate a cointegration based on case 2.

Table 2: Cointegration Results

Date: 02/08/17 Time: 21:01
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LEMP LFDI LGDP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.490514	39.97842	35.19275	0.0141
At most 1	0.266829	17.05046	20.26184	0.1306
At most 2	0.173956	6.497663	9.164546	0.1556

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.490514	22.92797	22.29962	0.0408
At most 1	0.266829	10.55279	15.89210	0.2866
At most 2	0.173956	6.497663	9.164546	0.1556

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

In the light of the model selection criterion, the FPE and AIC was employed when selecting a lag order within a second order VAR model since the data set is relatively small for this particular study. This procedure led to selection of order (p) = 2 through the use of FPE and AIC. Table 2, indicate that the null hypothesis of zero cointegrating vector $(r = 0)$ is rejected by both the trace (39.98 > 35.19) and the maximum eigenvalue (22.93 > 22.30) tests, at the 0.05% significance level. The null hypothesis of almost one cointegrating vector $(r = 1)$ cannot be rejected in by tests since the trace statistic (17.05 < 20.26) and the maximum eigenvalue (10.55 < 15.90). The relationship of one cointegration vector is then estimated and reported in equation 9, in the same pattern of β_{12} and β_{13} cointegration equation in equation 4. The error correction term (ECM) is used

to show how the short-run dynamics return to the long-run equilibrium among variables through the use of a coefficients.

4.1 The VECM Results of Long Run Relationship and Adjustment Coefficients

The estimated VECM short and long-run equation is presented in the following manner:

$$\Delta LEMP_t = -\mathbf{0.02}(\mathbf{62.6} + LEMP_{t-1} - \mathbf{0.64}LFDI_{t-1} + \mathbf{5.2}LGDP_{t-1}) + \mathbf{0.38}\Delta LEMP_{t-1} - \mathbf{0.13}\Delta LFDI_{t-1} + 0.18\Delta LGDP_{t-1} \quad (10)$$

The long-run coefficients (β_{12}) suggests that in the long-run, a 1 percentage rise in FDI will cause employment to decrease by 0.64 percent per annum statistically significant at 1%. On the other hand, the elasticity of employment to GDP, β_{13} (5.23) is of the correct positive sign and statistically significant at 1%. This is plausible because a rise in GDP ought to lead to a significant increase in employment. These results supports the "Jobless Growth" theory formulated by Ricardo (1821) which states that there is a negative relationship between investment, output expansion and job creation because capital investment is a perfect substitute for labour in the economy. The empirical evidence of a negative impact of FDI on employment levels has been reported by a number of global researchers among other such as Pinn et al., (2011); Wei (2013) and Onimisi (2014).

Some of possible reasons for FDI to have a negative effect on employment levels are that FDI may displace domestic investment in such a way that the net effect on employment is less than the number of people employed directly by FOEs. Pinn et al (2011) suggest that when FDI involves the acquisition of domestic firms instead of establishing new enterprises, in this case domestic employment level will stay the same, and if the foreign investor rationalizes the firm, employment level is even more likely to decrease in the domestic labour market. Fedderke and Romm (2004) suggested that the nature of FDI are more capital-intensive rather than labour-intensive, and capital investment favours the employment of a few skilled workers. Hence, employment opportunities that are created may be for relatively skilled labour rather than unskilled labour that is in excess supply in the South African labour market (Jenkins, 2006). According to Pinn et al., (2011) FDI can decrease employment levels by withdrawing investments and shutting down local firms through imposing intense competition in the domestic market.

4.2 Short-run Adjustments and Coefficients

The VECM results reported -0.024 speed of adjustment, which means that employment is moving by 2.4% in the same year in order to adjust the long-run disequilibrium. This error correction term indicates that there is no strong pressure on employment to restore long-run equilibrium whenever there is a disturbance in the system. The low speed of adjustment by employment may reflect the existence of other factors affecting employment in South Africa apart from FDI, such as the level of education, labour costs, inflation and trade union rigidity among others. The short-run coefficients for LEMP (0.38), LFDI (-0.13) and LGDP (0.18) have correct signs that complements the long-run coefficients and are also statistically significant at a conventional level except for the LGDP coefficient that is insignificant in the short-run. The Granger causality tests shows that employment has a bi-directional causal relationship with FDI significant at 5% significance level. Moreover, there is a uni-directional causal relationship running from FDI to GDP at 5% level of significance. There was no causal link that was noted between employment and GDP, which implies that these two variables are strongly exogenous to explain the movements in employment levels and vice versa.

4.3 Single Equation Models

Single equations methods produced plausible results when employing all six variables in the model specification, whereas VAR/VECM produced plausible results when estimating the model using three main variables which include employment, FDI and GDP.

4.3.1 The Ordinary Least Squares (OLS) Model Results

The OLS method seeks to examine the short-run interaction between of FDI, GDP, inflation rate, trade openness and labour cost on employment. The estimated OLS model:

$$LEMP = -\mathbf{6.70} - \mathbf{0.13}LFDI + \mathbf{0.65}LGDP + 0.005INF - 0.002TOP + \mathbf{0.13}LLC \qquad (11)$$

A negative elasticity coefficient of FDI suggests that if FDI increases by 1%, employment levels would decrease by 0.13% in the short-run. The estimated OLS results suggest that employment responds positively due to an increase in GDP and inflation rates as suggested by economic theory. However, inflation and trade openness are both

statistically insignificant to affect employment levels in the short-run. According to estimated results, unit labour cost also positively impact employment levels with 0.13%, implying that if labour cost increases by 1%, employment would rise by 0.13% in the short-run. On the other hand, trade openness has an inverse relationship with employment levels in the South African economy, implying that a 1% increase in trade openness would result to employment contracting by 0.002% in the short-run.

4.3.2 Fully Modified Ordinary Least Squares (FMOLS) Model

The FMOLS results are estimated with the non-prewhitened Barlett kernel, Newey-West fixed bandwidth $= 40.000$ model. The estimated equation of the FMOLS is reported as:

$$LEMP = -\mathbf{18.66} - \mathbf{0.16}LFDI + \mathbf{1.72}LGDP + \mathbf{0.01}INF - \mathbf{0.01}TOP + 0.12LLC \qquad (12)$$

The results of a FMOLS model indicate that there is a significant negative long-run relationship between FDI and employment levels. The results suggest that, a 1% rise in FDI causes employment to decrease by 0.16% in the long-run. A positive coefficient of GDP implies that a unitary increase in GDP lead to a 1.72% rise in employment levels, *ceteris paribus*. These elasticity coefficients are both statistically significant at 1% level of significance. As expected, inflation positively impacts on employment with the elasticity coefficient of 0.01. A negative coefficient of -0.01% for trade openness suggests that a 1% rise in trade openness would result to a 0.01% decrease in employment. A positive coefficient of labour cost suggests that a 1% rise in labour cost would results to a 0.12% increase in employment levels.

However, the coefficient elasticity of trade openness is not economically plausible because the more country becomes open to trade the more employment and growth transpires in the country. The major reason for a negative impact of trade openness on employment could be cheap imports that are imported from countries with low economies of scale and cheap labour costs which could results to a negative effects on domestic output levels, and thus employment levels. The coefficient result of labour cost is also not economically plausible since it is expected that a rise in the cost of labour will correlate with a decrease in employment levels, and vice versa. The main reason for this effect

could be that the cost of labour that is increasing is for skilled workers rather than for unskilled labour that is in excess supply in the South African labour market.

4.3.3 The Dynamic Ordinary Least Squares (DOLS) Model

The long-run equilibrium equation of the DOLS model is reported as follows:

$$LEMP = -\mathbf{16.98} - \mathbf{0.24}LFDI + \mathbf{1.61}LGDP + \mathbf{0.02}INF - \mathbf{0.01}TOP + \mathbf{0.28}LLC \qquad (13)$$

The results produced by the DOLS complement the results estimated by the FMOLS model, and hence those of the VECM long-run estimates. The above equation (13) suggests that 1% rise in FDI causes employment levels to decrease by 0.24%, *ceteris paribus*. The long-run positive coefficients for GDP, inflation and labour costs indicate that a 1% change in these variable would lead to a 1.61%, 0.02% and 0.28% increase in employment levels, respectively and all statistically insignificant at 1% level of significance. On the other hand, a negative coefficient of trade openness reveals that if trade openness increase by 1%, employment would contract by 0.01 at 5% level of significance. These variables have a long-run relationship with employment as suggested by Engle-Granger and Phillip ouliaris tests for cointegrating regressions equations.

4.3.4 The Canonical Cointegration Regression (CCR) Model

The estimated CCR regression equation is reported as follow:

$$LEMP = -\mathbf{18.25} - \mathbf{0.16}LFDI + \mathbf{1.68}LGDP + \mathbf{0.01}INF - \mathbf{0.01}TOP + 0.13LLC \qquad (14)$$

The CCR results suggest that increasing FDI inflows by 1% would result to a 0.16% decrease in employment in the long-run at 1% level of significance, *ceteris paribus*. In contrast, a 1% increase in GDP, inflation and labour cost causes employment levels to rise by 1.68%, 0.01% and 0.13% at 1%, 10% and labour cost is insignificant to affect employment, respectively. Moreover, a negative coefficient of trade openness indicates that a 1% rise in trade openness would lead to employment to contract by 0.01%. These results validate the results obtained from the VECM, FMOLS and DOLS.

4.4 Summary of the Empirical Results

The section gives the summary of the overall empirical results estimated by both multiple and single equation methods. Table 3 below presents the summarised results of both short and long-run coefficients for each variable affecting employment (LEMP) for the purpose of simplicity when discussing and comparing the empirical findings.

Table 3: Summary of Short and Long-Run Relationships

Sample Size 1985 to 2015 (Annual Data, i.e., 36 Observations)						
Variables	**VECM**		**OLS**	**FMOLS**	**DOLS**	**CCR**
	SR	**LR**				
LEMP	0.38**	**-**	**-**	**-**	**-**	**-**
LFDI	-0.13***	-0.64***	-0.13***	-0.16***	-0.24***	-0.16***
LGDP	0.18	5.21**	0.65***	1.72***	1.61***	1.68***
INF	**-**	**-**	0.005	0.01**	0.02**	0.01*
TOP	**-**	**-**	-0.002	-0.01***	-0.01*	-0.01***
LLC	**-**	**-**	0.13***	0.12	0.28***	0.13

Notes:

- SR and LR denote short and long-run, respectively.
- ***, **and * indicate statistical significance level at 1%, 5% and 10% respectively.
- The ECM (α) coefficients for the VECM model are not included in this table but are discussed under subsections 4.2.

The summary of results for VECM, FMOLS, DOLS and CCR methods provide evidence of a long-run cointegrating relationship between employed variables in both single and systems of equations. These empirical findings clearly demonstrate that the effect of FDI on employment levels in the South African economy is negative and highly significant at 1% significance level in both short and long-run relationship in all models under consideration. The results for both system and single equation models generates a negative short and long-run coefficient capturing the impact of FDI on employment. The short-run coefficients of FDI estimated by the VECM and OLS model is -0.13% for both models significant at 1% level of significance. The empirical findings of this study are plausible and make economic sense because all models that were estimated produced coefficients that point in the same direction in both short and long-run.

In the long-run, both multiple and single equations methods complements one another suggesting the FDI negatively and significantly affect employment, and its long-run coefficients ranges from -0.64%, -0.16%, -0.24% and -16% under VECM, FMOLS, DOLS and CCR, respectively and all significant at 1% level of significance. Hence, all models that tests for a long-run cointegrating relationship suggests that FDI has a negative and statistically significant impact on employment levels in the long-run in the economy of South Africa. The VECM results reveals that if FDI increases by 1%, then employment levels would contract by 0.64% in the long-run. The FMOLS, DOLS and CCR results suggest that a 1% rise in FDI would lead to a 0.16%, 0.24% and 0.16% fall in employment level in the long-run, respectively. These findings are consistent with the empirical literature conducted on the same subject area such as (Jenkins, 2006; Bailey & Driffield, 2007; Binh, 2013; Wei, 2013; Onimisi, 2014 and Beyar, 2014).

The long-run coefficient elasticity of LGDP indicates that GDP plays a very important role in increasing employment levels in South Africa's economy. The estimated results of the VECM, FMOLS, DOLS and CCR suggest that if GDP were to rise by 1%, employment levels would increase by 5.21%, 1.72%, 1.61% and 1.68%, at 5% and 1% level of significance, respectively. This finding is in line with economic theory and empirical evidence given by prior studies on the same subject area. The VECM and OLS short-run coefficients are both positive and statistically significant at 1% level of significance for OLS model but for VECM, the short-run elasticity coefficient if insignificant to affect employment levels. In a short-run, VECM and OLS suggest that a 1% rise in GDP would results to a 0.18% and 0.65% rise in employment levels, respectively. In a nutshell, GDP plays an important role in improving employment levels in both short and long-run.

The elasticity magnitude of inflation ranges from 0.01%, 0.02% and 0.01% significant at 5% for FMOLS and DOLS, and significant a 10% for CCR, respectively. The coefficients for labour costs are 0.12%, 0.28% and 0.13% under FMOLS, DOLS and CCR, respectively and only DOLS coefficient is statistically significant at 1% level of significance. The short-run coefficients of inflation and labour cost under OLS model are 0.002% and 0.13% significant at 1% but inflation is insignificant to affect employment.

On the other hand, the coefficients magnitudes of trade openness is -0.01% for all three single cointegrating regression equations (FMOLS, DOLS and CCR) at 1%, 10% and 1% level of significance, respectively. This implies that a 1% increase in trade openness would lead to a 0.01% decline in employment levels. The OLS short-run coefficient for trade openness was also found negative but statistically insignificant to influence employment in the short-run. OLS results suggest that a 1% rise in trade openness would lead to a 0.002% decrease in employment levels. This finding also contradict with several empirical literature presented by prior studies, however the economic reasoning behind this relationship could be that our major trading partners are providing cheap imports which could lead to a negative effects domestic output, and thus employment levels.

The single equation model (OLS, FMOLS, DOLS and CCR) provides the results that are consistent with those of the VECM method in all cases with respect to both short and long-run coefficients of employment, FDI and GDP. The magnitudes of the coefficients of variables tend to vary closely between the VECM multi-equation approach and the single equation models. Hence, most of these variations are consistent with the economic theory. The implication of a negative short and long-run FDI coefficients is that that FDI cannot be used to promote employment levels in the South African economy but FDI are good for the overall economic growth and development capacity of the country. These empirical findings suggest that FDI inflows lead to a jobless growth in the South African economy, as suggested by Ricardo (1821) in his theory of “jobless growth”.

5. Conclusion

The empirical results from both systems (VAR/VECM) and single (OLS, FMOLS, DOLS and CCR) equations models reveal that FDI inflows results to contraction of employment levels in both short and long-run overview of the South African economy. These findings are in line with the “Jobless Growth” theory that was formulated by Ricardo (1821) which states that there is a negative relationship between investment, output expansion and job creation because capital investment is a perfect substitute for labour in the economy. The results are also supported by a number of global researchers (Fedderke & Room, 2004 and Pinn et al, 2011) who suggest that FDI are more capital-intensive rather than labour-intensive and therefore they tends to sacrifice domestic employment opportunities.

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Appendix: The VECM Results for Cointegrating Vectors

Vector Error Correction Estimates
Date: 02/08/17 Time: 21:03
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LEMP(-1)	1.000000
LFDI(-1)	0.638470 (0.29246) [2.18314]
LGDP(-1)	-5.217160 (1.81103) [-2.88077]
C	62.63943 (22.9595) [2.72826]

Error Correction:	D(LEMP)	D(LFDI)	D(LGDP)
CointEq1	-0.024308 (0.00921) [-2.63933]	-0.149597 (0.03812) [-3.92415]	-0.016949 (0.00554) [-3.06127]
D(LEMP(-1))	0.381655 (0.14981) [2.54766]	-0.187462 (0.62008) [-0.30232]	-0.001161 (0.09006) [-0.01289]
D(LFDI(-1))	-0.134343 (0.04117) [-3.26326]	0.154786 (0.17040) [0.90835]	-0.041877 (0.02475) [-1.69206]
D(LGDP(-1))	0.181374 (0.32212) [0.56306]	-1.276555 (1.33332) [-0.95742]	0.281131 (0.19365) [1.45177]
R-squared	0.490297	0.162308	0.124363
Adj. R-squared	0.439327	0.078539	0.036799
Sum sq. resids	0.037295	0.638984	0.013479
S.E. equation	0.035259	0.145943	0.021196
F-statistic	9.619287	1.937567	1.420254
Log likelihood	67.61525	19.31811	84.91735
Akaike AIC	-3.742074	-0.901065	-4.759844
Schwarz SC	-3.562502	-0.721494	-4.580272
Mean dependent	0.015992	0.177272	0.021313
S.D. dependent	0.047088	0.152036	0.021597

Determinant resid covariance (dof adj.)	1.07E-08
Determinant resid covariance	7.35E-09
Log likelihood	173.6580
Akaike information criterion	-9.274000
Schwarz criterion	-8.555713