Determinants of FDI in South Africa: Do macroeconomic variables matter?

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DETERMINANTS OF FDI IN SOUTH AFRICA: DO MACROECONOMIC VARIABLES MATTER?

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ABSTRACT: In this study we examine the macroeconomic determinants of FDI for the South African economy using data collected between 1994 and 2016 using the ARDL model for cointegration. The specific macroeconomic determinants which are used in the study are per capita GDP, the inflation rate, government size, real interest rate variable, and terms of trade. With the exception of inflation the remaining macroeconomic determinants employed in the study are positively and significantly related with FDI. However, in the short-run all variables are positively and significantly correlated with FDI. Collectively, these results have important implications for policymakers.

Keywords: FDI; ARDL cointegration; Financial crisis; South Africa.

JEL Classification Code: C13; C22; C51; C52; F21.

1 INTRODUCTION

With the rise of globalization, FDI has been viewed as an important stimulus for productivity, economic growth and general welfare in both developing and developed economies. Although no consensus has been 'carved in stone' within the current literature, many scholars have rigorously argued that the benefits of FDI far outweighs its adverse effects. As conveniently mentioned by Jadhav (2012), emerging economies together attract more than half of the global FDI inflows and as international consumption and international production has shifted to emerging economies, MNC's are increasingly investing in both efficiency-seeking and market-seeking projects in these emerging countries. Nevertheless, FDI flows into the Sub-Saharan African (SSA) region over the last couple of decades has been particularly disappointing. This is due to the fact that African countries tend to be less open than other emerging markets, are perceived as very risky, and despite improvements in the policy environment, these countries have lost ground relative to other regions (Asedu, 2002). This is quite disconcerting since FDIs are quite appreciated in African countries as they could be used to direct capital flows to facilitate new technology developments, improve worker's skills and market access, reduce unemployment and therefore provided change to growth and development as well as to assist the host country in times of distress, such as financial difficulty (Ahmed et al, 2005).

In order to attract more FDI into Africa, it is imperative that policymakers are able to identify the major macroeconomic determinants of FDI hence much research has been conducted on the determinants of FDI with no conclusive consensus being reached in the literature so far (see Moosa and Cardak (2006), Kolstad and Villanger (2008), Jadhav (2012), Tintin (2013) for examples). In this current study, we make the South African economy subject to the empirical investigation of the determinants of FDI. We consider this research as being a worthwhile contribution to the literature for a number of reasons. For starters, South Africa, as an African economy, has being inducted into prestigious blogs such as the G20 countries and is currently the only African representative economy ranked within the top 25 FDI destination according to the A.T. Kearney FDI confidence index. Hence, South Africa may be viewed as

a gateway of FDI into Africa, of which increasing FDI flows into the country would prove beneficial to the continent via spillover effects. Secondly, there is no literature, to the best of our knowledge, which has investigated the macroeconomic determinants of FDI for the case of South Africa as a country-specific case study. Infact, previous related studies can only be traced to panel studies which include South African data amongst a host of other countries which have various economic discrepancies and thereafter generalize the obtained findings for all countries under investigation. Under such circumstances, performing a country-specific study could reveal findings which would otherwise be undetected in panel studies. Thirdly, due to the country's political history, the economy is largely characterized by an unequal distribution of wealth, amass unemployment and desperately needs to improve its worker skill, reduce unemployment, increase economic growth and development as well as improve market access. In this regards, FDI can assist policymakers in the country in improving economic growth, reducing unemployment, inequality and poverty we well as opening the country to foreign markets. Fourthly, with currently low annual savings rate of 14 to 16 percent of GDP makes the attraction of FDI very important to an emerging economy like South Africa, which has an investment requirement of between 25 to 30 percent of GDP per annum as articulated in national policy frameworks (Fedderke and Romm, 2006). Lastly, with South Africa's current sovereign debt ranking under threat, the rate of foreign direct investment is expected to decrease and therefore an examination into the determinants of FDI flows would have useful bearings for policymakers in terms of identifying which macroeconomic variables could be manipulated as a means of attracting FDI inflows.

In our study, we formally investigate the macroeconomic determinants of FDI for the South African economy over a period spanning between 1994 and 2016. Our choice of empirical methodology is the autoregressive distributive lag (ARDL) model of Pesaran et al. (2001) which is preferred over other competing cointegration models for the following reasons. Firstly, unlike other multivariate models like the vector autoregressive (VAR) models or the vector error correction model (VECM), the ARDL model can be applied to a group of time series data that is a mixture of I(0) or I(1) variables. Secondly, conventional cointegration methodologies typical estimate the steady-state relationship within a system of equations whilst

the ARDL model estimates single reduced-form regression. Therefore the ARDL model circumvents the issue of placing theoretically-sound restrictions within a system of equations. Lastly, the ARDL model performs exceptionally well even when the time series does not span over long periods. This last point allows us to perform a sensitivity analysis in which empirical estimates are performed on two smaller sub-samples, with one corresponding to the pre-crisis period and the other corresponding to the post-crisis period. This sensitivity analysis is important since it is currently debated as to whether the global financial crisis as orchestrated by the bankruptcy of major investment banks in the US in 2007 has affected the flow of FDI to developing countries. Therefore, our study will enable us to determine whether there has been a shift in the dynamics concerning the determinants of FDI in South Africa in light of the credit crunch of 2007. These findings would ultimately prove useful to policymakers in their quest to attract increasing FDI flows into the country.

Having introduced and given a motivation for the study, the remainder of the manuscript is organized as follows. The second section of the paper is the literature review of the study. The third section presents the methodology of the study whilst the fourth section presents the empirical data and estimation results. The paper is concluded in the fifth section of the paper.

2 LITERATURE REVIEW

2.1 Theoretical review

From a theoretical perspective, FDI is generally considered to be an outcome of some form of market imperfection, a feature which saw conventional dynamic theories such as the neoclassical model fail to adequately account for international FDI movements. The main shortcoming of dynamic growth theories in explain FDI is the treatment of FDI as a mere sub-set of portfolio investment, and as a consequence, international productive activity cannot be logically incorporate into such models. However, with the growth of international FDI flows in the post-World War II period, particularly from the US to Western European countries, a

number of alternative theories based on market imperfections emerged and the success of these theories can be described as having evolved over three phases.

The first phase, which corresponds to periods immediately subsequent to the Second World War when the US manufacturing firms took advantage of technology advances it had over its international competitors and began to export manufactured products to the European countries. At the time, traditional capital market theories dominated the paradigm with FDI's being viewed as a response to differences in rates of return to capital and this view was backed by factual experience, in which higher interest rate differentials experienced between the US and European countries allowed US entities to obtain a higher rate of return from aboard in comparison to those obtained from domestic investments. Notably, these capital market theories only account for FDI flows into foreign markets as monetary units which are internationally transmitted strictly under the assumption of immobility of factors of production and consequentially, they do not manage to explain the logical process of how Multi-National Enterprises (MNE's) gain control in these markets. Moreover, much of this theory failed to properly address FDI developments in less developed economies which are typically characterized by highly imperfect markets with heavily regulated foreign exchanges (Makoni, 2015).

In his much celebrated doctorate thesis, Hymer (1960) was the first to formally discredit the 'rate of return differential' hypothesis by articulating the process of FDI as one in which MNE's maintain control over productive activities outside it's national borders hence translating FDI into international production (Denissa, 2010). Despite, being regarded as a huge leap in the development of FDI theory, Hymer's (1960) thesis was eventually criticized on the basis of not providing a completely sound explanation of FDI, in the sense that it does not explain where and when FDI will take place (Nayak and Choudury, 2014). This observed hiatus was overcome in yet another important theoretical contribution of Vernon (1966) who provided an explanation as to how factors such as the availability of larger and cheaper capital, superior management, discovery of new products, product differentiation, all interact over time to determine production, export and foreign investment patterns of oligopolistic firms (Nayak and

Choudury, 2014). This theory has been more popularly dubbed as the 'production cycle theory' and particularly outlines a four-staged cycle of US FDI flows into European countries between 1940 and 1970, with FDI's being most visible during the later stages (i.e. maturity and declining stages) of the production cycle, after products are standardized in markets and have reached their maturity.

Under the second phase of theoretical development, the 'industrial organization approach' took centre stage as mainstream FDI theory whose foundation come courtesy of Hymer's (1976) firm specific advantage theory, Knickerbockers (1973) oligopolistic reaction theory as well as Buckley and Casson's (1976) modification of Coase (1937) internalization theory . These micro-foundational theories attempt to explain the motivations of investment across national borders from an investors' perspective and specifically argue that when MNE's establish a business in a foreign country it is faced with a number of challenges of competing with local firms (i.e. culture, language, legal system, consumer preferences) and the only way that these disadvantages can be offset is via some form of market power. Dunning (1980) amalgamated these theories by introducing an eclectic framework which contextualized ownership, internalization and localizing advantages attained by MNE's as a three-tier blueprint for the engagement of FDI and international production (Makoni, 2015).

However, with the vast exclusion of a theory of FDI based on macroeconomic foundations, the industrial organization approach has been deemed as being rather inconsistent with explaining FDI in developing countries. In this regard, Wilhelms et al. (1998) institutional FDI theory stands as the new paradigm for investigating the macroeconomic determinants of FDI flows, more particularly so for developing countries. According to Wilhelms et al. (1998), it is not the largest countries which attract the most FDI but those which adapt more cleverly and fitting to existing conditions. From this perspective, government and market institutions represent the most crucial pillars of attracting FDI on a macroeconomic platform and are easily measurable by variable such as government size, inflation, GDP growth and terms of trade. Indeed, many empirical studies have found that such 'premier' macroeconomic time series variables are important determinants of FDI inflows in developing and, especially African

countries. Such evidence is expounded upon in the empirical review of previous studies which is presented in the following sub-section of the paper.

2.2 Empirical review

There exist a plethora of previous empirical studies which have investigated the determinants of FDI for various countries, using different potential determinant variables and employing a wide range of estimation methodologies. Comprehensive reviews of the associated literature have been conveniently summarized in the works of Agarwal (1980), Blongien (2005), Assuncao et al. (2011) and Metaxas and Kechagia (2016). In view of the overwhelming empirical literature on the subject matter, we restrict our review to studies which have included South African data in their analysis. After conducting an extensive review of the literature, we find that the panel works of Morisset (2000), Asiedu (2002), Bende-Nabende (2002), Onyeiwu and Shrestha (2004), Ang (2007), Suliman and Mollick (2009), Vijayakumar et al. (2010), Anyunwa (2011), Sichei and Kinyondo (2012), Kariuki (2015) and Rodriguez-Pose and Cols (2017) suffice an exhaustible list of these studies.

One the earliest studies on the subject matter for African countries is the study of Morisset (2000). The study applied panel estimation techniques to 29 SSA countries using data collected between 1990 and 1997 to establish that GDP growth and trade openness are the most significant determinants of FDI inflows into Africa. Another prominent earlier study was presented by Asiedu (2002) who employed simple pooled OLS estimates for 71 African countries using data collected between 1988 and 1997. The authors are able to find that openness, infrastructure, per capita GDP, government size, inflation all produce a positive effect on FDI whilst political instability exerts a negative effect on FDI. Using a vector error correction model (VECM), Bende-Nabende (2002) investigate the determinants of FDI for 19 African countries from 1988 to 1998 and find that market size, GDP growth, openness, liberalization, real wages, exchange rates and education are significant determinants of African FDI's.

In a separate study, Onyeiwu and Shrestha (2004) investigate the FDI determinants for 29 African countries between 1975 and 1999 using the fixed effects and random effects estimators. The authors find a positive effect for GDP growth, openness, external debt, political stability and natural resources index whilst establishing a negative effect towards inflation, real interest rate, international reserves and taxation. On the other hand, Ang (2007) who employ the two-stage least squares methodology to investigate the determinants of FDI for Malaysia using data collected from 1960-2005. The authors find that financial development, GDP growth, trade openness, government size and macroeconomic uncertainty all exert a positive effect on FDI whilst the real exchange rate and taxation are both negative related with FDI. Meanwhile, Suliman and Mollick (2009) investigate FDI determinants for 29 SSA countries using data collected between 1980 and 2003 and find that whereas per capita GDP growth, literacy rates, openness and infrastructure have a positive effect on FDI, on the other hand political rights, civil rights and liquidity size of the market all exert a negative effect on FDI.

For BRICS countries, Vijayakumar et al. (2010) conducted their empirical analysis using fixed effects and random effects panel estimators to data collected between 1975 and 2007. The authors find that whilst GDP growth, the industrial production index, workers remittances, infrastructure index and trade openness, on the other hand infrastructure index, domestic investment and the real effective exchange rate exert negative effect on FDI. Anyunwa (2011) employ the OLS and GLS estimates to investigate the determinants of FDI for Africa between 1980 and 2007. The authors establish that FDI is positively related with urbanization, openness, infrastructure, government size and international remittances whilst being negatively correlated with per capita GDP, financial development, inflation rate, exchange rate, and index of political rights.

In another study, Sichei and Kinyondo (2012) investigate the FDI determinants for 45 African countries using data collected between 1980 and 2009. The empirical results indicate that macroeconomic variables such as GDP growth, openness and natural resources are all positive determinants of FDI. Using the least squares technique, Kariuki (2015) examined the determinants of FDI for 25 African countries using data collected between 1984 and 2010. The

authors find that economic, financial and political risk adversely affect FDI whereas political risk, inflation, stock market index, investment and trade openness all positively affect FDI. Mijiyawa (2015) uses the systems GMM model to investigate the FDI determinants for 53 African countries using data collected between 1970 and 2009. The findings reveal that trade openness, political stability, infrastructure, market size and per capita GDP are positively related with FDI, inflation adversely affects FDI. In a more recent study, Rodriguez-Pose and Cols (2017) establish a wider range of determinants which attract FDI into 22 SSA countries. The authors establish that natural resources, market size, political stability, government effectiveness, lower corruption are important determinants in attracting FDI inflows.

3 METHODOLOGY

Within the empirical literature, researchers commonly assess the determinants of FDI by regressing FDI on a set of potential determinant variables. Typically, the estimation regression assumes the following functional form:

$$FDI_t = \alpha + \beta_1 X_t + e_t \quad (1)$$

Where FDI is a measure of foreign direct investment, X_t is a vector containing the potential determinants of FDI and e_t is a normally distributed residual term. As shown in the literature review, various authors have used different FDI determinants and in our study we restrict these determinants to five macroeconomic variables commonly found in the literature. Our first determinants variable is per capita GDP (i.e. PCGDP) which is assumed to exert a positive effect on FDI (Asiedu (2002) and Mijiyawa (2015)). The second variable is the inflation rate (i.e. INF) which is assumed to be adversely correlated with FDI (Asiedu (2002), Onyeiwu and Shrestha (2004), Kariuki (2015)). The third determinant variable is government size (i.e. GOV) which should be positively correlated with FDI (Asiedu (2002), Anyunwa (2011)). The fourth variable is the real interest rate variable (i.e. RINT) which is assumed to have a positive effect on FDI (Onyeiwu and Shrestha (2004),). Lastly, we choose the terms of trade (i.e. TOT) variable which is hypothesized to exert a positive effect on FDI (Asiedu (2002),

Kariuki (2015), Mijiyawa (2015)). All-in-all, our vector of growth determinants can be represented as:

Xt = {PCGDP, INF, GOV, RINT, TOT} (2)

As earlier hinted, our empirical study relies on the ARDL cointegration methodology introduced by Pesaran et al. (2001). We particularly specify six ARDL regressions to achieve our end result of examining long-run and short-run cointegration relations between FDi and it's potential determinants. The first ARDL regression is:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta PCGFDP_{t-i} + \beta_1 FDI_{t-i} + \beta_2 PCGDP_{t-i} + \varepsilon_t \quad (3)$$

With the associated error correction model (ECM) being specified as:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta INF_{t-i} + \gamma_1 ECT_{t-i} + u_t \quad (4)$$

The second ARDL model regression is:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta INF_{t-i} + \beta_1 FDI_{t-i} + \beta_2 INF_{t-i} + \varepsilon_t \quad (5)$$

With the associated error correction model (ECM) being specified as:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta INF_{t-i} + \gamma_1 ECT_{t-i} + u_t \quad (6)$$

The third ARDL model regression is:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta RINT_{t-i} + \beta_1 FDI_{t-i} + \beta_2 RINT_{t-i} + \varepsilon_t \quad (7)$$

With the associated error correction model (ECM) being specified as:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta RINT_{t-i} + \gamma_1 ECT_{t-i} + u_t \quad (8)$$

The fourth ARDL model regression is:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta GOV_{t-i} + \beta_1 FDI_{t-i} + \beta_2 GOV_{t-i} + \varepsilon_t \quad (9)$$

With the associated error correction model (ECM) being specified as:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta GOV_{t-i} + \gamma_1 ECT_{t-i} + u_t \quad (10)$$

The fifth ARDL model regression is:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta TOT_{t-i} + \beta_1 FDI_{t-i} + \beta_2 TOT_{t-i} + \varepsilon_t \quad (11)$$

With the associated error correction model (ECM) being specified as:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta TOT_{t-i} + \gamma_1 ECT_{t-i} + u_t \quad (12)$$

And the last ARDL model regression is:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta PCGDP_{t-i} + \sum_{i=1}^{n} \phi_3 \Delta INF_{t-i} + \sum_{i=1}^{n} \phi_4 \Delta RINT_{t-i} + \sum_{i=1}^{n} \phi_5 \Delta GOV_{t-i} + \sum_{i=1}^{n} \phi_6 \Delta TOT_{t-i} + \beta_1 FDI_{t-i} + \beta_2 PCGDP_{t-i} + \beta_3 INF_{t-i} + \beta_4 RINT_{t-i} + \beta_5 GOV_{t-i} + \beta_6 TOT_{t-i} + \varepsilon_t \quad (13)$$

With the associated error correction model (ECM) being specified as:

$$\Delta FDI_t = \sum_{i=1}^{n} \phi_1 \Delta FDI_{t-i} + \sum_{i=1}^{n} \phi_2 \Delta PCGDP_{t-i} + \sum_{i=1}^{n} \phi_3 \Delta INF_{t-i} + \sum_{i=1}^{n} \phi_4 \Delta RINT_{t-i} + \sum_{i=1}^{n} \phi_5 \Delta GOV_{t-i} + \sum_{i=1}^{n} \phi_6 \Delta TOT_{t-i} + \gamma_1 ECT_{t-i} + \varepsilon_t \quad (14)$$

From regressions 3 through 14, β's represents the long-run regression coefficients, ϕ's represent the short-run regression coefficients and ECT is an error correction mechanism which measures the speed of adjustment in the advent of a disequilibrium. Pesaran et al. (2001) propose the bounds test for cointegration by testing the joint null hypothesis of whether the long-run coefficients are significantly different from zero i.e.

$$H_0: \beta_1 = \beta_2 = \ldots = \beta_i = 0 \quad (15)$$

An F-statistic is computed to test the null hypothesis of no ARDL cointegration effects of which there exists three possible outcomes. Firstly, the F-static can be lower than the lower bound of the associated critical values of which the null hypothesis of no cointegration effects is rejected. Secondly, the computed F-statistic can be of greater value than the upper bound of the critical values. Lastly, the F-statistic can lie in-between the upper and lower bounds of the critical values and this signifies an inconclusiveness concerning cointegration effects.

4 DATA AND EMPIRICAL RESULTS

4.1 Data description and unit root tests

The empirical data used in our study has been collected from various data sources and has been collected on an annual basis for a period ranging from 1994 to 2014. The details of the dataset are provided in Table 1 whereas the descriptive statistics and correlation matrix are given in Table 2. The descriptive statistics reveal some interesting information such as the low averages of 0.82 for FDI inflows into the country over the sample period. These low levels may be primarily attributed to the 'non-existence' of FDI's during the 1980's and early 1990's due to economic sanctions placed on the economy. Even though sanctions were eventually lifted off the economy, FDI inflows have been problematic into the country, most notably during the period of the financial crisis. We also note low average levels of 0.51 percent for per capita GDP, which as more effective measure of welfare compared to GDP, essentially reflects the

low levels of individual welfare faced by the South African economy as a whole in terms of inequality and other social ills.

On the other hand, the inflation average over the sample period is 9.37 and notably this statistic is well above the upper limit of the 3 to 6 percent target range as specified by the South African Reserve Bank (SARB). Similarly, we note a relatively moderate average 3.06 percent for real interest rates, and in view of the 'not-so-low' inflation rates faced by the economy, this observation reflects the high use of increases in nominal interest rates as practiced by the Reserve Bank in their efforts to keep inflation within it's target. The size of government, as measure by it's expenditure averages just over 25 percent of GDP over the sample period whilst trade as percentage of GDP averages 52.40 percent, and this latter result indicates that since the 1990's openness has been a pivotal component of economic prosperity towards the South African economy. In quickly scrutinizing through the correlation coefficients reports in Panel B of Table 2, all time series variables have positive correlations with FDI, that is, with the sole exception of the inflation series. These preliminary correlations more-or-less confirm to those predicted by conventional economic theory.

Table 1: Variables and expected signs

Variable	Data source	symbol	Expected sign
Dependent variable			
Foreign direct investment	World Bank	FDI	
Independent variable			
Per capita GDP	SARB	PCGDP	+
CPI inflation rate	SARB	INF	-
Government expenditure as a ratio of GDP	SARB	GOV	+
Real interest rate	World Bank	RINT	+
Trade (as % of GDP)	World Bank	TOT	+

Table 2: Descriptive statistics and correlation matrix

	FDI	RINT	PC GDP	INF	GOV	TOT
Panel A: Descriptive statistics						
Mean	0.82	3.06	0.51	9.37	25.10	52.40
Median	0.477	3.51	0.94	8.94	25.00	51.64
Maximum	5.98	13.01	4.23	18.65	29.90	72.87
Minimum	-0.84	-12.31	-4.55	1.39	19.40	37.48
Std. Dev.	1.21	4.72	2.33	4.19	2.53	7.74
Jarque-Berra	87.23	11.80	2.51	2.39	0.38	0.36
Probability	0.00	0.00	0.29	0.30	0.83	0.83
Panel B: Correlation matrix						
FDI	1.00					
RINT	0.27	1.00				
PCGDP	0.31	-0.04	1.00			
INF	-0.45	-0.36	-0.46	1.00		
GOV	0.08	0.39	-0.24	-022	1.00	
TOT	0.34	-0.17	0.38	0.22	1.20	1.00

Prior to modelling our ARDL regressions, it is imperative that we perform unit root tests on our employed time series variables. To recall, ARDL modelling procedure requires the variables to be integrated of either order I(0) or I(1), henceforth we are required to perform unit root testing procedures on the variables. To this end we perform ADF, PP and DF-GLS unit root tests, with i) an intercept and ii) a trend, on the observed series with the results of this empirical exercise been documented in Table 3. As can be easily seen from our reported results, the unit root tests results procedure a variety of mixed empirical evidences. For instance, we note that real interest rates and per capita GDP unanimously reject the unit root null hypothesis in both levels and first differences regardless of whether the test are performed with an intercept or a trend hence rendering these variables as being I(0). On the other hand, the inflation, government size and terms of trade time series reject the null hypothesis of unit roots in a vast majority of the performed tests whilst retain stationarity when all unit root tests are performed on the first differences on the variables. Finally, for the FDI variable in its levels, only the PP test rejects the unit root null hypothesis when performed with either an intercept or a trend

whereas the ADF and DF-GLS test reject the unit root hypothesis only when performed with a trend. Nevertheless, in it's first difference FDI retains its stationarity in all conducted unit root tests. In collectively summarizing our results, we note that none of the observed series is integrated of an order higher than I(1) hence permitting us to officially employ the ARDL model.

Table 3: Unit root tests on levels

TIME SERIES VARIABLES	ADF		PP		DG-ERS	
	INTERCEPT	TREND	INTERCEPT	TREND	INTERCEPT	TREND
FDI	-1.41	-5.72***	-4.83***	-5.71***	-1.32	-5.06***
ΔFDI	-8.54***	-8.42***	-17.10***	-17.06***	-3.29***	-7.98***
RINT	-3.24**	-3.78**	-3.21**	-3.78**	-3.27***	-3.67**
ΔRINT	-6.67***	-5.86***	-9.65***	-9.47***	-7.61***	-6,65***
PCGDP	-4.26***	-4.31**	-4.25***	-4.25**	-3.95***	-4.11***
ΔPCGDP	-7.00***	-6.91***	-19.63***	-19.23***	-6.42***	-6.89***
INF	-1.99	-3.12	-2.12	-3.14	-1.62*	-2.15
ΔINF	-6.24***	-6.33***	-6.99***	-8.07***	-5.33***	-6.32***
GOV	-2.04	-2.90	-2.03	-2.90	-0.74	-2.62
ΔGOV	-7.25***	-7.17***	-7.52***	-7.45***	-2.55**	-4.13***
TOT	-1.87	-2.20	-1.94	-2.11	-1.77*	-2.25
ΔTOT	-6.62***	-6.54***	-8.05***	-8.28***	-6.69***	-6.68***
CRITICAL VALUES						
1%	-3.81	-4.49	-3.77	-4.44	-2.67	-3.77
5%	-3.02	-3.66	-3.00	-3.63	-1.95	-3.19
10%	-2.65	-3.27	-2.64	-3.25	-1.60	-2.89

Notes: "***", "**", "*" denote the 1 percent, 5 percent and 10 percent significance levels. Δ denotes a first difference operator.

4.2 ARDL cointegration analysis

The first step in our modelling process involves conducting bounds test for ARDL cointegration on the six model regressions specified earlier in the paper. The results of this empirical exercise have been summarized in Table 4. In scrutinizing through the results, we note that all obtained F-statistics exceed the upper bound of the 1 percent critical level hence

rejecting the null hypothesis of no cointegration effects for all formulated regressions. In light of this evidence, we proceed to provide long-run and short-run ARDL estimates for the regressions.

Table 4: Bounds test for ARDL cointegration effects

Regression specification	F-statistic	95% lower bound	95% upper bound	90% lower bound	90% upper bound	Decision
f(fdi|rint)	7.90	3.51	3.02	4.16	3.62	cointegrated
f(fdi|inf)	10.70	3.51	3.02	4.16	3.62	cointegrated
f(fdi|pcgdp)	10.61	3.51	3.02	4.16	3.62	cointegrated
f(fdi|pcgdp)	7.61	3.51	3.02	4.16	3.62	cointegrated
f(fdi|tot)	8.21	3.51	3.02	4.16	3.62	cointegrated
f(fdi|rint, inf, pcgdp, gov, tot)	5.41	3.00	2.08	3.38	2.39	cointegrated

Notes: "***", "**", "*" denote the 1 percent, 5 percent and 10 percent significance levels. First difference statistics reported in parentheses ().

Panel A of Table 5 reports the long-run regression of the ARDL regression. We find that when the potential FDI determinants are regressed exclusively on FDI, as shown by regression functions f(FDI|PCGDP), f(FDI|INF), f(FDI|RINT), f(FDI|GOV) and f(FDI|TOT). We notice positive and statistically significant coefficient real interest rates, per capita GDP, government size and terms of trade whereas a negative and significant coefficient estimate is obtained for the inflation variable. Collectively, these results are in coherence with those presented in the former studies of Asiedu (2002), Onyeiwu and Shrestha (2004), Kariuki (2015), Mijiyawa (2015). However, when all FDI determinants are simultaneously regressed on FDI, as depicted by regression function f(FDI|RINT, INF, PCGDP, GOV, TOT), the signs produced on the coefficient estimates remain the same albeit being statistically insignificant.

Panel B of Table 5 reports the short-run and error correction coefficient estimates. We note that when the determinants are regressed separately on FDI, as in the f(FDI|PCGDP), f(FDI|INF), f(FDI|RINT), f(FDI|GOV) and f(FDI|TOT) regressions, then all coefficients then all short-run coefficients produce positive estimates which are statistically significant at a 10

percent critical level. However, when all determinants are simultaneously regressed on FDI (i.e. f(FDI|PCGDP, INF, RINT, GOV,TOT)) then none of the short-run coefficients are significant. On the other hand, the error correction terms all produce the correct negative estimates which are significant at all critical levels. The estimates of the error correction terms which range between -0.70 and -0.97 implies that between 70 and 97 percent of disequilibriums are corrected in each period.

Finally, we implement diagnostic test to our estimated regressions residuals. These results comprises of B-C test for serial correlation, ARCH and White's test for heteroscedasticity, and Ramsey's RESET test for functional form. Based on the test results, as reported in Panel C of Table 5, all estimated regression residuals do not suffer from autocorrelation, heteroscedasticity and incorrect functional form hence implying that our obtained empirical results can be meaningfully interpreted. As a supplement to these diagnostic tests, we provide the cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) analysis for all estimated regressions. The CUSUM and CUSUMSQ analysis indicates that the regressions are stable within their 5 percent critical bounds.

Table 5: Long-run and short-run ARDL estimates

	f(fdi|rint)	f(fdi|inf)	f(fdi|pcgdp)	f(fdi|tgov)	f(fdi|tot)	f(fdi|rint, inf, pcgdp, gov, tot)
Panel A: Long-run coefficients						
Rint	0.07 (0.01)***					0.07 (0.10)
Infl		-0.13 (0.01)***				-0.08 (010)
Pcgdp			0.20 (0.07)*			0.01 (0.90)
Gov				0.05 (0.06)*		0.07 (0.50)
Tot					0.06 (0.05)*	0.18 (0.90)
Panel B: Short-run coefficients						
ΔRint	0.05 (0.02)**					-0.06 (0.13)
ΔInf		0.01 (0.09)*				-0.01 (0.86)
ΔPcgdp			0.05 (0.05)*			-0.00 (0.80)
ΔGov				0.08 (0.02)**		0.04 (0.80)
ΔTot					0.06 (0.08)*	0.05 (0.34)
ect(-1)	-0.95 (0.00)***	-0.93 (0.00)***	-0.86 (0.00)***	-0.70 (0.00)***	-0.92 (0.00)***	-0.97 (0.00)***
Panel C: Diagnostic tests and stability analysis Normality						
B-C	0.79	0.17	0.17	0.68	0.48	0.55
ARCH	0.84	0.85	0.90	0.87	0.83	0.77
White	0.97	0.79	0.92	0.88	0.93	0.99
RESET	0.38	0.25	0.08	0.19	0.99	0.24

Notes: "***", "**", "*" denote the 1 percent, 5 percent and 10 percent significance levels. P-values reported in parentheses ().

4.3 Sensitivity analysis

In order to ensure the validity of our empirical estimates obtained thus far, we account for potential structural breaks as caused by the 2007-2008 financial crisis. In this regard, we re-perform our empirical analysis on two sub-periods, with one corresponding to the pre-crisis era (i.e. 1994-2007) and the other corresponding to the post-crisis period (i.e. 2008-2016). Tables 6 and 7 present the results of this empirical exercise, respectively, with Panel A presenting the long-run estimates, Panel B reports the short-run and error correction estimates,

Panel C reports the F-statistics of the bounds test for cointegration, whilst Panel D presents the residual tests as well as the stability analysis of the estimated regressions.

In making comparisons to the full sample estimates previously reported in Table 5, we firstly note, that whilst the signs on the coefficient estimates retain their expected correct signs in both sub-sample periods, the same cannot be said for their significance levels. In particular, we find that during the pre-crisis era only government size is positive and statistically significant at a 5 percent critical level, for in both bivariate and multivariate regressions, whereas the remaining long-run and short-run coefficients are insignificant for all other estimated regressions. Nevertheless, the results obtained for the post-crisis are more optimistic as the inflation rate and government size are statistically significant in both long and short run whereas terms of trade is only statistically significant in the short-run.

We do not consider the results reported for the multivariate regression (i.e. f(FDI|RINT, INF, PCGDP, GOV,TOT) since the F-statistic testing for cointegration as shown in Panel C of Table 7, falls below its associated 10 percent upper bound critical level. However, for the remaining estimated regression in both sub-periods we find that each F-statistic manages to exceed its relevant 10 percent upper critical bound, hence verifying ARDL cointegration in these regressions. Moreover, in similarity to those obtained for the full sample estimates we establish that i) all error correction terms produce the correct negative and significant estimate ii) none of the estimated regression suffers from abnormality of error terms, serial correlation, heteroscedasticity or incorrect functional form and iii) all regression pass the CUSUM and CUSUMSQ analysis for stability of estimated regressions.

Table 6: Long-run and short-run ARDL estimates (pre-crisis)

	f(fdi|rint)	f(fdi|inf)	f(fdi|pcgdp)	f(fdi|tgov)	f(fdi|tot)	f(fdi|rint, inf, pcgdp, gov, tot)
Panel A: Long-run coefficients						
Rint	0.10					0.01
	(0.23)					(0.94)
Infl		-0.03				-0.14
		(0.86)				(0.21)
Pcgdp			0.01			0.15
			(0.98)			(0.74)
Gov				0.45		0.68
				(0.03)**		(0.00)***
Tot					0.47	0.01
					(0.93)	(0.76)
Panel B: Short-run coefficients						
ΔRint	0.04					0.01
	(0.72)					(0.97)
ΔInf		-0.09				-0.21
		(0.52)				(0.17)
ΔPcgdp			0.19			0.08
			(0.41)			(0.80)
ΔGov				0.05		0.16
				(0.89)		(0.78)
ΔTot					0.04	0.05
					(0.77)	(0.72)
ect(-1)	-0.78	-0.72	-0.68	-0.93	-0.70	-0.93
	(0.01)***	(0.02)**	(0.03)**	(0.00)***	(0.02)**	(0.00)***
Panel C: Bounds tests						
F-Statistic	3.98*	4.98**	4.19**	3.56*	4.26**	3.76*
Panel D: Diagnostic tests (p-values)						
Normality	0.00	0.00	0.00	0.03	0.00	
B-C	0.95	0.68	0.67	0.43	0.68	
ARCH	0.55	0.58	0.56	0.53	0.56	
White	0.87	0.79	0.92	0.81	0.82	
RESET	0.77	0.76	0.84	0.55	0.84	
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	Stable	Stable	Stable

Notes: "***", "**", "*" denote the 1 percent, 5 percent and 10 percent significance levels. P-values reported in parentheses (). Critical values for bounds test are similar to those reported in Table 3.

Table 7: Long-run and short-run ARDL estimates (post-crisis)

	f(fdi|rint)	f(fdi|inf)	f(fdi|pcgdp)	f(fdi|tgov)	f(fdi|tot)	f(fdi|rint, inf, pcgdp, gov, tot)
Long-run coefficients						
Rint	1.53					-0.88
	(0.26)					(0.18)
Infl		-0.44				-0.03
		(0.06)*				(0.96)
Pcgdp			0.53			0.04
			(0.18)			(0.90)
Gov				0.73		1.13
				(0.01)**		(0.07)*
Tot					3.61	-0.27
					(0.25)	(0.95)
Short-run coefficients						
ΔRint	0.52					-0.39
	(0.03)**					(0.03)**
ΔInf		-0.24				-0.02
		(0.05)*				(0.63)
ΔPcgdp			0.20			-0.12
			(0.16)			(0.13)
ΔGov				0.59		0.72
				(0.05)*		(0.04)*
ΔTot					0.30	-0.14
					(0.96)	(0.02)**
ect(-1)	-0.33	-0.36	-0.49	-0.77	-0.56	-1.07
	(0.08)*	(0.01)**	(0.09)*	(0.00)***	(0.05)*	(0.02)**
Panel C: Bounds tests						
F-statistic	3.79	3.62	3.66	4.77	3.82	2.71
Panel D: Diagnostic tests (p-values)						
Normality	0.66	0.73	0.94	0.67	0.89	0.55
B-C	0.69	0.90	0.20	0.27	0.85	0.69
ARCH	0.55	0.99	0.89	0.88	0.83	0.48
White	0.68	0.80	0.27	0.78	0.79	0.54
RESET	0.11	0.94	0.85	0.41	0.53	0.39
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	Stable	Stable	Stable

Notes: "***", "**", "*" denote the 1 percent, 5 percent and 10 percent significance levels. P-values reported in parentheses (). Critical values for bounds test are similar to those reported in Table 3.

5 CONCLUSION

Increased worldwide economic integration as experienced over the last couple of decades has resulted in increased cross border activities towards SSA countries hence investing much needed FDI into these economies. In our study, we empirically examine the determinants of FDI for the South African economy which represents one of Africa's largest recipient of

FDI inflows and our empirical sample covers the period of 1994 to 2016. Our selection of FDI determinants includes per capita GDP, the inflation rate, government size, real interest rate variable, and terms of trade. Our choice of empirical methodology is the ARDL model of Pesaran et al. (2001) which presents the advantage of being able to model cointegration effects levels stationary and difference stationary time series. Indeed this empirical methodology proves to be useful as our unit root tests on FDI's and it's macroeconomic determinants reveal that the time series variables are either integrated of order I(0) or I(1). Moreover, we perform a sensitivity analysis which involves re-performing our empirical analysis on two sub-periods corresponding to the pre-crisis (i.e. 1994 - 2007) and the post-crisis (i.e. 2008 – 2016), and more-or-less, the post-crisis results best emulate the full sample estimates especially in terms of significance of regression estimates.

Our empirical results indicate that with the exception of inflation, all other macroeconomic determinants of FDI exert a positive long-run effect on FDI. In the short-run all determinants exert a positive effect on FDI. Our obtained empirical results have specific implications for policymakers. For instance, the finding of a positive correlation between government size and FDI highlights the importance which government plays in attracting FDI. In particular, our obtained results indicate that government spending on large scale fiscal policies like the recently introduced New Growth Path (NGP) and New Development Plan (NDP) may potentially play an important role in increasing FDI in the country. Similarly, the finding of an inverse relationship between inflation and FDI, on one hand, and a positive relationship between real interest rates and FDI, on the other, emphasizes on the importance of keeping inflation low through the Reserve Banks inflation targeting regime of 3-6 percent. According to our empirical results this monetary policy mandate is capable of creating a conducive environment for attracting FDI's. Finally, the findings of a positive FDI-trade openness and FDI-per capita growth relationship indicate that openness and economic welfare are also important contributors to attracting FDI into the country.

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