Linkages between foreign direct investment, trade openness and economic growth in South Africa: Does exchange rate regime choice matter?*

Thobekile Qabhobho**
Edmund Vincent Nyarko Amoah***
Isaac Doku****

Abstract

This paper investigates the linkages between FDI, trade openness, and economic growth, and the role of exchange rate regime choice. To achieve this objective, the study used a secondary data set for the period 1995 - 2018 for South Africa. The study employed the ARDL and Granger causality test. The results showed no Granger causality between GDP and FDI. Uni-directional Granger causality was found to flow from GDP to trade openness and FDI to exchange rate. A bi-directional causality was established between GDP and exchange rate, and between trade openness and exchange rate. A Gregory-Hansen cointegration test was introduced to handle the concept of regime changes in the current study. Findings from the

* This article is an expanded version of a dissertation entitled Foreign direct investment, trade openness and economic growth linkages: The role of exchange rate regime choice in South Africa presented at Nelson Mandela University for the Master of Commerce in Economics.

** Corresponding author. Department of Economics, Nelson Mandela University, South Africa. Email: Thobekile.Qabhobho@mandela.ac.za Received: December 1st, 2021; modifications: August 23rd, 2022; Accepted: August 26th, 2022.

*** Department of Economics, Nelson Mandela University, South Africa. Email: edmundvincento@gmail.com

**** Department of Economics Education, University of Education, Winneba-Ghana. Email: isaacoberkoh27@gmail.com

ARDL with a known structural break for exchange rate regime choice revealed that exchange rate had a significant positive impact on economic growth in the short-run, whereas it had a significant negative impact on economic growth in the long-run. This implies that, during the initial stages of an exchange rate policy, the South African rand appreciated, leading to a boost in economic growth. A change from managed float exchange rate regime to a free float exchange rate regime caused a 1.49% increase in economic growth. This may be interpreted as an indication that the free float exchange rate is a better choice compared to a managed float exchange rate. To conclude, the paper discusses policy implications and suggestions to policymakers in South Africa.

Keywords: Economic growth – exchange rate regimes – foreign direct investment – trade openness – South Africa.

Resumen

Este artículo analiza los vínculos entre la IED, la apertura comercial y el crecimiento económico, y el papel de la elección del régimen cambiario. Para lograr este objetivo, el estudio utilizó un conjunto de datos secundarios para el período 1995 - 2018 para Sudáfrica. El estudio empleó la prueba de causalidad ARDL y Granger. Los resultados no mostraron causalidad de Granger entre el PIB y la IED. Se encontró una causal de Granger uni-direccional del PIB a la apertura comercial y entre la IED al tipo de cambio. Se estableció una causalidad bidireccional entre PIB y tipo de cambio, y entre apertura comercial y tipo de cambio. Se introdujo una prueba de cointegración de Gregory-Hansen para manejar el concepto de cambios de régimen en el análisis actual. Los hallazgos del ARDL con una ruptura estructural conocida para la elección del régimen cambiario revelaron que el tipo de cambio tuvo un impacto positivo significativo en el crecimiento

económico a corto plazo, mientras que tuvo un impacto negativo significativo en el crecimiento económico a largo plazo. Esto implica que, durante las etapas iniciales de una política de tipo de cambio, el rand sudafricano se apreció, lo que generó un impulso en el crecimiento económico. Un cambio de un régimen de tipo de cambio de flotación administrada a un régimen de tipo de cambio de libre flotación provocó un aumento del 1,49% en el crecimiento económico. Esto puede interpretarse como una indicación de que el tipo de cambio de flotación libre es una mejor opción en comparación con un tipo de cambio de flotación administrada. Para concluir, el artículo analiza las implicaciones políticas y las sugerencias para los formuladores de políticas en Sudáfrica.

Palabras claves: Crecimiento económico – regímenes cambiarios – inversión extranjera directa – apertura comercial – Sudáfrica.

Introduction

After the end of apartheid rule in 1994, South Africa as a developing economy has embarked on many changes in its economic strategies. For this purpose, the country adopted economic policies to attract foreign direct investment (FDI) inflows and promote international trade, factors that foster a country's integration into the world. As a result, South Africa has seen a remarkable increase in FDI inflows from R1.3 billion in 1994 to R3.5 billion in 1996. Following this, and after the partial privatisation of the State-own enterprise Telkom, FDI inflows rise to R17.6 billion in 1997 (Masipa, 2018). This peak in FDI was followed by another eventful increase of 671% in 2005, after the acquisition of ABSA by Barclays (Thomas and Leape, 2005). In 2000, South Africa also transitioned from a managed floating to a free-floating exchange rate regime, in order to facilitate trade and attract more inward FDI. This policy was supported by a reduction of trade and investment barriers aiming to attain sustainable growth (Qabhobho, Wait, and Le Roux, 2019).

These policies were expected to impact economic growth, poverty reduction, job creation, and injection of funds into the economy. However, the current trends of economic growth and unemployment statistics are rather disappointing. Currency depreciation and insignificant skills development inversely impact the country's growth. These indicators raise the question about the linkages between FDI, trade openness, and economic growth, and the role of exchange rate policies implemented in the country in the last decades. Therefore, the objective of this study is to examine the linkages between FDI, trade openness, economic growth, and the role of exchange rate regime choice.

The paper is organized as follows. After this introduction, the second section provides the literature review. In the third section a

discussion on data issues and research methodology is presented. The fourth section presents, discusses and analyses the results of the study. Finally, the fifth section provides the conclusions and the implications of the study.

Literature review

The surge in FDI inflows has motivated research regarding its linkages with economic growth. Moreover, the research on the effects of trade openness on economic growth has also gained attention in the field of economic growth. Some research examines the effects of both FDI and trade openness on economic growth in a single study. However, these studies produced mixed results and disregarded the role of exchange rate regimes in facilitating interlinkages. Thus, this study attempts to contribute towards the closure of this gap. In this section, we provide a brief literature review on the interactions between FDI, trade openness, and economic growth.

Masipa (2018), using a vector error correction model, examines the association between FDI and economic growth in South Africa, showing a positive association between FDI and economic growth. A study by Makhoba and Zungu (2021) on the relationship between FDI and economic growth in South Africa, using a vector autoregressive model also found a positive relationship between these variables. This research concludes that host countries receive the necessary human capital development required for economic growth, as well as technological know-how and managerial expertise which are also required for economic development. Gunby, Jin, and Reed (2017) found contradicting results when they assessed the interactions between FDI and economic growth for the case of China, concluding that FDI has no significant impact on the Chinese economy. They further argued that in countries where FDI exerts positive impact, the

pre-existing conditions such as experience with foreign firms, the ownership structure of domestic firms, the source country of FDI, and a moderate technology gap play an important role in FDI's effectiveness.

Another glut of recent empirical research focussed on trade openness-economic growth nexus. Zahonogo (2017) examined the effects of trade on economic growth in sub-Saharan Africa using a pooled mean group estimation approach, finding a positive impact. Using an autoregressive distributed lag (ARDL) model for the case of South Africa, Malefane and Odhiambo (2018) found that trade openness has a positive impact on economic growth. Udeagha and Ngepah (2021) using the nonlinear autoregressive distributed lags (NARDL) model while examining the trade-economic growth nexus in the case of South Africa, found that trade openness has both short-run and long-run positive effects on economic growth. Asamoah, Mensah, and Bondzi (2019) assessed trade openness, FDI, and economic growth linkages in sub-Saharan Africa, using a structural equation modelling (SEM) approach. Their results also reveal a significant positive relationship between trade openness and economic growth.

Different from the above studies, Jakob (2016) conducted a research on the impact of the exchange rate regime on economic growth using a cross-sectional regression model across 36 developed and 38 developing countries. The findings from the study suggest that a fixed exchange rate regime stimulates economic growth. The author argues that a fixed exchange rate regime promotes stability, because the rate between a currency and its peg does not vary based on market conditions. Therefore, fixed exchange rate regimes create favourable business environment for investors and traders, while, with a floating exchange rate regime, central banks exercise uninterrupted monetary policy, which controls economies in times of crisis.

Based on the literature, the following hypotheses are formulated for the study.

H_0: There is no direct relationship between FDI, trade openness, and economic growth.

H_1: There is a direct relationship between FDI, trade openness, and economic growth.

H_0: There is no effect of exchange rate regime choice on FDI, trade openness and economic growth.

H_1: There is an effect of exchange rate regime choice on FDI, trade openness and economic growth.

Data issues and methodology

Variables description and data sources

For this study, annual time series data for the period 1995-2018, for FDI, trade openness, economic growth, and exchange rate regime in South Africa was used. The secondary data was sourced from the South African Reserve Bank (SARB), International Financial Statistics (IFS) of the International Monetary Fund (IMF), and World Bank. The selection of this time span allows to include the interactions between the variables, which can be compared between two periods of interest. first, the period from 1995 to 2000, where managed floating exchange rate regime was in place, and 2001 to 2018, when South Africa adopted a free floating-exchange rate regime (Mtonga, 2011). The selection of 1995 as a starting year was considered ideal for the study, as South Africa gained independence in 1994 and most economic restrictions were lifted after this period. Moreover, South Africa

was able to adequately trade (trade openness) with other countries across the world after the apartheid period.

Model specification

As stated in the introduction, the objective of this research is to determine the linkages between FDI, trade openness, economic growth, and the role of exchange rate regime choice. For this purpose, a functional form model is specified as:

$$LGDPt = ß0 + ß_1 LFDIt + ß_2 LTRADE\ OPENNESSt + ß_3 LEXRt + et \quad (1)$$

Where GDP is the gross domestic product, FDI is foreign direct investment inflows, trade openness is calculated as export plus import divided by GDP, and EXR represents the exchange rate. et is the stochastic error term. $ß_1$, $ß_2$, $ß_3$ and $ß_4$ represent the parameters to be estimated. All variables are log-transformed.

Priori expectations

In the context of this study, FDI to trade openness and economic growth linkages are expected to be positive. On the one hand, even though pegged and floating exchange rate regimes have significant implications for growth, each regime poses some degree of restrictions (Jakob, 2016). On the other hand, fixed exchange rate provides a volatility-free environment, which encourages investment and trade (Akani & Temitope, 2017). A fixed exchange rate discourages trade openness and promotes protectionist behaviour. However, the floating exchange rate regime allows industries to compete in production, encourages openness, and boosts economic growth (Adjei, Yu & Nketia, 2019). Literature provides contradictory views on the influence of trade openness. However, Kurihara (2013) argues that trade openness influences

inflation and economic growth. Thus, increasing trade openness will cause a rise in the quantity of capital flows into an economy, which will boost economic growth, but cause the general price level of goods and services to increase (Haque & Amin 2018). A lower tax rate is expected to boost economic growth in the short-run but increase foreign direct investment in the long-run (Howard, 2019).

Unit root test in presence and absence of structural breaks

In time series analysis, it is necessary to test data for stationarity. To cope with spurious problems, the current study performed the conventional unit root tests, Augmented Dickey-Fuller (ADF), and Phillips-Perron tests. In addition to the traditional tests, the study applied the alternative tests developed by Zivot & Andrews (1992) for one structural break, and by Clemente, Montanes & Reyes (1998) for two structural breaks. These alternative tests are necessary since the conventional tests are ineffective in cases where there are structural breaks as they result in a type-two error (Baimaganbetov et al., 2021).

Gregory-Hansen cointegration test

The concept of change in regime for the current study was handled differently using the Gregory-Hansen test. Gregory and Hanson (1996) define regime shifting as a change in both intercept and trend. The study made use of three models of the Gregory-Hanson test, such as intercept shift, intercept shift with the trend and intercept shift with slope. For a co-integration model, the Gregory–Hansen test (1996) was used to determine one unknown structural break. The null hypothesis is that there is no co-integration at the breakpoint against the alternative of co-integrating relationship, despite the break. If the absolute value

of the Zt statistic is higher than the 5% significant level, the null hypothesis is rejected.

ARDL bound test

This study adopts the ARDL test to test short-run and long-run causality relationships. The ARDL bounds test was used based on the assumption that the variables are I(0) or I(1). This model was adopted due to several features, which sets it apart from other models. First, ARDL can be applied, irrespective of whether the underlying variables are I(0), I(1), or a combination of both (Dantama et al., 2012). Second, the error correction model (ECM) can be derived from the model through a modest linear transformation, which incorporates short-run changes with long-run equilibrium without misplacing long-run data (Dantama et al., 2012). Third, small samples in the ARDL model are superior when compared to other cointegration models (Dantama et al., 2012). Pesaran and Shin (1999) claim that the ARDL model has fewer endogeneity concerns because it is free of residual correlation. Thus, the appropriate lags are corrected for both serial correlation and endogeneity problems. Lastly, the ARDL model can distinguish between dependent and explanatory variables in the model (Dantama et al., 2012).

Before using this test measure (ARDL bound test), the order of integration of all variables was ascertained by comparing the results of the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC). The ARDL co-integration procedure will begin by determining the bound test for the null hypothesis of no co-integration, i.e., H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \boldsymbol{O}$, against the alternative hypothesis of $\delta_4 \neq \boldsymbol{O}$. The ARDL bound test model is written as:

$$\Delta GDPt = a + \sum^{m}i=1\beta_1 i\Delta LGDPt\text{-}1 + \sum^{m}i=1\,\beta_2 i\Delta LFDIt\text{-}1 + \sum^{m}i=1\,\beta_3\Delta TRADE\ OPENESSt\text{-}1 + \sum^{m}i=1\,\beta_4\Delta LEXRt\text{-}1 + \delta_1 iGDPt\text{-}1 + \delta_2 iFDIt\text{-}1 + \delta_3 iTRADE\ OPENESSt\text{-}1 + \delta_4 iEXRt\text{-}1 + \mu t \quad (2)$$

Where, Δ represents first change, ^{m} is the lag length, a is the drift component, μt is the random error term, and δi (i=1,…,4) denotes the long-run coefficients, and βi (i=1,…,4) are short-run dynamic coefficients of the ARDL model. The F statistic was used to establish the presence of a long-run relationship. The null hypothesis indicates that there is no long-run relationship among the variables, and the alternative hypothesis indicates that there is a long-run relationship.

Error correction term (ECT)

The error correction term assesses the swiftness at which the dependent variables return to equilibrium after variations in other variables (Grant & Lebo, 2016). ECT assists in testing the short-run dynamics of the variables. Therefore, when utilizing a stationary process using time series data, some degrees of freedom may be lost (Scott-Joseph & Turner, 2016). Error correction term was used as a preventive measure in the current study and was specified as:

$$\Delta GDPt = a + \Delta GDPt\text{-}1 + \sum^{m}i=1\beta_2 i\Delta FDIGt\text{-}1 + \sum^{m}i=1\,\beta_3 i\Delta Trade\ Openess\ t\text{-}1 + \sum^{m}i=1\,\beta_4 i\Delta EXRt\text{-}1 + yECt\text{-}1 + \mu t \quad (3)$$

Where Δ is the first difference operator, $ECt\text{-}1$ is the error correction term, y denotes the speed at which the variables return to equilibrium. μt represent the random error term, and βi (i=1,…,4) are short-run dynamic coefficients of the ARDL model.

Results

Descriptive statistics

The results for the main descriptive statistics of the data used in the research are shown in Table 1. The descriptive statistics includes the mean, median, maximum, minimum, standard deviation, Jarque-Bera, and probability of each variable. In terms of Jarque-Bera, the test investigates whether data samples have skewness or kurtosis matching a normal distribution. Relating to the current study, the test statistics for GDP, FDI, trade openness, and exchange rate are all greater than zero. This is an indication that the variables are not normally distributed. The results indicate that the data is very close to the mean, as the mean value produces the lowest number of errors from all other values in a data set. The lowest mean score occurred for trade openness, while FDI attracted the highest mean score. As for the range of the data, on the one hand, the minimum values ranged from 0.088 to 20.12 for trade openness and FDI, respectively. On the other hand, maximum values ranged from 1.35 to 23.01, which occurred for trade openness and FDI, respectively.

Table 1. Descriptive statistics

	GDP	FDI	TRADE OPENNESS	EXCHANGE RATE
Mean	10.805	21.652	0.732	2.052
Median	10.860	21.774	0.828	2.009
Maximum	10.924	23.014	1.351	2.688
Minimum	10.624	20.126	0.088	1.289
Sd	0.113	0.944	0.465	0.361
Jarque-Bera	11.440	7.400	11.950	0.060
Probability	0.003	0.024	0.002	0.968

Lag lengths selection

Table 2 presents the identification and selection of lag length for the study. Based on the results for AIC, HQIC, and SBIC, the study shows a maximum lag length of 1.

Table 2. Selection of lag length

Table 2. Selection of lag length

Lag	LogL	LR	Df	p	FPE	AIC	HQIC	SBIC
0	-788.192				3.0e+29	79.2192	79.2581	79.4184
1	-733.576	109.23	16	0.000	6.6e+27	75.3576*	75.5519*	76.3533*
2	-718.711	29.728*	16	0.019	9.3e+27	75.4711	75.821	77.2635
3	-708.331	22.761	16	0.120	3.0e+28	75.9331	76.4385	78.522
4			16		-8.9e+14*			

Note: * Indicates lag order selected by criterion. *LR: sequential modified, FPE: Final prediction error, AIC: Akaike information criterion, SBIC: Schwarz information criterion, HQIC: Hannan-Quinn information criterion.*
Source: Computed by authors.

Analysis for unknown structural break

This subsection presents and discusses the results of the unit root test, unit root with unknown structural breaks, Gregory-Hansen cointegration test, error correction model, and stability test results.

Unit root tests

Before the data analysis, a less robust unit root test using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were carried out for the variables. These tests were carried out by levels and, in first difference, to formally establish their order of integration. To be sure of the order of integration, a general model with constant and trend was carried out. However, if no trend is detected, a unit root test invariant to the mean will be carried out with only the constant intercept and no time trend, and then with both intercept and time trend in the model. From the results presented in Table 3, it becomes clear that all the variables are not stationary at levels for both ADF and PP, apart from FDI. At I(1), all variables were stationary for both methods employed, apart from GDP that showed a 1% significance level when including constant, both under ADF and PP; but not significant for I(1) for both methodology when including constant and trend.

Table 3. ADF and PP unit root results

	ADF TEST				PP TEST			
	I(0)		I(1)		I(0)		I(1)	
Variables	Constant	Constant and trend	Constant	Constant and trend	Constant	Constant and trend	Constant	Constant and trend
GDP	-1.698	0.118	-2.570*	-2.784	-1.497	-0.418	-2.590*	-2.776
FDI	-4.002***	-4.767***	-8.489***	-8.300***	-4.027***	-4.768***	-9.840***	-9.673***
TRADE OP.	-0.677	-1.896	-4.306***	-4.202***	-0.673	-2.032	-4.298***	-4.185***
EX. RATE	-1.669	-2.084	-3.283**	-3.208*	-1.699	-2.283	-3.251**	-3.176*

Note: ***, ** and * represent 1%, 5%, and 10% critical levels, respectively.

Unit root with unknown structural breaks

Results of the Zivot-Andrews (Zandrews) structural break trended unit root test are presented in Table 4. The results indicate that apart from FDI that showed a structural break in 2007-significant at 1 percent- the rest of the variables show no structural break. The reason is that, although the rest of the variables showed breaking point figures, they were not statistically significant to affirm the existence of unit root in them.

Table 4. Zivot–Andrews structural break trended Unit Root Test

VARIABLES	I(0)		Critical Values		
	t-statistics	Time break	1%	5%	10%
GDP	-2.306	2004	-5.34	-4.8	-4.58
FDI	-6.031***	2007	-5.34	-4.8	-4.58
TRADE OPENNESS	-3.465	2004	-5.34	-4.8	-4.58
EXCHANGE RATE	-3.546	2003	-5.34	-4.8	-4.58

Note: ***, ** and * represent 1%, 5%, and 10% significance levels.

A major setback of the Zivot-Andrews strategy is its inability to account for more than one break in a time series. To address this problem, the Clemente-Montanes-Reyes unit root test (Clemao) is proposed, because it allows two events within the observed history of a time series. Table 5 presents the results of the Clemao unit root test. Interestingly, the Clemao results shows that the variables are significant with various structural breaks. As per

the results applies the Gregory-Hansen test for co-integration with structural breaks.

Table 5. Clemente-Montanes-Reyes unit root test

Variables	t-statistic	Break
GDP	5.107***	2009
FDI	3.368***	2004
Trade Openness	10.732***	2005
Exchange Rate	4.542***	2014

Note: ***, ** and * represent 1%, 5%, and 10% significance levels, respectively.

In this subsection, the study further conducts a Gregory-Hansen co-integration test to determine the possible existence of a structural break. Three main models of the Gregory-Hansen test are carried out. First, with intercept shift, second, intercept shift with the trend, and third, intercept shift with the slope. The test has a null hypothesis of co-integration for the 1(1) series in the presence of structural break applied to it. As shown in Table 6, the findings indicate that a long-run relationship exists among GDP, FDI, trade openness, and South African exchange rate. It points out that co-integration is established under the assumption of intercept shifts with slope at a 5% level of significance, the shift occurs in 2010 with minimum SIC. The result indicates that the linear combination of the variables exhibits stable properties in the long term, yet with structural breaks.

Figure 1 shows a line graph for GDP from the Gregory-Hansen cointegration. If a structural break is established in 2010, as depicted in Figure 1 and Table 6, then the indicator function to be estimated using autoregressive distributed lags (ARDL) will be zero for 1995-2009. Thus, the indicator function will be equal to

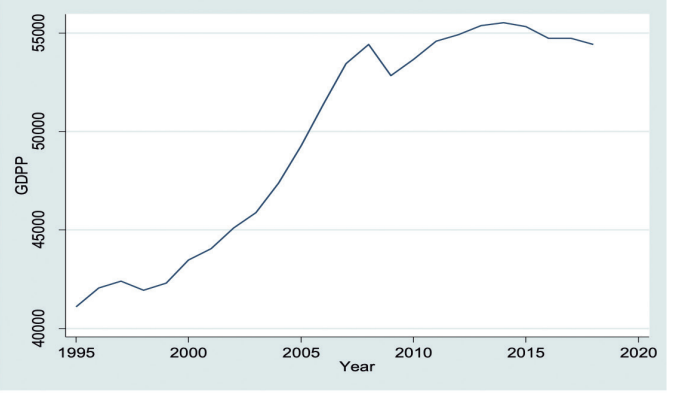
1 for periods after 2009. The break of 2010 is significant because South Africa's economy was bolstered due to the FIFA World Cup that it hosted. History has it that, all countries hosting the FIFA World Cup see a big jump in the tourism subsector of the services sector; pushing up the economic growth of such countries.

Table 6. Gregory-Hansen test for co-integration with regime shifts

	ADF			Z_t			Z_a		
Gregory-Hansen Models	**Statistic**	**Breakpoint**		**Statistic**	**Breakpoint**		**Statistic**	**Breakpoint**	
Intercept Shift	- 4.59	2010		-4.74	2010		-27.45	2010	
Intercept shift with trend	-5.20	2010		-5.31	2010		-29.18	2010	
Intercept shift with slope	-6.05**	2010		-6.30**	2010		-29.98	2010	
Asymptotic Critical Values	1%	5%	10%	1%	5%	10%	1%	5%	10%
Intercept Shift	-5.77	-5.28	-5.02	-5.77	-5.28	-5.02	-63.64	-53.58	-48.65
Intercept shift with trend	-6.05	-5.57	-5.33	-6.05	-5.57	-5.33	-70.27	-59.76	-54.94
Intercept shift with slope	-6.51	-6.00	-5.75	-6.51	-6.00	-5.75	-80.15	-68.94	-63.42

Note: ** represents a 5% level of significance. Stata routine ghansen is used with optimal lag structure chosen by BIC.
Source: Authors' computation.

Figure 1. Line graph for GDP (dependent variable). Gregory-Hansen cointegration.



ARDL analysis with unknown structural breaks

In this section, the ARDL error correction model (ECM) is applied. This is based on Engel and Granger (1987), who asserted that the variables could be modelled with a dynamic ECM model

if a co-integration relationship exists among them. Results of the long-run estimates taken into consideration the break dummies are presented in Table 7, with the short-run estimates shown in Table 8

Table 7. Estimation of long-run coefficients

Variable	Coefficient	St. Error	P-value
Speed of adjustment	-0.950***	0.2768816	0.006
FDI	-.0018108	0.0071672	0.805
Trade openness	.2465753***	0.0120604	0.000
Exchange rate	.1009979***	0.013632	0.000
Z	.3776504**	0.1638744	0.042
Z FDI	.0010835	0.0087266	0.903
Z Trade openness	-.1981323***	0.0479301	0.002
Z Exchange rate	-.0965338***	0.0277142	0.005
R-squared	0.8949		
Adjusted R-Square	0.7899		
Breusch-Godfrey Test of autocorrelation(*P-value*)	0.1380		

Note: ***, **, * denotes the rejection of the null hypothesis at the 1%, 5%, and 10% significance levels, respectively.

The long-run estimates depicted in Table 7 show that trade openness and exchange rate policies have significant impact (1% significance) on economic growth for South Africa. The part that considers the break dummies indicated a good result. This suggests that a percentage increase in the exchange rate and trade policy increases economic growth by 0.10% and 0.24%, respectively. This indicates an inelastic response of trade openness and exchange rate policy on economic growth. However, FDI did not show any significant impact on economic growth, both in the short-run (Table 8) and long-run estimates. The short-run estimates (Table 8) showed that there is no significant impact of FDI, trade openness, and exchange rate on economic growth. The error correction term, which shows the speed of adjustment to the long-run is 0.950; this indicates that about a 95% adjustment from the short-run to the long-run is made within a year. This explains why the short-run estimates are not significant. The findings indicate that structural breaks should be considered when looking at how trade and exchange policy influence economic growth in South Africa.

Table 8. Short-run estimation results

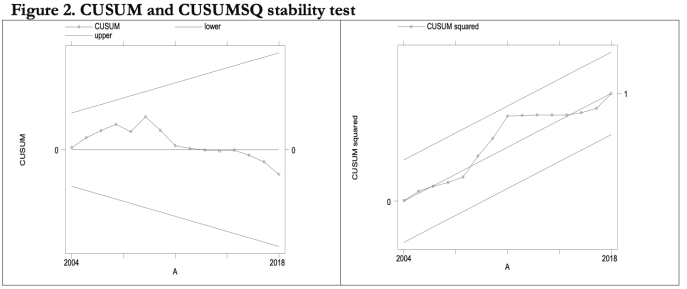
Dependent variable: D (GDP)			
Variable	Coefficient	Std. Error	t-Statistic
D (FDI)	-.0001247	.0037305	0.974
D (TRADE OPENNESS)	-.062062	.049238	0.234
D (EXCHANGE RATE)	-.0191967	.0354002	0.598
Constant	9.962624***	2.827213	0.005

Note: ***, **, * denotes the rejection of the null hypothesis at the 1%, 5%, and 10% significance levels, respectively.

Stability test result

The cumulative sum of recursive residuals (CUSUM), and the cumulative sum of the squares of recursive residuals (CUSUMSQ) tests proposed by Brown et al. (1975) were carried out to ascertain the stability of the economic growth function over the study period, estimated using ARDL-ECM. If the recursive residual of the estimated economic growth function is located outside the boundaries of the two critical lines, then there is evidence of parameter instability in that period. As shown in Figure 2, both CUSUM and CUSUSMSQ tests show that the economic growth function is stable, since the recursive residual function is located within the boundaries of the two critical lines. The result shows that the parameters are stable both during the pre and post FIFA 2010 World Cup hosted by South Africa.

Figure 2. CUSUM and CUSUMSQ stability test



ARDL bound test

Table 9 presents the ARDL bounds test result regarding the existence of long-run relationships between the variables under study. Due to the small nature of the sample size (between 1995-2018), and to achieve precision in results, the study employed critical values as presented by Pesaran, Shin, and Smith (2001). The result in Table 9 shows that the value of F-statistic from the ARDL model is greater than the critical values, to indicate the existence of a long-run relationship between the variables. The speed of adjustment is significant and shows that short-run disequilibrium adjusts quickly to the long-run by over 100%.

Table 9. Pesaran-Shin-Smith ARDL bounds test

H0: no levels relationship F = 6.396
t = -6.349

Table 9a: Critical values (0.1-0.01), F-statistic, case 3

	(I_0) L_1	(I_1) L_1	(I_0) L_05	(I_1) L_05	(L_0) L_025	(I_1) L_025	(I_0) L_01	(I_1) L_01
K_7	2.03	3.13	2.32	3.50	2.60	3.84	2.96	4.26

Accept if F < critical value for I(0) regressors; Reject if F > critical value for I(1) regressors.

Table 9b: Critical values (0.1-0.01), t-statistic, case 3

	(I_0) L_1	(I_1) L_1	(I_0) L_05	(I_1) L_05	(L_0) L_025	(I_1) L_025	(I_0) L_01	(I_1) L_01
K_7	-2.57	-4.23	-2.86	-4.57	-3.13	-4.85	-3.43	-5.19

Accept if t > critical value for I(0) regressors; Reject if t < critical value for I(1) regressors.

ARDL analysis with known structural break for exchange rate regime choice

South Africa, from 1995 to 2018, underwent two main exchange rate regimes: unitary exchange rate regime under managed float and free floatation. In this section, the study segregates the period under study into two subperiods: 1995-2000 for unitary exchange rate regime under the managed float, and 2001-2018 for unitary exchange rate regime under free float. A dummy variable

was created, taking value 1 for 2001-2018 and 0 for the period 1995-2000, to capture the exchange rate regimes in the data set. Next, the dummy variables interacted with the independent variables (FDI, exchange rate, and trade openness) of the study. The findings were then compared to the managed float regime (1995-2000) to serve as a reference period.

To estimate the ARDL model with a known structural break, first, it is necessary to perform a VAR model to identify the optimal lag length between the variables. This was earlier done, and results are shown in Table 2, establishing that there is a maximum lag length of one. Further steps were taken to validate the ARDL model based on the bounds test to check the coefficient stability of the model.

Table 10 presents the results of estimates of the ARDL short-run and long-run exchange rate regime choice structural break. The results indicated that the exchange rate shows a positive significant impact on economic growth in the short-run, whereas a significant negative impact on economic growth, in the long-run, is seen. This implies that, during the initial stages of an exchange rate policy, appreciation of the South African Rand translates into higher economic growth. With time, depreciation of the Rand rather manifests economic growth. The dummy variable, interacted with exchange rate policy to take care of the free float exchange rate regime (2001-2018), showed a positive significant (5% significance) impact on economic growth. A change from managed float exchange rate to a free float exchange has caused a 1.49% increase in economic growth. This points out that the free float exchange rate is a better choice compared to a managed float exchange rate.

Trade openness showed a significant negative impact on economic growth in the short-run for the free float exchange rate

regime, but no long-term relationship is established. This finding aligns with the study conducted by Khobai and Mavikela (2017) who argue that fluctuations in trade openness exclusively impact the trend of product specialization, but not the long-term rate of economic growth. Thus, a negative short-term relationship shows that as import reduces in the short-term under the free float exchange regime, economic growth will also increase compared to the managed float exchange regime. This indicates that if South Africa projects to enjoy economic growth benefits from their current exchange rate regime, they must reduce imports to make the Rand stronger against the major trading currencies.

Further, FDI showed a significant positive influence on economic growth, both in the short-run and long-run for the free float exchange regime. The findings support a study conducted by Buhari et al. (2020) who confirmed that FDI impacts positively on economic growth. However, FDI, for the whole study period indicated a significant negative impact. This implies that FDI better promotes economic growth under the free float exchange rate regime compared to the managed float regime.

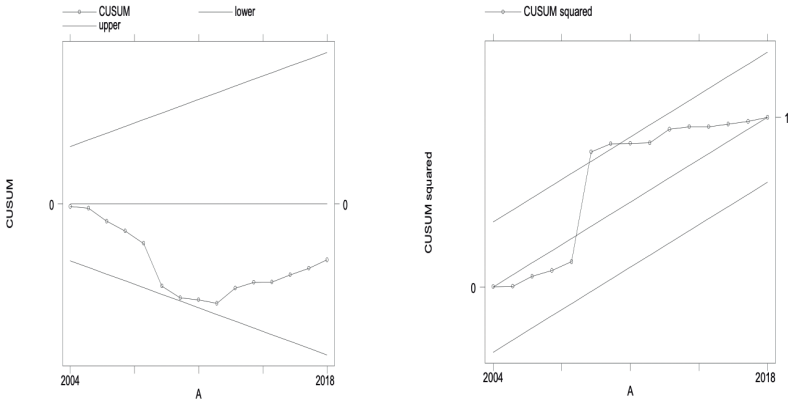
Table 10. Estimates of the ARDL for exchange rate regime choice structural break

Variable	Coefficient	St. Error	P-value
Short-run			
Exchange rate	0.00050***	0.00010	0.001
Dummy	22.0541**	6.9740	0.010
Dummy_Trade openness	-27.4809***	6.1652	0.001
Dummy_FDI	0.3856*	0.1852	0.064
Speed of adjustment	-1.0321***	0.1625	0.0000
Long-run			
FDI	-1.23e-09***	3.09e-10	0.003
Trade openness	-.0000362	0.0001	0.774
Exchange rate	-1.7578***	0.4501	0.003
Dummy	-11.8633	10.6078	0.290
Dummy_FDI	2.7775***	0.8169	0.007
Dummy_Trade openness	2.5842	7.4104	0.735
Dummy_ Exchange rate	1.4949**	0.4914	0.012
Constant	16.8813*	7.8137	0.056
R-squared	0.9198		
Durbin-Watson	1.77068		
Breusch-Godfrey Test of autocorrelation(*P-value*)	0.6879		

Note: ***, **, * denotes the rejection of the null hypothesis at the 1%, 5%, and 10% significance levels, respectively.

Figure 3 looks at the stability of the model. On the left of the figure, the result for CUSUM is presented, to indicate that the model is stable. However, as seen on the right panel, for the CUSUM of squares, indicates that the model is relatively stable.

Figure 3. CUSUM and CUSUM squared for Exchange rate regime



Granger causality

Finally, the study carried out a Granger causality Wald test to find out whether there is a unidirectional or bidirectional causality among the variables under study, or not. The results are presented in Table 11. The results show no Granger causality between GDP and FDI. Uni-directional Granger causality is found to flow from GDP to trade openness, FDI to trade openness, and FDI to exchange rate. A bi-directional causality is established between GDP and exchange rate, and between trade openness and exchange rate. FDI rakes into South Africa more foreign currency that has the potential to make the Rand stronger and more stable. This will help bolster productivity and hence engineer growth. The

FDI effect on growth is felt more under the current exchange rate regime compared to previous ones.

Table 11. Granger causality Wald tests

Equation	Excluded	chi2	Df	Prob > chi2
GDP	FDI	2.0609	1	0.151
GDP	Trade openness	2.4674	1	0.116
GDP	Exchange rate	3.2726	1	0.070
GDP	All	4.7375	3	0.070
FDI	GDP	1.8036	1	0.179
FDI	Trade openness	.16359	1	0.686
FDI	Exchange rate	2.2255	1	0.136
FDI	All	14.807	3	0.002
Trade openness	GDP	10.829	1	0.001
Trade openness	FDI	3.9873	1	0.046
Trade openness	Exchange rate	3.0995	1	0.078
Trade openness	All	14.824	3	0.002
Exchange rate	GDP	8.9098	1	0.003
Exchange rate	FDI	2.842	1	0.092
Exchange rate	Trade openness	10.362	1	0.001
Exchange rate	All	13.88	3	0.003

Conclusion

This study investigated the linkages between FDI, trade openness, and economic growth and the role of exchange rate regime choice in South Africa. To accomplish this objective, an ARDL analysis was carried out in two ways. The first approach was to allow the system to determine a break period for analysis. The second approach segregated the data into unitary exchange rate regimes under the managed float (1995-2000) and free float (2001-2018) regimes, making 2000 the known break period for analysis. These two regimes existed during the period under investigation. Using the Gregory-Hansen co-integration test for unknown structural breaks, the study established that a long-term relationship exists between GDP, FDI, trade openness, and the South African exchange rate. A structural break was established in 2010. Based on the known structural breaks for exchange

rate regimes in South Africa, the results revealed that there is no Granger causality between GDP and FDI. Uni-directional granger causality was found, however, to drift from GDP to trade openness, FDI to trade openness, and FDI to exchange rate. The bi-directional causality was found between GDP and exchange rate, and between trade openness and exchange rate.

Since South Africa is currently using a free float exchange rate regime, policy makers should consider minimizing economic restrictions to attract genuine foreign investors to make an impact on the economy. Using the free float exchange rate regime choice, FDI is revealed to promote economic growth. Therefore, high economic growth will avert unemployment in the country. South Africa should also condition foreign investors to provide special training in skills development to South Africans who are employed within their organisation. This will enhance in the long term, knowledge, technological transfer, and human capital in the form of capacity building. Additionally, to promote economic growth under the free float regime choice, South Africa should significantly reduce importation of goods and services. This can be done by imposing high tariffs on imported products that are locally manufactured.

References

Adjei, M., Yu, B. & Nketiah, E. (2019). The development and determinants of foreign exchange market in Ghana. *Open Journal of Business and Management*, 7, 1831-1845.

Akani, O.P. & Temitope, D.J. (2017). Real exchange rate, exchange rate volatility and trade balance in sub-Saharan African countries: a generalized method of moment approach. I*nternational Journal of Scientific Research and Management*, 5 (11), 7395-7403.

Asamoah, L.A., Mensah, E.K. & Bondzie, E.A, (2019). *Trade openness, FDI, and economic growth in sub-Saharan Africa: Do institutions matter?* [Online]. Available at: https://www.tand fontline.com/loi/rncr20. (Accessed on 20/2/2020).

Baimaganbetov, S., Kelesbayev, D., Baibosynova, G., Yermankulova, R. & Dandayeva, B. (2021). The Impact of Oil Prices on the Food Inflation in Kazakhstan. *International Journal of Energy Economics and Policy*, 11(3), 73-79.

Brown, R.L., Durbin, J. & Evans, J.M. (1975). Techniques for Testing the Constancy of Regression Relationships over Time. Central Statistical Office, London School of Economics and Political Science.

Buhari, D., Lorente, D.B. & Nasir, M.A. (2020). European commitment to COP21 and the role of energy consumption, FDI, trade and economic complexity in sustaining economic growth. *Journal of Environmental Management*, 273 (1), 1-10.

Clemente J., Montañés, A. & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. *Economics Letters*, 59 (2), 175-182.

Dantama, Y. U., Abdullahi, Y. Z. & Inuwa, N. (2012). Energy consumption-Economic Growth Nexus in Nigeria: An empirical assessment based on ARDL Bound Test approach. *European Scientific Journal,* 8 (12), 141-157.

Engle, R. & Granger, C. (1987). Cointegration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55, 251-276.

Grant, T. & Lebo, M.J. (2016). Error correction methods with political time series. *Political analysis*, 24 (1), 3–30.

Gregory, A.W. & Hansen, B.E. (1996). Practitioner's corner: Tests for cointegration in models with regime and Trend Shifts. *Oxford Bulletin of Economics and Statistics*, 58, (3), 555-560.

Gunby, P., Jin, Y. & Robert Reed, W. (2017). Did FDI Really Cause Chinese Economic Growth? A Meta-Analysis. *World Development*, 90, 242–255.

Haque, S. & Amin, S.B. (2018). Foreign Direct Investment, Trade Openness and Economic Growth: The Case of Bangladesh. *World Review of Business Research*, 8 (3), 104-125.

Howard, C. (2019). Ireland: a study in the effectiveness of corporate tax rate reduction. *Journal of interdisciplinary undergraduate research*, 11 (3), 37-51.

Jakob, B. (2016). Impact of exchange rate regimes on economic growth. *Undergraduate Economic Review*, 12 (1), 1-22.

Khobai, H. & Mavikela, N. (2017). *The causal linkage between trade openness and economic growth in Argentina: Evidence from the ARDL and VECM techniques*. [Online]. Available at: https://mpra.ub.uni-muenchen.de/82463/. (Accessed on 16/4/2020).

Kurihara, Y. (2013). International Trade Openness and Inflation in Asia. *Research in World Economy*, 4 (1), 70-75.

Makhoba, B.P. & Zungu, L.T. (2021). Foreign Direct Investment and Economic Growth in South Africa: Is there a Mutually Beneficial Relationship? *African Journal of Business and Economic Research*, 16 (4), 101 – 115.

Malefane, M.R. & Odhiambo, N.M. (2018). Trade openness and economic growth: Empirical evidence from South Africa. *International Economics*, 71 (4), 387-416.

Masipa, T.S. (2018). The relationship between foreign direct investment and economic growth in South Africa: Vector error correction analysis. *Acta Commercii*, 18(1), 1-8.

Mtonga, E. (2011). *Did it matter? Monetary Policy Regime Change and Exchange Rate Dynamics in South Africa*. Washington: The World Bank

Pesaran, M. H. & Shin, Y. (1999). An autoregressive distributed lag modeling approach to cointegration analysis, In Strom, S. (ed.), *Econometrics and Economic Theory in the twentieth*

century, the Ragner Frisch Centenial Symposium. Cambridge: Cambridge University Press.

Pesaran, M. M., Shin, Y. & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 6 (3), 289-326.

Qabhobho, T., Wait, C.V.R. & Le Roux, P. (2019). Exchange-Rate Regimes and Monetary Autonomy: The Transmission of Interest Rates in the SADC. *Studies in Economics and Econometrics*, 43 (1), 1-16.

Scott-Joseph, A. & Turner, T. (2016). Does the composition of government expenditure matter for Eastern Caribbean economies' long-run sectoral output growth? An ARDL bound test approach. *International Journal of Development Issues*, 18 (1), 2-14.

Udeagha, M.C. & Ngepah, N. (2021). The asymmetric effect of trade openness on economic growth in South Africa: a nonlinear ARDL approach. *Economic Change and Restructuring*, 54, 491–540.

Thomas, L. & Leape, J. (2005), *Foreign direct investment in South Africa: The initial impact of the trade, development, and cooperation agreement between South Africa and the European Union*. London: CREFSA, London School of Economics.

Zahonogo, P. (2017). Trade and economic growth in developing countries: Evidence from sub-Saharan Africa. *Journal of African Trade*, 3, 41–56.

Zivot, E. & Andrews, D.W.K. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics*, 10 (3), 251–270.