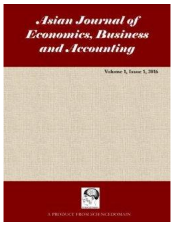

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Impact of Japanese Foreign Direct Investment on the Economic Growth of South Africa

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

The main purpose of this paper is to investigate the impact of Japanese foreign direct investment on the economic growth of South Africa over the period 1996-2016. The study employed the Autoregressive Distribute Lagged (ARDL) bound test to investigate the long-run relationship between the study variables. The results show that Japanese foreign direct investment has a direct positive and statistically significant effect on South Africa economic growth. In policy terms, the government of South Africa should sustain the institutional reform policy agenda already in place in order to benefit more from the significant inflows of Japanese foreign direct investment.

Keywords: Japanese FDI; economic growth; South Africa; ARDL.

1. INTRODUCTION

Economic relationship between Japan and South Africa has been expanding since the establishment of the first Tokyo International Conference on African Development (TICAD I) in 1993. According to the Japan's embassy in South Africa [1], the total bilateral trade between Japan and South Africa increased to 7.348 billion US (910 billion Japanese Yen) in 2014, and more than 130 Japanese companies are currently operating in South Africa. Japan has created more than 150,000 local job opportunities in South Africa. In terms of foreign direct

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investment (FDI), Japanese foreign direct investment flows to Africa increased from 400 million US in 2006 to 1.708 billion US in 2014. However the economic effect of Japan investment in South Africa is less studied.

The direct and indirect impact of FDI on economic growth is theoretically agreed [2,3]. Empirically, there are still several controversies [4]. While several studies confirm the hypothesis that FDI positively affects economic growth [5,6], other studies conclude that FDI is not significant for economy [7,8] and can be negative [9].

Although numerous studies have been carried out on FDI and economic growth in developed and developing countries, very few studies have examined the causality between Japan FDI and economic growth in Africa. In addition, there is very little literature on Japan FDI and economic growth in South-Africa. The country is chosen for at least two reasons: first, the economy of South Africa is the second largest in Africa, after Nigeria. Second, the availability of data on Japanese FDI in Africa. The main contribution of the article to literature is that it is one of the few attempts to analyze the causal links between Japanese foreign direct investment and economic growth in a middle-income country of Sub Sahara Africa.

The remaining sections of the article are as follows. Section 2 presents brief empirical literature while, Section 3 discusses econometric techniques used in investigating the effect of Japanese FDI on South Africa economic growth. The results are discussed in Section 4, and finally the conclusions and policy implications are presented in Section 5.

2. BRIEF LITERATURE REVIEW

The theoretical foundations of empirical studies on the FDI-Growth relationship come from either neoclassical growth models or endogeneous growth models. In neoclassical growth models, FDI promote economic growth by augmenting the capital stock and/or its efficiency [10] and technology [11]. Whereas, in endogeneous growth models, FDI increases economic growth by increasing the stock of knowledge and generating technological diffusion from developed countries to underdeveloped countries [12]. Thus at the theoretical level, there is unanimity on the beneficial effects of FDI for the host country. However, at the empirical level, the effect of FDI on economic growth is still inconclusive.

Borensztein et al. [12] are among the first to analyse the effect of FDI on economic growth based on endogeneous growth models. From a sample of 69 developing countries over the period 1970-1989, they conclude that FDI is an important channel for technology transfer and contributes more to the economic growth as compared to the domestic investment. Moreover, they show empirically that FDI has a positive impact on economic growth only if the level of education exceeds a given threshold. As a result, the positive effect of FDI on host economies would depend on their interactions with human capital. Bengoa and Sanchez-Robles [13] by using panel data for Latin America, examined the relationship between FDI, economic freedom and economic growth. Comparing fixed and random effects estimations, they conclude that FDI has a significant positive effect on host country economic growth, and similar to [12], the magnitude depends on host country conditions. Hansen and Rand [14] found a strong causal link from FDI to GDP for a group of 31 developing countries over the `period 1970-2000. Bloomstrom, Lipsey and Zejan [15] found evidence that FDI Granger caused economic growth. However, FDI’s positive contribution is conditional. According to the authors, FDI is growth enhancing if the country has sufficiently reached measured in term of high per capita income.

De Mello [16] argues that the impact of FDI on economic growth is expected to be twofold. First, economic growth can be achieved with the help of capital accumulation in the recipient economy. The FDI inflows may add new technology and inputs in the existing stock of domestic physical capital available in the host country. Secondly, FDI stimulates economic growth by technology transfer, labour trainings, alternative management practices and organizational arrangements.

Gui-Diby [6] analyses the effect of FDI on economic growth of 50 African countries over the period 1980-2009 and finds that FDI has a positive and significant effect on the growth rate. In addition, he does not find the links highlighted by [12] between FDI, human capital and economic growth. Alfaro et al. [17] show that human capital is not an important channel for technology transfer as [12] argued. These findings are supported by other authors as [18], [19, 20, 21]. These authors, while using different methods and samples, come to a similar conclusion: FDI contributes to economic growth, regardless of any prior level of human capital.

Other work has examined the role of financial market development. Alfaro et al. [17] examined the relationship between foreign direct investment, the level of development of the financial sector, and economic growth. The authors found that an increase in the share of foreign direct investment led to higher additional economic growth rate in countries with a more advanced/developed financial sector. This conclusion highlights the necessity of a well-functioning financial system that can transfer the surplus savings into the most productive investment. Choong et al. [22] in their study show that FDI positively impacts growth only if the development of the financial system has reached a certain level. They conclude that the relationship between FDI and economic growth depends on their dynamic interaction with the development of the domestic financial sector. Similarly, Hermes and Lensink [23] argued that the development of the financial system in the host economy is an important precondition for FDI to have a positive impact on economic growth. According to their study, for most developing countries (30 out of 67) this threshold has not yet been reached.

Although several empirical and theoretical studies support the idea that FDI has a positive impact on the economic growth of developing countries, several studies came up with the conclusion that FDI has a negative impact on economic growth of developing countries.

Carkovic and Levine [24] analysed the impact of FDI on the economic growth of 72 developed and developing countries. Their study came up with the conclusion that foreign direct investment has adverse effects on the economic growth of the host country. Moreover, Chowdhury and Mavrotas [25] took a different route by testing for Granger Causality using the [26] specification. Using data from 1969 to 2000 they conclude that FDI did not "Granger-cause" GDP in Chile. Nuzhat [27] examined the impact of FDI on economic growth of Pakistan, using data from 1980 to 2006 with variables of domestic capital, foreign owned capital and labor force. She concluded that the effect of FDI on economic growth in Pakistan is negative but not statistically significant.

3. DATA AND METHODOLOGY

3.1 Data

This study employs annual time series data between 1996 and 2016, which comprises 21 data points. The data were obtained from two different sources. The World development indicator released by the World Bank (WDI) and the Japanese Trade and Investment Statistics (JETRO). The dependent variable is economic growth measured by GDP per capita. There are three main independents variables used in this study including: (1) Japanese foreign direct investment (FDI), (2) Openness measured as the sum of export and import as a percentage of GDP, and (3) domestic investment (IDOM) measured by gross fixed capital formation. All variables are log transformed. The coefficients are thus interpreted as elasticities. Eviews 9 is used for estimations. Descriptive statistics and data sources are given in Table 1.

3.2 Methodology

Our econometric model is derived from a production function in which the level of a country's economic growth depends on FDI, trade and domestic investment. The model is based on endogenous growth theory, in the tradition of Balasubramanyam et al. [28] and Borensztein et al. [12]. To investigate empirically the effects of Japanese FDI on economic growth of South Africa, we specify the following basic formulation:

$$GDP_t = \gamma_0 + \lambda_1 FDI_t + \lambda_2 OPENNESS_t + \lambda_3 IDOM_t + \varepsilon_t \quad (1)$$

Where, GDP represents economic growth, which is measured by GDP per capita. FDI indicates Japanese foreign direct investment, OPENNESS is trade openness measured as the sum of export and import as the percentage of GDP. IDOM is domestic investment measured by gross fixed capital formation.

Several econometrical methods have been proposed for investigating long-run equilibrium (co-integration) among variables. However, this study utilizes the autoregressive distributed lag (ARDL) modelling approach which was initially developed by Pesaran and Pesaran [29], performed and popularized by Pesaran et al. [30] and by Pesaran et al. [31]. The main advantage

Table 1. Descriptive statistics and data sources

Variable	Obs	Std. Dev.	Mean	Min	Max	Source
lnFDI	21	1.318087	20.85905	17.68796	22.8973	JETRO(2017)
lnGDP	21	.1115059	8.818466	8.656274	8.939562	WDI(2017)
lnIDOM	21	.3336439	24.80601	24.33581	25.2122	WDI(2017)
lnOPENNESS	21	.1227247	3.337515	3.149897	3.595467	WDI(2017)

of ARDL modelling lies in its flexibility with small sample study and it can be useful when the variables are of different order of integration.

To estimate the long-run relationship between variables, a two-step procedure is utilized. Without having any prior information about the direction of the relationship, If the first step predicts that there is a long-run relationship among the variables, the error correction version of ARDL is formulated and specified as follows:

$$\Delta \ln GDP_t = \beta_0 + \sum_{i=1}^{q} \beta_1 \Delta \ln GDP_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta \ln FDI_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta \ln OPENNESS_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta \ln IDOM_{t-i} + \lambda_0 \ln GDP_{t-1} + \lambda_1 \ln FDI_{t-1} + \lambda_2 \ln OPENNESS_{t-1} + \lambda_3 \ln IDOM_{t-1} + \varepsilon_t \quad (2)$$

Where, ln indicates natural logarithm, Δ is the first difference operator, and β_0 is the drift component. $\beta_1, \beta_2, \beta_3, \beta_4$ represent the short-run dynamics of the model, while the coefficients $\lambda_0, \lambda_1, \lambda_2, \lambda_3$ represent long-run relationship and ε_t is the serially uncorrelated disturbance. F statistic (the bound tests approach) is used for testing the existence of long run relationships. The null hypothesis for testing the nonexistence of the long run relationship is given by $H_0 : \lambda_0 = \lambda_1 = \lambda_2 = \lambda_3 = 0$. If the calculated F-statistics is below the lower bound critical value, the null hypothesis of no co-integration is accepted. If F-statistic is greater than the appropriate upper bound critical values, the null hypothesis is rejected implying co-integration. However, if F-statistic lies within the lower and upper bounds, the result becomes inconclusive.

In the next step, after establishing the existence of the co-integration between variables, the following long-run model for economic growth can be estimated:

$$\ln GDP_t = \gamma_0 + \lambda_1 \ln FDI_t + \lambda_2 \ln OPENNESS_t + \lambda_3 \ln IDOM_t + \varepsilon_t \quad (3)$$

After the estimation of the ARDL (m, n, o, p) specification and the calculation of the associated long-run multipliers, the final step is the estimation of the short-run dynamic coefficients by using the following error correction model:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_1 \Delta DGP_{t-i} + \sum_{i=0}^{n} \alpha_2 \Delta FDI_{t-i} + \sum_{i=0}^{o} \alpha_3 \Delta OPENNESS_{t-i} + \sum_{i=0}^{p} \alpha_4 \Delta IDOM_{t-i} + \lambda ECM_{t-1} + \eta_t \quad (4)$$

Where ECM is the error correction term and $\lambda\ (-1 \leq \lambda \leq 0)$ the parameter indicating the speed of adjustment to the equilibrium after a shock. The sign of the ECM must be negative and significant to ensure the convergence of the dynamic to the long-run equilibrium. $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the short-run parameters. To ensure the stability of the long-run and short-run coefficients, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests to the residuals of equation is applied in order to examine if the two statistics stay within the 5 % significant level.

4. RESULTS AND DISCUSSION

4.1 Unit Root Test Results

Before applying ARDL estimation, we must examine the time series properties of individual variables. Even if the use of ARDL models does not impose pre-testing of variables for unit root problems (because this estimation can accommodate I(0) and I(1) variables, or mutually co-integrated variables) it cannot be estimated with I(2) series. For checking the order of integration, we use the Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) test. Results are presented in Table 2.

Our results indicate the GDP is stationary at level, but FDI, Openness and domestic investment exhibit unit root process. Consequently, the chosen variables are a mixture between I(0) and I(1). Given this result,

Table 2. Unit root test

	ADF test			PP test		
Variable	**Level**	**First difference**	**Inference**	**Level**	**First difference**	**Inference**
GDP	-5,17***	-7,78***	I(0)	-5,19***	-11,43***	I(0)
FDI	-1,31	-5,48***	I(1)	-0,28	-4,28***	I(1)
OPENNESS	-0,31	-5,27***	I(1)	-1,32	-5,48***	I(1)
IDOM	-1.070	-2.728*	I(1)	-1.038	-2.805*	I(1)

*Notes: ***, * show the statistical significance at the 1% and 10% level of confidence. Only test-statistics results are reported here. The null hypothesis is the series has a unit root which is tested against Mackinnon Critical values. Eviews 9 has been used for all computations.*

Table 3. Lag-length selection criteria of the first difference variables

Lag	LogL	LR	FPE	AIC	SC	HQ
0	67.15165	NA	1.05e-08	-7.016850	-6.818989	-6.989568
1	120.8011	77.49359*	1.71e-10	-11.20012	-10.21082	-11.06371
2	138.6057	17.80461	1.95e-10	-11.40063	-9.619886	-11.15509
3	173.9996	19.66332	6.97e-11*	-13.55552*	-10.98333*	-13.20085*

*Note: * indicates the lowest value under each criteria*

the appropriate estimation technique is the ARDL approach.

4.2 Bounds Test and Lag Length Selection

Since the bound test for co-integration is very much sensitive to lag length (Table 3), the results of both Akaike Information Criterion (AIC) and Schwartz-Bayesian Criterion (SBC) criteria are similar, thus a lag order of 3 is selected. The total number of regressions estimated following the ARDL (m, n, o, p) method is $(p+1)^k$, where p is the maximum number of lag order to be used and k is the number of variables in the equation.

Table 4. ARDL bounds test results

Dependent variable	F-statistic	k
GDP	10.19	3
Critical values bounds		
Signifiance level	I(0) bound	I(1) bound
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61

Notes: k represents the number of independent variables, Critical values are obtained from the study by Pesaran et al. (2001). I(0) bound is the lower bound and I(1) bound is the upper bound of the ARDL bounds test.

Above Table 4 presents the results of the Pesaran co-integration test. The F-statistic is 10.19, which is more than 5.61, at 1% level of confidence. Therefore, it could be inferred that the variables used in this paper are co-integrated or have a long-run relationship. Hence, ARDL model could be estimated to examine the long-run and short-run dynamics among the variables.

4.3 ARDL Results

The estimations of the effect of Japanese FDI on economic growth in South Africa are presented in Table 5. Several tests (Panel B), like the serial correlation test (LM test) and heteroskedasticity test (ARCH test) were performed. The results show that these tests are conclusive. Indeed, there is no serial correlation and there is no evidence of traditional autoregressive heteroscedasticity. Therefore, our model is well specified.

Table 5 (Panel A) shows that Japanese FDI has a positive and statistically significant impact on economic growth in the long-run. The coefficient of FDI is 0.0194, suggesting that a one percent increase in Japanese foreign direct investment will cause a 0.0194% increase on South Africa economic growth. Even if the effect of Japanese FDI is positive and statistically significant on South Africa economic growth, this effect is very small. Our results are consistent with the studies of [32] and [6]. In addition, domestic investments and openness have a positive and statistically significant impact on economic growth in South Africa in the long-run.

4.4 Short-Run Dynamics

Table 6 presents the results of the short-run parameters. Results show that both current and previous Japanese foreign direct investment have a positive and statistically significant effect on South Africa economic growth. As in the long-run, theses effect still small. In addition, the previous year's economic growth has a positive and statistically significant effect on the current economic growth in short-run. By looking at the coefficient of the error correction term, we see that this coefficient is negative and significant as expected. This result indicates that the dynamics of the model converge towards the long term.

For testing the stability of the long-run coefficients alone with the short-run dynamics, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) are applied. A graphical illustration of CUSUM and CUSUMSQ is exposed in Figs. 1 and 2. The plots of both the CUSUM and the CUSUMSQ are within the boundaries, and, hence these statistics prove the stability of the long-run coefficients. The model appears to be stable and properly specified given that none of the two tests statistics go outside the bounds of the 5 percent level of significance.

Table 5. Long-run coefficients with GDP as dependent variable

Variables	Coefficient	Std. error	t-statistic	Prob
Panel A: Long run coefficients				
InFDI	0.0194***	0.0047	4.082	0,0035
InOPENESS	0.0611**	0.0245	2.493	0,0373
InIDOM	0.3598***	0.0155	23.148	0.0000
Panel B : Diagnostic tests				
		F- statistic		**p-value**
(A) Serial Correlation		F(3,24)=1,25		0,314
(B) Heteroscedasticity		F(3,21)=0,52		0,675

*Note. ***, ** and * show the statistical significance at the 1%, 5% and 10% level of confidence, respectively*

Table 6. Error correction model

Variables	Coefficients	Std, error	t-statistic	Prob
ECT	-0.8979***	0,0871	-10.310	0.0000
ΔGDP_{t-1}	0.4152**	0.1309	3.172	0.0132
ΔGDP_{t-2}	0.1052	0.0890	1.181	0.2714
ΔFDI	0.0176***	0.0040	4.369	0.0024
ΔFDI_{t-1}	0.0086*	0.0042	2.023	0.0777
ΔFDI_{t-1}	0.0119***	0.0034	3.517	0.0079
$\Delta IDOM$	0.3231***	0.0306	10.570	0.0000
ΔOPENESS	0.0549**	0.0227	2.418	0.0419

*Note. ECT stands for error correction term which is nothing but the one period lagged residuals of the long-run equation. ***, ** and * show the statistical significance at the 1%, 5% and 10% level of confidence, respectively.*

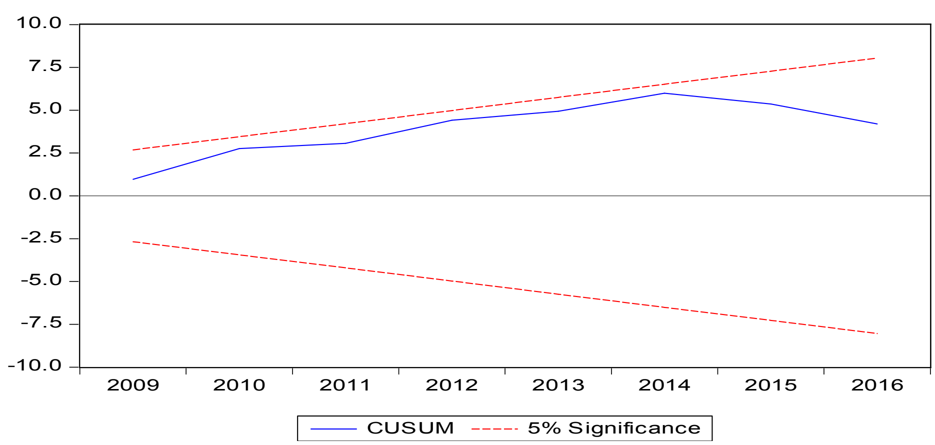

Fig. 1. Residual plots for CUSUM

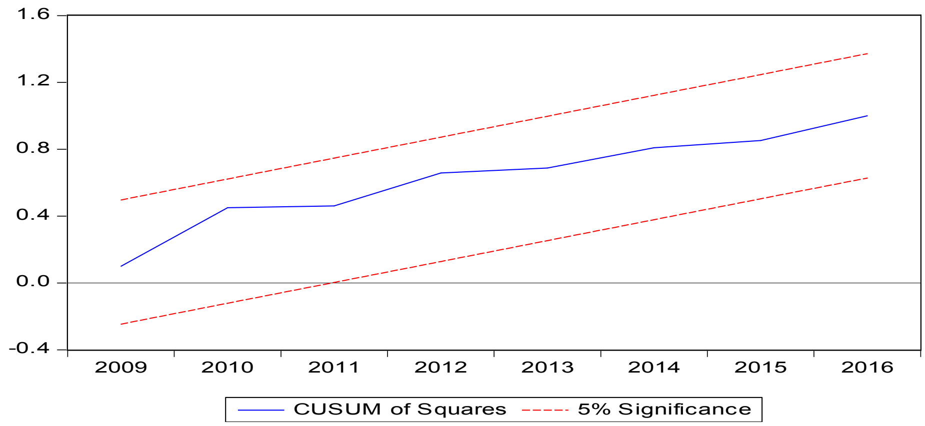

Fig. 2. Residual plots for CUSUMSQ

5. CONCLUSION

This study uses ARDL co-integration technique to investigate the effect of Japanese foreign direct investment on economic growth in South Africa over the period 1996-2016. Other variables such as, domestic investment and openness were used as control variables. The results suggest that Japanese FDI has a positive and statistically significant effect on economic growth in South Africa. These results are consistent with theory and some existing empirical studies [6, 32].

In terms of policy implications, government of South Africa should sustain the institutional reform policy agenda already in place in order to benefit more from the significant inflows of Japanese foreign direct investment.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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