FOREIGN CAPITAL FLOWS, EXPORTS AND GROWTH IN ZAMBIA. A VECM APPROACH

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Abstract

This study investigates the causality between FDI net inflows, exports and GDP using Vector Error Correction Model (VECM) approach. The words foreign capital flows and FDI are used interchangeably in this study. The findings from the VECM estimation technique is six fold: (1) the study revealed a long run causality relationship running from exports and GDP towards FDI, (2) the study showed a non–significant long run causality relationship running from FDI and exports towards GDP and (3) the existence of a weak long run causality relationship running from FDI and GDP towards exports in Zambia.

The study also found out that no short run causality relationship that runs from FDI and exports towards GDP, short run causality running from FDI and GDP towards exports does not exist and there is no short run causality relationship running from exports and GDP towards FDI. Contrary to the theory which says that FDI brings along with it a whole lot of advantages (FDI technological diffusion and spill over effects), the current study found that the impact of FDI in Zambia is not significant in the long run. This is possibly because certain host country locational characteristics that ensures that Zambia can benefit from FDI inflows are not in place or they might be in place but still not yet reached a certain minimum threshold levels. This might be an interesting area for further research. On the backdrop of the findings of this study, the author recommends that the Zambian authorities should formulate and implement export promotion strategies and economic growth enhancement initiatives in order to be able to attract more FDI.

Keywords: GDP, Exports, FDI, VECM, Zambia

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1 Introduction

Studies that have so far investigated the combined causality relationship between FDI, exports and economic growth are very scant. Majority of the studies have separately investigated either FDI and exports, FDI and economic growth or exports and economic growth. For example, the long run causality relationship between FDI and growth was found to be non-existent in Malaysia (Lean, 2008). Adams (2009) showed that the positive impact of FDI on the economy is a result of augmentation of domestic capital as compared to total productivity in the Sub-Saharan countries.

High technology exports were found to have had a very strong positive impact on economic growth in Malysia (Yoo, 2008). This was buttressed by Keong et al (2005) who using the bounds testing approach noted that exports proceeds accelerated economic growth in Malaysia both in the short and long run. Furthermore, Al Mamun & Nath (2005) showed that both industrial production and exports had a long run causality relationship in Bangladesh. Furthermore, Aditya & Acharyya (2011) observed that exports were one of the major cornerstones that were instrumental in driving economic growth whilst economic growth was revealed to have been the engine pushing exports growth in Chile (Siliverstovs & Herzer, 2006). Studies that focused on FDI and exports wanted to investigate the role of trade openness in the promotion of FDI for example (Tsaurai, 2015).

Won & Hsiao (2008) observed strong bidirectional causality relations between foreign capital flows, exports and economic growth for the three first-generation Asian newly industrialised economies (ANIEs) and weak bidirectional causality between exports and GDP for the second-generation Asian newly industrialised economies (ANIEs). This was buttressed by Iqbal et al (2010) whose study showed a feedback effect between foreign capital flows, exports and economic growth in Pakistan.

The investigation of the causality relationship between FDI, exports and economic growth in one study has so far not received sufficient attention in Zambia. This is the reason why the current study is examining the causality between FDI, exports and economic growth using the VECM approach. FDI net inflows as a ratio of GDP, total exports (% of GDP)

and GDP per capita are the measures of FDI, exports and economic growth respectively that this study is going to use. The study is organized as follows: Section 2 reviews related literature whilst section 3 discusses the trends of foreign capital flows, exports and economic growth in Zambia. Section 4 deals with the methodological framework and data analysis whilst section 5 provides the conclusion of the study. The reference list constitutes section 6.

2 Review of Related Literature

The dependency theory says that the reliance on FDI has a negative effect on economic growth and the distribution of income. FDI creates a predominantly monopolistic industrial structure that result in the inefficient utilization of the factors of production (Amin, 1974). The latter also argued that if an economy is being controlled by foreign firms, is does not grow organically and instead it will grow in a disorganized manner. The modernization theory stipulates that for the economy to growth, it requires capital investment. In support of the modernization theory, Calvo and Sanchez-Robles (2002) observed that FDI flows as a bundle of resources which includes organizational, managerial skills, market know-how and market access, technology and capital which are all very important in stimulating the growth of the host country's economy. Furthermore, FDI contributes to capital accumulation and increases total factor productivity thereby boosting the growth of the economy, argued Al Mamun & Nath (2005).

The endogenous growth theory is of the view that foreign investors bring along the new technology, improved labour skills and know-how which overally improve the quality of the workforce. According to Romer (1986) and Lucas (1988), such a scenario provides the economy of the host country a very good foundation upon which its growth can be relied upon in a sustainable manner. The neoclassical growth theory mentions that the change in capital stock that happens due to the inflow of FDI has got an influence on short-run economic growth. This was proposed by (Solow, 1956; Swan, 1956). Swan (1956) viewed foreign capital inflows as an addition to the stock of savings in the economy which has got a positive effect on the economy via the increased provision of liquidity to the firms. This was buttressed by Solow (1956) who observed that foreign capital inflows positively affect the economy in the short run only because foreign investors add physical capital stock to the economy.

Ben-David & Loewy (1998) found out that exports give access to advanced technologies and better management practices. This was buttressed by Chenery & Strout (1966) whose studies noted that increased earnings from exports increase foreign currency reserves and this is necessary to enable the country to meet its import bill obligations. On the other hand, Bhagwati (1988) noted that an improvement in the economy leads to a boost in the quantity of exports because economic growth improves the skills of the workforce in general, afford the workforce the opportunity to increase their skills level hence giving a country a comparative advantage in the export business. This was supported by Konya (2006) whose study discovered a causality relationship running from GDP to exports in Austria, France, Greece, Japan, Mexico, Norway and Portugal. Furthermore, economic growth in developing countries leads to the general improvement in the technological skills thus giving the exporting country a comparative advantage (Lim, 2011). In contrast, economic growth negatively affected export levels in South Korea (Baimbridge & Zang, 2011).

According to Esfahani (1991), exports alleviate foreign currency shortages hence enabling the country to have more access to international markets. This was supported by Balassa (1978) who noted that exports bring in foreign currency that is used to buy heavy equipment from other country that helps the economy to grow. Tsen (2010) observed a feedback effect between exports, economic growth and domestic demand in China. The same study noted that a combination of exports and domestic demand Granger caused economic growth and economic growth had a favourable impact on both domestic demand and exports. This was supported by a study on Korea carried out by Awokuse (2005) who observed that both exports-led growth and growth-led exports were relevant in Korea.

According to Mina (2007), the positive influence of trade openness on FDI is quite significant in developing nations. This was supported by Zhang & Felmingham (2001) who using error correction modeling (ECM) approach found out that trade had a positive impact on FDI in the Central China from 1986 to 1999. This was also buttressed by MacDermott (2007) who revealed that FDI in Mexico, Canada and United States of America (USA) was attracted by trade integration from 1982 to 1997. Furthermore, North American Free Trade Agreement (NAFTA) boosted FDI inflow into Mexico, Canada and the USA by 1.73 percent, 1.54 percent and 0.96 percent respectively (MacDermott, 2007). This was reinforced by Buthe & Milner (2008) who observed that host countries that are part of the international and preferential trade agreements attract more FDI as multinational enterprises feels secure operating in such countries.

According to Jordaan (2004), multi-national enterprises which are export oriented would rather locate their production facilities in nations whose trade openness levels are quite high because such countries have got lower transaction costs. This was contradicted by ODI (1997) whose studies revealed that for exports oriented multinational enterprises, domestic market variables are not that relevant in their FDI location decision making process.

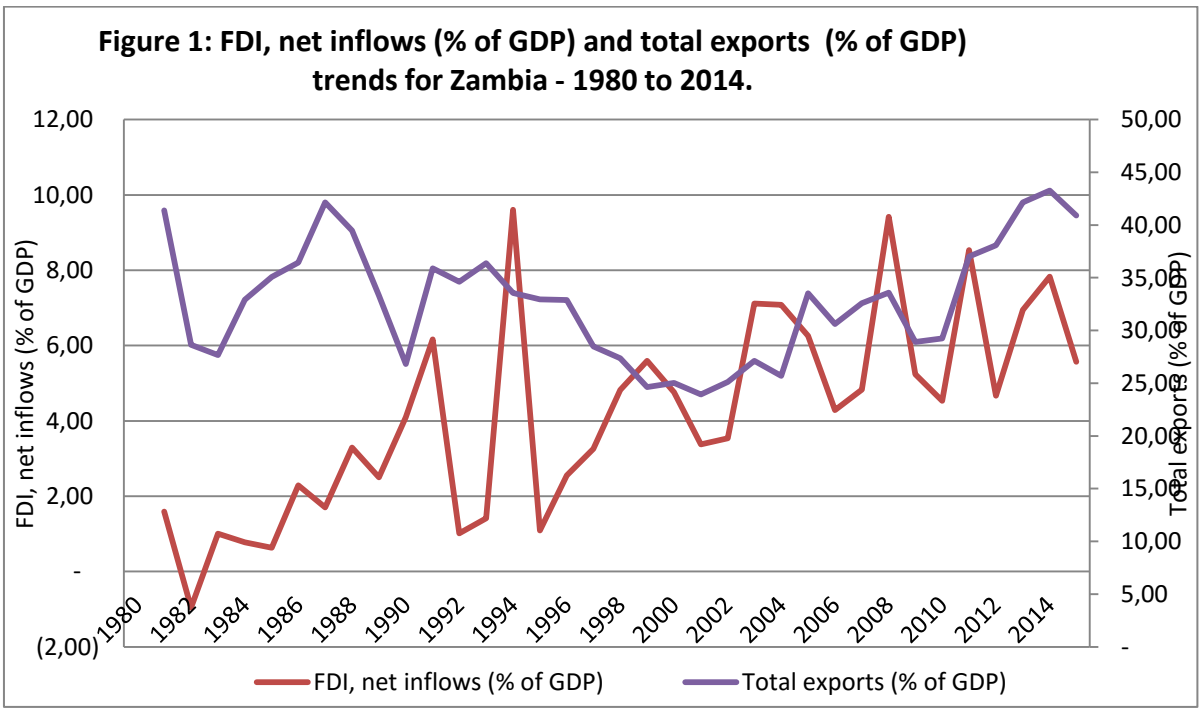
Zhang & Felmingham (2001) showed a feedback effect between FDI and exports in the provinces of China using the ECM estimation approach. A feedback relationship between FDI and exports was also found by Klasra (2011) in Turkey both in the short and long run. This was buttressed by Aizenman & Noy (2006) in the case of developing countries in contrast to developed nations.

High levels of trade openness had a high level of influence on FDI in Pakistan, according to a study that was carried out by Zakaria et al (2014). The same study also buttresses findings by other researchers who mentioned that there is a feedback effect between FDI and exports. Countries which are characterized by higher levels of trade openness are in a better position to harness the FDI technological and spill-over effects as compared to countries that have got lower trade openness index, argued Cuadros et al (2004). On the contrary, Ghosh (2007) observed no relationship at all between trade openness and FDI in developing countries from 1970 to 1997.

3 Foreign capital flows, exports and growth trends in Zambia

This section discusses the trends of FDI net inflows as a ratio of GDP and total exports (% of GDP).

Figure 1: FDI, net inflows (% of GDP) and total exports (% of GDP) trends for Zambia - 1980 to 2014.



Source: World Bank (2014)

FDI net inflows (% of GDP) went up from 1.59% in 1980 to 2.29% in 1985, representing a surge by 0.70 percentage points whilst total exports (% of GDP) plummeted by 4.95 percentage points (from 41.39% in 1980 to 36.44% in 1985) during the same time frame (see Table 1). Total exports (% of GDP) further declined by 0.56 percentage points during the subsequent five year period to end the year 1990 at 35.88% whilst FDI net inflows gained a massive 3.88 percentage points during the same time frame. Both FDI net inflows as a ratio of GDP and total exports (% of GDP) plummeted during the five year period from 1990 to 1995. However, FDI net inflows as a ratio of GDP marginally gained a 0.83 percentage points, from 2.55% in 1995 to 3.38% in 2000 whilst total exports as a ratio of GDP took a massive knock by 8.98 percentage points during the same time frame (from 32.90% in 1995 to 23.92%).

The period from 2000 to 2005 saw both total exports and FDI net inflow as a ratio of GDP recorded positive growth with the latter only managing to gain a marginal 0.90 percentage points to close the year 2005 at 4.28% and the former growing by a huge 6.69 percentage points to close the year 2005 at 30.69%. Furthermore, FDI net inflow (% of GDP) grew by a 4.25 percentage points, from 4.28% in 2005 to 8.53% in 2010. During the same time frame, total exports as a ratio of GDP significantly grew by 6.42 percentage points to close the year 2010 at 37.03%. However, FDI net inflow as a ratio of GDP plummeted by a 2.96 percentage points during a four year time frame, from 8.53% in 2010 to 5.57% in 2014. On the other hand, total exports went up by 3.88 percentage points, from 37.03% in 2010 to 40.90% in 2014 (refer to Table 1).

Table 2 shows the trends in US$ millions of FDI, net inflows, total exports and GDP from 1980 to 2014. FDI, net inflows declined by 16.53%, from US$61.70 million in 1980 to US$51.50 million whilst total exports and GDP went down by 48.95% and 42.01% respectively during the same time frame.

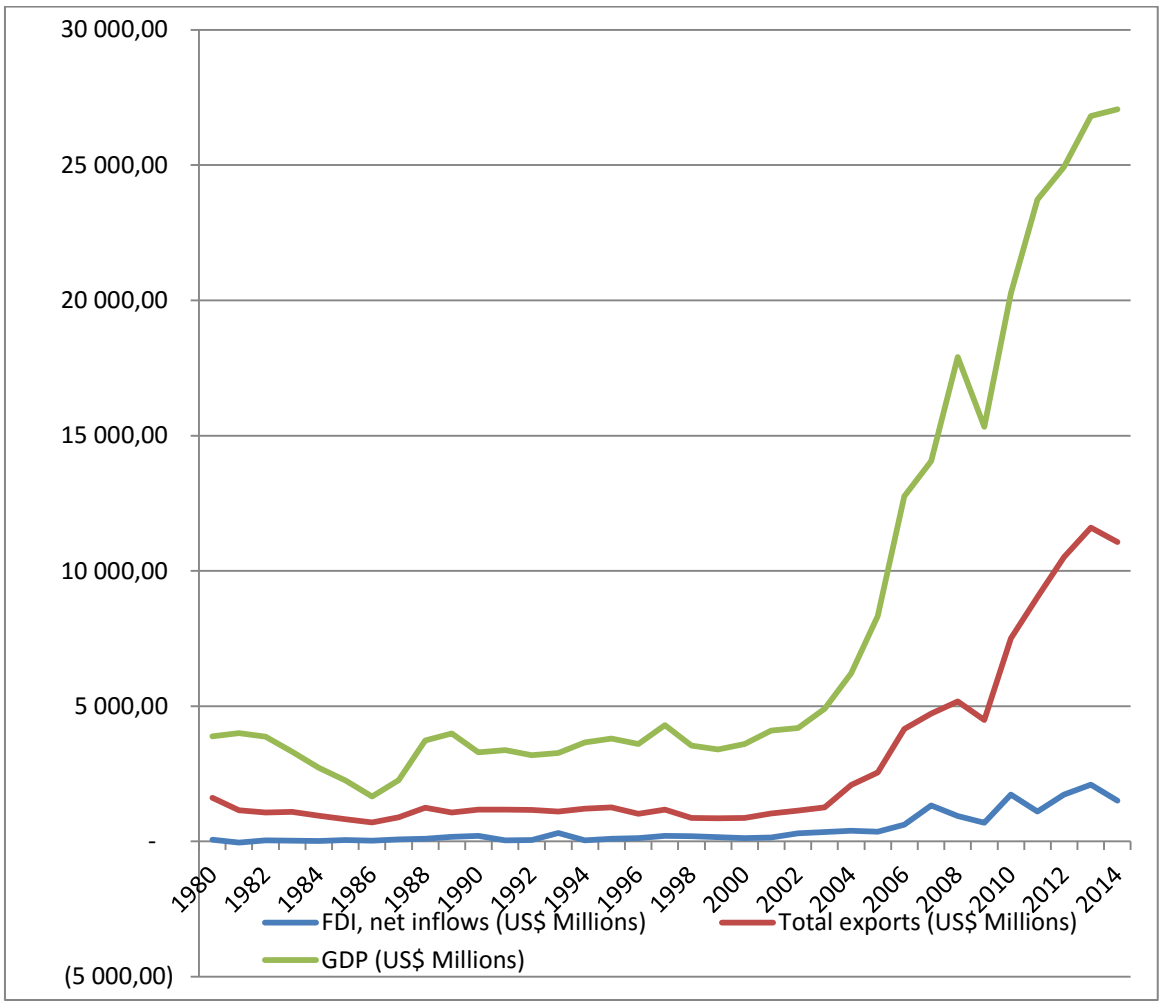


Figure 2. FDI, net inflows, total exports and GDP trends for Zambia (1980 to 2014)
Source: World Bank (2014)

The period 1985 to 1990 saw FDI net inflows, total exports and GDP increasing by 293.59%, 43.75% and 45.99% respectively. However, FDI net inflows plummeted by 52.15%, from US$202.70 million in 1990 to US$97 million in 1995 whilst total exports marginally increased by 6.166% during the same time frame. GDP increased by 15.77%, from US$3 288.38 million in 1990 to US$3 806.98 million in 1995 before going down by 5.42% to close off the year 2000 at US$3 600.63 million. Total exports went down by 31.23%, from US$1 252.54 million in 1995 to US$861.41 million in 2000 whilst FDI net inflows gained by 25.46% during the same time frame (refer to Table 2).

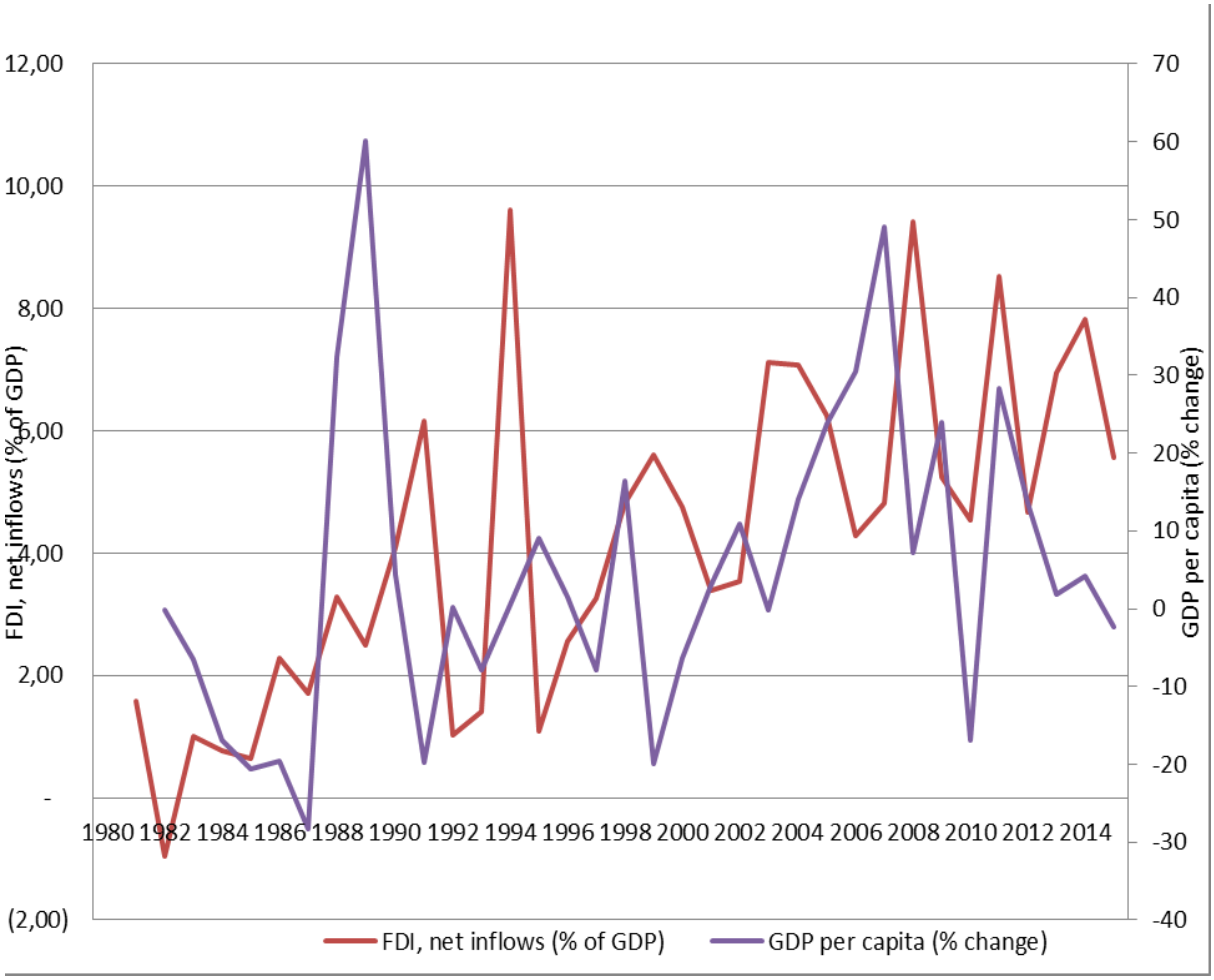


Figure 3. GDP per capita (% changes) and FDI, net inflows (% of GDP) trends for Zambia – 1980 to 2014
Source: World Bank (2014)

The period between 2000 and 2005 saw FDI net inflows, GDP and total exports going up by 193.29%, 131.40% and 196.08% respectively. Furthermore, FDI net inflows went up by 384.48%, from US$356.94 million in 2005 to US$1 729.30 million in 2010 whilst total exports increased by 194.20% during the same period to end the year 2010 at US$7 503.51 million. GDP surged by 143.23%, from US$8 331.86 million in 2005 to US$20 265.55 million in 2010. Last but not least, GDP further increased by 33.56%, from US$20 265.55 in 2010 to US$27 066.23 million in 2014. The same time frame saw total exports increasing from US$7 503.51 million in 2010 to US$11 071.02 million in 2014 whilst FDI net inflows plummeted by 12.81% (from US$1 729.30 million in 2010 to US$12.81 million in 2014.

4 Methodological Approach

(a) Data Sources and Proxies.

The study used time series annual data from 1980 to 2014 obtained from the World Development Indicators. FDI, net inflow (% of GDP), total exports (% of GDP) and GDP per capita proxies were used as a measure of FDI, exports and economic growth respectively. Although the data variables were auto-correlated at level, it was dealt with at first difference. E-Views 8 is the software package used by the current study for data analysis purposes.

(b). Unit root tests.

Augmented Dickey Fuller (ADF), Philips-Perron (PP) and the Dick-Fuller GLS were used to test for stationarity of all the three data variables at both level and first difference. Both GDP and exports data was found to be non-stationary at 1% and 5% significance levels whilst FDI data was found to be stationary at both 1% and 5% significance level at level (Table 1).

Table 2 shows results of stationarity tests of all the three data sets at first difference.

Table 1. Stationarity Tests of Variables in Levels

Variable	Test Statistic – Trend &Intercept	Critical Values	
Stationarity Tests of Variables on levels - Augmented Dickey-Fuller - Test			
FDI	-6.7545	-4.2627*	-3.5530**
EXPORTS	-2.4614	-4.2529*	-3.5485**
GDP	-1.1628	-4.2529*	-3.5485**
Stationarity Tests of Variables on levels – Phillips-Perron (PP) Test			
FDI	-7.8479	-4.2529*	-3.5485**
EXPORTS	-2.5756	-4.2529*	-3.5485**
GDP	-1.1487	-4.2529*	-3.5485**
Stationarity Tests of Variables on levels – Dickey-Fuller GLS (ERS) Test			
FDI	-6.8021	-3.7700*	-3.1900**
EXPORTS	-2.3207	-3.7700*	-3.1900**
GDP	-0.9480	-3.7700*	-3.1900**

Note:

*1) * and ** denote 1% and 5% levels of significance, respectively.*

*2) * MacKinnon critical values for rejection of hypothesis of a unit root.*

3) The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.

Table 2. Stationarity Tests of Variables on first Difference

Variable	Test Statistic – Trend &Intercept	Critical Values	
Stationarity Tests of Variables on first Difference - Augmented Dickey-Fuller - Test			
DFDI	-4.6858	-4.3561*	-3.5950**
DEXPORTS	-6.6270	-4.2846*	-3.5629**
DGDP	-10.7559	-4.2733*	-3.5578**
Stationarity Tests of Variables on first Difference – Phillips-Perron (PP) Test			
DFDI	-18.9338	-4.2733*	-3.5578**
DEXPORTS	-14.7023	-4.2733*	-3.5578**
DGDP	-31.2054	-4.2733*	-3.5578**
Stationarity Tests of Variables on levels – Dickey-Fuller GLS (ERS) Test			
DFDI	-8.4375	-3.7700*	-3.1900**
DEXPORTS	-7.6353	-3.7700*	-3.1900**
DGDP	-11.0188	-3.7700*	-3.1900**

Note:

*1) * and ** denote 1% and 5% levels of significance, respectively.*

*2) * MacKinnon critical values for rejection of hypothesis of a unit root.*

3) The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.

4) Critical values for Dickey-Fuller GLS test are based on Elliot-Rothenberg-Stock (1996, Table 1).

Table 2 shows that FDI, exports and GDP data were stationary at first difference at both 1% and 5% significance levels. In other words, all the data variables were integrated of order 1. Before running the Johansen test for co-integration, all the three variables are supposed to integrated of the same order and this requirement was satisfied (refer to Table 2).

c). Johansen Test for Co-integration Test.

The results of the AIC and SBC tests (not reported here) indicate that the optimal lag of both FDI, exports and GDP is 1. The study used the Johansen co-integration test (see table 3 & 4).

Johansen & Juselius (1990) approach employs two tests (Maximum Eigenvalue test and the Trace test) to investigate the number of co-integration vectors. The Maximum Eigenvalue statistic tests the null hypothesis of *r* co-integrating relations against the alternative of *r-1* co-integrating relations for r = 0, 1, 2…n-1. This test statistics are computed as:

$$LR_{\max}(r / n+1) = -T * \log(1 - \lambda) \qquad [1.1]$$

Where λ is the Maximum Eigenvalue and T is the sample size. Trace statistics investigate the null hypothesis of *r* co-integrating relations against the alternative *n* co-integrating relations, where *n* is the number of variables in the system for r = 0, 1, 2…n-1. Its equation is computed according to the following formula:

$$LR_{tr} = -T * \sum_{i=r+1}^{n} \log(1-\lambda) \quad [1.2]$$

In some cases Trace and Maximum Eigenvalue statistics may yield different results and Alexander (2001) indicates that in this case the results of Trace Test should be preferred.

Table 3. Unrestricted Co-integration Rank Test (Trace)

Eigenvalue	Trace Statistic	5% Critical Value	Hypothesized No. of CE(s)	Probability**
0.428428	28.47913	29.79707	None *	0.0704
0.258884	10.02012	15.49471	At most 1	0.2792

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

The null hypothesis (at most 1) means that there is at least one co-integrated equation in the relationship between the variables. The trace statistic is less than the critical value and probability is also more than 5% meaning we cannot reject the null hypothesis. This means that FDI net inflows, exports and GDP are co-integrated and they have got a long run relationship.

Table 4. Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Eigenvalue	Maximum Eigen Statistic	5% Critical Value	Hypothesized No. of CE(s)	Probability**
0.428428	18.45901	21.13162	None *	0.1136
0.258884	9.886752	14.26460	At most 1	0.2195

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

The null hypothesis (at most 1) means that there is at least one co-integrated equations. The max-eigen statistic is less than the critical value and probability is also more than 5% meaning we cannot reject the null hypothesis which says there is one co-integrated equation. This means that FDI net inflows, exports and GDP are co-integrated and they have got a long run relationship.

d) VECM Estimation Technique for causality among FDI, exports & GDP

We can run the VECM because all the three variables (FDI, GDP and exports) are co-integrated or there is a long run relationship among the three variables under study. The VECM framework is represented by the following econometric model specification.

$$\Delta y_t = \gamma_0 + \gamma_{yt-1} + \gamma_1 \Delta y_{t-1} + \gamma_2 \Delta y_{t-2} + \ldots\ldots\ldots \gamma_p \Delta y_{t-p} + e_t \quad [1.3]$$

Where γ is a matrix with elements γ_{jk} such that one or more elements of γ_{jk} are not equal to 0 and that γ_{yt-1} is the error correction representation of variables in y_t. e_t is the error term; Δ = first difference operator of a non-stationary variable; subscripts $_t$ and $_{t-i}$ represents time periods.

In the VECM model, the differenced dependent variables in this case FDI, GDP and exports are influenced by both the short term differenced lagged variables (Δy_{t-1} and Δy_{t-p}) and long term error correction term (γ_{yt-1}). Granger causality emerges through the error correction term in a VECM model.

Furthermore, Miankhel et al (2009) showed that the combined significance of the co-efficients of lagged variables and error correction co-efficients can modify the existence of long and short run relationship among variables in a VECM framework.

(i) FDI as a dependent variable whilst exports and GDP are independent variables

Table 5. Dependent Variable: D(FDI)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.872563	0.250555	-3.482521	0.0016
C(2)	-0.015163	0.189236	-0.080127	0.9367
C(3)	0.088657	0.105506	0.840302	0.4079
C(4)	0.001363	0.003346	0.407522	0.6867
C(5)	0.146952	0.429591	0.342075	0.7348
R-squared	0.467197	Mean dependent var		0.197879
Adjusted R-squared	0.391082	S.D. dependent var		3.003756
S.E. of regression	2.343926	Akaike info criterion		4.680259
Sum squared resid	153.8317	Schwarz criterion		4.907002
Log likelihood	-72.22427	Hannan-Quinn criter.		4.756551
F-statistic	6.138066	Durbin-Watson stat		2.144078
Prob(F-statistic)	0.001120			

C(1) is the long run co-efficient whilst C(2) to C(5) are all short run co-efficients. C(1) is the speed of adjustment towards long run equilibrium, must be significant and must be negative for a significant co-integrating relationship is to exist between the variables. In Table 5, the long run co-efficient is negative whilst the p-value is less than 5%. This means that there is a significant long run causality running from independent variables such as exports and GDP towards FDI.

Does a short run causality running from GDP towards FDI exist?

Using the Wald statistic, the null hypothesis is: there is no short run causality from GDP towards FDI. Table 6 shows that p-value of the Chi-square is greater than 5%, meaning the null hypothesis cannot be rejected. In summary, there is no short run causality running from GDP to FDI.

Table 6. Wald Test:

Test Statistic	Value	df	Probability
t-statistic	0.407522	28	0.6867
F-statistic	0.166074	(1, 28)	0.6867
Chi-square	0.166074	1	0.6836

Does a short run causality running from exports to FDI exist?

Table 7. Wald Test:

Test Statistic	Value	df	Probability
t-statistic	0.840302	28	0.4079
F-statistic	0.706107	(1, 28)	0.4079
Chi-square	0.706107	1	0.4007

Using the chi-square statistic, p is 40.07% and greater than 5% meaning we cannot reject the null hypothesis. That means there is no short run causality from exports to FDI.

Checking the efficiency of the model in which FDI is the dependent variable

The model does not have serial correlation, does not have heteroscedasticity and the residual of this model is normally distributed. The F-statistic and the corresponding probability is significant. These are the characteristics of a good and an efficient model. The R-squared is 46.71% and not favourable. Generally, the model meets the majority of characteristics of an efficient model.

(ii) GDP as a dependent variable whilst FDI and exports are independent variables.

Table 8. Dependent Variable: D(GDP)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.063396	0.037886	-1.673327	0.1054
C(2)	0.027578	0.183428	0.150347	0.8816
C(3)	-5.592974	10.37545	-0.539059	0.5941
C(4)	1.323741	5.784690	0.228835	0.8207
C(5)	34.48637	23.55359	1.464166	0.1543

R-squared	0.156476	Mean dependent var	34.49030
Adjusted R-squared	0.035973	S.D. dependent var	130.8885
S.E. of regression	128.5127	Akaike info criterion	12.68866
Sum squared resid	462434.7	Schwarz criterion	12.91540
Log likelihood	-204.3629	Hannan-Quinn criter.	12.76495
F-statistic	1.298523	Durbin-Watson stat	2.063809
Prob(F-statistic)	0.294607		

The co-efficient of the long run relationship C(1) is negative, the p-value is greater than 5% and the interpretation is that there is an insignificant long run causality running from exports and FDI towards GDP.

Does a short run causality running from FDI towards GDP?

Using the Wald statistic, the null hypothesis is: there is no short run causality from FDI towards GDP. Table 9 shows that p-value of the Chi-square is greater than 5%, meaning the null hypothesis cannot be rejected. In summary, there is no short run causality running from FDI to GDP.

Table 9. Wald Test

Test Statistic	Value	df	Probability
t-statistic	-0.539059	28	0.5941
F-statistic	0.290584	(1, 28)	0.5941
Chi-square	0.290584	1	0.5898

Does a short run causality running from exports to GDP?

Table 10. Wald Test

Test Statistic	Value	df	Probability
t-statistic	0.228835	28	0.8207
F-statistic	0.052366	(1, 28)	0.8207
Chi-square	0.052366	1	0.8190

Using the chi-square statistic, p is 81.90% and greater than 5% meaning we cannot reject the null hypothesis that says there is no short run causality from exports to GDP. Therefore there is no short run causality from exports to GDP.

Checking the efficiency of the model in which GDP is the dependent variable

The R-squared of 15.64% is low and the F-statistic and the corresponding probability is not significant and this is not favourable (see Table 10). The model has serial correlation which means that the model is undesirable. The model does not have heteroscedasticity hence desirable. The residual of this model is not normally distributed which shows that the model is not desirable. The only good characteristic of the model is that it does not have heteroscedasticity.

(iii) Exports as a dependent variable whilst FDI and GDP are independent variables.

Table 11. Dependent Variable: D(EXPORTS)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.094956	0.082959	-1.144608	0.2621
C(2)	0.052540	0.174556	0.300994	0.7656
C(3)	0.076294	0.313084	0.243685	0.8093
C(4)	-0.003780	0.005535	-0.682893	0.5003
C(5)	0.489625	0.710740	0.688894	0.4966
R-squared	0.095159	Mean dependent var		0.371818
Adjusted R-squared	-0.034104	S.D. dependent var		3.813448
S.E. of regression	3.877929	Akaike info criterion		5.687207
Sum squared resid	421.0733	Schwarz criterion		5.913950
Log likelihood	-88.83891	Hannan-Quinn criter.		5.763499
F-statistic	0.736168	Durbin-Watson stat		2.135205
Prob(F-statistic)	0.575150			

The co-efficient of the error correction term C(1) is negative, the p-value is greater than 5% therefore insignificant meaning that there is an insignificant long run causality running from FDI and GDP towards exports.

Does a short run causality running from FDI to exports?

Using the chi-square statistic, p is 80.758% and greater than 5% meaning we cannot reject the null hypothesis (refer to Table 12). That means that there is no short run causality from FDI to exports.

Table 12. Wald Test

Test Statistic	Value	df	Probability
t-statistic	0.243685	28	0.8093
F-statistic	0.059382	(1, 28)	0.8093
Chi-square	0.059382	1	0.8075

Does a short run causality running from GDP to exports?

Table 13. Wald Test

Test Statistic	Value	df	Probability
t-statistic	-0.682893	28	0.5003
F-statistic	0.466342	(1, 28)	0.5003
Chi-square	0.466342	1	0.4947

Using the chi-square statistic, p is 49.47% and greater than 5% meaning we cannot reject the null hypothesis. That implies that there is no short run causality from GDP to exports (see Table 13).

Checking the efficiency of the model in which exports is the dependent variable

The model has no serial correlation which means that the model is good. The model does not have heteroscedasticity and that is desirable. The residual of this model is normally distributed which is a good characteristic. The R-squared of 9.5% is low and is not favourable. The F-statistic and the corresponding probability is not significant and that is not good (see Table 11). The only undesirable characteristic of this model is that the r-squared and the F-statistic are not favourable. All the other characteristics are desirable. Generally, it is a good and reliable model.

Table 14 shows a summary of the causality relationships between FDI, exports and GDP both in the short and long run for Zambia.

Table 14. Long and short run causality in the VECM framework for Zambia – FDI, exports and GDP

	FDI→GDP	GDP→ FDI	EXPORTS→ FDI	FDI→ EXPORTS	EXPORTS→ GDP	GDP→ EXPORTS
Long run	Yes	Yes	Yes	Yes	Yes	Yes
Short run	No	No	No	No	No	No

Conclusion

The findings from the VECM estimation technique is sixfold: (1) the study revealed a long run causality relationship running from exports and GDP towards FDI, (2) the study showed a non–significant long run causality relationship running from FDI and exports towards GDP and (3) the existence of a weak long run causality relationship running from FDI and GDP towards exports in Zambia (see Table 14).

Furthermore, the study found out that (4) no short run causality relationship that runs from FDI and exports towards GDP, (2) short run causality running from FDI and GDP towards exports does not exist and (3) there is no short run causality relationship running from exports and GDP towards FDI (refer to Table 14). Contrary to the theory which says that FDI brings along with it a whole lot of advantages (FDI technological diffusion and spill over effects), the current study found that the impact of FDI in Zambia is not significant in the long run. This could as a result that (1) certain host country locational characteristics that ensures that Zambia can benefit from FDI inflows are not in place or (2) they might be in place but still not yet reached a certain minimum threshold levels. This might an interesting area of further research. On the backdrop of the findings of this study, the author recommends that the Zambian authorities should formulate and implement export promotion strategies and economic growth enhancement initiatives in order to be able to attract FDI.

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