Impact of Foreign Direct Investment on Economic Growth: Empirical evidence from Tanzania (1990-2020)

By

MWITTA, Norbert Zavery

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

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Committee in charge:

Professor Cho, Dongchul, Supervisor

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ABSTRACT

This paper uses the Vector Error Correction Model (VECM) to analyze the impact of foreign direct investment (FDI) on Tanzania's economic growth rate. This paper aim to ascertain if inflows of foreign direct investment impact positively or negatively, the real GDP growth rate in the long run. Time series annual data of relevant macroeconomic variables have been used from 1990 to 2020. The paper revealed a statistically significant positive association between real GDP growth rate and FDI inflow to GDP ratio. On the other hand, the study revealed a negative correlation between gross fixed capital formation to GDP ratio and the real GDP growth rate which may be caused by the current situation of public investment. In order to promote sustainable and inclusive economic growth in Tanzania, it is suggested in this paper that the government continues upgrading its policies regarding inward foreign direct investments, public investment, and the export sector.

Keywords: FDI, Real GDP Growth rate, Tanzania, VECM

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1. INTRODUCTION

Background of Study

Among the outstanding features in the global economy in recent decades is the increase of FDI flows where many sub-Saharan countries including Tanzania allowed FDI to be the integral part of their strategic development plans. Tanzania is among the major recipients of FDI in Africa. Primary investors are coming from China, India, Canada, United Kingdom, and Kenya to mention a few. Mining, Oil and Gas and primary agriculture are among the key sectors which draw most FDI. FDI is highlighted as type of capital and means through which technology and knowledge can be transferred and diffused from advanced country to another. In this aspect, FDI inflows could help the nation's economy thrive. The government of Tanzania adopted socialist development route from 1967 to the middle of the 1980s as a result of the Arusha Declaration, making FDI as a relatively new kind of investment in Tanzania. Beginning the middle of the 1980s, the government began to put economic liberalization policies into practice, which increased FDI inflows to USD 3.8 billion in 2001 from USD 2.4 billion in 1999. Further, the annual GDP growth rate increased to 6.07% in 2001 from 4.9% in 1999.

There are fascinating issues around how FDI affects the economic growth rate in developing nations. FDI has a variety of effects on economic growth. For instance, according to the new growth models, FDI enhances economic growth by promoting technology transfer (Borensztein, Gregorio & Lee, 1998). According to the neo classical growth theory, FDI inflows had unidirectional impact on GDP growth rate while exports had a bidirectional impact. (Hsiao, 2006). Although foreign direct investment has a potential to raise capital, it's impact on growth is limited in the long run (Neusser, 1991). In accordance with the endogenous growth theory in 1980s, through the transfer of technology and spillover, FDI and technological advancement affect the growth in the receiving country (Fan, 2002). Foreign direct investments can facilitate economic

growth rate in long term by ensuring the transfer of technology and accumulation of capital when there is openness of trade. Furthermore, inflows of FDI can enhance economic and market growth by fascinating multinational corporations (MNCs) that would wish to invest in high growing economies (Lim, 2001).

Numerous papers have looked at the connection among FDI Inflows and GDP, on either specific economy or cross economy. GDP can be well-thought-out as a measure of health, prosperity and well-being for a country. Among the other factors, GDP can be affected by gross fixed capital formation and Trade openness. Hye, Wizarat & Lau (2016), mentioned that, trade openness has a favorable impact growth in all time periods. According to Overseas Development Institute (ODI, 2016), gross fixed capital formation is essential for boosting the nation's economy. To determine the association of the aforementioned variables within the context of various economies, the majority of these studies have used various time series and cross-sectional data approaches. For instance, Rahman (2015) discovered a long-term symmetric link among growth and FDI in Bangladesh along with the existence of a unidirectional influence. In a different study, Adhikary (2011) highlighted that openness to trade had unfavorable impact on Bangladesh's GDP, although capital formation and FDI inflows had a favorable impact. Numerous studies have highlighted that FDI enhances economic growth of a particular country, however, others have concluded that, the impact is essentially uncertain.

Problem Statement

There has been a positive and rising trend of FDI inflows in Tanzania as a result of transitions to the free and liberalized economy from a centrally planned one, by enhancing trade regime and enacting various policies in the late 1980s.There has been a positive trend up to 2013 and thereafter the downward trend had experienced according to World bank data, 2022. The amount of inward FDI increased from USD 47 million in 1990 to about USD 2.1 billion in 2013

and thereafter fell down to about USD 685 million in 2020. To improve investment climate, the government of Tanzania established Act of 1990 for National Investment Promotion and Protection (Muganda, 2004).

The impact of FDI on growth of various economies has been the subject of numerous studies, all of which have highlighted different findings. The implications of FDI on many economic sectors, including employment, trade, education, technology, and so forth, have been discussed in some literature. Zhang (2001) assessed how FDI affect the economic growth among nations in two continents and discovered that 5 out of the 11 countries under study had a positive impact from FDI. FDI significantly and favorably impacted Tanzania's manufacturing sectors (Matonya, 2017). Regardless of the increasing or negative trend in FDI inflows, it is still unclear how FDI has affected Tanzania's GDP. Consequently, this study tries to assess whether FDI has a positive or negative long run impact on Tanzania's economy by applying various quantitative techniques.

Research Objective and Research Questions

This study's primary goal assessing FDI inflows' impacts on Tanzania's GDP growth rate. Additionally, the paper examines effects gross fixed capital formation and trade openness on the GDP growth rate. Investors, policymakers, and the government may consider the ramifications of these results.

The following are the study's inquiries, with references to the aforementioned objectives: Is there a long run substantial impact of FDI inflows on GDP growth rate? Is there a long run significant impact of gross fixed capital formation on GDP growth rate? Is there a significant impact of openness to trade on the GDP growth rate in the long run?

For the past several decades, a large number of scholars, economists, and policy makers have been attempting to examine the association among significant trade deficits, public investment, FDI and GDP based on the varying pattern of economic growth rates and FDI inflows. This paper attempts to respond the above questions to evaluate the association among FDI inflows, gross fixed capital formation, trade openness, and economic growth in Tanzania.

Method of Study

This paper employed quantitative techniques approach by looking time series data spanning 20 years, from1990 to 2020. The secondary data variables were gathered from World Bank data bank 2022. GDP is used to measure economic growth. The volume of inward foreign direct investment of Tanzania is denoted by FDI. CAP refers to the gross fixed capital formation of Tanzania. OPEN refers to Openness of Trade of Tanzania. In order to determine whether the variables under study do not have a unit root problem, the stationarity test was conducted by employing Augmented Dickey Fuller (ADF) and Phillips Perron tests. The Johansen Cointegration test was performed to ascertain the presence of association among variables. In addition, the Vector Error Correction Model (VECM) employed to calculate the impacts of the independent factors on the dependent variable under study in the long run.

Hypothesis

The hypothesizes regarding the long run association with growth have been established and are outlined below in accordance with the research purpose and research questions:

i. Foreign Direct Investment has favorable impact on Tanzania's economic growth rate

ii. Gross fixed capital formation has favorable impact on Tanzania's economic growth rate

iii. Openness to trade has favorable impact on Tanzania's economic growth rate

Organization of Paper

Introduction and background of the study have been provided in the first chapter. The second chapter describe examination of theoretical and empirical researches, including a summary of FDI performance in Tanzania. The third chapter elaborates research methodology and interpretations of data. Chapter four presents result and discussion. Lastly, chapter five provides conclusion.

2. LITERATURE REVIEW

2.1 Foreign Direct Investment

Krugman & Obstfeld (2008) highlighted FDI as transnational flow of capital where a parent company in one economy initiates its subsidiary in another economy.   UNCTAD (2016), defined FDI as an investment by entity which belongs to one country which aim to undertake business investment in another country for more than a year. FDI is a crucial mechanism to foster economic development of the growing economies as it boosts exports and trade balance (Hailu, 2010). The theoretical and empirical investigations are reviewed in this chapter.

2.2 Theoretical Review

Generally, many literatures have highlighted the positive connection between FDI and economic growth rate; nevertheless, some few insights for it. According to the endogenous growth models (Romer,1986 and Lucas,1988), FDI describe the significance of productivity, efficiency and technological improvement and it can enhance the economy of the country due to positive externalities and spillover effects. By referring to endogenous growth theory, the problem of adverse selection may facilitate developing economies not to benefit from FDI (Krugman, 1994).

The neoclassical growth theories claim that, FDI can improve the economic growth by enhancing capital creation (Neusser,1991). FDI enhance economic growth by ensuring improvement of various kinds of capitals, and research and development (R&D). Through means of technological transfer and its repercussions in the host nation, MNCs can boost industrial production, improve human capital and enhance cooperation on R&D (Ikiara, 2003). FDI could strongly enhance sustainable growth compared to local investment in any time periods (Melnyk, Kubatko & Pysarenko, 2014).

The Standard Solow type growth model highlights the importance of FDI in facilitating the host economies to attain effective investment more than their own internal savings (Nyanga, 2013).

According to this theory, FDI can facilitate capital formation like steel plants, robots and computers in the host economies (Mankiw & Wolfers, 2003). Furthermore, according to modernization theory, FDI influence growth as it facilitates sharing of information, knowledge and technology with growing economies (Rahman, 2015).

2.3 Empirical Review

Numerous researches have attempted to establish the link between FDI and macroeconomic performances including GDP, however, the results are rather mixed. Many papers have mentioned that FDI influence growth in various ways, others have portrayed the negative influence of FDI to economic growth and others showed insignificant results. Balasubramanyam, Salisu and Sapsford (1996) argued that FDI can speed up growth of the receiving countries through improving foreign trade and ensuring stability of macroeconomic variables. Further, they concluded that FDI inflows can effectively boost economic growth than local investments in developing economies which implement export promotion policies. For nations with high institutional competence, FDI has a significant beneficial influence on their growth. (Olofsdotter,1998). When FDI is directed toward the mining industries, it has favorable impact on Tanzania's GDP (Usiri, 2014).

Sadik and Bolbol (2001) examined that FDI inflows had affected positively the GDP growth and local investment in six Arab countries from 1978 to 1998. Moreover, Bengoa (2003) found the positive association among FDI and GDP in 18 economies of south America. Sokang (2018) examined that foreign direct investment had a favorable effect on growth in Cambodia's economy by examining data from 2006 to 2016. Furthermore, Akiri, Vehe and Ijuo (2016) used VECM and determined positive impact of inward FDI to Nigeria's GDP growth during from 1981 to 2014.

Stoneman (1975) investigated the effect on growth caused by foreign direct investment in the growing economies from 1945 to 1970. He came to the conclusion that FDI had a detrimental effect on economic growth. The effect of FDI on Nigeria's GDP was negative and negligible when Error Correction Model (ECM) was used (Akinlo, 2004). Rahman (2015) determined the insignificant results on impacts of FDI to the GDP growth of Bangladesh.

Other papers have indicated the presence of both benefits and costs of FDI to the economy. For instance, Langley (1968) portrayed that FDI could boost the GDP growth rate of Nigeria; however, he was worried that it could also narrow down the balance of payment (Akinlo, 2004). Nevertheless, FDI may have benefits or costs to macroeconomic performances, developing countries should enact and implement proper policies to enhance FDI because of mutual benefits.

2.4 Types of FDI

FDI is generally alienated in two categories: horizontal FDI and vertical FDI. Further distinctions are made between vertical FDI's backward and forward versions.

Horizontal FDI allows MNCs to expand their production abroad such that producing equivalent products to domestically available ones in the FDI receiving country. Lim (2001) highlights that Horizontal FDI seeks to penetrate a new market; however, it may be affected by various factors, including openness to trade and GDP growth rate. Horizontal FDI takes a large part in global FDI (Campos & Kinoshita, 2003).

In Vertical FDI, MNCs takes advantages of geographical position and low costs to launch production process in receiving state and to produce for both the domestic and international markets. Vertical FDI is sometimes mentioned as the resource seeking FDI as investors tend to seek the low cost and efficient resources in the foreign country compared to the home country (Campos & Kinoshita, 2003). In Backward FDI, the established enterprises in foreign country

provide inputs to the parent enterprise while in Forward FDI, which is less popular, enterprises in the host country sells products from parent enterprises.

Moreover, FDI can be classified into target, direction and motive as means for FDI to effect growth of the host nation (Khaing, 2009). Target effect ways include investment, horizontal and vertical FDI, and mergers and acquisitions. The direction effect can be divided into inward and outward FDI, whereas market seeking, resource seeking, strategic asset and efficient seeking are means of motive effect.

2.5 Overview of FDI inflows in Tanzania

According to UNCTAD (2002), Tanzania's FDI was slightly lower than that of the neighboring country, Kenya before reforms, in the 1990s. In this era, the average inflows of FDI in Tanzania was approximately USD 4.4 million while Kenya received on average about USD 32 million. Further, from 1970 to 1990 the three East African countries received FDI inflows of about USD 757 million while Kenya got almost 90% as she had already established foreign direct investment policies while Tanzania and Uganda got only 10%. In this period, Tanzania believed in the so named Ujamaa, the socialist society which was characterized nationalization of properties and forbidding foreign investments.

In mid 1980s, Tanzania made some economic reforms, including trade liberation, privatization and opening the economy towards foreign direct investments. These changes rose the volume of FDI inflows in Tanzania by 15.3% over ten years from 1990 with of USD 47 million to 2000 with USD 768 million. The value of FDI inflows in Tanzania increased further to USD 6,239.9 million in 2008 from USD 4438.7 in 2005 (BOT, NBS & TIC, 2009).

Ngowi (2001) emphasized that, the raising volume of FDI inflows in Tanzania was highly contributed by reforms established by the government. Such reforms included privatization

reforms, mining reforms in 1990s which attracted many investors in the mining sector, allowing banking operations in 1993 and changes in legal structure in favor of FDI in 1997. Except for petroleum sector, demands for government equity was removed for all sectors (UNCTAD, 2002). According to Tanzania Invest (2016), Tanzania is ranked the top country in East Africa with high FDI inflows, where as the top investors are from Canada, Kenya, the United Kingdom and China. The mentioned countries and some other countries signed Bilateral Investment Agreement Treaties with Tanzania in different years.

There was a decline of FDI inflows in Tanzania from USD 0.9 billion in 2005 to USD 0.5 billion in 2008 due to World economic crisis. Moreover, Tanzania received the highest FDI inflows about USD 2.1 billion in 2013 and thereafter the trend fell down to about USD 685 million in 2020. This fall is largely contributed by the low returns to FDI followed by low prices of product and low demand for exports (Tanzania Investment Report, 2018).

Figure 1. *FDI inflows in Tanzania from 1990 to 2020*
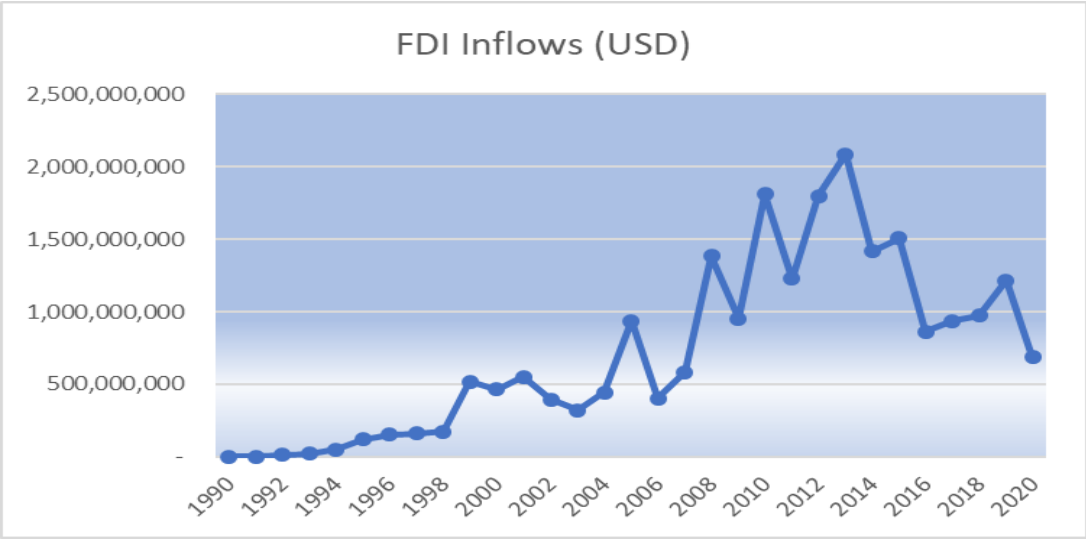
Source: World bank data 2022

3. EMPIRICAL ANALYSIS

3.1 Trend analysis of GDP, FDI, CAP and OPEN.

The trend for economic growth rate of Tanzania has been positive excluding in the years 1991-1994 and 2020. (Figure 2). The negative trend in early 1990s was caused by poor macroeconomic performances and failure in the first phase of the economic reform program. The sharp decline in 2020 was due to COVID -19 pandemic. As result of macroeconomic performances and economic reforms, Tanzania got the highest annual economic growth rate of 4.45% in 2011.

Figure 2. *GDP growth rate of Tanzania 1990 - 2020*
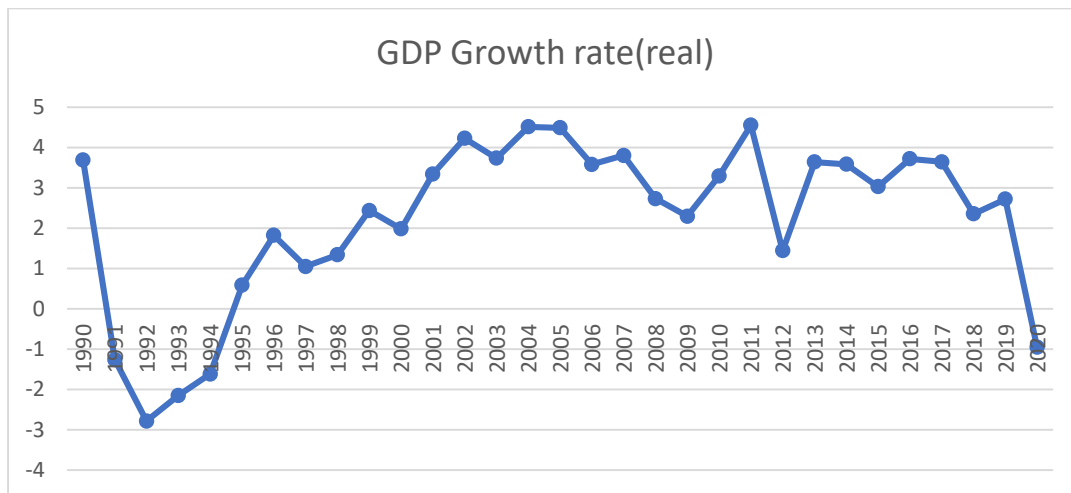
Source: World Bank data, 2022

The positive trend of Tanzania economic growth was partly influenced by inflow of FDI. The trend of contribution of FDI to GDP has had been positive since 1990 (Figure 3). The sharp decline in 2005 – 2008 can be explained by global economic crisis and the decreasing trend of FDI to GDP ratio from 2010 was caused by low returns to FDI companies due to low prices of products.

Figure 3. *Contribution of FDI to GDP in percentage 1990 – 2020*
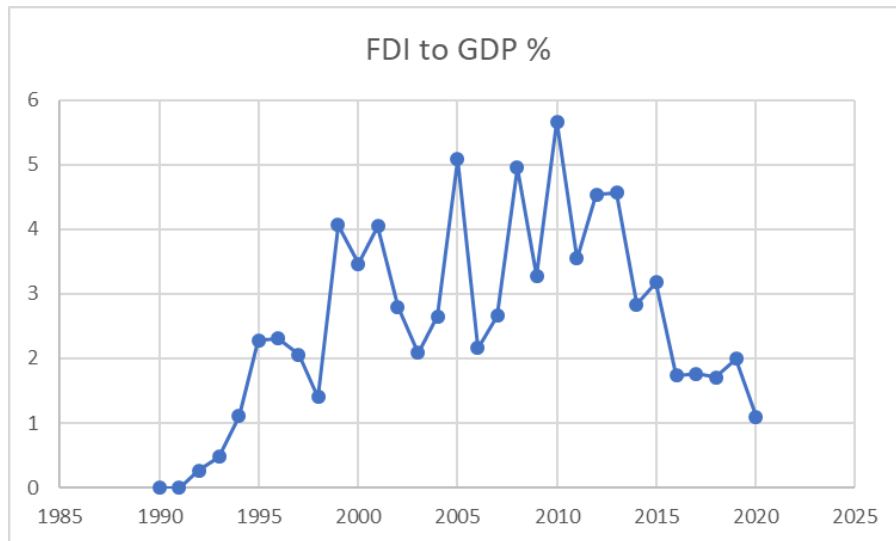
Source: World bank data, 2022

The gross fixed capital formation to the GDP ratio of Tanzania has been increasing as shown in figure 4. Its trend has been positive and increasing; however, it slowed down in 1997 as the results of low production in agriculture due to drought and floods. The increasing trend portrays the importance of investments in economic growth of Tanzania.

Figure 4: *Gross fixed capital formation to GDP ratio in Tanzania 1990 – 2020 (%)*
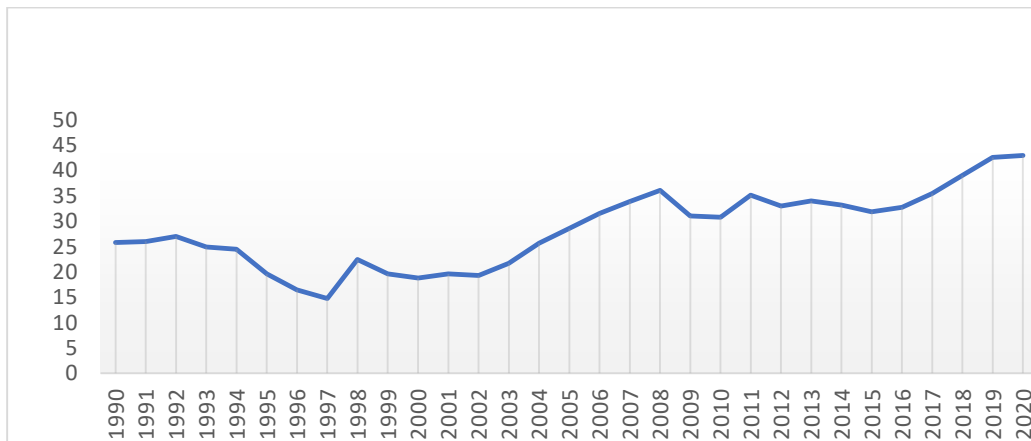
Source: World bank data, 2022

With reference to the trade openness trend graph as shown in figure 5, the trade openness index[1] has been increasing to the highest of 45.82 percent in 2011 as a result of implementation trade liberalization policies from 1990s. However, trade openness index for the World has endured below an average of 50 percent, the declining trend in Tanzania from 2012 can be explained my implementation of mega FDI projects related to natural gas exploration as switched to imported oil (Bank of Tanzania, 2018).

Figure 5: *Trade openness index in Tanzania 1990 – 2020*
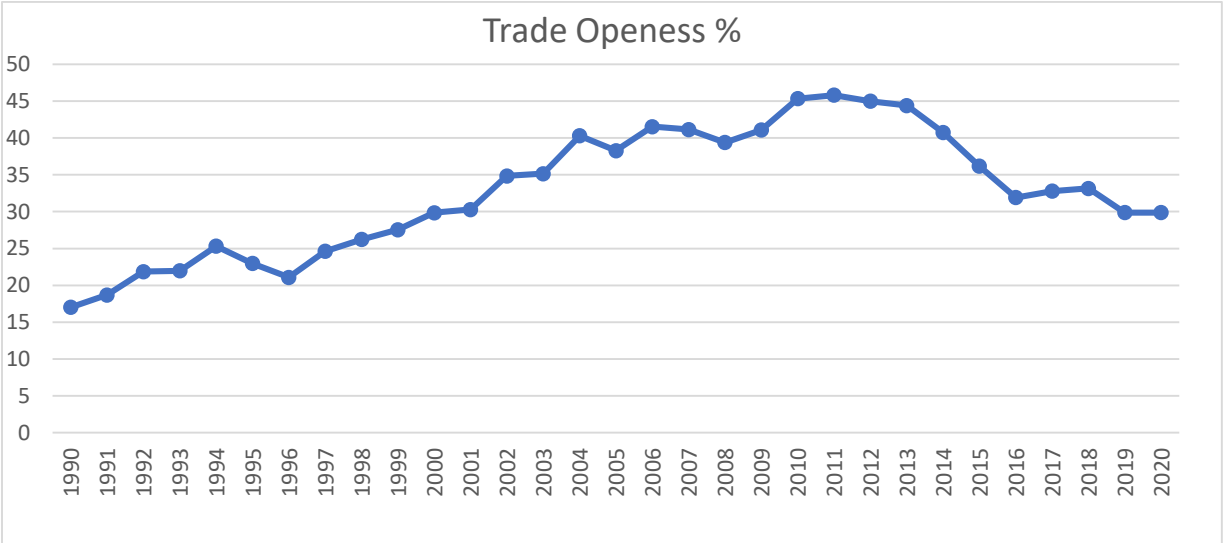
Source: World Bank data, 2022

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[1] The total exports and imports of a nation are calculated as a proportion of its GDP for the trade openness index. (World Bank Data, 2022)

In general theory, the variables investigated in this paper are all positively correlated. Neoclassical and endogenous growth theories emphasize how FDI boosts the amount and effectiveness of physical capital, which in turn promotes economic growth (Romer 1986). In terms of the link between risk and return, the flow of foreign capital tends to rise with openness to trade. Endogenous growth theories stress the importance of an open trade framework for promoting effective investment allocation to boost international trade and growth. (Balasubramanyam, Salisu & Sapsford, 1996). Additionally, capital formation frequently affects FDI and GDP growth. In line with neo-classical growth theory, when sufficient capital is infused into developing countries with low capital stocks, they are likely to experience higher productivity and growth.

3.2 Data Collection and Methodology

From 1990 through 2020, Tanzania's annual macroeconomic data were applied in this paper. The World Bank's Data 2022, a vital and reliable source for research investigations, was used to acquire the time series data. Before using the Johansen co-integration test to assess the presence of any long-term association, the "Augmented Dickey Fuller (ADF)" and "Phillips Perron (Pperron)" tests used to examine the stationarity among variables under examination. Subsequently, the "Vector Error Correction Model (VECM)" used to assess the long-term associations among GDP, FDI, CAP, and OPEN. The Stata/SE 17.0 software was utilized to implement the aforementioned quantitative procedures.

Empirical and econometrical models for this study are as follows,

$$GDP_t = f (FDI_t, CAP_t, OPEN_t) \dots\dots\dots(i)$$

$$GDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 CAP_t + \beta_3 OPEN_t + \mu_t \dots\dots\dots (ii)$$

Where:

Target Variable, **GDP** = GDP per Capita growth rate (real)

Explanatory Variables:

FDI = FDI inflows per GDP (constant price)

CAP = Gross Fixed Capital Formation per GDP

OPEN = Openness to trade

β = Coefficient

μ = Error term

t = Time period

3.3 Description of Variables

Table 1. *Descriptions of variables and anticipated signs*

Variables	Description	Anticipated sign
GDP	Real GDP per capita growth rate	
FDI	FDI inflows - GDP ratio	Positive
CAP	Gross fixed capital formation - GDP ratio	Positive
OPEN	Openness to trade	Positive or Negative

GDP and FDI

FDI is among the proper mechanism to foster economic growth especially for the third World countries. FDI inflows facilitate transfer of technology and stimulate production in local industries through linkage effects which lead to increase of exports for a recipient country. FDI facilitate development of human capital and employment opportunities to indigenous which in turns increase disposable income and purchasing power on the economy. Moreover, by bringing

foreign companies in the country, FDI enhance competition and innovation which stimulate growth. The rise in FDI inflows has the possibility of accelerating Tanzania's economic growth. Therefore, this study anticipates that inflows of FDI has a favorable effect on real GDP in this aspect.

GDP and CAP

The study expects CAP to have positive impacts on GDP. CAP is an important instrument in domestic investment where by the increase of domestic investments lead to increase in employment as well as aggregate demand which boost economic growth. Gross fixed capital formation facilitates exploitation of resources through creating various enterprises and enhance large scale production and specialization which are vital for economic growth in Tanzania. Overseas Development Institute (ODI, 2016) argued for gross fixed capital formation as a crucial instrument to enhance growth and employment.

GDP and OPEN

With regard to Tanzania's economic growth, this study anticipates either favorable or negative impacts of trade openness. OPEN may have positive effects on economy through facilitating spillover effects on technology and innovation which, in turn, increases competition in the international market, efficiency in product and revenues. Openness to trade encourage specialization, boost economies of scale and raise production (Bond, Jones & Ping, 2005). Conversely, trade openness might cause a detrimental effect on growing economies as they always fall on disadvantages on their terms of trade.

Stationarity Test

This paper used "Augmented Dickey Fuller (ADF)" test to assess the existence of unit root on variables, and the outcomes were then verified by "Phillips Perron (Pperron)" tests. The variance does not change over time for a variable with a unit root or non-stationary variable.[2] In order to avoid spurious regression outcomes, the econometric model should encompass stationary variables which may be generated by differencing.[3] For a variable to be stationary, test statistic value should be significant and greater than critical value.

$$\Delta Y_t = \beta_0 + \alpha t + \beta Y_{t-1} + \sum_{i=1}^{n-1} \gamma_i \Delta Y_{t-1} + \mu t$$

Where:

β_0 = Constant

α = Time trend coefficient

Y = Dependent variable

t = Period of time

Δ = Operator for first difference

μ = Error term

For the variable to be stationary, β should be significant and not equal to zero.

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[2] Green R. Econometrics,2003

[3] Gujarati Basic Econometrics, 2009

Optimal Lags

The dependent variable often responds to explanatory variables with the lapse of time (lag). Lag is one such a previous value of every variable that is used to describe the potential future value of an outcome variable. Decisions may be impacted by the outcomes of changing the lag value. By observing at the lowest value from the information criterion, the ideal lag is identified. Such criterion includes *"Hannah-Quinn (HQIC)* and *Schwarz-Bayesian (SBIC)* to list a few.

Johansen Cointegration Test

when two series advance together toward long-term equilibrium in the same direction, are considered to have cointegrated. In this regard, Cointegration describes the presence of long run equilibrium where the system converges over time.[4] When variables in a time series are cointegrated, it suggests that long-term relationships exist, which makes it necessary to run the VECM for the study. To determine whether a variable, exhibits long-term association, Johansen Cointegration Test should be applied.

Vector Error Correction Model (VECM)

The VECM is conducted to approximate effect of one variable on another among cointegrated variables by scheming an adjustment term. The adjustment term should be negative and significant suggesting that, the current year can be used to make up for any long-term equilibrium deviations. To facilitate accurate interpretation, the normalized cointegrating coefficients' signs are switched. If there is no cointegration between the variables, the investigation can be conducted using other models, such as the Vector Autoregression Model (VAR).

4. QUANTITATIVE RESULTS AND DISCUSSION

4.1 Summary Statistics

Table 2*: Summary Statistics*

Data	Observation	Mean	Deviation from mean	Min value	Max value
Year	31	2005	9.092121	1990	2020
GDP	31	2.219438	2.058308	-2.784067	4.549406
FDI	31	2.573369	1.510036	0.0002018	5.663728
CAP	31	28.3033	7.537	14.72108	42.91082
OPEN	31	32.33231	8.932136	17.02079	45.82166

Table 2 above highlights, some summary statistics of the variables under study. The lesser standard deviation denotes that the data are gathered around the mean value under observation.

4.2 Unit Root Test Results

Table 3 (1): *Augmented Dickey Fuller (ADF) Test*

	Level		First Difference	
Variable	**Test Statistic**	**5% Critical value**	**Test Statistic**	**5% Critical value**
GDP	-1.142	-1.950	-4.766	-1.950
FDI	-0.621	-1.950	-5.456	-1.950
CAP	0.843	-1.950	-3.316	-1.950
OPEN	0.232	-1.950	-2.586	-1.950

Table 3 (2): *Phillips Perron (Pperron) Test with trend value*

Variable	Level		First Difference		
	Test Statistic	5% Critical value	Test Statistic	5% Critical Value	P Value
GDP	-2.413	-3.580	-6.399	-3.584	0.0000
FDI	-2.422	-3.580	-9.754	-3.584	0.0000
CAP	-2.040	-3.580	-4.963	-3.584	0.0002
OPEN	0.173	-3.580	-5.226	-3.584	0.0001

From the tables above, all variables are not stationary at levels as the test statistics are less than their 0.05 critical value. GDP, FDI, CAP and OPEN have unit roots at level which make the need to check the stationarity at the first difference.

At the first difference, all variables have negative coefficients, test statistics for each variable is significant and greater than 0.05 critical value. The variables do not have unit root at the first difference. Thus, this model can be accepted.

4.3 Optimal Lags

Before testing for cointegration among variables understudy, the optimal lag test was conducted to establish the optimal number of lags. This is because, cointegration analysis can be affected by the number of lags selected which may affect the final outcome. The ideal number of lags is 1, according to AIC information criteria.

Table 4: *Optimal Lag Test*

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-257.16				2962.19	19.3451	19.4021	19.537
1	-193.15	128.02	16	0.000	86.0155*	15.7887*	16.0742*	16.7486*
2	-181.28	23.74	16	0.095	127.649	16.0949	16.6086	17.8227
3	-162.26	38.05*	16	0.001	129.904	15.8709	16.613	18.3666
4	-152.62	19.28	16	0.254	357.741	16.3419	17.3124	19.6055

* Optimal lag

4.4 Johansen Cointegration Test

Table 5: *Johansen Cointegration Test*

Johansen Cointegration Rank Test (Trace Statistic)			
Maximum Rank	Eigenvalue	Trace Statistic	Critical Value 5%
0	.	65.0511	47.21
1	0.70541	28.3862*	29.68
2	0.49551	7.8599	15.41
3	0.14745	3.0740	3.76
4	0.09739		

* Selected rank

Maximum Eigen Value			
Maximum Rank	Eigen value	Max-Eigen Value	Critical Value 5%
0	.	36.6649	27.07
1	0.70541	20.5263	20.97
2	0.49551	4.7859	14.07
3	0.14745	3.0740	3.76
4	0.09739		

Table 5 above highlights the results of Johansen cointegration rank by using two estimators which are trace statistics and maximum eigen value.

H0: rank equals to zero

H1: rank is greater or equal to one

In rank 0, the critical value is lower and the trace statistic is higher. The variables appear to be cointegrated, as evidenced by the rejection of the null hypothesis.

H0: rank is less or equal to 1

H1: rank is greater or equal to 2

The trace statistic is less compared to critical value. The null hypothesis cannot be proven false. The findings reveal the presence of at most one cointegration equation in this model. The same applies to maximum eigen value estimator.

All estimators highlight the presence of one cointegration equation in this model which exist between GDP, FDI, CAP and OPEN. Thus, the variables have a long-term association which can be estimated by using the VECM. Therefore, this study will focus on estimating the long-term impact of FDI, CAP and OPEN on GDP of Tanzania by the VECM Model.

4.5 Estimation of VECM Long-run Coefficients

Table 6: *VECM Coefficients' estimations with GDP as target variable*

Variable	Coefficient	Std Error	Z statistic	P value
Long run Coefficients estimations				
FDI	-1.104592	0.2923435	-3.78	0.000
CAP	0.0837888	0.0459704	1.82	0.068
OPEN	-0.6039316	0.566114	-0.43	0.666
Constant	-0.6039316			
Short run Coefficients' estimations				
ECT	-0.561069	0.2026046	-2.77	0.006
ΔFDI_{t-1}	-0.2262816	0.2010881	-1.13	0.260
ΔCAP_{t-1}	0.0275959	0.1105622	0.25	0.803
$\Delta OPEN_{t-1}$	-0.0625218	0.1051048	-0.59	0.552
Constant	-0.6039316	0.161942	0.71	0.478

From table 6 above, two equations based on cointegration and Error Correct Term (ECT) can be formulated as follows:

GDP as a target variable.

$$\Delta GDP_{t-1} = 0.162 + 0.035\Delta GDP_{t-1} - 0.226\Delta FDI_{t-1} + 0.028\Delta CAP_{t-1} - 0.063\Delta OPEN_{t-1} - 0.561ECT_{t-1} \dots (i)$$

Long run equation.

$$ECT_{t-1} = 1.000GDP_{t-1} - 1.105FDI_{t-1} + 0.084Cap_{t-1} - 0.024Open_{t-1} - 0.604\dots (ii)$$

To assess whether the study's factors have any long-term associations, the ECT resulting from VECM should have a negative and of significant value. Long-term adjustment speed toward

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equilibrium is highlighted by the ECT, and convergence to equilibrium is indicated by the negative sign. The adjustment term (-0.561) is statistically substantial suggesting that, the current year can be used to make up for any long-term equilibrium deviations at convergence speed of 56%. Therefore, the variables in this model have a long run association.

According to VECM, coefficient estimates of the cointegrating variables can be revealed as long run relationship. The findings reveal that, over the long term, the real GDP per capita growth rate is positively impacted by the FDI to GDP ratio, but negatively impacted by the gross fixed capital formation to GDP ratio. At 1% and 10% significance levels, respectively, the coefficients are statistically significant. This implies that, GDP increases as FDI increases, and it decreased by the increase of CAP in the long run. CAP and FDI have asymmetric effects on Tanzania's GDP. On the other hand, it appears that over the long run, GDP is not much impacted by trade openness to GDP ratio. In this aspect, long-term FDI inflows has a considerable positive impact on Tanzania's economic growth rate. Conversely, the increase of CAP appears to have a detrimental effect on Tanzania's economic growth rate, whereas trade openness appears to have little to no effect.

The relevance of CAP and its association with growth has been the study of long-standing analysis in economics. Nguyen (2021) examined that in the long run, public investment had impacted negatively Vietnam's economic growth. The coefficient estimate of CAP may implies that; the investments led by the government may have not been productive. The government of Tanzania may enhance mostly private foreign direct investment with public investment included in capital formation.

4.6 Diagnostic Tests

To check whether the employed model is effective for this study, various diagnostic tests were applied. Such diagnostic tests in the model included, Lagrange Multiplier (LM) test which was used to examine serial relationship of error terms and CUSUM test to examine the stability of the model. Moreover, the Jarque Bera (JB) test was employed to assess whether the distribution of residuals is normal.

Table 7: *Diagnostic tests*

Diagnostic test	Chi^2 value	P value	Conclusion
Lagrange Multiplier (LM)	13.9697	0.60097	No serial correlation of residuals
Jarque Bera (JB)	11.276	0.18653	Residuals are normally distributed
Stability (CUSUM)			No stability problem

LM test was applied to check the serial correlation problem. The probability value is 0.6007 which is less than Chi^2 (13.9697). Hence, there is no way to prove the null hypothesis that there is no serial connection among the model's error terms. The JB test was also employed to determine if the model's residuals follow a normal distribution. The likelihood value is 0.18653, less than Chi^2 value of 11.276. Null hypothesis of no normality problem cannot be proven false and hence, residuals are normally distributed. According to figure 4 and 5, the model is stable, as shown by the fact that the values for the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of recursive squares are all within the relevant constraints. Based on these diagnostic tests, the employed model is good for this study.

Figure 6: *CUSUM plot*
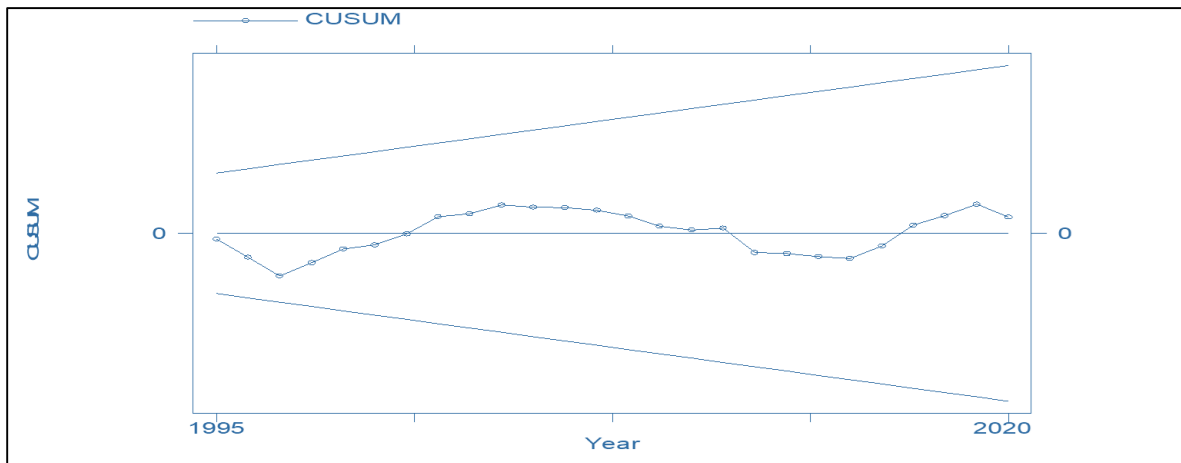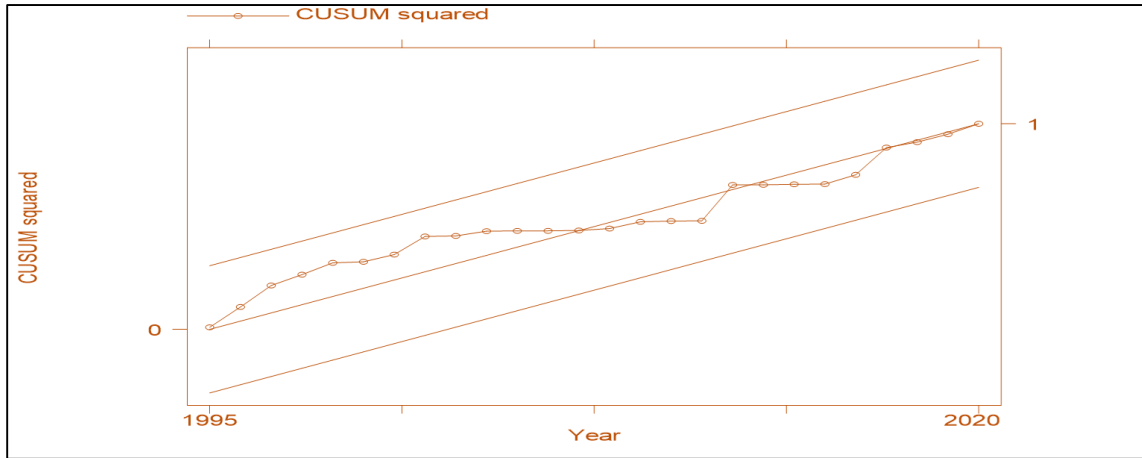
5. CONCLUSION

This paper aimed to assess the impact of foreign direct investment on economic growth of Tanzania by using VECM for the period of 1990 to 2020. Dependent variable is GDP while FDI, CAP and OPEN are independent variables. The variables become stationary at all levels of significances at first differences. The results showed a long-term, favorable association between foreign direct investment and Tanzania's GDP growth. Thus, the key hypothesis of this study cannot be rejected. The government of Tanzania should keep on improving the policies to fascinate more foreign direct investments in the country.

Furthermore, the findings have revealed the negative association between gross fixed capital formation and GDP growth rate. On the other hand, Openness to trade found to have insignificant association with GDP growth rate of Tanzania in the long run. This make the null hypothesis to be rejected in relation to the two variables mentioned. The government may need to enact and implement appropriate policies towards public investment and export sector to ensure sustainable and inclusive economic growth in Tanzania. The results from this paper can support researches in the future which aim to enhance proper policies in relation to foreign direct investment and Tanzania's economy.

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Appendix

Table 1.

```
. summarize Year GDP FDI CAP OPEN

    Variable │        Obs        Mean    Std. Dev.         Min         Max
─────────────┼──────────────────────────────────────────────────────────
        Year │         31        2005    9.092121        1990        2020
         GDP │         31    2.219438    2.058308   -2.784067    4.549406
         FDI │         31    2.573369    1.510036     .0002018    5.663728
         CAP │         31     28.3033       7.537    14.72108    42.91082
        OPEN │         31    32.33231    8.932136    17.02079    45.82166
```

Table 2.

```
. dfuller GDP, noconstant lags(1)

Augmented Dickey-Fuller test for unit root          Number of obs   =         29

                              ─────────── Interpolated Dickey-Fuller ───────────
                  Test         1% Critical       5% Critical       10% Critical
               Statistic          Value             Value              Value
─────────────────────────────────────────────────────────────────────────────
 Z(t)            -1.142           -2.654            -1.950             -1.602

. dfuller FDI, noconstant lags(1)

Augmented Dickey-Fuller test for unit root          Number of obs   =         29

                              ─────────── Interpolated Dickey-Fuller ───────────
                  Test         1% Critical       5% Critical       10% Critical
               Statistic          Value             Value              Value
─────────────────────────────────────────────────────────────────────────────
 Z(t)            -0.621           -2.654            -1.950             -1.602

. dfuller CAP, noconstant lags(1)

Augmented Dickey-Fuller test for unit root          Number of obs   =         29

                              ─────────── Interpolated Dickey-Fuller ───────────
                  Test         1% Critical       5% Critical       10% Critical
               Statistic          Value             Value              Value
─────────────────────────────────────────────────────────────────────────────
 Z(t)             0.843           -2.654            -1.950             -1.602

. dfuller OPEN, noconstant lags(1)

Augmented Dickey-Fuller test for unit root          Number of obs   =         29

                              ─────────── Interpolated Dickey-Fuller ───────────
                  Test         1% Critical       5% Critical       10% Critical
               Statistic          Value             Value              Value
─────────────────────────────────────────────────────────────────────────────
 Z(t)             0.232           -2.654            -1.950             -1.602
```

Table 3.

```
. pperron dFDI, lags(1) trend

Phillips-Perron test for unit root                    Number of obs   =        29
                                                      Newey-West lags =         1

                                    ──────────── Interpolated Dickey-Fuller ────────────
                    Test           1% Critical          5% Critical         10% Critical
                    Statistic      Value                Value               Value
───────────────────────────────────────────────────────────────────────────────────────
 Z(rho)             -42.503        -23.012              -18.204             -15.792
 Z(t)                -9.754         -4.343               -3.584              -3.230
───────────────────────────────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.0000

. pperron dCAP, lags(1) trend

Phillips-Perron test for unit root                    Number of obs   =        29
                                                      Newey-West lags =         1

                                    ──────────── Interpolated Dickey-Fuller ────────────
                    Test           1% Critical          5% Critical         10% Critical
                    Statistic      Value                Value               Value
───────────────────────────────────────────────────────────────────────────────────────
 Z(rho)             -28.239        -23.012              -18.204             -15.792
 Z(t)                -4.963         -4.343               -3.584              -3.230
───────────────────────────────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.0002

. pperron dOPEN, lags(1) trend

Phillips-Perron test for unit root                    Number of obs   =        29
                                                      Newey-West lags =         1

                                    ──────────── Interpolated Dickey-Fuller ────────────
                    Test           1% Critical          5% Critical         10% Critical
                    Statistic      Value                Value               Value
───────────────────────────────────────────────────────────────────────────────────────
 Z(rho)             -29.056        -23.012              -18.204             -15.792
 Z(t)                -5.226         -4.343               -3.584              -3.230
───────────────────────────────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.0001
```

Table 4.

```
. varsoc GDP FDI CAP OPEN

  Selection-order criteria
  Sample:  1994 - 2020                       Number of obs      =        27
  ┌─────────────────────────────────────────────────────────────────────────────┐
  │ lag      LL        LR       df    p      FPE      AIC       HQIC      SBIC     │
  ├─────────────────────────────────────────────────────────────────────────────┤
  │  0    -257.158                        2962.19   19.3451   19.4021   19.537    │
  │  1    -193.148   128.02    16  0.000  86.0155*  15.7887*  16.0742*  16.7486*  │
  │  2    -181.281   23.735    16  0.095  127.649   16.0949   16.6086   17.8227   │
  │  3    -162.257   38.048*   16  0.001  129.904   15.8709   16.613    18.3666   │
  │  4    -152.616   19.281    16  0.254  357.741   16.3419   17.3124   19.6055   │
  └─────────────────────────────────────────────────────────────────────────────┘

  Endogenous:  GDP FDI CAP OPEN
   Exogenous:  _cons
```

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Table 5.

```
. vecrank GDP FDI CAP OPEN, trend(constant)

                          Johansen tests for cointegration
Trend: constant                                        Number of obs =      29
Sample:  1992 - 2020                                            Lags =       2

                                                          5%
maximum                                         trace   critical
  rank      parms        LL       eigenvalue  statistic   value
    0         20     -225.05768        .       56.6986    47.21
    1         27     -209.73725     0.65236    26.0577*   29.68
    2         32     -202.86105     0.37763    12.3053    15.41
    3         35      -199.1091     0.22799     4.8014     3.76
    4         36     -196.70838     0.15259
```

Table 6.

```
. vec GDP FDI CAP OPEN, trend(constant)

Vector error-correction model

Sample:  1992 - 2020                      Number of obs   =         29
                                          AIC             =   16.32671
Log likelihood = -209.7372               HQIC            =   16.72539
Det(Sigma_ml)  = 22.49132                SBIC            =   17.59971

Equation           Parms      RMSE      R-sq      chi2     P>chi2

D_GDP                6       1.17761   0.3658    13.265    0.0390
D_FDI                6        1.2651   0.2993   9.823762   0.1323
D_CAP                6       2.81576   0.2564   7.932344   0.2431
D_OPEN               6       2.71905   0.1787   5.003473   0.5434


                   Coef.    Std. Err.     z     P>|z|     [95% Conf. Interval]

D_GDP
      _ce1
       L1.    -.561069    .2026046    -2.77    0.006    -.9581667   -.1639713

       GDP
       LD.    .0351336    .1594659     0.22    0.826    -.2774138    .3476811

       FDI
       LD.   -.2262816    .2010881    -1.13    0.260     -.620407    .1678439

       CAP
       LD.    .0275959    .1105622     0.25    0.803     -.189102    .2442938

      OPEN
       LD.   -.0625218    .1051048    -0.59    0.552    -.2685233    .1434798

      _cons    .161942    .2284188     0.71    0.478    -.2857506    .6096346
```

Table 7.

```
Cointegrating equations

Equation              Parms     chi2     P>chi2

_ce1                     3    78.40546   0.0000


Identification:  beta is exactly identified

                    Johansen normalization restriction imposed
```

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_ce1						
GDP	1	.	.	.	.	.
FDI	-1.104592	.2923435	-3.78	0.000	-1.677574	-.531609
CAP	.0837888	.0459704	1.82	0.068	-.0063115	.173889
OPEN	-.0244487	.0566114	-0.43	0.666	-.135405	.0865076
_cons	-.6039316	.	.	.	.	.

Table 8.

```
. veclmar, separator(1)

   Lagrange-multiplier test
```

lag	chi2	df	Prob > chi2
1	13.9697	16	0.60097
2	9.6851	16	0.88255

```
   H0: no autocorrelation at lag order

. vecnorm, jbera dfk separator(1)

   Jarque-Bera test
```

Equation	chi2	df	Prob > chi2
D_GDP	2.606	2	0.27177
D_FDI	2.571	2	0.27655
D_CAP	4.220	2	0.12124
D_OPEN	1.880	2	0.39063
ALL	11.276	8	0.18653

```
   dfk estimator used in computations
```

Table 9. Trend of GDP, FDI, CAP and OPEN

Year	GDP	FDI	CAP	OPEN
1990	3.687664467	0.000234811	25.75981741	17.0207933
1991	-1.262043402	0.000201752	25.99972567	18.69490667
1992	-2.784067347	0.264476121	26.96349602	21.85845614
1993	-2.148298561	0.480488362	24.89342442	21.96830758
1994	-1.619836118	1.108459134	24.43895188	25.31810493
1995	0.584744476	2.282237875	19.59592783	22.97991861
1996	1.81980404	2.310065686	16.47176138	21.0844325
1997	1.048397332	2.054764377	14.7210808	24.62040411
1998	1.339431742	1.404237523	22.42805088	26.2232537
1999	2.43848715	4.064919874	19.5929887	27.55926065
2000	1.978704412	3.46442642	18.75745859	29.86152384
2001	3.342624572	4.044211007	19.57586565	30.29494176
2002	4.224159913	2.797101915	19.2909067	34.84272657
2003	3.733837575	2.091407706	21.69432712	35.15322219
2004	4.512531372	2.653759399	25.66522529	40.29738605
2005	4.489368363	5.084614661	28.54497165	38.27436864
2006	3.579046849	2.161114459	31.50318589	41.53181823
2007	3.801083999	2.662169681	33.88753209	41.15026823
2008	2.731043461	4.950614566	36.06015286	39.3865008
2009	2.293194511	3.275733534	30.99673579	41.09348761
2010	3.290225792	5.663727899	30.77056841	45.35431303
2011	4.549406244	3.547208559	35.09952948	45.82165442
2012	1.441770134	4.538769413	32.96518491	45.00021062
2013	3.637372694	4.569257822	33.95704063	44.41053379
2014	3.581687916	2.834172021	33.17034921	40.75768023
2015	3.027500479	3.178702889	31.87113175	36.16934047
2016	3.716771195	1.735925655	32.75384498	31.91219602
2017	3.643718302	1.758606511	35.45980398	32.79788519
2018	2.355083458	1.704409774	39.0488317	33.14948123
2019	2.719336486	1.991000159	42.55369344	29.8861683
2020	-0.950176518	1.097405659	42.91082272	29.88617

Source: World Bank data, 2022