Dynamic Relationship among FDI, Capital Formation, Trade Openness, and Economic Growth in Bangladesh

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Abstract

The Main Objective Of This Study Is To Examine The Impact Of Foreign Direct Investment (FDI), Gross Capital Formation, A Trade Openness On The Economic Growth In Bangladesh Over The Period Of 1980–2021 Using The Vector Error Correction (VEC) Model And Granger Casualty. The Johansen Cointegration Outcomes Reveal That FDI, Gross Capital Formation, And Trade Openness Has A Positive And Significant Impact On The Economic Growth In Bangladesh.The Results Of The VECM Show That The Increases In FDI And Capital Formation May Stimulate Economic Growth In The Short Run. Trade Openness Is Negatively Related To The Economic Growth In Bangladesh In The Short Run.The Granger Causality Test Results Show Unidirectional Causal Relationships Running FromGross Capital Formation To FDI (GCF→FDI), From Trade Openness To Foreign Direct Investment (TO→FDI), And Bidirectional Causal Relationship Between Foreign Direct Investment And Economic Growth (FDI↔GDP); Gross Capital Formation And Economic Growth (GCF↔ GDP).Therefore, The Study Suggests That The Government Of Bangladesh Should Reformulate The Current Policies Regarding FDI, Capital Formation, And Trade Openness In Order To Enhance Its Economic Growth.

Keywords:*FDI, Gross Capital Formation, Trade Openness, Economic Growth, Johansen Co-Integration Test, VECM, Granger Causality*

I. Introduction

In the period of major economic growth worldwide, trade openness, foreign direct investment, and capital formation have developed dynamic relations to economic growth and development in developing economies. Bangladesh a developing economy in recent decades, is no exception to this developing scenario. Bangladesh's thriving economy has grown to a great extentin recent years, establishing itself as acaptivating market in the world scope. This remarkable growth spiral can be credited to foreign direct investment, trade openness, and capital formation, all of which have noteworthy impacts on its economic growth.

According to classical and neo-classical economic theory, the key to strong and sustainable economic growth depends on the balanced supply of capital as well as labor and technology. Countries like Bangladesh are self-sufficient and perhaps rising in the skilled labor pool area. But it faces capital shortages on a large scale that puts a limit on investment levels and therefore growth. As one of the fastest-growing developing economies in Asia according to IMF, Bangladesh has managed to bring in a large amount of foreign direct investment over the last two decades.

The main reasons for attracting huge FDI are a cheaper labor pool, closeness to the market, increasing purchasing power, and a more investor-friendly, and liberalized economic environment. On the other hand, Bangladesh adopted a relatively restrictive import-substitution trade policy in the early years of its independence.But in the early 1990s, the country gradually eased its trade policy. As a result of this, the trade-GDP ratio of Bangladesh has increased significantly in the last 3 decades based on data gathered from reliable sources (Hasan, 2021).Bangladesh has also managed to achieve impressive economic growth during the same period, which many experts believe that trade openness has a significant contribution to. Trade openness has both positive and significant effects on economic growth in Bangladesh(Hasan, 2021).

Few studies have looked at the impact of FDI, and trade openness on economic growth in the context of Bangladesh.The main objective of this research paper is to examine the impact of FDI, capital formation, and trade openness on economic growth as well as the casual nexus between FDI, trade openness, capital formation, and economic growth in Bangladesh.

For a number of reasons, it is important to investigate the relationship between FDI, capital formation, trade openness, and the economic growth of a developing country like Bangladesh First of all, FDI is expected to spur economic growth in a developing nation by raising investment volume and marginal productivity(Grossman and Elhanan, 1991; Lucas, 1988; Romer, 1986). Additionally, FDI may boost economic growth by boosting technology spillovers, expanding the reach of global competition, and enhancing a host

nation's supply-side capabilities. Second, countries with higher levels of trade openness tend to expand quicker than economies with lower levels of trade openness because the former can absorb new technology more quickly. Trade openness also lowers investment transaction costs (reduction of tariff and non-tariff barriers to investment, as well as the lubrication cost of doing business) and promotes allocative efficiency of investment by reorienting factors of production in sectors with a relative advantage in trade, thereby increasing economic growth rates(Balasubramanyam, and Sapsford, 1996; Solow, 1956). Third, it is thought that a country's degree of capital production influences its economic growth rate. This is because economies with a lower starting capital stock can achieve greater marginal rates of return (productivity) when more capital is invested in productive sectors. Similarly, a higher level of human capital (skilled and knowledgeable labor force) tends to boost aggregate production growth, prevent the marginal product from declining, increase knowledge exchange and reverse engineering, and therefore stimulate economic progress (Adhikary, 2015).

The rest of this study is organized as follows: section 2 describes the literature review. Section 3 describes the data, model speciation, and methodology. The empirical results and discussion are analyzed in section four. Finally, section 5 concludes with a policy remark.

II.   Literature Review

Extensive work has been conducted to document the link between FDI, trade openness, capital formation, and economic growth. According to Haque and Amin, a co-integrating relationship can beestablished between FDI and the economic growth of Bangladesh in the long run. Their research also identified a unidirectional causality relationship ranging from trade openness to economic growth and from trade openness to inflation. Through this statement, it can be stated that trade openness has an impact on the economic growth of the country (Haque and Amin 2018).

Another study by Adhikari on another growing economy namely Nepal showed a long-term equilibrium relationship between FDI, trade openness, capital formation, and economic growth. His works have shown that FDI and trade openness can have a positive effect on Nepal's overall economic growth. Similarly, capital formation proves to show a negative relationship with economic growth in the short-run although in the long-run it possessed a positive impact on Nepal's economy(Adhikary 2015).

According to Alguacil, Cuadros, and Orts (2002), Baharumshan&Thanoon (2006), Chakraborty &Basu (2002), De Mello (1999), Kar & Sinha (2014), Liu, Burridge, and Sinclair (2002), find a positive relationship between foreign direct investment and economic growth across the countries. Another paper analyzing the impact of trade openness on economic growth in Bangladesh found a long-run connection between GDP growth and Trade Openness through the Engle-Granger co-integration test. The paper suggested steps emphasizing measures on export orientation and reducing reliance on imports (Khanom, 2021).

Chakraborty and Nunnenkamp (2008); Lee and Chang (2009); Li and Liu (2005); Madsen (2002); Mah (2010); Qin, Cagas, Quising, & He (2006); and Zou (2006)). The basic assumption about investment's contribution to overall economic growth is that investment expansion favorably promotes economic growth as a result of investment's numerous economic advantages. Literature has shown a favorable correlation between investment and economic growth worldwide (Borensztein, Gragario, & Lee, 1998; Hermes &Lensink, 2003; Li & Liu, 2005; Odedokun, 1997; Zou, 2006). Both unidirectional and bidirectional relationships are present in emerging and industrialized nations when it comes to the causation issue.

A coauthored research by Nurul Mohammad Zayed and others showed that trade openness has a long-term relationship with GDP growth. His analysis is an increase in exports and a reduction in imports through trade openness can have a positive impact on the economic development of Bangladesh (Zayed et al., 2020).

Ismail and Lazim have identified the existence of a long-term equilibrium between FDI, trade openness, capital formation, and economic growth by conducting a Johansen Co-integration test. Their study has revealed that in the case of Malaysia's economy, an increase in capital formation may stimulate its economic growth in the short term. But they suggested more diverse research to reveal more evidence to support their hypothesis that a relationship does indeed exist between FDI, trade openness, capital formation, and economic growth(Lazim, 2018).

Adhikari (2011) investigated the liaison between FDI, trade openness, capital formation, and economic growth rates empirically from Bangladesh's perspective by analyzing time series data for the duration of 1986-2008. His research concluded that based on the evidence the study revealed a strong long-run equilibrium relationship among the dependent and independent variables. There was a strong unidirectional long-term causal flow which was stemmed from changes in FDI, trade openness, and capital formation concerningthe economic growth rates of Bangladesh (Adhikary 2011).

Another paper by Hussain and Haque found evidence that there indeed is a relationship between foreign direct investments, trade openness, and economic growth namely GDP for Bangladesh. They have used annual time series data from 1973 to 2014 to establish this empirical relationship. The VECM model analysis that they conducted showed that there is a long-term relationship between these variables. The growth rate of

GDP per capita is significantly impacted by trade openness and foreign direct investment variables. To check the authenticity of the VECM model, they also conducted post-estimation diagnostic tests and found that the residuals of the regressions have a normal distribution and do not show any auto-correlation (Hussain and Haque 2016).

However, after reviewing recent literature, it is discovered that there are very few empirical studies that explicitly explore the relationship between foreign direct investment, gross capital formation, trade openness, and Bangladeshi economic growth. Additionally, the variables are not combined, which has led to results that are generally unconvincing.

III. Methodology

Data and sources

The data is collected from the World Development Indicators (WDI) to examine the connection between FDI, Gross Capital Formation, trade openness, and economic growth of Bangladesh from 1980 to 2022.

Table 1. Summary and Sources of the Variables

Variable	Name	Source
GDP	Gross Domestic Product (current US$)	World Development Indicator
FDI	foreign direct investment (current US$)	World Development Indicator
GCF	Gross Capital Formation	World Development Indicator
TO	Trade Openness	World Development Indicator

Source: Computed by Author's

Model Specification

The model for this research was developed in accordance with Yusoff&Nuh (2015) work.

$$GDP_t = f(FDI_t,\ GCF_t, TO_t) \tag{1}$$

Where GDP is the proxy for economic growth as measured by Gross Domestic Product, FDI denotes net inflows of foreign direct investment (current US$); GCF for Gross Capital Formation, and TR means trade openness percentage of GDP, and t is the time period.

Equation 1 may be converted to natural logarithm form as follows:

$$LN\ GDP_t = \beta_0 + + \beta_1\ LN\ FDI_t + \beta_2\ LN\ GCF_t + \beta_3\ LNTO_t + \varepsilon_t \tag{2}$$

Where β_0 isconstant, (β_1, β_2, and β_3) are parameters to be estimated, LN is the natural log and ε_t represents the error term.

The Vector Error Correction Model (VECM)

The VECM model takes the following form based on equation (2):

$$\Delta LNGDP_t = \alpha + \sum_{i-1}^{P=2} \beta_0 \Delta LNGDP_{t-j} + \sum_{i-1}^{P=2} \beta_1 \Delta LNFDI_{t-j} + \sum_{i-1}^{P=2} \beta_2 \Delta LNGCF_{t-j}$$
$$+ \sum_{i-1}^{P=2} \beta_3 \Delta LNTO_{t-j} + \lambda ECM_{t-1} + \varepsilon_t$$

There are three procedures to estimate the VECM as follows. Firstly, the Augmented Dickey-Fuller (ADF) test is applied to investigate the stationarity of the series. Secondly, the Johansen co-integration test is applied to examine a long-run nexus among all variables. Lastly, the VECM is employed both in the short-run as well as long-run (Azlina& Mustapha, 2012). This study also used a Granger causality test to determine the causal nexus among the variables.

IV. Empirical Results and Discussions

Test for Stationarity

At first, it's crucial to determine whether the variables are stationary or not(Alam et al. 2022; Alam, Hassan, and Sadekin 2021; Alam, Sadekin, and Saha 2020; Sadekin et al. 2021).We utilize the ADF test to verify the integration order of a series, and the results are given in Table 2.

Table 2. ADF Test Results

Variables	ADF		Decision	Order of Integration
	Level	First difference		
LNGDP	-0.874	-5.771***	Stationary	I(1)
LNFDI	-3.377	-5.565***	Stationary	I(1)
LNGCF	-1.403	-6.546***	Stationary	I(1)
LNTO	-1.395	-6.531***	Stationary	I(1)

Notes: ***, indicates a 1% level of significance.
Source: Computed by Author's

All of the series, as shown in Table 2, are nonstationary in their level form but become stationary in their first difference form. They are therefore integrated, which implies they are I (1) in nature. Given that both series are I(1) in nature, we can now determine whether or not they are cointegrated, which indicates whether or not they have a long-run equilibrium connection.

Lag Selection Criteria

It is critical to choose the appropriate lag duration before estimating the co-integration test and VECM model for efficiency. The optimal lag length of 2 is determined based on the Final Prediction Error criterion, Akaike Information Criterion (AIC), Hannan and Quinn Information Criteria (HQ), and LR criteria, and it is used for the current study's analysis.

Table 3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-116.225	NA	0.006	6.1654	6.336	6.227
1	67.477	320.301	1E-06	-2.435	-1.582*	-2.129
2	89.925	34.535*	7.65e-07*	-2.765*	-1.23	-2.214*
3	102.956	17.376	9.58E-07	-2.613	-0.395	-1.817

Notes. * denotes lag order chosen by the criterion.
Source: Computed by Author's

JohansenCo-integration Test

Because of cointegration, a linear combination of two or more time series can be stationary even while they are individually non-stationary. When two (or more) time series cointegrate, it is likely that there is an equilibrium or long-run connection between them. The cointegration test must be carried out since it is discovered that the variables under study are integrated of order 1. The study uses the Johansen cointegration test to determine whether or not a long-run equilibrium connection existed between variables.The Johansen cointegration test's trace statistics and maximum eigenvalue estimates are shown in Table 4.

Table 4. Cointegration test outcomes (Trace Test and Maximum Eigenvalue Test)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.764	91.575	63.876	0.000	None *	0.764	56.386	32.118	0.000
At most 1	0.412	35.190	42.915	0.237	At most 1	0.412	20.708	25.823	0.205
At most 2	0.254	14.481	25.872	0.618	At most 2	0.254	11.404	19.387	0.473
At most 3	0.076	3.077	12.518	0.867	At most 3	0.076	3.077	12.518	0.867

Notes. * explains the rejection of the hypothesis at a 0.05 level
Source: Computed by Author's

The findings of the Johansen cointegration test are summarized in Table 4 in both the intercept and intercept plus trend regression formats. At the 5% level of significance, both the trace test and the maximum eigenvalue test give one cointegrating equation. As a result, it is determined that the variables are cointegrated and have a long-run equilibrium connection among them. Thus, there is a long-run equilibrium nexus between the series of economic growth, FDI, gross capital formation, and trade openness. As a consequence, the study uses the vector error correction model, as described in (3).

Table 5. Long-run Coefficient Results

Explanatory Variables	Coefficient	Standard Error	t-Statistics
LNFDI	0.099	-0.014	7.305***
LNGCF	3.612	-0.378	9.552***
LNTO	1.096	-0.317	3.462***
@Trend (81)	0.339	-0.042	-8.000***

Notes. Dependent variables: LNGDP. ***, shows the significance level at 1%.
Source: Computed by Author's

Table 5 represents the normalized cointegrating coefficients result. The estimated long-run relationship is expressed as:

$$\text{LNGDP} = 0.099 \text{ LNFDI} + 3.612 \text{ LNGCF} + 1.096 \text{ LNTO} \qquad (4)$$

The obtained empirical results demonstrate that the coefficient of foreign direct investment (LNFDI) is 0.099, indicating a positive and statistically significant relationship with economic growth, confirming that foreign direct investment accelerates economic growth. That is, a 1% rise in FDI translates to a 0.01 % increase in economic growth while gross capital formation and trade openness remain unchanged. FDI can fuel economic growth by transferring managerial and technical know-how, accumulating capital, increasing total factor productivity, expanding international trade, and developing labor skills (Alguacil, Cuadros, & Orts, 200).A similar result is consistent with previous studies like Adhikary (2011); Adhikary (2015); Anh Tru Nguyen (2020);Baharumshan&Thanoon (2006); Chakraborty &Basu (2002); De Mello (1999); Hussain & Haque (2016);Kar & Sinha (2014); Liu, Burridge, & Sinclair (2002); Sirén et al. (2020).

Similarly, gross capital formation has a positive and statistically significant effect on economic growth. It implies that a 1% rise in gross capital formation corresponds to a 3.612 percent increase in economic growth, assuming that FDI and trade openness remain constant. This finding is also supported by the empirical study of Adhikary (2011);Alam and Bhowmik (2020); Hermes &Lensink(2003); Li & Liu (2005); Odedokun, (1997); Zou (2006).

As for trade openness, it has a positive and statistically significant effect on economic growth, with a 1% increase in trade openness leading to a 1.096% increase in economic growth while holding FDI and gross capital formation constant. Thus, in the long run, the study finds that FDI, gross capital formation, and trade openness have positive effects on economic growth in Bangladesh. This result is consistent with the empirical study of Adhikary (2015); AkbulutYıldız (2020);Hasan (2021); Zahonogo (2016).

Short-run dynamics (VECM)

Because co-integration test results indicate the long-run relationship between the components, the study used VECM to identify the short-run dynamic nexus between FDI, gross capital formation, trade openness, and economic growth in Bangladesh. Therefore, the Vector Error Correction Model results are shown in Table 6.

Table 6. Short-Run Dynamic (VECM) Results.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.049	0.010	4.900	0.000***
ECT_{t-1}	-0.039	0.011	-3.740	0.001***
$\Delta LNGDP_{t-1}$	0.264	0.199	1.325	0.197
$\Delta LNGDP_{t-2}$	0.253	0.161	1.574	0.128
$\Delta LNFDI_{t-1}$	0.005	0.002	2.500	0.020
$\Delta LNFDI_{t-2}$	0.008	0.003	2.667	0.005***
$\Delta LNGCF_{t-1}$	-0.007	0.023	-0.304	0.747
$\Delta LNGCF_{t-2}$	0.740	0.353	2.095	0.043**
$\Delta LNTO_{t-1}$	-0.011	0.003	-3.667	0.001***
$\Delta LNTO_{t-2}$	-0.017	0.004	-4.250	0.000***
R-squared	0.623	Durbin-Watson stat		2.128
Adjusted R-squared	0.603			
F-statistic	17.561			
Prob(F-statistic)	0.000			

Notes. Dependent Variable: ΔLNGDP. **, ***, represents the significance level at 1% and 5%.
Source: Computed by Author's

The outcomes of the vector error correction model are shown in Table 6. The suitable lag length (lag 2) of the variables has been chosen using the lag selection criterion to run the VEC model. At the 1% level of significance, the estimated coefficient of error correction term (ECT_{t-1}) is statistically significant and has a negative sign, confirming the presence of a long-run equilibrium connection between the independent and dependent variables. The estimated relative value of --0.039 demonstrates the rate of convergence to equilibrium. To be more specific, the rate of adjustment of any disequilibrium towards a long-run equilibrium is that around 3.9 percent of the disequilibrium in all four variables is rectified each year.It is discovered that FDI significantly improves economic growth in Bangladesh over the short run.

Additionally, in the shortrun, capital formation has a positive impact on economic growth in Bangladesh. Furthermore, it is discovered that there is a short-term negative association between trade openness and economic growth. This unfavorable association is most likely caused by the increased import demand of Bangladesh which caused the trade balance of the country to be negative for most of the years since the 1908s.

Granger Causality Test

The Granger Causality test is employed to determine the direction of the causality between foreign direct investment (FDI), gross capital formation, trade openness,and economic growth. Table 7 shows the Granger Causality outcome based on the previously estimated stable VECM with two lags.

Table 7. Pairwise Granger Causality Test

| Null Hypothesis:	Obs.	F-Statistic	Prob.
LNFDI does not Granger Cause LNGDP	40	8.221	0.001
LNGDP does not Granger Cause LNFDI		7.599	0.003
LNGCF does not Granger Cause LNGDP	40	3.077	0.059
LNGDP does not Granger Cause LNGCF		2.551	0.092
LNTO does not Granger Cause LNGDP	40	1.072	0.353
LNGDP does not Granger Cause LNTO		0.033	0.968
LNGCF does not Granger Cause LNFDI	40	8.880	0.001
LNFDI does not Granger Cause LNGCF		0.213	0.810
LNTO does not Granger Cause LNFDI	40	4.000	0.027
LNFDI does not Granger Cause LNTO		0.825	0.446
LNTO does not Granger Cause LNGCF	40	0.860	0.432
LNGCF does not Granger Cause LNTO		0.120	0.888

Notes. **, ***, represents the significance level at 1% and 5%.
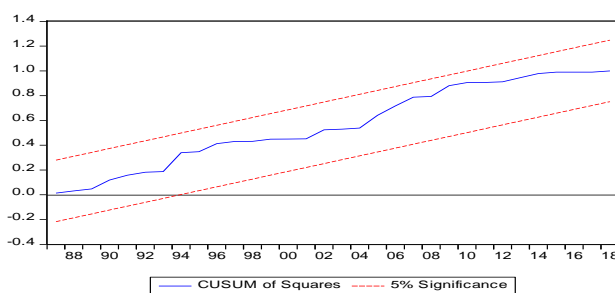**Source:** Computed by Author's

The pairwiseGranger causality test resultsshow that there exists evidence of feedback effect or a bi-directional causal nexus between FDI and GDP, as well as gross capital formation and economic growth in Bangladesh. However, the study further shows that there is a uni-directional causal relationshipbetween economic growth to FDI,gross capital formation to FDI, and trade opennessto FDI.

StabilityTests

Figures 1 and 2 show evidence from both the CUSUM and CUSUMQ stability tests that validate the VECM model's stability at the 5% significant level since the blue line never deviates beyond the key red lines.
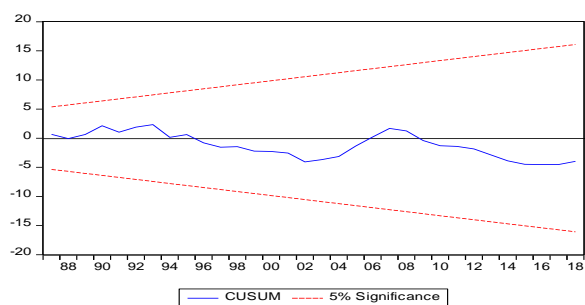
Figure 1. Plot of Cumulative Sum (CUSUM)

Figure 2. Plot of Cumulative Sum of Squares

(CUSUMQ)

Source: Computed by Author's

V. Conclusion and Policy Implication

This study investigates the relationship among FDI, gross capital formation, trade openness,and economic growth in the context of Bangladesh during the period 1980–2021by applying a vector error correction model and the Granger casualty test. The investigation of the causal link begins with the testing of conventional time series methodologies.

Results of stationary tests (ADF test) show that all of the series are nonstationary in their level form but become stationary in their first difference form.The outcomes of the Johansen cointegration test reveal that the variables are cointegrated and have a long-run equilibrium connection among them. The empirical outcomes from the long-run model indicate thatFDI, gross capital formation, and trade openness has a positive and significant impact on the economic growth of Bangladesh

The results of the VECM show that the increases in FDI and capital formation may stimulate economic growth in the short term. Trade openness is negatively related to the economic growth in Bangladesh in the short run. The pairwiseGranger causality test results find that there exists unidirectional causality from gross capital formation to FDI (GCF→FDI), from trade openness to foreign direct investment (TO→FDI), and bidirectional causality between foreign direct investment and economic growth (FDI↔GDP) as well as gross capital formation and economic growth (GCF ↔ GDP).

The following points outline the policy implications of this study. First, there is a long-term relationship between foreign direct investment (FDI), gross capital formation, trade openness, and economic growth in Bangladesh. This relationship suggests that the government of Bangladesh should carefully consider the aforementioned factors in the long run in order to maximize the benefits of the nexus. Second, FDI is most likely a significant factor in explaining variations in economic growth. As a result, an FDI-led growth policy might be supported to boost the country's economic growth.Third, trade openness has a negative influence on economic growth.In reality, Bangladesh is ahighly import-oriented economy with a negative trade balance. As a result, the government must successfully manage trade policy. Therefore, the study concludes that the government of Bangladesh should reformulate the current policies regarding FDI, capital formation, and trade openness in order to enhance its economic growth.

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