Effect of Foreign Direct Investment on Bangladesh Economy: a time series analysis from 1972 to 2013

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Abstract

This study investigates the impact of Foreign Direct Investment (FDI) on economic growth and examines the causality between FDI and economic growth in Bangladesh during 1972-2013. Gross Domestic Product (GDP), export performance (EXP), Foreign Direct Investment (FDI), and Gross Fixed Capital Formation (GFCF) are considered to capture the objective of the study. The study methodology includes some systematic steps. As the data used in the study is time-series in nature, the author employs unit root tests, and in this case, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used. Then Johansen's cointegration test, Granger causality test, regression with Newey-West Standard Error and Vector Error Correction Model (VECM) are applied. By using the ADF and PP test the study reveals that the variables of four-time series are integrated of I (1) i.e. they are stationary at first difference. Regression analysis result demonstrates that FDI has a positive effect on economic growth. The Granger Causality test discloses that there is a unidirectional relationship between FDI and economic growth. But the VECM estimation finds that in the long run FDI negatively affects economic growth.

Keywords: Time-series analysis, Foreign Direct Investment, economic growth, Bangladesh economy

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Introduction

In any country, economic growth hinges on the sustainable growth of productive capacity, bolstered by investment and savings. Particularly in developing countries and least developed countries, low level of capital stock and economic growth all are outcomes of low levels of savings and investment (Dinh et al., 2019). International trade and investment flows is one of the ways to achieve economic development in a globalized world (Zaidi et al., 2019). To both host and home countries, Foreign direct investment (FDI) has been beneficial in several cases in terms of greater economic growth in the medium to long run. For economic growth and development, FDI can serve as an engine by increasing integration into the world economy, technology transfer, employment, infrastructure development, skills training, and revenue from taxation, among other forms of capital (Kehl, 2008).

FDI plays a crucial role in several ways in the host country's economy. Firstly, through the transmission effect of more advanced technologies pioneered by multinationals, FDI contributes positively to boost a country's economic performance (Borensztein et al., 1998; Findlay, 1978; Ford et al., 2008; Hermes & Lensink, 2003; Saggi, 2002; Varamini & Vu, 2007). FDI helps in not only bringing technology into production and management practices but also offering a highly skilled labor force (Hale & Xu, 2016; Zhang, 2001). Secondly, to expand competitive pressures in the host country, FDI has immense potential (De Mello Jr, 1997; Driffield, 2001; Varamini & Vu, 2007). Thirdly, to the integration of the country into the world economy, FDI contributes greatly and this integration engenders economic growth which increases the country's capacity to become more open (Barry, 2000; Blomström, 1986; Blomström & Kokko, 1998; Zhang, 2001). Fourthly, it comes up with the capital accumulation and boost of total factor productivity of the receiving country (De Mello Jr, 1997; Wang, 2009). Fifthly, in developing export-oriented sector FDI plays a vital role that expands sectoral growth (Alam, 1999; Hossain, 2008).

In Bangladesh, the importance of foreign investment is undeniable where there is insufficient domestic savings rate for investment after satisfying its basic needs. In this article, an attempt has been taken to investigate the significance of FDI on economic growth and to demonstrate the causal relationship between FDI, economic growth, export performance, and capital formation.

In the present study, the author tries to investigate to what extent FDI affects the economic growth of Bangladesh through time series analysis. The author also analyzes the impact of FDI on the economic growth of Bangladesh and illustrates the causality among FDI, economic growth, export performance, and capital formation in Bangladesh through time series analysis.

Literature Review

FDI tends to promote economic growth by providing essential ingredients that are necessary for economic growth. It has the potential to create employment, boost exports, transfer exotic skills, and know-how and contribute to overall economic growth to the developing countries of the world (Te Velde & Development, 2006). For economic growth and development, FDI can serve as an engine by expanding integration into the global economy, technology transfer, employment, infrastructure development, and revenue from taxation, amid other forms of capital (Kehl, 2008).

In the host country's economy, there is a positive relationship between FDI and GDP (Abbas et al., 2011; Agrawal & Khan, 2011; Dondeti & Mohanty, 2007; Iqbal et al., 2014). Another study makes a comparative analysis and their result shows that FDI stimulates economic growth. The study also provides an estimation that a 1% rise in FDI would beget a 0.07% increase in GDP of China and 0.02% expansion in GDP of India (Agrawal & Khan, 2011). It is also observed in a previous study that FDI promotes economic growth in China, India, Singapore, and Malaysia and also gives an estimation that one dollar of FDI raises around 3.27

dollars to the GDP of the four countries (Dondeti & Mohanty, 2007). Another study examines the effect of FDI on GDP of SAARC countries and by applying multiple regression models, this relationship is analyzed (Abbas et al., 2011). The result demonstrates that there is a positive and significant relationship between FDI and GDP that is the GDP of the country rises with the increasing trend of FDI. In a study on Pakistan's economy, it has been revealed that through training, education, more employment, technology transfer and other spillover effects on the country economy FDI stimulates human resource development which has a positive influence on the GDP (Iqbal et al., 2014). Through the transmission impact of more sophisticated know-how generated by multinationals, FDI plays a very significant role to ameliorate a country's economic performance (Borensztein et al., 1998; Findlay, 1978; Ford et al., 2008).

Though FDI is regarded as a key factor for enhancing economic growth, a country's absorptive capacity plays an influential role. In a study, it is stated that for the weak or conflicting effect of FDI, the absorptive capacity of the host country is considered to be a major variable (Azman-Saini et al., 2010).

Export success can serve as a procedure for the competitiveness of the industries of a country and lead to rapid growth. In recent times, a much optimistic view on the importance of FDI has evolved on export performance in the host country. The inflow of FDI benefits a country in the form of export promotion and GDP growth (Blomström & Kokko, 1999). Another article indicates a positive correlation between FDI, GDP, and Exports (Barua, 2013). An increase in the manufactured production quantity is led by FDI growth and hence contributes to the export performance (Pelinescu & Radulescu, 2009).

Watching the growing trend of FDI inflows into India, the effect of FDI inflows on the export performance has been explored by a study and it is observed that on export performance the effect of FDI inflows is significantly positive (Prasanna, 2010). A previous study reveals that there is a positive effect of FDI on China's export performance. It has been found that compared

to the domestic capital, the export-promoting effect is much greater on china's economy (Zhang, 2001). He also states that exports of host countries are promoted by FDI through expanding domestic capital for exports, assisting the transfer of technology and new products for exports, facilitating entree to large and new foreign markets, and offering training for the domestic workforce and upgrading management and technical skills.

For the development of new technologies and technology transfer FDI is considered an important tool. Productivity can be boosted by technology transfer and that results in a larger expansion in production. It has been advocated that the existence of foreign firms can also influence the choice of domestic firms to export along with their export share (Anwar & Nguyen, 2011).

Another study was made on China's economy to demonstrate the relationship between FDI and export performance of the country and it has been suggested by the empirical results that FDI inflows into China have a statistically significant and positive impact on its exports and it displays variances across sectors (Awokuse et al., 2008).

While a study declares that FDI seems to have no statistically significant effect on export performance (Ahmed et al., 2011), another study reveals the negative impact of foreign ownership on export performance (Sudershan et al., 2012). It is noticed that foreign-owned firms export less and emphasize more on local demand and the host country's specific benefits. It was asserted in a study that FDI has appeared as the most crucial source of external resource inflows to developing countries over the years and has developed a considerable part of capital formation (Khan, 2007). In establishing the long-run relationship between FDI, Economic Growth, and Capital Formation in Nigeria, a study applied Cobb–Douglas production function and it was found that there is a substantial positive relation between FDI and capital formation (Orji et al., 2010). Again another study in Sub-Sahara African countries also found a positive

relationship between FDI and capital formation while investigating the effect of FDI on the private capital formation (Ghirmay & Cadet, 1998).

A study found a causal relationship between gross fixed capital formation and FDI and found that FDI affects capital formation in the short-run positively but insignificantly and significant positive effect of FDI on gross fixed capital formation in the long run (Ugwuegbe et al., 2014). The result demonstrates that capital formation is positively correlated with FDI and also indicates FDI to be complementary with foreign credit whereas a substitute for domestic credit. It is assessed the impact of openness, FDI, and gross capital formation on economic growth in Kenya, considering the period 1960 to 2010 in a study and the result of the study reveals that FDI and gross capital formation had no significant impact on GDP growth rate (Koskei et al., 2013).

The casual relationship between FDI and economic growth has been focused on by many studies (Anwar & Nguyen, 2010; Borensztein et al., 1998; Faruku et al., 2011; Nosheen, 2013; Sandalcilar & Altiner, 2012). A study found that FDI Granger causes economic growth and export also granger causes growth while examining Granger causality among FDI, export and output growth in Mexico and the relationship is unidirectional in both the cases (Alguacil et al., 2002). Another article uncovered bidirectional causality between FDI and export as well as between FDI and economic growth (Cuadros et al., 2004). An earlier study showed a bidirectional relationship between FDI and economic growth (Anwar & Nguyen, 2010). It is also observed in a study that there is bidirectional causality between FDI and GDP in an open economy (Basu et al., 2003). While there is a slightly less positive causality from GDP to FDI in the ECO (Economic Cooperation Organization) region there is strong positive causality from FDI to GDP (Sandalcilar & Altiner, 2012).

Whereas, a study found that though FDI inflows direct to higher economic growth as well as better environmental quality, it expands the income disparity in the long run in the economy of

6

Singapore (Ridzuan et al., 2017). While investigating the causal relationship between domestic capital investment, FDI and economic growth in Saudi Arabia, an article shows that in the short run, FDI influences domestic capital investment negatively, though, in the long run, domestic capital investment impacts FDI negatively (Belloumi & Alshehry, 2018).

After reviewing the literature, it can be said that different researchers have illustrated the different connection between FDI and economic growth. Some found a positive relationship whereas some found a negative correlation between FDI and economic growth. Some also noticed no significant effect of FDI on economic growth. In the case of a causal relationship, some illustrated a bidirectional relationship whereas others demonstrated a unidirectional relationship between these two variables. Some also showed no causal relationship. But the literature review reveals that the studies on this subject are limited from the perspective of Bangladesh. So, the effect of FDI on economic growth and the causal correlation between them is a vital issue that needs empirical research.

Methodology

The objective of this paper is to examine the importance of FDI on the growth of the economy of Bangladesh and to illustrate the Causality among GDP, FDI, export performance, and capital formation in Bangladesh using the annual data for the period 1972 to 2013 (41 years observations for each variable). World Bank Development Indicator (WDI) provides the time series data on GDP, FDI, and Gross Fixed Capital Formation. The time-series data on annual total export is collected from Bangladesh Economic Review. In the table (1), a description of variables used in the models is presented with their sources.

Table 1: List of Variables used in Model

Variable Name	Variable Description	Unit of Measurement	Data Source	Time Period
GDP	Gross Domestic Product	Million US$	World Bank Development Indicator	1972- 2013
FDI	Foreign Direct Investment	Million US$	World Bank Development Indicator	1972- 2013
EXP	Total Export	Million US$	World Bank Development Indicator	1972- 2013
GFCF	Gross Fixed Capital Formation	Percentage	World Bank Development Indicator	1972- 2013

Econometric methodology

To demonstrate the significance of FDI on the growth of the economy of Bangladesh and to illustrate the Causality among GDP, FDI, export performance, and capital formation the author has followed mainly five steps.

Unit Root Test of Stationary

As the data is time-series in nature, it is required to ensure that the data is stationary. If the variance and mean of a time series data set remain constant over a period of time and between two periods the value of covariance relies only on the gap between the actual time at which the covariance is calculated (Shumway & Stoffer, 2017). When time-series data is not stationary, there arises a non-stationary process in the data set, and to overcome the problem Augmented Dickey-Fuller (ADF) and Phillips Perron test of the unit root has been used to test the Stationarity of the data of all the variables.

A time series is stated to be integrated of order d, i.e. I (d) in the differenced series if it is to be differenced d times to get it stationary. In another word, the time series is I (1), if $\Delta y_t = y_t + y_{t-1}$ will be stationary. If a time series is I (2) then $\Delta y_t = y_t - 2y_{t-1} + y_{t-2}$ will be stationary. In the present study, to test the unit root of the time series data on four macroeconomic variables, GDP, FDI, EXP, and GFCF, the author has applied Augmented Dickey Fuller (ADF)

and Phillips Perron test. To allow for the various possibilities, the tests are estimated in the following two different forms.

No drift and no trend model:

$$\Delta y_t = \delta y_{t-1} + \varepsilon_t \qquad \text{-- (1)}$$

Drift and Trend Model:

$$\Delta y_t = \alpha_0 + \alpha_1 + \delta y_{t-1} + \varepsilon_t \qquad \text{-- (2)}$$

Where $\Delta y_t = y_t + y_{t-1}$ is the first difference of the series y_t. α and δ are the parameters and ε_t denotes stochastic disturbance term. In the test, the optimum lag is selected as 3 based on AIC. Later the null hypothesis of non-stationary is examined against the alternative hypothesis of stationary.

Cointegration Test

In the second step, the existence of cointegration between the series of the similar order of integration through establishing a cointegration equation has been tested. The fundamental concept of cointegration is that if more than two series move closely at the same time, in the long run, the difference between them is constant even if the series themselves are trended. In this study, Johansen's test has been used to test the possible existence of cointegration in the data set. Two statistics named trace statistic (λ_{trace}) and maximum eigenvalue (λ_{max}) are applied to decide the number of cointegrating vectors after defining the order of integration. In trace statistics, the following vector autoregression is projected.

$$\Delta y_t = r_1 \Delta y_{t-1} + r_2 \Delta y_{t-2} + \text{------------------} + r_\rho \Delta y_{\rho-t+1} \qquad \text{----------------- (3)}$$

Alternatively, in maximum eigenvalue, the following vector autoregression is estimated.

$$\Delta y_t = r_1 \Delta y_{t-1} + r_2 \Delta y_{t-2} + \text{------------------} + r_\rho \Delta y_{\rho-t+1} \qquad \text{---------------- (4)}$$

Where, y_t denotes the vector of the variables engaged in the model and ρ is the order of autoregression. Both the equations are estimated based on the following hypothesis.

9

Null Hypothesis, H_0: r = 0

Alternative Hypothesis, H_1: r > 1

In Johansen's cointegration test the null hypothesis asserts there is no cointegrating vector and the alternative hypothesis indicates that there are one or more cointegrating vectors.

Granger Causality Test

The Granger Causality test is conducted to determine the direction of causality between the variables under study. The existence of cointegration among the variables implies the existence of a causal relationship between the variables but this does not tell the direction of causality hence it is required to conduct the Granger Causality test to determine the direction of causality within the variables. However, there is a presence of causality at best in one direction if two variables have a similar trend: unidirectional or bidirectional (Granger, 1988). This method entails assessing regressions listed below.

$$y_t = \sum_{i=1}^{n} \alpha_i \; x_{t-i} + \sum_{j}^{n} \beta_j \; y_{t-j} + u_{1t} \qquad \text{------------------------------ (5)}$$

$$x_t = \sum_{i=1}^{n} \lambda_i \; x_{t-i} + \sum_{j}^{n} \delta_j \; y_{t-j} + u_{2t} \qquad \text{------------------------------ (6)}$$

Equation (5) suggests that present y is related to past values of itself along with that of x and equation (6) proposes the same behavior for x. In equation (5) the following hypothesizes are tested.

Null Hypothesis, $H_0 = x_t$ does not Granger cause y_t

Alternative Hypothesis, H_1: x_t Granger causes y_t

Likewise, equation (9) applied the following hypothesis to assess the causality.

Null Hypothesis, $H_0 = y_t$ does not Granger cause x_t

Alternative Hypothesis, H_1: y_t Granger causes x_t

Four-time series variables, GDP, FDI, EXP, and GFCF are simultaneously regarded as x_t and y_t and subsequently, the null hypotheses are examined against their corresponding alternative hypothesis.

10

Regression with Newey-West Standard Error

The first research objective of the study is to illustrate the role of FDI on the economic growth of Bangladesh. In this case, instead of simple OLS, the author uses the Newey-West standard error to correct the standard errors for autocorrelation. The Newey-West procedure is used not only to correct OLS standard errors in the situation of autocorrelation but also in cases of heteroscedasticity. To investigate the role of FDI on economic growth the author uses the following model.

$$GDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 EXP_t + \beta_3 GFCF_t + u_t \quad \text{---------------------------------- (7)}$$

Where, GDP_t is the Gross Domestic Product used as a proxy variable of economic growth, FDI_t is the measurement of Foreign Direct Investment, EXP_t is total export and $GFCF_t$ is the measurement of Gross Fixed Capital Formation and u_t is the error term.

Vector Error Correction Model (VECM)

When the cointegration is proven to be present between variables, then the next step is to run the Vector error correction model to analyze the dynamic relationship. To demonstrate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state is the objective of the error correction model. When variables are co-integrated other methods except VECM may suffer from omitted variable bias.

In VECM, the cointegration term is defined as the error correction term because through a series of partial short-run adjustments, the deviation from long-run equilibrium is corrected gradually. The dynamic specification of the VECM permits the omission of the insignificant variables, whereas the error correction term is retained. The speed of adjustment of any disequilibrium towards a long-run equilibrium state is indicated by the size of the error correction term. The following are the models for VECM.

$$\Delta GDP_t = \alpha_1 + \alpha_{GDP} \hat{e}_{t-1} + \sum_{i=1}^{n} \alpha_{11} \Delta FDI_{t-1} + \sum_{i=1}^{n} \alpha_{12} \Delta EXP_{t-1} + \sum_{i=1}^{n} \alpha_{13} \Delta GDP_{t-1} +$$

$$\sum_{i=1}^{n} \alpha_{14} \Delta GFCF_{t-1} + \varepsilon_{GDP_t} \quad \text{------------------- (8)}$$

11

$$\Delta FDI_t = \alpha_2 + \alpha_{FDI}\hat{e}_{t-1} + \sum_{i=1}^{n} \alpha_{21}\Delta FDI_{t-1} + \sum_{i=1}^{n} \alpha_{22}\Delta EXP_{t-1} + \sum_{i=1}^{n} \alpha_{23}\Delta GDP_{t-1} +$$

$$\sum_{i=1}^{n} \alpha_{24}\Delta GFCF_{t-1} + \varepsilon_{FDI_t} \qquad \text{------------------- (9)}$$

$$\Delta EXP_t = \alpha_3 + \alpha_{EXP}\hat{e}_{t-1} + \sum_{i=1}^{n} \alpha_{31}\Delta FDI_{t-1} + \sum_{i=1}^{n} \alpha_{32}\Delta EXP_{t-1} + \sum_{i=1}^{n} \alpha_{33}\Delta GDP_{t-1} +$$

$$\sum_{i=1}^{n} \alpha_{34}\Delta GFCF_{t-1} + \varepsilon_{EXP_t} \qquad \text{------------------ (10)}$$

$$\Delta GFCF_t = \alpha_4 + \alpha_{GFCF}\hat{e}_{t-1} + \sum_{i=1}^{n} \alpha_{41}\Delta FDI_{t-1} + \sum_{i=1}^{n} \alpha_{42}\Delta EXP_{t-1} + \sum_{i=1}^{n} \alpha_{43}\Delta GDP_{t-1}$$

$$\sum_{i=1}^{n} \alpha_{44}\Delta GFCF_{t-1} + \varepsilon_{GFCF_t} \qquad \text{------------------- (11)}$$

Where, ΔGDP_t, ΔFDI_t, ΔEXP_t and $\Delta GFCF_t$ are the Gross Domestic Product, Foreign Direct Investment, total export, and Gross Fixed Capital Formation for the year 2013. α_i and α_{ij} are parameters. $\hat{e}_{t-1}$ is the error correction term lagged one period and ε_{GDP_t}, ε_{FDI_t}, ε_{EXP_t} and ε_{GFCF_t} are the disturbance term.

Result and discussion

Unit Root Test for Stationarity of the Selected Variable

As time-series data has been used in this study, the author first tries to confirm that the data is stationary over the time period through the Augmented Dickey-Fuller and PP (Phillips Perron) Unit root test. The result of ADF (Augmented Dickey Fuller) and PP (Phillips Perron) unit root tests without constant and with the trend on first difference series of the GDP, FDI, EXP, and GFCF are presented in Table 2.

Table2: ADF and PP Test of Unit Root

Variable	ADF Test		PP Test		Decision	
	No Drift	Trend	No Drift	Trend	Stationariy	Order of Integration
GDP	-1.565*	-5.813***	-5.182***	-6.390***	Stationary	I(1)
FDI	-6.050***	-6.096***	-9.232***	-9.063***	Stationary	I(1)
EXP	-1.096**	-3.228*	-6.952***	-10.810***	Stationary	I(1)
GFCF	-3.946***	-3.956*	-8.771***	-10.242***	Stationary	I(1)

(***) denotes significance level at 1 percent level, (**) denotes significance level at 5 percent level, and (*) denotes significance level at 10 percent level.

The result from the ADF test shows that the null hypothesis of the presence of unit root in the four variables is rejected. The results thus indicate that they are stationary. This result is also matched by the result of the PP test. Thus, it can be concluded that the four variables are first-ordered integrated, i.e. I (1), and thus subject to the cointegration test.

Cointegration Test

If there exists a long run or equilibrium relationship between two variables, then they are said to be co-integrated. In the unit root test, it is observed that the variables under consideration are integrated of the order first. So, it is required to perform the cointegration test.

Order of Cointegration: Result of Johansen's Test

The author has used the Johansen cointegration test for finding the order of cointegration. From equation (3) and equation (4) of the Johansen cointegration test, the generated result of trace statistics and maximum eigenvalue estimation is represented in table 3.

Table 3: Trace Statistic and Maximum Eigenvalue

Maximum Rank	Trace (λ_{trace})	5% Critical Value	Maximum Eigenvalue (λ_{max})	5% Critical Value
r = 0	121.7307	39.89	64.7632	23.80
r = 1	56.9675	24.31	36.0983	17.89
r = 2	20.8692	12.53	17.7572	11.44
r = 3	3.1121**	3.88	3.1121**	3.84

r is the cointegrating vector

(**) indicates rejection of null hypothesis at 5% significance level.

Trace Statistic

Table 3 shows that the trace statistic at r = 0 of 121.7307 exceeds its critical value of 39.89, resulting in the rejection of the null hypothesis of no cointegrating equation. Trace statistic at r = 1 of 56.9675 exceeds its critical value of 24.31, resulting in rejection of the null hypothesis of 1 or fewer cointegrating equation. Similarly, trace statistic at r = 2 of 20.8692 exceeds its critical value of 12.53. Hence, the null hypothesis is rejected. In contrast, the trace statistic at r = 3 of 3.1121 is less than its critical value of 3.88. As a result of which the null hypothesis where there are 3 or fewer cointegrating equations cannot be rejected.

Maximum Eigenvalue

Table 3 also shows the maximum eigenvalues with their corresponding 5 % critical values. Maximum eigenvalue at r = 0 of 64.7632 exceeds its critical value of 23.80 indicates rejection of the null hypothesis of no cointegrating equation. Similarly, maximum eigenvalues at r = 1 and r = 2 exceed their critical values and that indicates rejection of the null hypothesis. In contrast, the maximum eigenvalue at r = 3 of 3.1121 is less than the critical value of 3.84, which signifies there are one or fewer cointegration equations and the null hypothesis cannot be rejected.

Thus, the result discloses that there are 3 cointegrating vectors in the time series of GDP, FDI, EXP, and GFCF.

Short Run Causality among FDI, GDP, EXP, and GFCF

The cointegration test reports that there are 3 cointegrating vectors in the time series variables of GDP FDI, EXP, and GFCF. Thus, there is either short run or long run or both relationships among these variables. To verify the short-run relationship, the author uses the Granger Causality test and in table 4 the result of the test has been represented.

Table 4: Granger Causality Test

Null Hypothesis	Alternative Hypothesis	Chi-Squared	Result
FDI does not Granger Cause GFCF	FDI Granger Cause GFCF	0.37899	
GFCF does not Granger Cause FDI	GFCF Granger Cause FDI	2.1275	-
EXP does not Granger Cause GFCF	EXP Granger Cause GFCF	4.6722	
GFCF does not Granger Cause EXP	GFCF Granger Cause EXP	4.6283	-
GDP does not Granger Cause GFCF	GDP Granger Cause GFCF	17.991***	
GFCF does not Granger Cause GDP	GFCF Granger Cause GDP	9.3794***	GDP↔GFCF
EXP does not Granger Cause FDI	EXP Granger Cause FDI	5.9134	
FDI does not Granger Cause EXP	FDI Granger Cause EXP	23.462***	FDI→EXP
GDP does not Granger Cause FDI	GDP Granger Cause FDI	6.2269**	
FDI does not Granger Cause GDP	FDI Granger Cause GDP	7.0169**	FDI↔GDP
GDP does not Granger Cause EXP	GDP Granger Cause EXP	4.7456	
EXP does not Granger Cause GDP	EXP Granger Cause GDP	15.218***	EXP→GDP

(***) and (**) indicate rejection of the null hypothesis at 10 percent and 5 percent significance level respectfully.

From table 4, it can be said that GDP Granger causes GFCF and GFCF Granger causes GDP as well, which means a bidirectional causality between the variables for the phase under review.

15

It is also viewed from the table that EXP does not granger cause FDI but FDI Granger causes EXP, that is, between the variables there exists unidirectional causality. Again, GDP Granger causes FDI, and FDI also Granger causes GDP and hence the estimation exhibits bidirectional causality between FDI and GDP. There is also an indication of a unidirectional relationship between EXP and GDP, where EXP Granger causes GDP. The table also represents that neither FDI Granger causes GFCF nor GFCF Granger causes FDI, which signifies no causality between the variables. Likewise, GFCF and EXP do not Granger cause one another which indicates no causality between the variables.

Role of FDI in Economic Growth of Bangladesh

The causality test result demonstrates that between GDP and FDI there is a bidirectional relationship. So, it is possible to reveal the role of FDI on economic growth by applying regression estimation. As in the whole estimation, time-series data have been used, the author uses regression with Newey-West standard error method to estimate the cointegrating regression instead of simple OLS. The estimated result of the regression is reported in table 5.

Table 5: Role of FDI in Economic Growth of Bangladesh

Variable	Coefficient	Standard Error	p-Value
FDI	0.0055168*	0.0029432	0.069
EXP	0.2835274***	0.0980815	0.000
GFCF	-0.5493633***	0.1252238	0.000
Constant	0.0652673	0.0142948	0.000
F-Statistic	11.32	Prob > F-Statistic	0.000

Dependent Variable: GDP

(***), (**) and (*) indicate significance level at 1 percent, 5 percent, and 10 percent respectfully.

The result indicates that FDI has a positive influence on GDP, but the influence is not so significant. Rather EXP has a significant impact on GDP and there exists a significant positive effect of EXP on GDP. GFCF also has a statistically significant impact on GDP. The result shows that GFCF has a negative influence on GDP. The outcome of the F-statistic is 11.32 and

the prob (F-statistic) is 0.000 which is lower than 0.05 suggesting that at a 5 percent level of significance the overall regression is statistically significant.

Long run Causality between FDI, GDP, EXP, and GFCF

The Johansen cointegration test indicates that the time series variables of GDP, FDI, EXP, and GFCF have 3 cointegrating vectors. The short-run causality has been determined by the granger causality test and the VECM mechanism has been applied in search of the long-run relationship among the variables.

Table 6 presents the result of VECM identifying the long-run relationship among the variables. The estimated outcome of equation (8) reports that one-year lagged FDI, EXP, and GFCF have a statistically significant long-run causal impact on current GDP. But the positive sign of the corresponding error term does not ensure a long-run equilibrium relationship between the variables. The positive sign of the error term states that GDP_{t-1} is excessively high to be in equilibrium, that means, GDP_{t-1} is beyond its equilibrium value. Therefore, ΔGDP_t will be negative to restore the equilibrium. The estimated result of equation (8) shows that FDI_{t-1}, EXP_{t-1}, and $GFCF_{t-1}$ have a negative relationship with GDP. On the other hand, GDP_{t-1} has a positive relationship with GDP.

The possible reasons for the negative effect of FDI on economic growth may be that to shut down and obtain monopoly power, a local company might be bought by foreign companies (Huang & Khanna, 2005). Another reason may be that generally foreign corporations aim for the local market and the local corporations often fail to participate in the competition with these foreign corporations, as a result, FDI can fall a negative impact on GDP.

It is expected that EXP has a positive relationship with GDP but here there is a negative relationship between them. The reason can be that the exporting firm may need raw materials or other accessories from abroad which increases import thus export may influence GDP

17

negatively. Another reason may be that these firms are exporting goods without meeting the domestic demand for the goods. As a result, to meet the demand, it is necessary to import goods from abroad. Thus, GDP can be negatively affected by EXP. Again, the reason behind the negative relation between GFCF and GDP may be that despite an increase in GFCF, due to an increase in inflation real GDP may not increase rather it may decrease.

Equation (9) shows that one-year lagged GDP has a statistically significant positive long-run causal effect on current FDI and it's confirmed through the negative error correction term the negative sign of the corresponding error term ensures the long-run equilibrium relationship between two variables.

Equation (10) states that one-year lagged GDP and GFCF have a statistically significant relationship with current EXP. One-year lagged EXP is negatively correlated with the current EXP. The negative sign of the error correction term also ensures the long-run equilibrium relationship.

Equation (11) one-year lagged EXP and GFCF have a statistically positive causal relationship with current GFCF. One-year lagged GDP has a statistically negative causal relationship with current GFCF. The negative sign of the error correction term ensures the long-run equilibrium relationship between the variables.

Table 6: Long run Causality between FDI, GDP, EXP and GFCF

	Equation 8		Equation 9		Equation 10		Equation 11	
	ΔGDP_t		ΔFDI_t		ΔEXP_t		$\Delta GFCF_t$	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ΔFDI_{t-1}	-0.013*	-1.89	0.224	1.40	-0.008	-1.07	0.0013	0.27
ΔEXP_{t-1}	-0.357***	-3.16	-0.675	-0.25	-0.55***	-4.04	0.285***	3.26
ΔGDP_{t-1}	0.359***	2.83	6.530**	2.19	0.32**	2.11	-0.217**	-2.22
$\Delta GFCF_{t-1}$	-0.452***	-3.11	4.077	1.20	0.33*	1.90	0.235**	2.11
α	-0.001	-0.07	0.00	.00	0.00	-0.03	-0.002	-0.15
$\hat{e}_{t-1}^1$	0.524***	4.10	-3.393	-1.13	-0.323**	-2.12	-0.408***	-4.14
$\hat{e}_{t-1}^2$	0.025**	2.29	-1.596***	-6.36	0.044***	3.46	-0.001	-0.10
$\hat{e}_{t-1}^3$	0.348*	1.76	-5.280	-1.14	-0.616***	-2.61	-0.395**	-2.59
R squared	0.816		0.748		0.829		0.707	

(***), (**) and (*) indicate significance level at 1 percent, 5 percent, and 10 percent respectfully.

Conclusions

From the above discussion, it may be concluded that FDI affects economic growth in the short run positively. But it is very surprising that in the long run, FDI affects economic growth negatively. There may be different reasons for this situation. One of the reasons is that it may create environmental risk. There may be other reasons such as joblessness, wage exploitation, unequal competition high cost of technology, and so on. So, the government should take proper measures in this regard. At last, it can be said that as in the short-run FDI has a positive effect on economic growth so the government should create a conducive environment to invest and to encourage FDI. Besides, it is necessary to try to overcome the threat of negative impact of FDI by implementing suitable investment policies.

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