

Foreign Direct Investment and Economic Growth in Bangladesh: An Empirical Analysis¹

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Abstract: Foreign direct investment (FDI) is considered as the driving force of economic growth to the resource scarce underdeveloped and developing countries of the world. FDI stimulates economic growth through spillover effects, which results from new technology, capital formation, human resource development (labor skills and employment) and the expansion of international trade by gaining from comparative advantage. Besides, it also positively affect domestic investment and capital inflow to the home country. Bangladesh, which has plethora of tangible resources FDI can provides capital from abroad which the country is unable to supply domestically. The inflows facilitate the growth of a number of economic sectors, including industry, manufacturing, infrastructure, and energy. The expansion leads to a rise in the availability of jobs and a fall in the unemployment rate. Consequently, GDP and per capita income increase which, in a developing country like Bangladesh, fosters poverty alleviation. Besides analyzing the trends the study has also undertaken a scientific approach to examining the relationship between FDI and economic growth by Granger Causality test and found unidirectional causality from FDI to GDP implying that FDI inflows have been able to increase GDP by raising the economy's output capacity at the full-employment level. In addition FDI can provide the necessary tools for Bangladesh to progress further and realize higher growth levels by utilizing all its resources to their fullest potential. Therefore, attempts should be taken to attract more FDI in Bangladesh.

1.0 Introduction

In a developing country like Bangladesh FDI has positive reasons to stimulate overall economic growth. Creating congenial environment to attract FDI remains a big challenge to the developing and underdeveloped countries since 1980s, when the world economies become more open. Market based economic reforms and outward orientation was the major policy agenda in the 1980s, which resulted huge flow of capital worldwide and thus enhance output growth. FDI not only provided to home country necessary benefits but also benefited host country's companies by scale economies in production, research and development (R&D) activities, and by promoting brand value. Besides, FDI tends to have significant effect on economic growth through multiple channels

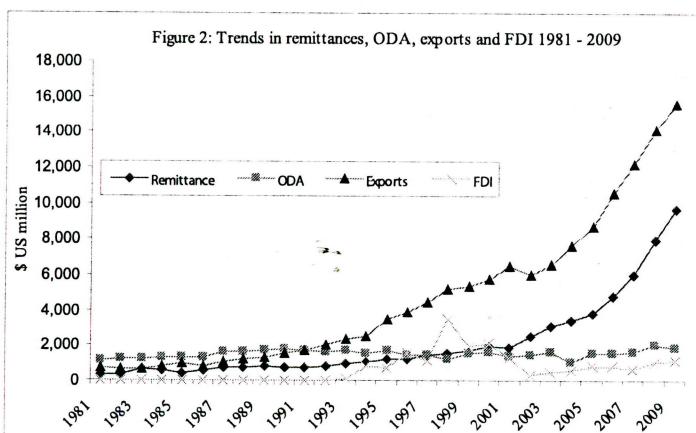
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such as capital formation, technology transfer and spillover, human capital (knowledge and skill) enhancement, and so on. Though the home countries have also experienced the negative impact of FDI, the amount of FDI continued to increase in recent years. China and the East Asian countries for instance, Hong Kong and Singapore have attracted the lion's share of FDI among the developing countries. Hsu and Liu (2002) stated that global financial integration and financial capital movement drives the potential regional integration in East Asia. This area, including Taiwan, Hong Kong, Singapore and Japan, is the major FDI capital sources since 1990. However, in 1997, Asia financial crisis resulted in FDI capital flow changed its direction to Mainland China and in the South Asian region. Most of the investment in China and South Asia belong to the labor-intensive industries as these regions have a huge mass of surplus labor. FDI in these regions created employment for them and host country also has benefited from low labor costs (Haseen, L. 2012).

Bangladesh is a resource scarce labor surplus economy and is facing the daunting challenges of feeding its 150 million of people about half of whom are lying below the food based poverty line. Of the very few sources of foreign exchange the overseas remittances is one of the major sources of tangible resources to the economy of Bangladesh followed by commodity exports, foreign direct investment (FDI) and the official development assistance (ODA). In the backdrop of the narrow based exportable and their high concentration in a less wider market, shrinking trends of the bilateral and multilateral assistances (ODAs), foreign direct investment (FDI) and the overseas remittances become the major issue of concern to the policymakers, politicians and economists.

It is evident from the figure that though the commodity exports and foreign remittances are increasing sharply, official development assistance remains almost stable over the long period of time. However, the FDI increases slightly till 1999. Then it shows a declining trend till 2003. After that it show slim upward trend.



Source: Bangladesh Bank, 2010.

For the last few decades like many developing countries Bangladesh is heavily relying on foreign trade for enhancing its economic development. However there is a scope for attracting foreign capital due to its natural advantage of low labor and so the production cost. Since its independence in 1971 Bangladesh has experienced different policy regimes inwardness to the outward orientation by making the economy open. The degree and extent of openness has increased over the decades. Now Bangladesh is one of the most liberalized countries in the South Asian region, thus created the ground for FDI. However, most of the foreign investment in Bangladesh is in the ready-made garments industries. The examination of the relationship between the FDI and economic growth is thus imperative.

The paper is organized as follows. After introducing the issues in section 1, section 2 will critically examine the theoretical and empirical literature on the relationship between FDI and economic growth. Methodological issues and objective are discussed in section 3. Section 4 presents the trends and patterns of FDI in Bangladesh. Section 5 briefly analyze the growth impact of FDI. Section 6 sets out the empirical framework for causality, cointegration and error correction models. Finally, section 7 concludes the paper with policy implications.

2.0 Brief Survey of the Literature

The dynamic causal relationship between FDI and economic growth has widely been discussed in the theoretical and empirical literature.

The neoclassical growth theory, led by Solow and Swan argued that

economic growth generally comes from two sources: factor accumulation and total factor productivity (TFP) growth (Felipe, 1997). To them, FDI contributes to the total factor productivity growth through spillover effect such as new technologies, capital formulation, the expansion of international trade and the development of human capital (labor skills and employment) (Alguacil et al., 2002; Baharumshan and Thanoon, 2006; Balasubramanyam et al., 1996, 1999; Bende-Nabende and Ford, 1998; Borensztein et al., 1998; Chakraborty and Basu, 2002; De Mello, 1997, 1999; Liu et al., 2002; Wang, 2005).

The endogenous growth models points out that, FDI can not only contribute to economic growth through capital formation and technology transfers (Blomstrom et al. 1996; Borensztein et al., 1995) but also do so through the augmentation of the level of knowledge through labor training and skill acquisition (de Mello 1997, 1999). These models mentioned three main channels through which FDI affects growth. First, FDI increases capital accumulation in the receiving country by introducing new inputs and technologies (Dunning, 1993; Blomstrom et al., 1996; Borensztein et al. 1998). Second, it raises the level of knowledge and skills in the host country through labor and manager training (de Mello, 1996, 1999). Third, FDI increases competition in the host country industry by overcoming entry barriers and reducing the market power of existing firms.

Recent literature attempts to analyze the impacts of FDI on host country's economy and competitiveness of firms. These studies used different econometric techniques and have found mixed results. Some studies indicate that FDI can stimulate the economic growth. As explained by Chowdhury and Mavrotas (2005), a large number of empirical studies on the role of FDI in host countries suggest that FDI is an important source of capital, complements domestic private investment, is usually associated with new job opportunities and enhancement of technology transfer and spillover, human capital (knowledge and skill) enhancement, and boosts overall economic growth in host countries. On the other hand, a number of firm-level studies do not lend support for the view that FDI promotes economic growth.

Some recent literature mentioned that FDI growth relationship depends on some crucial factors such as the trade regime, the human capital base in the host country, financial market regulations, banking system and the degree of openness in the economy. In essence, Hermes and Lensink

(2003), Durham (2004) and Alfaro et al. (2004) all find that countries with better financial systems and financial market regulations can exploit FDI more efficiently and achieve a higher growth rate.

However, other studies reveal that FDI can offset economic growth (Bende-Nabende et al., 2003; Carkovic and Levine, 2005). Bende-Nabende et al. (2003) found that FDI in some countries had a negative relation with economic growth. Considering the omitted variable bias of the early studies several other studies included export in the model along with FDI and GDP. Burrige and Sinclair (2002) found bidirectional causality between each pair of real GDP, real exports, and real FDI for China using seasonally adjusted quarterly data from 1981:1 to 1997:4; Kohpaiboon (2003) found that, under export promotion (EP) regime, there is a unidirectional causality from FDI to GDP for Thailand using annual data from 1970 to 1999; Alici and Ucal (2003) found only unidirectional causality from exports to output for Turkey using seasonally unadjusted quarterly data from 1987.1 to 2002.4; Dritsaki, Dritsaki and Adamopoulos (2004) found a bidirectional causality between real GDP and real exports, unidirectional causalities from FDI to real exports, and FDI to real GDP.

Following the general pattern, a few empirical studies explored the validity of FDI-led growth in Bangladesh using different data sets and adopting different econometric techniques and found mixed results (Ahmad, 1990; Alam, 1999; Sattar, 1999; Mian and Alam, 2006; Kabir, 2007; Hossain, 2008; Ahmad et.al. 2010 etc.). Although these studies bear significance, they suffer either from methodological deficiencies or from the omitted variable bias or have data problems. The present paper marks an improvement over the early studies in terms of overcoming the above problems and relying on the Johansen-Juselius maximum likelihood method in fully specified error correction modeling, which produces identical cointegrating vectors for either variable in the model.

3.0 Objectives and Methodology

The dynamic causal relationship between FDI and economic growth has largely been discussed in the developed and developing economies, while only a few studies have been conducted for the emerging economies like Bangladesh. Most of the recent studies on this issue tried to establish FDI led growth hypothesis and thus suffer from methodological deficiencies of omitted variable bias or specification errors, as they did not explain the trends and patterns of FDI in Bangladesh. This study is an improvement

of the early studies in terms of data used and methodological point of view. The major objective of this paper is to explain the trends and pattern of FDI in Bangladesh and its growth impact. It also sheds lights on the relationship among the considered variables using the annual time series data for the period 1990 to 2010. The main data sources are the publications of Bangladesh Bureau of Statistics (BBS), Board of Investment (BOI) and the economic trends published by Bangladesh Bank. To examine the linkages among the variables the paper applies the Granger Causality Test (GCT) as well as the cointegration and error correction models to examine the short run dynamics of the long run relationships between FDI and economic growth. The findings of the above tests will be of immense help for formulating apposite policies to attract FDI to the labor surplus economy Bangladesh.

4.0 Trends and Patterns of FDI in Bangladesh²

4.1: FDI and its Categories

The Board of Investment (BOI) defines foreign direct investment as, 'an investment involving a long term relationship and reflecting a lasting interest and control by a resident entity in one economy (parent enterprise) in an enterprise in another economy (FDI enterprise or foreign affiliate)'. Under this definition there are three components of FDI, which are

- i) Equity capital is the foreign direct investor's purchase of shares of an enterprise in a country other than its own.
- ii) Intra company loans refer to short- or long-term borrowing and lending of funds between direct investors (parent enterprises) and affiliate enterprises.
- iii) Reinvested earnings comprise the direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates, or earnings not remitted to the direct investor. Such retained profits by affiliates are reinvested.

The Board of investment categorized four different types of FDI as:

- i) Green Field FDI: entails establishment of new production facilities and movement of intangible capital (in service) contributing to capital formation and employment generation.

² This section draws heavily from the report 'Foreign Direct Investment in Bangladesh (1971-2010) by Board of Investment, Bangladesh (November, 2010), and Haseen, L. (2012)

- ii) Cross-border M & As: end up transferring production assets to foreign investors and does not increase capital stock.
- iii) Round-tripped investment: involve channeling of local investor's funds abroad and subsequent return to local economy in the form of direct investment.
- iv) Trans-shipped investment: or investment mainly intended for FDI in some other country does not increase capital stock.

4.2: Trends and Patterns of FDI

In the broad categories FDI can be decomposed either as 100 percent FDI or joint venture investment.

A. 100 percent FDI

100 percent foreign direct investment proposal represents projects having full ownership of the foreign investors. They enjoy equal privilege as local investors. Following Table 1, shows the year wise registration of 100 percent FDI proposals registered with board of investment (BOI).

Table 1: Year wise Investment

Year	Investment (in million US\$)	Employment opportunities (person)
1990	0.623	100
1991	2.841	344
1992	18.919	206
1993	0.2	150
1994	28.037	2541
1995	10.318	252
1996	22.257	4125
1997	191.242	3998
1998	1018.871	3887
1999	436.907	13116
2000	406.695	1012
2001	11.258	1761
2002	35.963	9709
2003	83.516	8042
2004	224.806	20775
2005	3197.623	14439
2006	1120.82	11688
2007	55.163	23779
2008	65.584	6208
2009	44.688	11050
2010	36.437	4795
Total	7012.768	141,957

Source: Board of Investment (2010)

Table 1, represents a gloomy scenario of 100% FDI in Bangladesh. From the very lowest level it has shown remarkable improvement in the last half of the 1990s. However, the momentum has not been maintained. As it fallen sharply in the latter years and reached its peak in the history of Bangladesh in 2005. But its falls down very rapidly again in the recent years.

The 100% FDI in Bangladesh is narrow based. These are concentrated only a few sectors. In the considered time frame the textile, chemical and engineering sectors are the prominent among the manufacturing sector apart from the service sector which attracted almost 90 percent of the FDI in Bangladesh, as shown in the following table 2:

Table 2: Sector wise Investment

Sl	Sectors	No of units	Investment (in million US\$)	Employment opportunities (person)
1	Agro based	59	154.291	24434
2	Chemical	65	1985.938	6147
3	Engineering	57	38.963	4388
4	Food and Allied	13	19.112	1662
5	Glass and ceramics	3	8.188	328
6	PrintingnPublication an Packaging	7	2.269	325
7	Tannery and Rubber Products	4	4.013	602
8	Textile	115	221.259	84,578
9	Services	91	4575.901	18,758
10	Miscellaneous	7	2.834	735
	Total	418	7012.678	141,957

Source: Board of Investment (2010)

Bangladesh has succeeded to attract 100% FDI only from a small number of countries. The top 10 investing countries in terms of investment amount are as follows:

Table 3: Top investing countries in Bangladesh

(From 1977-2010)

Sl. No.	Country	No of units	Investment (in US\$ millions)	Employment opportunities(in person)
1	United Arab Emirates	6	2229.898	6,513
2	Kingdom of Saudi Arabia (KSA)	4	1850.406	2,154
3	United Kingdom	45	952.035	26,194
4	United States	23	735.376	3,881
5	The Netherlands	7	351.197	595
6	Egypt.	2	177.149	243
7	Malaysia	7	162.006	833
8	South Korea	88	123.708	46,089
9	India	43	93.803	7,982
10	China	54	55.622	7,071
11	Singapore	9	51.636	1,842
12	Thailand	8	48.418	804
13	Hong Kong SAR, China	18	45.121	11,147

Source: Board of Investment (2010)

It is evident from table 3 that United Arab Emirates, Saudi Arabia and the United Kingdom are the top three foreign investors in Bangladesh. They contributed the lion's share of 100% FDI in Bangladesh while the shares of the other investors are almost trifling.

B. Joint Venture Investment

Year wise the list of Joint Venture Investment proposals registered with Board of Investment are as follows. The table shows a very dissatisfactory figure of joint venture in Bangladesh. From a very low level it shows a slight improvement in last half of the 1990s. However, it falls gradually after that and have shown slight improvement in the recent years.

Table 4: Year wise Investment

Year	Investment(in US\$ million)	Employment opportunities (person)
1977	5.031	60
1979	10.16	260
1980	6.203	327
1981	1.938	140
1982	21.118	680
1983	21.111	110
1984	9.284	229
1985	2.49	210
1986	2.228	136
1987	49.133	480
1988	55.62	330
1989	75.085	280
1990	95.377	1,011
1991	5.617	415
1992	14.545	1,248
1993	19.608	717
1994	211.622	1,522
1995	651.816	1,313
1996	616.978	6,692
1997	1838.911	10,820
1998	786.09	8,713
1999	101.657	4,851
2000	127.779	4,670
2001	228.445	4,679
2002	218.827	10,786
2003	365.974	18,925
2004	247.894	13,180
2005	602.498	22,081
2006	349.148	40,516
2007	271.687	39,037
2008	2403.328	36,677
2009	579.75	22,590
2010	175.518	5,522
Total	10,172.47	259,207

Source: Board of Investment (2010)

The sector wise joint venture investment is also narrow based. In line with the 100% foreign owned investment, Chemical, Engineering and Textile sector received the most proposals. The service sector represents 301 proposals, which is 66% of the total joint venture investment. The scenario is shown in the following table 5.

Table 5: Sector wise Investment

				(From 1977-2010)
SI	Sectors	No of units	Investment in (USD million)	Employment opportunities (person)
1	Agro based	111	329.807	12,588
2	Chemical	169	1413.025	21,319
3	Engineering	151	412.821	18,847
4	Food and Allied	50	54.65	3,069
5	Glass and Ceramics	15	69.424	2,334
6	Printing Publishing and Packaging	13	17.159	877
7	Tannery and Rubber products	42	85.754	17,219
8	Textile	320	1093.168	135,053
9	Services	301	6693.352	47,394
10	Miscellaneous	8	3.31	507
Total		1179	10,172.47	259,207

Source: Board of Investment (2010)

5.0 Growth Impact of Foreign Direct Investment

Bangladesh is a resource scarce labor surplus economy and is facing the daunting challenges of feeding its 150 million of people about half of whom are lying below the food based poverty line. Of the very few sources of foreign exchange the overseas remittances is one of the major sources of tangible resources to the economy of Bangladesh followed by commodity exports, foreign direct investment (FDI) and the official development assistance (ODA). In the backdrop of the narrow based exportable and their high concentration in a less wider market, the FDI become the main issue of concern to the policymakers, politicians and economists. Therefore attracting FDI becomes a top policy agenda in the economy of Bangladesh for maintaining the overall macroeconomic stabilization. It is now considered as the crucial development strategy which augments country's potency of import payments, improve balance of payments situations. Thus help the country to trim down from the dependence on foreign aid / loans. It is widely acknowledge fact that FDI can bump up capital formation through additive savings, and generating employment to the huge mass of unskilled workers and so to ensure long run economic growth of the country.

Globalization i.e. the economic integration among the nations of the world has given a new pace in capital movements from the economically

developed regions to backward regions. FDI can give a big push to the economy and drive away the economy from a low level equilibrium to the high equilibrium by giving a big push to the economy. Inward FDI flows to Bangladesh as a percentage of Gross Fixed Capital Formation (GFCF), from 1972 to 2008 is shown as follows:

Table 6: Inward FDI as a percentage of Gross Capital Formation

Year of Investment	Inward FDI as a % of Gross Fixed Capital Formation
1972	0
1973	0.3
1974	0.3
1975	0.1
1976	0.4
1977	0.3
1978	0.3
1980	0.2
1981	0.1
1982	0.2
1983	0
1986	0.1
1987	0.1
1988	0
1989	0
1990	0.1
1991	0
1992	0.1
1993	0.2
1994	0.2
1995	1.3
1996	2.9
1997	6.7
1998	6.2
1999	3.1
2000	5.5
2001	3.4
2002	3
2003	2.9
2004	3.4
2005	6
2006	5.3
2007	4
2008	5.9

Source: Board of Investment (2010)

Domestic investment remains around 25% of the GDP of Bangladesh for the last decades. However, though the FDI scenario is gloomy the inward FDI as a percentage of GDP in Bangladesh shows a slightly rising trends fro 2.3% in 1980 to 5.9% in 2008 as shown in the following table 7:

Table 7: Inward FDI stock as a percentage of Gross Domestic Products

Year of Investment	Inward FDI stock as a Percentage of GDP
1980	2.3
1981	2.5
1982	2.7
1983	2.5
1984	2.2
1985	2.1
1986	2
1987	1.9
1988	1.7
1989	1.6
1990	1.5
1991	1.5
1992	1.5
1993	1.5
1994	1.3
1995	1.6
1996	2.1
1997	3.4
1998	4.3
1999	4.2
2000	4.8
2001	4.8
2002	5.2
2003	5.6
2004	5.5
2005	6.1
2006	6.9
2007	6.5
2008	5.9

Source: Board of Investment (2010)

6.0 Empirical Analysis

6.1 Methodology³

To examine the relationship between trade openness and economic growth the concept of Granger causality is employed within a bivariate vector autoregression (VAR) framework. The basic idea of the Granger Causality is that X causes Y if Y can be explained better by the present and lagged values of X than by the past values of Y alone assuming that both X and Y are stationary variables. This test assumes that the information relevant to the prediction of the respective variables is contained solely in the time series data on these variables (Gujrati, 2003). In a two variable framework, the test is based on the following regression:

$$Y_t = \alpha + \sum_{i=1}^m \beta_i Y_{t-i} + \sum_{i=1}^n \phi_i X_{t-i} + \varepsilon_t \dots\dots\dots(1)$$

$$X_t = \chi + \sum_{i=1}^m \phi_i X_{t-i} + \sum_{i=1}^n \mu_i Y_{t-i} + v_t \dots\dots\dots(2)$$

where, ε_t and v_t are white noise error term and assumed to be stationary, and m & n are the number of lags to be specified. Equation (1) postulates that current Y is related to past values of itself as well as that of X and equation (2) proposes a similar behavior for X. Given the above specification the following cases can be distinguished:

- i) unidirectional causality from X to Y i.e. X causes Y if $H_0: \phi_i = 0, i = 1, \dots, n$, can be rejected and (ii) does not hold;
- ii) unidirectional causality from Y to X i.e. Y causes X if $H_0: \mu_i = 0, i = 1, \dots, n$, can be rejected and (i) does not hold;
- iii) feedback or bilateral causality is said to occur if both (i) and (ii) hold; and
- iv) independence is suggested if neither (i) nor (ii) hold.

In addition, the framework can be generalized to include more variables in the system.

The stationarity properties of the series are not taken into consideration in the standard Granger causality test, which may report one-way, or two-way causality or no causality. However, if the variables are cointegrated, the modified Granger causality test rules out the possibility of no causality when the variables share a common trend. The estimation of the Granger causality test involves three steps. Step I includes the identification of the order of integration of the variables under consideration. Cointegration is determined

³ This section draws heavily on Hossain (2011), (mimeo).

through the Johansen and Juselius (1990) technique in step II. In step III, we proceed with the standard Granger causality test if the variables are not cointegrated. However, if the variables are cointegrated, the residuals obtained from the cointegrating regressions are used as error-correction terms in estimating the modified Granger causality equations.

6.2 Step I: Testing for the Order of Integration (ADF Test)

Since we are considering annual time series data, the first step consists of determining the order of integration of the variables under consideration. This is done by using the Augmented Dickey- Fuller (ADF) test (Dickey and Fuller, 1981) as follows:

$$\Delta Q_t = \phi_0 + \phi_1 t + \phi_2 Q_{t-1} + \sum_{i=1}^n \phi_i \Delta Q_{t-i} + \varepsilon_t \quad (3)$$

In the above equations, Q_t is a random walk with drift around a stochastic trend, Δ is the first difference operator, ε_t is the white noise error term. The null hypothesis that Q is a nonstationary time series is rejected if ϕ_1 is less than zero and statistically significant. The ADF test is carried out by replacing Q_t with GDP_t , and FDI_t in equation (3) respectively.

Table 1: Unit Root Test with ADF for the period 1990 to 2010

Variables Difference	ADF		ADF	
	C	First Difference	C, T	First
Ingdp	-2.075 (2)	-2.770 (2)*	-2.566 (2)	-3.506 (2)*
Infdi	-1.005 (3)	-2.890 (3)*	-3.435 (3)	-4.670 (3)***

Notes: i) C = constant term included in the unit root test, C,T = constant and trend term included in unit root test; ii) Figures within parentheses indicate lag lengths chosen by the Akaike information criterion (AIC); iii) ***, ** and * denote rejection of the null hypothesis of unit root at the 1%, 5% and 10% levels respectively.

Results of the unit-root tests are presented in Table-1. The test results indicate that at the levels GDP, and FDI are nonstationary. Therefore to achieve stationarity the variables must be first-differenced. The ADF statistics are significant only for the first-differenced series. This shows that, all the series are integrated of the same order i.e., $I(1)$. Since all of the series are integrated of the same order, the series may be tested for the existence of a long-run relationship between them.

6.3 Step II: Testing for Cointegration (Johansen-Juselius Test)

The next step is to search for cointegration between variables. This can be done either by Engle-Granger two steps cointegration procedure or by

Johansen-Juselius cointegration technique. We relied on Johansen-Juselius cointegration techniques because our sample size is small and by this we can avoid the defects⁴ of the Engle-Granger test. This test relied on the relationship between the rank of matrix and its characteristic roots. This test involves checking two test statistics to identify the number of cointegrating vectors. These are the trace statistic and the maximum eigenvalue test statistic. The Trace test statistic for the null hypothesis that there are atmost r distinct cointegrating vectors is

$$\lambda_{trace} = T \sum_{i=r+1}^N \ln(1 - \lambda_i) \dots\dots\dots(4)$$

where, λ_i 's are the $N-r$ smallest squared canonical correlations between X_{t-k} and ΔX_t (where $X_t = (GDP_t, FDI_t)'$ and where all variables in X_t are assumed $I(1)$), corrected for the effects of the lagged differences of the X_t process.

The maximum eigenvalue statistic tests the null that the number of cointegrating vectors is r against the alternative of $r + 1$ cointegrating vectors is given by

$$\lambda_{max} = -T \ln(1 - \lambda_{r+1}) \dots\dots\dots(5)$$

Johansen (1988) shows that equations (6) and (7) have non-standard distributions under the null hypothesis and provide approximate critical values generated by Monte Carlo methods.

Table 2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.660643	24.16967	15.49471	0.0019
At most 1	0.174187	3.636347	3.841466	0.0565

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

⁴ For details see Enders, W (2004).

Table 3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.660643	20.53332	14.26460	0.0045
At most 1	0.174187	3.636347	3.841466	0.0565

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Table-2 and 3, presents the maximum eigen-value and trace tests of Johansen and Juselius (1990). These are complementary versions of the same test to determine the cointegration rank, r . Both the eigen value and trace statistic suggest that GDP and foreign direct investment are cointegrated in Bangladesh implying that the considered variables maintain a stable long run relationship meaning that investment has long run impact on output in Bangladesh.

6.4 Step III: Granger Causality in the ECM-VAR

Since the considered variables have stable long run relationship in the long run, they turn out to be cointegrated. However, in the short run they may drift apart, i.e. they may be in disequilibrium. To take care of this disequilibrium, we need see the short run dynamics between the variables, which can be examined by error correction mechanism. The standard Granger causality test is thus modified by incorporating the error correction terms obtained from the cointegrating regressions as follows:

$$\Delta Y_t = \beta_0 + \rho_1 \eta_{t-1} + \sum_{i=1}^m \beta_i \Delta Y_{t-i} + \sum_{j=1}^n \alpha_j \Delta X_{t-j} + u_t \quad (6)$$

$$\Delta X_t = \gamma_0 + \rho_2 \mu_{t-1} + \sum_{i=1}^m \gamma_i \Delta X_{t-i} + \sum_{j=1}^n \delta_j \Delta Y_{t-j} + v_t \quad (7)$$

where all variables are stationary time series, Δ is the first difference operator and η_{t-1} and μ_{t-1} are the error correction terms which represents the lagged residuals from the cointegrating equations, m and n are the lag lengths chosen by the Akaike Information Criterion (AIC) and u_t and v_t are the disturbance terms. X is said to Granger- cause Y not only if α_i 's are jointly significant but also if ρ_1 is significant. Similarly, Y is said to Granger- cause X not only if δ_j 's are jointly significant but also if ρ_2 is significant. The results of the error correction model are shown in the following table.

Null Hypothesis	F statistic	t-Statistic on Error Correction Term
FDI does not Granger cause GDP	1.30***	-2.698**
GDP does not Granger cause FDI	0.060	-0.0024

Notes: i) ***, ** and * denote rejection of the null hypothesis at the 1%, 5%, and 10% levels respectively; ii) The optimal lag length has been considered to be 2 according to the Akaike information criterion (AIC).

Table-3: Temporal Causality Results based on Granger Causality Tests (F statistic) and Error Correction Model (t statistic)

Table-3 reports the F-statistics and the t-statistics on the lagged ECM terms. The lagged changes in the independent variable represent the short-run causal impact while the error correction term gives the long-run impact. The F-statistic measures the long-run causation while the t-statistic on the lagged error correction terms indicates short-run causality. Both tests show that there exists a unidirectional causality both in the short as well as in the long run from FDI to GDP. However, no feedback relationship has been established.

7.0 Summary and Conclusions

The positive impact of Foreign Direct Investment (FDI) on a macroeconomic level has largely been discussed both in the theoretical and empirical literature. Bangladesh, which has plethora of tangible resources FDI can provides capital from abroad which the country is unable to supply domestically. The inflows facilitate the growth of a number of economic sectors, including industry, manufacturing, infrastructure, and energy. The expansion leads to a rise in the availability of jobs and a fall in the unemployment rate. Consequently, GDP and per capita income increase which, in a developing country, fosters poverty alleviation. In addition, FDI strengthens ties with developed countries that may yield cost advantages in the form of advanced technology transfers and resulting positive externalities. Bangladesh is one of the most liberalized economies in the South Asian region, which offers maximum facilities to the foreign investors, with its natural advantage of cheap labor.

The objective of this study is to conduct a historical and statistical analysis of the trend, patterns and growth impact (by cointegration and error correction models) of FDI in Bangladesh. This study has also

undertaken a scientific approach to examining the relationship between FDI and economic growth by Granger Causality test and found unidirectional causality from FDI to GDP. Since Bangladesh has only very few sources of foreign exchange, FDI is pivotal in providing Bangladesh the necessary finance and capital to achieve sustainable growth. FDI inflows have been able to increase GDP by raising the economy's output capacity and full-employment level. At the same time, it has also delivered development by improving per capita income levels. In short, FDI can provide the necessary tools for Bangladesh to progress further and realize higher growth levels by utilizing all its resources to their fullest potential. Therefore, attempts should be taken to attract more FDI in Bangladesh.

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