Causal links between trade, foreign direct investment and economic growth for Bangladesh

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Abstract: This study investigates empirically the causal relationship between trade, foreign direct investment (FDI) and economic growth of Bangladesh for the period of 1973 to 2008. To analyze this Johansen cointegration test and Granger causality test are used. The cointegration analysis suggests that there is a long run equilibrium relationship among the variables. The results of Granger causality test identifies that there is a causal relationship among the mentioned variables. According to the study, economic growth of Bangladesh leads both FDI and export growth and there is a unidirectional causal relationship between FDI and export with direction from export to FDI.

Key words: gross domestic product, foreign direct investment, export, Johansen cointegration test and Granger causality

1 Introduction

The role of trade policy on the economic growth of a country has been a research interest in both the theoretical and empirical literatures. The literatures on the export-led growth hypothesis postulate trade as main engine of growth. Export in particular improves the growth through adopting foreign technologies and increasing capital utilization and merits of economies of scale (Helpman and Krugman 1985). Generally, export help to remove foreign exchange hurdles and can thereby provide greater access to international market (Esfahani 1991). Nevertheless, results obtained from empirical studies to find out the nature of causal relationship between export and economic growth is mixed. Some studies find that there is positive association between export and economic growth but others have reverse findings. Giles and Williams (2000) tested export-led economic growth hypothesis and they found that there is a negative relation between export and growth. This may be due to the fact that there are some other factors which affect this relationship. Rahman (2009) finds that the short run net effects of export on real GDP of Bangladesh are more visible than those of FDI and remittances.

Studying the relationship between trade and economic growth is important because it can help to understand the impact of FDI on economic growth and at the same time it can facilitate the interpretation of association between trade and FDI. Hence, the role of FDI in the development process has been a topic of discussion these days. Policymakers are engaged in creating different kinds of incentives (e.g. export processing zones and tax incentives) to attract FDI, because it is assumed to have positive impact on local economic development.

The relationship between FDI and economic growth has motivated a voluminous empirical literature focusing on both developed and developing countries. Neoclassical models of growth as well as endogenous growth models provide the basis for most of the empirical work on the association between FDI and growth. The relationship has been studied by explaining four main channels: i. determinants of growth, ii. determinants of FDI, iii. role of multinational firms in host countries and iv. direction of causality between the two variables. It is observable that some studies have found no causal relationship between FDI, while others found unidirectional relationship. In contrast, Chow (1987) has identified bidirectional association between FDI and economic growth. There are several studies explaining relationship between FDI and economic growth although very few studies on this particular issue have been done in case of Bangladesh. Most of the studies provide a descriptive discussion on FDI and economic growth of Bangladesh but there is very few time series study in this context.

Samad (2007) investigates the direction of causal link between FDI and economic growth measured by GDP in nineteen developing countries of South East Asia and Latin America using cointegration technique, Granger causality test and Error Correction Model (ECM). In case of Bangladesh, this study finds that there is a unidirectional short run link running from GDP to FDI which implies that GDP growth of Bangladesh provides market and attracts foreign investment. In addition, Shimul and Siddiqua (2009) identifies that there is no long run relationship between FDI and GDP of Bangladesh by using time series data of 1973-2007.

Chakraborty and Basu (2002) utilize the technique of cointegration and error correction model to identify the link between FDI and economic growth in India. They have identified that GDP in India is not Granger caused by FDI, and the causality runs more from GDP to FDI. Dasgupta (2007) has studied the effects of international trade and investment related macroeconomic variables, namely, export, imports and FDI inflows and the outflows of FDI from India over the period of 1970 to 2005. Unidirectional Granger causality has found from the export and import to FDI out flows. However, no such causality exists from FDI inflows to the corresponding outflows.

Empirical findings based on Toda-Yamamoto test seem to suggest that there is no strong evidence of a bi-directional causality between GDP and FDI in Malaysia. Karimi and Yusop (2009) also state that there is no

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long run relationship between FDI and GDP in Malaysia.

Mucchielli and Soubaya (2000) investigate the determinants of the volume of trade of the French Multi National Companies (MNCs). This study finds that inward FDI has a positive influence on foreign trades and this positive influence is stronger for export compared with imports.

M. Dritsaki, C. Dritsaki and A. Adamopoulos (2004) investigate the relationship between export, FDI and GDP of Greece over the period of 1960-2002. The cointegration analysis suggests that there is a long run equilibrium relationship. The results of Granger causality test identified that there is a causal relationship between examined variables. Economic growth, FDI and export of Greece appear to be mutually reinforcing under the open door policy.

Miankhel, Thangavelu and Kalirajan (2009) show the comparative analysis for the causality relationship among GDP, export and FDI for six countries namely India, Pakistan, Malaysia, Thailand, Chile and Mexico. The results from comparative analysis of this study are not same for all countries since each country is at a different level of development and has followed different policies to attain the present level of development. In case of South Asian countries, the export growth hypothesis holds either in the short run or long run. However, it is the GDP growth in the long run that attracts FDI in India. On the other hand, GDP leads to export growth in Pakistan. However, in Thailand there is a bidirectional relationship between GDP and FDI which means that GDP attracts FDI and FDI further stimulates the growth of GDP.

Ericsson and Irandoust (2001) examined the causal effects between FDI growth and economic growth for the four OECD countries by applying a multi-country framework data from Denmark, Finland, Norway and Sweden. The authors fail to identify any causal relationship between FDI and economic growth for Finland and Denmark. They suggest that the specific dynamics and nature of FDI entering these countries can be responsible for the no-causality results.

It is important to recognize the links between GDP, FDI and export. Each variable has a plausible theoretical foundation to affect the other variables. Without understanding the direction and pattern of mechanisms of these variables it is not possible to undertake effective policy in order to promote economic growth. For this reason, it is important to identify the relationship between these variables to correctly formulate policies in Bangladesh.

This study mainly focuses on an under developed country like Bangladesh. Since Bangladesh is just liberalizing its economy, we should expect the impact on this country to be different from those of more matured emerging countries such as India, Malaysia and Thailand. In order to reveal the effect of FDI on economic growth, so far, most studies have used the bi-variate Granger Causality testing methodology. This study investigates the relationship between export, GDP and FDI of Bangladesh in time series context from 1973 to 2008. This research work has adopted three steps time series procedure to estimate the direction of causality. The steps include checking stationary of the variables, cointegration test and Granger causality test. Since it is not obvious that any of the links among export, GDP and FDI can be ruled out; it has used Granger causality test.

This study is organized in four sections. Section 1 includes background discussion and literature review. Data and their sources and functional forms of the variables are given in section 2. Section 3 has discussed empirical models and results. Conclusion and policy implications are discussed in section 4.

2 Data and Methodology

The granger causality test is adopted to estimate the casual links between export, economic growth and FDI of Bangladesh in this study. The functional form is:

$$EXP = f(GDP, FDI) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

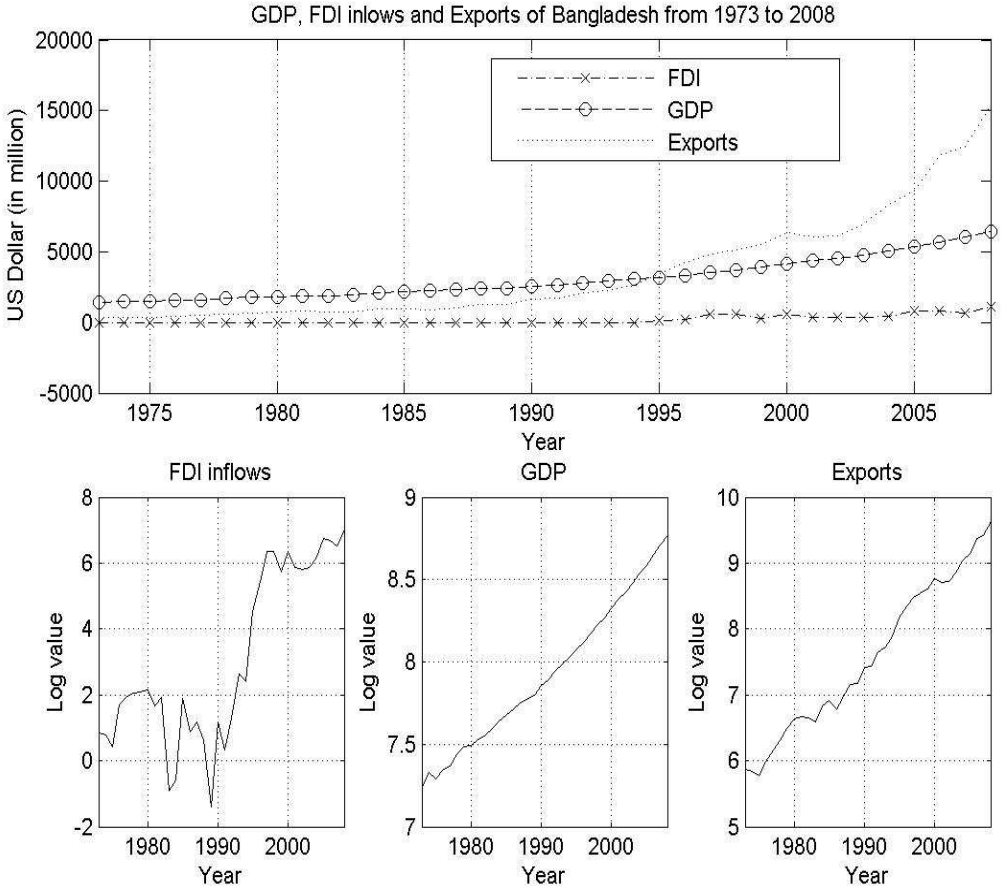
Where,
EXP= Export
GDP= Gross Domestic Product
FDI= Foreign Direct Investment

The variable of economic growth (GDP) is measured by the real GDP and the variable of FDI is measured by the FDI inflows. The variable of export is measured by the real revenue of export. This study has used annual data covering the period of 1973 to 2008 and the unit of all data is million US dollar (see figure 1). The data are obtained from United Nations Conference on Trade and Development (UNCTAD) Handbook of Statistics 2009 and United States Department of Agriculture (USDA). All data are in logarithmic forms in order to include the proliferative effect of time series and it is denoted by the letter L prior to each variable name.

The methodology of this study involves constructing an econometric model to investigate the relationship

between export, GDP and FDI. If the variables mentioned in the model share a common stochastic trend and their first differences are stationary then they can be cointegrated (M. Dritsaki, C. Dritsaki and A. Adamopoulos 2004). So the first step is to check for the order of integration through the unit root tests. If the unit root test is present then stationary is achieved by the first differencing of the data. The use of 1st differences in econometric studies facilitates the results of interpretation, since the first differences of logarithms of initial variables represent the rate of change of these variables (Dritsaki 2003). Next step is to test for cointegration by applying the Johansen and Juselious cointegration test. It is necessary to test for Granger causality by applying the standard Granger test modified with an error correction term if cointegration is present.

Figure 01: GDP, FDI inflows and export scenario of Bangladesh from 1973 to 2008



3 Empirical Models and Results

3.1 Unit root test

Stationary can be checked by finding out if the time series contains a unit root. This study uses the Augmented Dickey Fuller (ADF) test for unit roots. The ADF test includes the extra lagged terms of the dependent variables in order to eliminate autocorrelation (Sridharan 2009). In this study, the minimum values of the Akaike Information Criterion (AIC) and Schwartz Criterion (SC) have provided the number of relative time lags. The ADF test statistic has the same asymptotic distribution as the Dickey Fuller (DF) statistic, so same critical values can be used. The ADF test expresses the following regression equation:

$$\Delta X_t = \delta_0 + \delta_1 t + \delta_2 X_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta X_{t-i} + u_t \text{ ..... (2)}$$

The ADF regression test for the existence of unit root of X_t, namely in the logarithm of all variables at time t. Here, ΔX_{t-i} shows the 1st differences with k lags. On the other hand, u_t adjusts the error of autocorrelation. It requires to estimate α_i and the coefficients δ_0, δ_1 and δ_2. The null and alternative hypotheses for the existence of unit root in variable X_t are as follows:

$H_0 : \delta_2 = 0$

$H_A : \delta_2 < 0$

Table 01: DF/ADF unit root tests

Variables	In their levels Test statistics (DF/ADF)	1st differences Test statistics (DF/ADF)
LEXP	-2.4136	-6.5365*
LGDP	-0.5531	-4.4141*
LFDI	-2.1377	-3.6438***

Source: UNCTAD and USDA
Note: *** denotes 5% level of significance and * implies 10% significance level respectively.

The results of this test (see table 1) suggest that the null hypothesis of a unit root in the time series can not be rejected at 5% level of significance. Hence, no time series appear to be stationary in variable levels. The first differencing of series removes the non stationary components in all cases and the null hypothesis of non stationary is clearly rejected at 10% significance level in case of FDI and 5% significance level for export and GDP. So all the relevant variables of the model are not stationary on their level but entire variables become stationary after first difference that is all variables are I (1)

3.2 Cointegration and Johansen test

Cointegration means that despite being individually non stationary, a linear combination between two or more time series can be stationary. Cointegration of two (or more) time series suggests that there is a long run or equilibrium relationship between them. Since it is found that the variables under the examination are integrated of order 1, the cointegration test is necessary to perform. The cointegration analysis captures the dynamic relationship among the variables. The multivariate cointegration test based on Johansen-Juselius is used to determine the long run relationship (Miankhel, Thangavelu and Kalirajan 2009). The testing hypotheses are the null of non-cointegration against the alternative that is the existence of cointegration by using the maximum likelihood procedure (Johansen and Juselius 1990). An autoregressive coefficient is used for modelling each of the variables (which is regarded as endogenous) as a function of all lagged endogenous variables of the model. The outline of Johansen test is given as follows:

If Z_t denotes a p $\times 1$ vector of variables which are not integrated in order higher than one, then Z_t can be formulated as a Vector Autoregression (VAR) model of order k:

$$Z_t = \Pi_1 Z_{t-1} + \Pi_2 Z_{t-2} + \Lambda + \Pi_k Z_{t-k} + \text{Deterministic components} + \varepsilon_{1t} \text{ …….. (3)}$$

Where, ε_{1t} is independently and normally distributed and $\Pi_1, \Pi_2, \Lambda, \Pi_{t-k}$ are coefficient matrices.

Table 02: Johansen and Juselious cointegration tests variables LEXP, LGDP and LFDI

				Critical values
Eigenvalue test	**Null**	**Alternative**	**Max-Eigen statistics**	**95%**
	r=0	r=1	30.1625***	21.13162
	r<=1	r=2	5.3756	14.26460
	r<=2	r=3	1.2945	3.841466
Trace statistics	**Null**	**Alternative**	**Trace statistics**	**95%**
	r=0	r>=1	36.8327***	29.7971
	r<=1	r>=2	6.6702	15.4947
	r<=2	r=3	1.2945	3.8415

Source: UNCTAD and USDA
Note: r is the co-integration vector and *** denotes 5% level of significance

In order to apply the Johansen test a sufficient number of time lags are required. It is better to follow the relative procedure which is based on the calculation of likelihood ratio test statistics (Sims 1980). The trace test and maximum eigenvalue test to establish the number of cointegration vector is reported in table 02. The optimum lag length is determined by using Akaike Information Criterion and Schwartz Criterion. Johansen's cointegration test for this model indicates that the rank one cointegration is present in the variables. The results of both trace test and eigenvalue test reject the null hypothesis at 5% level of significance.

3.3 Granger causality test

Because of the lags involved, distributed and/or autoregressive models raise the topic of causality in

economic variables. In applied work, the Granger causality modelling has received considerable attention. The Granger causality test assumes that the information relevant to the prediction of the respective variables is contained solely in the time series data on these variables (Gujarati 1998). The model is used in order to determine the Granger causal relationships between variables. In this study, testing criterion is F statistic. Hypotheses of statistic significance of specific groups of explanatory variables are tested for each separate function with the F statistics. The results show the existence of Granger causal relationships among export; FDI and GDP are available in the table 03.

Table 03: Granger causality test

Null hypothesis	Alternative hypothesis	F statistic	Result
GDP does not Granger cause export	GDP Granger cause export	4.33836***	GDP $\Rightarrow$ Export
Export does not Granger cause GDP	Export Granger cause GDP	0.91162	
FDI does not Granger cause export	FDI Granger cause export	2.23628	Export $\Rightarrow$ FDI
Export does not Granger cause FDI	Export Granger cause FDI	4.92148***	
FDI does not Granger cause GDP	FDI Granger cause GDP	0.30555	GDP $\Rightarrow$ FDI
GDP does not Granger cause FDI	GDP Granger cause FDI	4.51479***	

Source: UNCTAD and USDA
Note: *** denotes 5% level of significance

Table 03 demonstrates that there is a unidirectional causal relationship between GDP and export with the direction from GDP to export. Moreover, unidirectional relationship is also found between GDP and FDI where direction is from GDP to FDI. It means that FDI is not a good predictor of GDP growth. Although FDI is an important contributing factor for economic development of country, this study does not find any evidence at this claim for Bangladesh. Finally, there is also a unidirectional causal relationship between FDI and export with direction from export to FDI. Specifically, FDI does not have major impact on export growth which contradicts with the findings of M. Dritsaki, C. Dritsaki and A. Adamopoulos (2004) and Samsu et al. (2008). However, this finding is similar to the findings of Alici (2003) for Turkey. Hence, this study does not support the FDI led export growth hypothesis.

4 Conclusions and Policy Implications

This study uses the annual data for the period from 1973 to 2008 in order to identify the causal relationship between export, GDP and FDI of Bangladesh. In this study, the data series are checked for the stationary using the Augmented Dicky Fuller (ADF) test. The empirical analysis has suggested that all the variables which are used in this study have a unit root. This study employs the Johansen cointegration to find out the level of consistence of cointegration. Later, by adopting Granger causality test this research shows that the GDP of Bangladesh leads FDI and export growth. Therefore, to achieve the long run growth in the economy of Bangladesh, the major policy implication is to focus on enhancing productivity through increasing human capital, removing inefficiencies and other policies oriented towards economic growth. This will lead to GDP growth which will stimulate export growth and will also attract FDI. In case of FDI and export, Granger causality runs from export to FDI. Hence, policy focus should be to reduce production inefficiencies in the economies besides removing trade, fiscal and financial bottlenecks and impediments in infrastructure development that are restricting export growth as FDI will follow export growth.

The results of this study may contribute to the growing studies on economic growth, international trade and international capital movement. There are some limitations of this study. The series of annual data of Bangladesh are not sufficient. Better quality data may improve the quality of findings.

References

Ahmed, A., E. Cheng, and G. Messinis. 2007. Links between export, FDI and output: Evidence from Sub-Saharan African countries. Working paper 35, Centre for Strategic Economic Studies, Victoria University.

Alici, A. 2003. Foreign direct investment, exports and output growth of Turkey: Causality analysis. Paper presented at ETSG Fifth Annual Conference, September 11-13, in Madrid, Spain.

Chakraborty, C., and P. Basu. 2002. Foreign direct investment and growth in India: A cointegration approach. *Applied Economics* 34: 1061–1073.

Chow, P. 1987. Causality between export and industrial development. *Journal of development Economics* 26: 55-63.

Dritsaki, M., C. Dristaki, and A. Adamopoulos. 2004. A causal relationship between trade, foreign direct investment and economic growth of Greece. *American Journal of Applied Sciences* 1: 230-235.

Dritsakis, N. 2003. Hungarian macroeconomic variables–Reflection on causal relationships. *Acta Oeconomica* 53: 61-73. *Oeconomica*, 53, 61-73.

Ericsson, J., and M. Irandoust. 2001. On the causality between foreign direct investment and output: A comparative study. *The International Trade Journal* 15: 122-132.

Esfahani, H. 1991. Exports, imports and economic growth in semi-industrialized Countries. *Journal of Development Economies* 35: 93-116.

Giles, J., and C. Williams. 2000. Export-led growth: A survey of the empirical literature and some non-causality results part 1. *Journal of International Trade and Economic Development* 9: 261-337.

Gujarati, D. 1998. *Basic econometrics*. 3rd ed. Singapore: McGraw-Hill.

Greene, W. 1997. *Econometric analysis*. London: Prentice Hall.

Granger, C. 1988. Some recent developments in a concept of causality. *Journal of Econometrics* 39: 99-211.

Helpman, E. and P. R. Krugman. 1985. *Market structure and foreign trade*. Cambridge: MIT Press.

Ilhan, O., and K. Huseyin. 2007. Foreign direct investment and growth: An empirical investigation based on cross country comparison. *Economia Internationale* 60: 75-82.

Jayachandran, G.. and A. Seilan. 2010. A causal relationship between trade, foreign direct investment and economic growth for India. *International Research Journal of Finance and Economics* 42: 74-88.

Johansen, S., and K. Juselious. 1990. Maximum likelihood estimation and inference on cointegration with applications to the demand for the money. *Oxford Bulletin of Economics and Statistics* 52: 169-210.

Johansen, S. 1988. Statistical analysis of cointegration vectors. *Journal of Economics, Dynamics and Control* 12: 231 – 254.

Karimi, M., and Z. Yusop. 2009. FDI and economic growth in Malaysia. MPRA, 14999.

Miankhel, A.K., S.M. Thangavelu, and K. Kalirajan. 2009. Foreign direct investment, export and economic growth in South Asia and selected emerging countries: A multivariate VAR analysis, Working paper 23, Centre for Contemporary Asian Studies, Doshisha University.

Mucchielli, J.L., and I. Soubaya. 2000. Trade and foreign direct investment: An analysis of intra-firm and arm's length trade of French multinational firms. Paper presented at the Pacific Rim Conference, January11-16, in Sydney, Australia.

Rahman, M. 2009. Contributions of exports, FDI and expatriates' remittances to real GDP of Bangladesh, India, Pakistan and Sri Lanka. *Southwestern Economic Review* 36: 141-154.

Shimul, S.N., S. M. Abdullah, and S. Siddiqua. 2009. An examination of FDI and growth nexus in Bangladesh: Engle Granger and bound testing cointegration approach. *BRAC University Journal* 1: 69-76.

Sridharan, P., N. Vijayakumar, and C.S.K. Rao. 2009. Causal relationship between foreign direct investment and growth: evidence from BRICS countries. *International Business Research* 2: 198-203.

Samsu, S.H., A.M. Derus, and M.F. Ghazali. 2008. Causal links between foreign direct inverstment and exports: Evidence from Malaysia. *International Journal of Business and Management 3*: 177-183.

Samad, A. 2007. Does FDI cause economic growth? Evidence from South-East Asia and Latin America. Working Paper 1-09, Woodbury School of Business, Utah Valley University.

Sims, C. 1980. Macroeconomics and Reality. *Econometrica* 48: 1-48.

Xuan, N.T., and Y. Xing. 2008. Foreign direct investment and exports: The experiences of Vietnam. *Economics of Transition* 16: 183-197.