On Openness and Economic Growth: Evidence from Bangladesh

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Abstract

The present paper examines the debate over long run nexus between trade openness and economic growth for a small open economy, Bangladesh. Using Phillips-Hansen fully modified OLS and vector autoregression for data of three decades, from 1976 to 2005 we found that openness strongly influences long term per capita output growth. Reduction of implicit nominal tariff significantly increases growth. Vector autoregression result implies that trade and growth are mutually reinforcing.

1. Introduction

The nexus between trade openness and economic growth has magnetized substantial interest in terms of analytical insights and empirical explorations the in the last one and half decades. While in theory the outcome is mixed, *i.e.*, higher openness does not necessarily foster growth, country and cross-country studies overwhelmingly certify in favor of 'yes' and 'significantly'. The channels through which trade effects growth are different in 'traditional', 'dynamic' and 'new' trade theories under certain underlying assumptions that are sometimes conflicting. According to traditional trade theory, a more open trade regime via reduction of import and export barriers increases welfare due to specialization and consumption gains and thus an increased rate of output growth in the absence of imperfect competition. In dynamic trade theory, the sources of higher output growth in medium and long runs due of trade are accelerated accumulation of

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physical and human capital, enhanced technology diffusion, 'stimuli' and 'X-efficiency' (Baldwin, 1992; Kreinin, 1998). On the contrary, with the assumptions of imperfect competition and market failures, new trade theories confirmed that trade barriers might be welfare-enhancing. However, a body of empirical evidence suggests that a more open trade regime is virtuous for growth mainly through accumulation or TFP growth (Harrison, 1996; Levine and Renelt, 1992).

Bangladesh, a small open economy, started to open its external sector in early 1980s through a number of policy measures including a new industrial policy, vitalized role of private sector, fiscal reform, financial liberalization, maintaining flexible exchange rate, along with higher trade openness through reduction of implicit nominal tariff, and gradual shift from import substitution to export promotion (Salim, 2003). To attract higher foreign direct investment (FDI) mainly in the export sector, the government enacted Foreign Private Investment (Promotion and Protection) Act in 1980. The country undertook the first phase of openness during 1982-86 under the World Bank's policy based lending, while the second phase (1987-91) commenced with the IMF's three-year structural adjustment facility (SAF) in. However, IMF's Enhanced Structural Adjustment Facility (ESAF) initiated the third phase of trade liberalization since 1992. These reforms resulted in substantially lower quantitative restrictions, opened up trade in many restricted items, rationalized and lessened import tariffs, and created a more liberalized foreign exchange regime (Razzaque *et al*, 2003). The Volume of trade has also increased hand in hand. On the other hand, while per capita real GDP growth had been meager with often negative growth during 1976-1989, it has been positive and ranging from 1 to 4.28 per cent since 1990 with an average of 2.91 per cent. Now the question is whether openness caused or exerted substantial influence on economic growth in the country.

The present paper tries to address this question. We identified nine explanatory variables of which seven were related to openness, and utilized Phillips-Hansen fully modified OLS (PH-OLS) and seemingly unrelated regression (SUR) techniques to examine the relationship between trade openness and economic growth in Bangladesh for three decades, 1976-2005. Vector autoregression (VAR) model has been constructed to assess causality between the two, and time series properties of the variables have also been tested.

2. Literature review

Studies of growth macroeconomics suggest that openness would influence economic growth mainly through four routes. A more open trade regime helps

enhance efficiency of domestic firms via higher competition and improved resource allocation. Greater access to global market fosters firms to increase production capacity and economies of scale. Imported capital goods and thus expanded production of both local and foreign firms affect growth process. International technology diffusion and adoption also result in productivity and efficiency gains (Din *et al*, 2003).

Against the neoclassical assumption that technological progress is exogenous and is not influenced by trade policy, new growth theory assumes that it is endogenous. Openness affects a country's technological change through import of new technology, and thus enhances productive efficiency and facilitates expansion of the economy (Grossman and Helpman, 1991). Greater openness, however, contributes to raise long-term growth through greater access to capital goods (Levine and Renelt, 1992). Destination of FDI is determined by a country's degree of trade openness; FDI is believed to be associated with increased competition between local and foreign firms, efficiency and productivity gains by local firms, R&D, and technology diffusion (Alfaro *et al*, 2004).

Conversely, greater openness may result primarily in economic slowdown due to reduced tariff, lower relative price and attraction of domestic than foreign items, and consequently domestic economy would experience downturn (Batra, 1992; Batra and Slotjee, 1993; Leamer, 1995). On the other hand, if trading partner countries are asymmetric in terms of technological advancement and endowment, economic integration may affect individual countries adversely (Grossman and Helpman, 1991; Lucas, 1988; Rivera-Batiz and Xie, 1993).

Today, openness bears somewhat similar meaning to free trade through elimination of trade distortions (Yanikkaya, 2003). Openness also means neutrality in the sense that "saving a unit of foreign exchange through import substitution and earning a unit of foreign exchange through exports" (Harrison, 1996, p.420). Therefore, highly export-oriented economy may not be neutral or more open when it provides more. Gradual withdrawal of export incentives and import barriers is, however, a sign of greater openness.

Many different measures have been used to investigate the influence of openness on economic growth. Trade restrictiveness index (developed by Anderson and Neary, 1992), trade-GDP ratio (Harrison, 1996), average tariff rates and non-tariff barriers (NTB) (Lee, 1993; Harrison, 1996; Edwards, 1998; Sala-i-Martin, 1997; Clemens and Williamson, 2001), relative price of capital goods to international prices (Barro, 1991), difference between actual and predicted trade (Edwards,

1992), black market premium (Harrision, 1996), openness index (developed by Leamer, 1988; Sachs and Warner, 1995), and price distortion and variability index (developed by Dollar, 1992) are some of these widely used measures.

Trade-GDP ratio has been found to have positive and significant relationship with growth (Harrison, 1996; Frankel and Romer, 1999; Irwin and Tervio, 2002), which may be due to greater access to world market, development of R&D, and technology diffusion. Lee (1993), Harrison (1996), and Edwards (1998) found a negative and significant relationship between average tariff rates and growth, whereas Rodriguez and Rodrik (2001) revealed that tariff rates have positive and strong effect on TFP growth. NTBs have not been found to be significantly growth-influencing (Edwards, 1992, 1998). Black market premium was, however, evident to have negative and strong relationship with growth (Harrison, 1996; Edwards, 1998; Sala-i-Martin, 1997). Barro (1991) found a positive effect of openness on per capita GDP growth for 98 cuntries.

Several recent studies on LDCs and developing countries, particularly for South and East Asia, provide mixed result. Using a five-variable VAR for six East Asian countries Jin (2000) did not find support for the prediction of new growth theories that increasing openness influences long run growth. Edwards (1992) and Piazolo (1995), however, found positive and strong impact of openness on GDP growth. Within the Error Correction Mechanism framework, Bahmani-Oskooee and Alse (1993), Henriques and Sadorsky (1996) and Al-Yousif (1996) found positive association between export growth and economic growth. Anorou and Ahmad (1999) found positive cointegration between openness and economic growth for ASEAN countries.

3. Empirical setting

3.1 Analytical framework

One way of testing whether openness has any impact on economic growth is simply to estimate the coefficient of 'pre-post' dummy variable. If it turns out to be significant, one may claim that trade openness has impact on economic growth, either positive or negative. Well, this simpler exercise will not be appropriate if the period of policy reforms is longer and even continuous for gradual opening of the trade regime. On the other hand, the sources of economic growth, *i.e.*, the variables that explain growth, remain obscure and we cannot claim that openness has a decisive impact.

In the neoclassical growth models, accumulation of physical capital and growth of labor force and total factor productivity (TFP) are the sources of economic growth through constant returns to scale, where TFP is assumed to be an effect of exogenous technological advancement. In the new growth theory, returns of human capital and R&D are assumed to have a more significant role than capital and labor force in accelerating economic growth through increasing returns to scale. Taking openness in account, the Cobb-Douglas production function becomes

$$Y = AK^{\alpha} L^{\beta} H^{\gamma} O^{\lambda} \tag{1}$$

where, Y is real output, A refers to TFP, K implies the stock of physical capital, L means labor force, H stands for the stock of human capital, and O is a measure of openness. In the empirical models for Bangladesh, the significance of L in explaining the real output growth is evident in recent studies (*e.g.*, Razzaque *et al*, 2003; Salim, 2003). However, Bangladesh Bureau of Statistics (BBS) conducts Labor Force Survey (LFS) with interval of two to three years, therefore time series data of labor force or employment could not be generated to support H. Now the empirical framework takes the following general form:

$$Y = f(K, H, O) \tag{2}$$

However, O includes policy, outcome and demographic variables that are related either strongly or weakly to trade openness. For example, implicit nominal tariff (INT), the ratio of total customs duty to imports, is a policy variable, whereas trade (import plus export)-GDP ratio is an outcome variable of openness.

Table 1: Notation and description of the variables

	Meaning	Expected sign
PCGTH	Growth rate of per capita real GDP, per cent	…
TPML	Telephone mainline per 1,000 people	positive
ALR	Adult literacy ratio	positive
XGDP	Export-GDP ratio	positive
MGDP	Import -GDP ratio	positive
TGDP	Trade-GDP ratio	positive
INT	Implicit nominal tariff	negative
FGDP	Net FDI inflow-GDP ratio	positive
DENS	Ratio of total population to total area	positive
TPR	Trade-population ratio	…

Demographic variables like DENS and TPR have relationship with openness due to the fact that a country, particularly developing one, has to be more open in accommodating the growing need of its huge population, and to accelerate growth through domestic industrialization and export growth. Export sector of many developing countries including Bangladesh is heavily dependent on import of capital goods and raw materials because of low domestic value addition using cheap labor. The readymade garment (RMG) industry that earns around three-quarter of Bangladesh's foreign currency can add only 25 to 30 per cent value including entrepreneur's profit by employing about one-fifth of total women labor force.

We used additional variables XGDP and MGDP to disaggregate the influence of export and import on PCGRT. On the other hand, TPML has been used as a proxy of *K*, as suggested by Yanikkaya (2003), due to lack of time series data for three decades. Following Razzaque *et al*'s (2003) argument that adult literacy is a stock variable we used ALR as a proxy of *H*. However, we did not include NTB, black market premium, BPA, and openness and distortion indices due primarily to unavailability of time series data on these variables. Data on the variables come from World Development Indicators 2007, Bangladesh Economic Review and Bangladesh Government's budget documents (various years), and IMF's Direction of Trade Statistics Yearbook (various years).

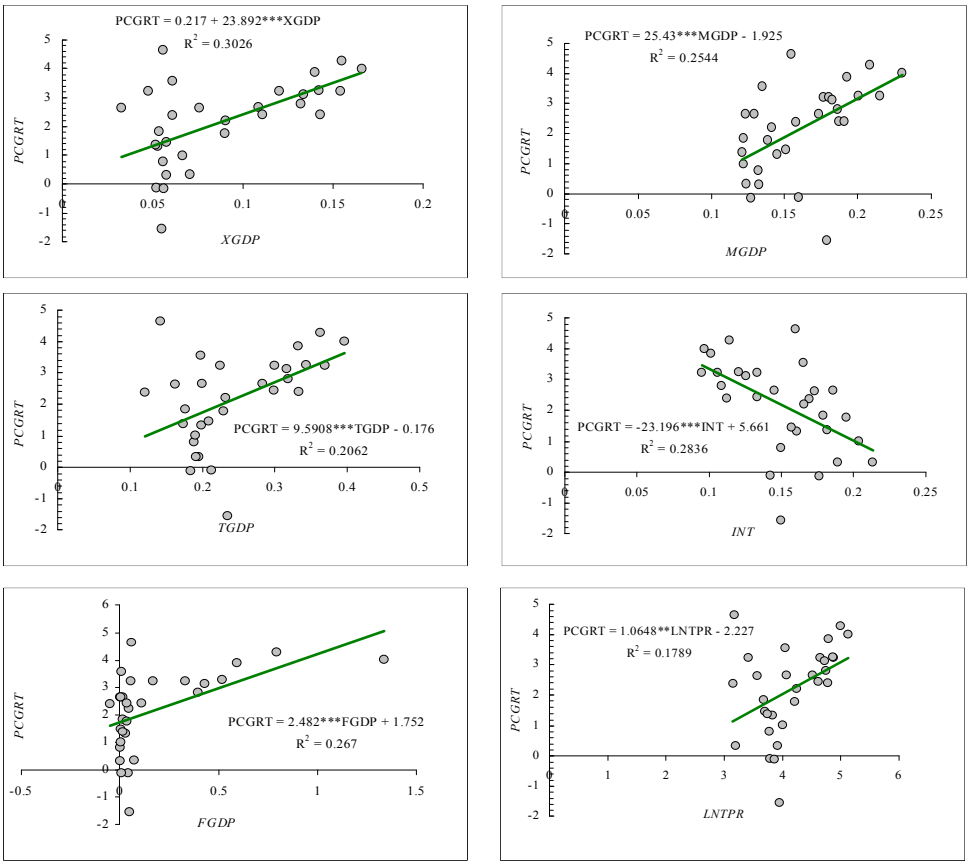
3.2 Estimation strategy and results

Equations (1) and (2) suggest that the growth estimable objective function should take the following form:

$$\ln Y_t = \ln A + \alpha \ln K_t + \gamma \ln H_t + \lambda \ln O_t + e_t \qquad (3)$$

where, *Y* refers to PCGRT, *ln* is natural logarithm, and *e* represents the error term. As log is used mainly for data compression to avoid discrepancy of level of different variables, we used a semi-logarithmic equation taking log of only DENS and TPR because the other variables did not have much

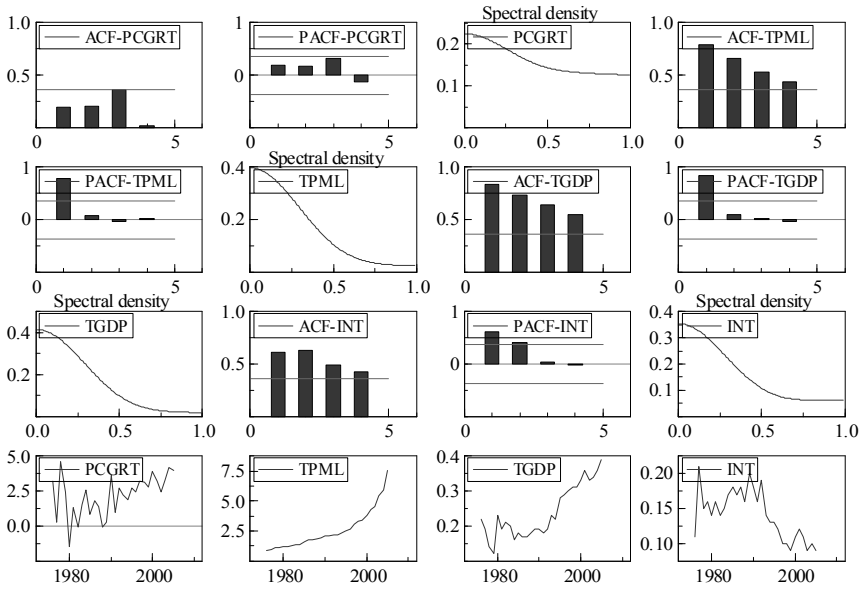
Figure 1 : Openness measures and economic growth



*Note: *** and ** imply that the particular coefficient is significant at 1 and 5 per cent levels, respectively.*

Non-stationarity is a common feature of time series data. If we run OLS regressions in the presence of non-randomness, we may end up with spurious regression and non-standard diagnostic tests like t and F. However, popular test for detecting stationarity are autocorrelation function (AC), partial autocorrelation function (PAC), Ljung-Box tests, unit root tests like a Dickey-Fuller (DF) and augmented Dickey-Fuller (ADF), and non-parametric Phillips-Perron (PP) tests.

Figure 2 : Time series plots of PCGRT, TPML, TGDP and INT



AC, PAC, Q and Ljung-Box statistics are likely to provide inconclusive results in detecting stationarity, particularly about GDP data, whereas DF and ADF tests provide consistent results (Kabir, 2007). However, except LNDENS, all the variables used in the study have been found to be non-stationary of while applying the DF (up to lag 8 according to Schwert criterion). PCGRT, TPML and LNDENS were stationary in ADF, while PCGRT and INT were found to be stationary in PP test.

Table 2 : Test results of stationarity

	DF1	ADF2	PP3
PCGRT	-2.273	-4.113***	-26.304***
TPML	-1.543	7.076***	5.703
ALR	-2.148	0.125	0.018
XGDP	-1.613	0.317	0.907
MGDP	-1.244	-0.866	-1.778
TGDP	-0.769	-0.236	0.416
INT	-0.961	-2.550	-13.853**
FGDP	-1.304	1.471	6.561
LNDENS	-3.481**	-10.347***	-0.255
TPR	-1.757	-0.413	-0.089

*Note: *** and ** imply that the particular coefficient is significant at 1 and 5 per cent levels respectively.*

Phillips-Hansen fully modified OLS, a method widely used in trade modeling, is an optimal single-equation technique asymptotically equivalent to maximum likelihood procedure. To eliminate dependency of the nuisance parameters and provide standard errors that follow standard normal distribution asymptotically and thus are valid for drawing inferences, it makes a semi-parametric correction to the OLS estimator as follows.

$$Y_{1t} = \alpha_0 + \alpha_1 + \beta' Y_{2t} + u_{1t} = \lambda R_t + u_{1t} \tag{4}$$

$$\Delta Y_{2t} = u_{2t} \quad u_1 = \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} = \psi(L)\varepsilon_t \quad E(\varepsilon_t \varepsilon_t') = PP' \tag{5}$$

where, Y1t and Y2t are scalar and mxt vector of I(1) stochastic process, respectively. Now the OLS estimator of Equation (4), is subject to autocorrelation in u1t and endogeneity of , and therefore is consistent but biased. Phillips and Hansen (1990) corrected for these problems of OLS estiamtor by providing the modified estimators of parameters as

$$\hat{\lambda}^{PH} = \begin{bmatrix} \hat{\alpha}_0^* \\ \hat{\alpha}_1^* \\ \hat{\beta}^* \end{bmatrix} = \begin{bmatrix} T & \sum_{t=1}^{T} Y_{2t}' & \sum_{t=1}^{T} t \\ \sum_{t=1}^{T} t & \sum_{t=1}^{T} t Y_{2t}' & \sum_{t=1}^{T} t^2 \\ \sum_{t=1}^{T} Y_{2t} & \sum_{t=1}^{T} Y_{2t} Y_{2t}' & \sum_{t=1}^{T} Y_{2t} t \end{bmatrix}^{-1} \begin{bmatrix} \sum_{t=1}^{T} \hat{Y}_{1t}^{+} \\ \sum_{t=1}^{T} t Y_{1t}^{+} \\ \sum_{t=1}^{T} Y_{2t} Y_{1t}^{+} - T\hat{V}_T^{+} \end{bmatrix} \tag{6}$$

The results of presented in Table 3 are quite surprising and opposite of our expectation in some cases. TPML, ALR were supposed to have positive relationship with growth according to the theory, i.e., stocks of physical and human capital are the core sources of output growth in neoclassical and new growth models.

Table 3 : Phillips-Hansen fully modified OLS results

	$\hat{\lambda}^{PH}$	P-value
Intercept	-109.5733	0.017
TPML	-0.91496	0.074
ALR	-8.2353	0.298
XGDP	35.0994	0.072
MGDP	36.6368	0.046
TGDP	-29.5416	0.029
INT	-18.8514	0.097
FGDP	3.4246	0.026
LNDENS	19.9336	0.014
TPR	-3.7841	0.087

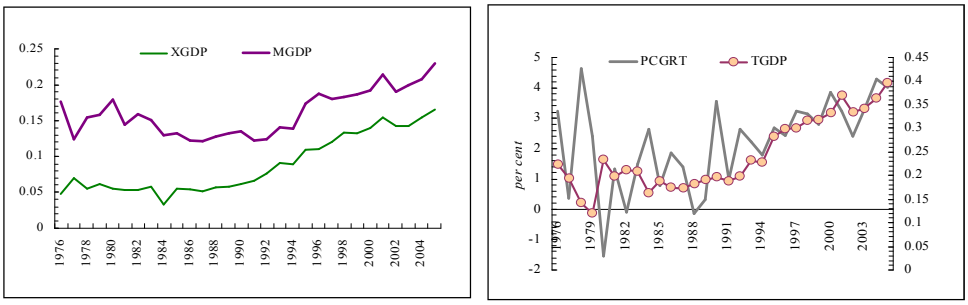
ALR is the only insignificant variable in the estimation. This, however, does not necessarily neglect the practical significance of human capital in the growth process. In Bangladesh ALR witnessed a continued growth over the years while PCGRT experienced frequent fluctuations with negative values. Human capital also appeared to be insignificant in Yanikkaya (2003), which may be due to the fact that in earlier study it was in log of life expectancy, while we took only the ratio in a semi-log model. The significance of ALR can be traced in its high correlation with XGDP, TGDP, FGDP, LNDENS and TPR (Table 4). This means, increasing human capital stock is related to higher volume of trade, foreign investment and population density, and thus influencing PCGRT indirectly through these variables. Among the other variables, INT, FGDP and LNDENS demonstrate expected sign and significance but TPR not. This may be due to the fact that TPR has demonstrated a sustained growth due to increased trade volume and decreased population growth over the last one and half decades.

Table 4 : Correlation matrix

	PCGRT	TPML	ALR	XGDP	MGDP	TGDP	INT	FGDP	LNDENS	TPR
PCGRT	1.00									
TPML	.541	1.00								
ALR	.556	.879	1.00							
XGDP	.561	.906	.935	1.00						
MGDP	.507	.765	.714	.829	1.00					
TGDP	.456	.881	.899	.946	.880	1.00				
INT	-.532	-.655	-.655	-.713	-.911	-.805	1.00			
FGDP	.517	.874	.726	.757	.729	.761	-.629	1.00		
LNDENS	.485	.878	.958	.892	.605	.844	-.537	.638	1.00	
TPR	.423	.873	.953	.914	.741	.936	-.676	.686	.956	1.00

The negative but significant TGDP is a major paradoxical finding of simple regression of Figure 1, and also of Harrison (1996), Frankel and Romer (1999), and Irwin and Tervio (2002). However, TGDP shows negative correlation with INT, and since INT and PCGRT are negatively associated, it might have caused negative value of TGDP. On the other hand, volume of trade as well as XGDP and MGDP has increased substantially after 1994 mainly due to reform packages towards greater liberalisation, which went hand in hand with PCGRT. The gap between XGDP and MGDP has become lower and obtained similar pattern. Before that year the directions of TGDP and PCGRT do not show a similar pattern (Figure 3). That is, after 1994 trade might have strong and positive influence on PRGRT. But the data of about two decades before 1994 may have outweighed that influence, and resulted in a negative of TGDP.

Figure 3 : Movements of trade variables and per capita GDP growth



Since all the openness variables turned out to be statistically significant in Phillips-Hansen OLS, we now explore the direction of causality between openness and growth. One way is to examine the direction using Granger causality test. However, the test is less appropriate than VAR for multiple regression. VAR is used to capture the evolution and the interdependencies between multiple time series through generalizing the univariate autoregressive models. All the variables in a VAR are treated symmetrically by including for each variable an equation explaining its evolution based on its own lags and the lags of all the other variables. VAR model describes the evolution of a set of k endogenous variables measured over the sample period (t = 1, ..., 30 in the present case) as a linear function of only their past evolution. A reduced VAR of the pth order, VAR(p), is

$$Y = \beta Z + e \tag{7}$$

where, Y is n×1 vector for dependent variable, ß represents k×1 vector for parameters, Z stands for n×k matrix for regressors, and u indicates n×1 vector for error terms. The estimator for ß can be written as

$$\hat{\beta} = ((ZZ')^{-1} Z \otimes I_k)Y \tag{8}$$

We constructed a five-variable VAR model to comprehend causality of core variables and growth. The variables are assumed to have immediate impact on PCGRT and vice versa, given the fact that a reduction in tariff rate immediately increases volume of import and later on export as a feedback effect since Bangladesh's export sector heavily depends on imports of machinery, raw materials and intermediate products. The core variables are expected to exert interrelatedness and thus impact each other vis-à-vis output growth without delay. We therefore estimated VAR for these variables with lag two.

Table 5 : VAR estimated directions

	PCGRT	TGDP	INT	FGDP	TPR
PCGRT (-1)	...	18.791**	30.709***	2.362	-0.34
PCGRT (-2)	...	15.013	8.752	-1.603	1.946
TGDP (-1)	0.001	...	-0.217	0.031	0.116
TGDP (-2)	0.008*	…	0.078	0.003	-0.029
INT (-1)	0.002	0.038	...	-0.026	-0.001
INT (-2)	0.002	-0.190	...	-0.059**	-0.013
FGDP (-1)	-0.032	-0.422	-0.263	...	0.004
FGDP (-2)	0.044*	3.21*	2.131	...	0.14
TPR (-1)	0.035	-3.929	0.875	0.135	...
TPR (-2)	0.056***	2.18	0.132	-0.073	...
R2	0.62	0.89	0.82	0.79	0.97
	45.34***	239.92***	126.79***	1087.93***	107.31***

*Note: ***, ** and * imply that the particular coefficient is significant at 1, 5 and 10 per cent levels respectively.*

The results, however, show that PCGRT has bilateral causality with TGDP, i.e., trade increases output growth and growth again increases trade. INT has unidirectional causality; tariff reduction strongly causes growth at 1 per cent level of significance. Trade growth two years back appears to cause FDI growth at the present period. However, mutually reinforcing variables PCGRT and TGDP reconcile the paradox of Phillips-Hansen OLS result that trade reduces per capita growth.

4. Concluding Remarks

The present paper provides a powerful basis to conclude that trade openness is not always harmful for economic growth for a developing country. The apprehension that leads to protectionism in developing countries may not help increase strength of the economy. This does not mean that these countries could readily take up the blow of speedily opening external sector. What happened in Bangladesh is that its external sector started opened up gradually in 1980s with few support packages of international donors. The immediate and medium term growth impacts were at least not significantly positive (e.g., Salim, 2003; Razzaque et al, 2003). Ahmed (2001) found positive effects of trade liberalization on industrial growth, whereas Siddiki (2002) revealed positive influence of TGDP on the overall economic growth of Bangladesh for 1975 to 1995. Industrial growth is a small portion of

overall economic growth, and TGDP is an outcome of openness and only one measure of openness, and therefore two studies be claimed to have satisfactory response to the crux of the debate. In the previous studies per capita growth was also absent. We, however, tried to examine the openness-growth nexus quite comprehensively including a range of simple measures to conclude that trade openness helps attain higher per capita economic growth in the country.

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