Abstract

During the last three decades, Bangladesh has experienced substantial economic growth. Many argue that manufacturing exports are the new engine of economic growth in Bangladesh. Some studies also show empirical evidence for both export-led growth and growth-led exports in Bangladesh. However, the potential growth-enhancing contribution of imports and its causal effects is largely missing in the existing literature. In this chapter, using Autoregressive Distributed Lag framework, we examine the (causal) relationship between trade and economic growth, focusing on the role of both exports and imports on economic growth (or vice versa) in Bangladesh during 1970-2017. Our empirical results support the well-known export-led growth and growth-led exports hypotheses with respect to Bangladesh. Interestingly, we also find evidence for import-led growth with some evidence for economic growth-led imports.
1. **INTRODUCTION**

The nexus between international trade and economic growth has attracted continuous interest in both theoretical and empirical literature. Early studies that investigate the link between trade and economic growth established the well-known export-led growth (ELG) hypothesis. Under this hypothesis, the positive externalities generated by export expansion and trade openness were considered as the engine of economic growth. Additionally, foreign exchange earnings from exports are expected to finance imports of intermediate goods which in turn raise capital formation contributing to further growth in output. Japan’s experience after WWII and empirical evidence from newly industrialised countries, such as South Korea, Hong Kong, Singapore, Taiwan, Malaysia, Thailand and China provide strong support for ELG hypothesis.

In a number of studies, ELG hypothesis was established based on simple correlation analysis (Balassa, 1978; Heller & Porter, 1978; Kormendi & Mequieire, 1985; Tyler, 1981) or regression based analysis where export growth were considered as an explanatory variable (Balassa, 1985; Feder, 1983; Ram, 1987; Sprout & Weaver, 1993; Ukpolo, 1994; Voivodas, 1973). The strong positive correlation between export growth and economic growth or the highly significant positive coefficient of export growth variable was used to support the export-led growth hypothesis.

However, there is an inherent problem associated with these studies. This is, while the studies based on correlation analysis did not identify the possibility of the causal relationship between exports and economic growth, the studies based on regression-based analysis depended on the priori assumption that export growth causes economic growth and hence ignores the direction of the causality between export growth and economic growth.

With the advancements in econometric techniques, such as Granger causality test (Engle & Granger, 1987; Granger, 1981), cointegration and error correction models (Johansen & Juselius, 1990) and Autoregressive Distributed Lag (ARDL) framework (Pesaran & Shin, 1999; Pesaran, Smith, & Shin, 2001), recent studies address the above drawback in early studies and investigate the bidirectional causality between export growth and
economic growth. In addition to supporting the validity of the well-known export-led growth hypothesis, some recent studies observed a reverse causal flow from economic growth to exports growth in many countries (Begum & Shamsuddin, 1998; Hossain & Karunaratne, 2004; Islam, 1998; Islam & Iftekharuzzaman, 1996; Mamun & Nath, 2005; Shirazi & Manap, 2005). This is commonly known as the growth-led export (GLE) hypothesis (Ahmad & Kwan, 1991; Bahmani-Oskooee, Mohtadi, & Shabsigh, 1991; Chow, 1987; Darrat, 1987; Dodaro, 1993; Jin & Yu, 1995; Jung & Marshall, 1985; Sung-Shen, Biswas, & Tribedy, 1990). The underlying idea is that productivity gains through skilled-labour and advanced technology increase the level of domestic production and thereby exports (Bhagwati, 1988; Krugman, 1984).

The empirical evidence on the nexus between trade and economic growth is not limited to ELG or GLE. A recent study (Awokuse, 2007) argued that the presence of import-led growth (ILG) allow firms to access raw materials and high-tech foreign machinery and equipment. This could enhance the domestic production of goods (Coe & Helpman, 1995). Lawrence and Weinstein (1999) and Mazumdar (2000) argue that import growth can serve as a medium for the transfer of foreign research and development knowledge that enhances domestic production from developed to developing countries.

Since Bangladesh embarked on an export promoting strategy in 1982, the country has witnessed a significant growth in its exports of goods and services. Particularly in recent years, not only the volume of exports, but also the composition exports have seen some drastic changes. For example, exports from Bangladesh have changed from traditional items, such as jute and jute products towards new manufactured products such as ready-made garments. To this end, some studies raise the possibility that manufacturing exports is the new engine of economic growth in Bangladesh (Hossain & Karunaratne, 2004). Most of the existing studies on trade and economic growth in Bangladesh focus on the nexus between exports and growth.

This chapter examines the causal relationship between exports, imports and economic growth under an ARDL bounds test of cointegration framework (Pesaran & Shin, 1999; Pesaran et al., 2001). Additionally,
following Toda and Phillips (1993) this analysis adapts recent advances in time series modelling by specifying causal models based on vector error correction models.

This chapter answers the following questions; a) whether the ELG hypothesis holds for Bangladesh; b) whether the GLE hypothesis holds for Bangladesh and c) whether the ILG hypothesis holds for Bangladesh. The remainder of this chapter is organized as follows. Section 2 presents a review of literature focused on the nexus between exports, imports and economic growth in Bangladesh. Section 3 presents a preliminary analysis of the data used for the analysis in this chapter. The methodology adopted for the empirical analysis is discussed in Section 4, the estimated results are presented in Section 5. Section 6 provides some concluding remarks.

2. REVIEW OF LITERATURE: NEXUS BETWEEN TRADE AND ECONOMIC GROWTH IN BANGLADESH

In the 1970s, Bangladesh, like a number of other neighbouring countries in South Asia, was a strongly inward-oriented economy with a heavy focus on import-substitution industrialization strategy. However, low saving and investment, inefficiencies associated with the protectionism of domestic industries, poor allocation of resources, mounting foreign debts and fiscal and current account deficits during this period were identified as impediments to economic growth. The dismal growth performances together with other economic structural impasses created the necessity for a policy shift in Bangladesh in the 1980s, (as in many other developing countries), towards export promoting strategy. In 1982, Bangladesh introduced several holistic structural adjustment programs, targeting all key areas; fiscal, financial, industrial and trade policy in the economy, with the support from the International Monetary Fund and the World Bank. A series of further reforms were introduced during 1985-1986 and 1991-1992. The success of the Asian Tigers with export-oriented industrial strategies provided further incentives for Bangladesh to embrace the export promotion economic
reforms. These reforms focused on a) enhancing greater efficiency and international competitiveness, b) enhancing faster growth of export-oriented industries, c) exchange rate depreciation, d) reduction of tariffs, e) provision of credits and income tax rebates and disinvestment on loss-making public enterprises. The first export-processing zone was established in Chittagong in the 1980s and two others were later established in Dhaka and Khulna. As a result of these economic reforms and incentives for export-oriented industries, Bangladesh exports, particularly manufacturing exports have seen an impressive growth over the past two decades (Hossain & Karunaratne, 2004; Mamun & Nath, 2005; Rahman, 1995).

Currently the economy of Bangladesh is largely dependent on the exports of ready-made garments – the second largest exporter in the world – followed by remittances and the domestic agricultural sector. During the 2017-2018 financial year, Bangladesh reported US$ 34.02 billion worth of exports. Bangladesh’s main export goods include ready-made garments and knit wear, frozen fish, jute and jute goods, pharmaceutical products, tea, leather products, handicrafts and chemicals. The main destinations of exports are the United States of America (USA), Canada, Germany, the United Kingdom (UK), and France (Bangladesh Bureau of Statistics, 2017). In the 2017-2018 financial year, Bangladesh imports amounted US$ 46.02 billion. Machinery and equipment, textile and fabrics, petroleum products and edible oil are the main imported goods in Bangladesh; China, India, Singapore, and the European Union (EU) are the major import partners of the Bangladesh (Bangladesh Bureau of Statistics, 2017).

applying the cointegration and error correction framework. Begum & Shamsuddin (1998) show that export growth positively influences economic growth in Bangladesh through its positive impact on total factor productivity. On the other hand, Love & Chandra (2005b), adapting cointegration and error correction modelling reported that the Bangladesh data provides evidence for GLE. Similar results were found by Love & Chandra (2005a), using the Johansen multivariate framework. Shirazi & Manap (2005) investigated the ELG hypothesis using cointegration and multivariate Granger causality test found strong evidence for ELG as well as for GLE with Bangladesh data. A study by Shirazi & Manap (2005) also reported empirical evidence for the strong long-run bidirectional relationship between imports and output growth in Bangladesh.

3. DATA SOURCES AND PRELIMINARY DATA ANALYSIS

The three variables used in the empirical analysis of this chapter are; annual real GDP, real exports and real imports during the period 1970-2017, which are measured in constant 2010 US dollar values. The data for these variables were collected from World Development Indicators (World Bank, 2019). Figure 1 plots the three variables in log-form (natural logarithm). As observed, all three variables; GDP, imports and exports exhibit mostly a strong upward trend. While there was a downward trend in imports during early 1970s, this trend became a clear upward trend during the 1980s onwards. In addition, it can also be seen that imports and exports tend to move closely together, particularly since late 1970s. Throughout the period, expenditure on imports appear to be higher than export income in Bangladesh.

Figure 2 plots exports and imports as a percentage of GDP. As can be seen, imports exceed that of exports throughout the sample period. Furthermore, exports and imports move together throughout the sample period, except the in the early 1970s, following Bangladesh’s independence. There were sudden decreases in imports and exports levels during 2001-
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2002, following the 9/11 terrorist attack in the United States of America (USA) and in 2008-2009 corresponding with the Global Financial Crisis.

Figure 1. Log form of Real GDP, Exports and Imports (Constant 2010US$), Bangladesh, 1970-2017.

Figure 2. Real Exports and Imports as a percentage of real GDP, Bangladesh, 1970-2017.
Figures 3 and 4 plot GDP against exports and imports, respectively. Figure 5 plots exports against imports. As expected, a clear positive

Figure 3. GDP vs Exports, Bangladesh, 1970-2017.

Figure 4. GDP vs Imports, Bangladesh, 1970-2017.
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Figure 5. Exports vs Imports, Bangladesh, 1970-2017.

association can be seen in all three plots with high fitted $R^2$ values. The Pearson’s correlation coefficients with respect to all three plots – 0.97, 0.83 and 0.90 – also indicate that the positive association is strong.

Figure 6 plots the GDP growth rate during the period 1971-2017. As can be observed, Bangladesh’s GDP fluctuated between negative and positive growth rates until 1976 and then experienced continued positive growth. Overall, there is an upward trend in GDP growth and currently the country’s economy is growing at a rate of 7 percent per annum. Figure 7 plots the import and export growth rates for the period from 1971-2017. Up until the mid-1970s when the economy was underpinned by the import-substitution industrialization strategy, Bangladesh experienced a negative import growth rate. Since 1980, import and export growth rates appear to take an almost identical pattern, however, with a shorter lag effect between imports and exports.

Table 1 presents statistics informing GDP, exports and imports for selected years. Columns (2) and (3) present the imports and exports as a percentage of GDP, respectively and Columns (4)-(6) present the growth in GDP, exports and imports, respectively. The last two rows of the table
Figure 6. GDP growth rate, Bangladesh, 1971-2017.

Figure 7. Import and Export growth rates, Bangladesh, 1971-2017.
Table 1. Exports and Imports as a percentage of GDP and GDP,
Exports and Imports Growth Rates
(selected years), 1971-2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Exports (% of GDP)</th>
<th>Imports (% of GDP)</th>
<th>GDP growth rate</th>
<th>Exports growth rate</th>
<th>Imports growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>2.54</td>
<td>36.82</td>
<td>-5.48</td>
<td>-27.62</td>
<td>-21.60</td>
</tr>
<tr>
<td>1976</td>
<td>3.65</td>
<td>14.21</td>
<td>5.66</td>
<td>24.77</td>
<td>37.63</td>
</tr>
<tr>
<td>1981</td>
<td>2.72</td>
<td>7.04</td>
<td>7.23</td>
<td>-31.77</td>
<td>-52.51</td>
</tr>
<tr>
<td>1986</td>
<td>2.51</td>
<td>5.93</td>
<td>4.17</td>
<td>-1.15</td>
<td>-4.16</td>
</tr>
<tr>
<td>1991</td>
<td>2.94</td>
<td>6.03</td>
<td>3.49</td>
<td>-3.09</td>
<td>-15.02</td>
</tr>
<tr>
<td>1996</td>
<td>4.85</td>
<td>9.53</td>
<td>4.52</td>
<td>8.08</td>
<td>14.11</td>
</tr>
<tr>
<td>2001</td>
<td>6.57</td>
<td>10.26</td>
<td>5.08</td>
<td>14.90</td>
<td>12.85</td>
</tr>
<tr>
<td>2006</td>
<td>16.51</td>
<td>24.57</td>
<td>6.67</td>
<td>25.48</td>
<td>18.19</td>
</tr>
<tr>
<td>2011</td>
<td>19.47</td>
<td>26.42</td>
<td>6.46</td>
<td>29.34</td>
<td>29.15</td>
</tr>
<tr>
<td>2016</td>
<td>16.83</td>
<td>20.97</td>
<td>7.11</td>
<td>2.20</td>
<td>-7.09</td>
</tr>
<tr>
<td>2017</td>
<td>15.32</td>
<td>20.11</td>
<td>7.28</td>
<td>-2.34</td>
<td>2.88</td>
</tr>
<tr>
<td>Mean</td>
<td>7.66</td>
<td>15.30</td>
<td>4.24</td>
<td>9.57</td>
<td>5.61</td>
</tr>
<tr>
<td>SD</td>
<td>6.30</td>
<td>9.97</td>
<td>3.74</td>
<td>22.02</td>
<td>25.30</td>
</tr>
</tbody>
</table>

Source: World Bank open data.

represent the mean and standard deviation for each column, respectively. As can be seen, on average, during the sample period, exports and imports as a percentage of GDP is 7.7 per cent and 15.3 percent per annum, respectively. There has been a significant increase in both exports and imports (as a percentage of GDP) since the mid-2000s. The GDP, on average, has grown at a rate of 4.2 percent per annum, while exports and imports have grown at a rate of 9.6 and 5.6 percent per annum during the period of 1971-2017. Since 2001, export growth rate is consistently higher than the import growth rate, except in 2017 where the export growth rate was negative, while the import growth rate reported a positive value.

4. Methodology

In this section, we specify a number of hypotheses in relation to the three variables; GDP, Exports and Imports. For each pair of variables (1) (GDP,
Exports) (2) (GDP, Imports) and (3) (Imports, Exports), we investigate the presence of a one-way or two-way causal relationship between each pair of the variables. For example, the most popular Export-led growth (ELG) hypothesis will hold if there is a causal relationship between exports and GDP, if the direction is from Exports to GDP. Alternatively, some studies also found support for the growth driven exports hypothesis (GLE) where growth influences the level of exports. The GLE hypothesis holds if the causal relationship between GDP and exports is in the direction of GDP to exports. Similarly, the Imports led Growth (ILG) and Growth led Imports (GLI) hypotheses can also be tested between GDP and imports as well as similar hypotheses between exports and imports. To achieve this, we use the ARDL model and perform the bounds test. The attraction of the ARDL bounds test approach is that, (a) it does not require all the variables of the model to be integrated of the same order, that is, all I(0) or all I(1); (b) it can be used in small sample situations as well; and (c) long-run and short-run models can be estimated simultaneously.

The long-run relationship between the three variables GDP, Exports (EXP) and Imports (IMP) can be written as

\[
\ln GDP_t = \alpha_1 + \beta_1 \ln EXP_t + \beta_2 \ln IMP_t + \epsilon_t \tag{1}
\]

\[
\ln EXP_t = \alpha_1 + \beta_1 \ln GDP_t + \beta_2 \ln IMP_t + \epsilon_t \tag{2}
\]

\[
\ln IMP_t = \alpha_1 + \beta_1 \ln GDP_t + \beta_2 \ln EXP_t + \epsilon_t \tag{3}
\]

The ARDL \((p, q, r)\) formulations involving GDP, Exports (EXP) and Imports (IMP) can be written

\[
\Delta(\ln GDP_t) = \alpha_1 + \beta_1 \ln GDP_t + \beta_2 \ln EXP_t + \beta_3 \ln IMP_t \\
+ \sum_{j=1}^{p} y_{1j} \Delta(\ln GDP_{t-j}) + \sum_{j=0}^{q} y_{2j} \Delta(\ln GDP_{t-j}) \\
+ \sum_{j=0}^{r} y_{3j} \Delta(\ln IMP_{t-j}) + \epsilon_t \tag{4}
\]
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\[ \Delta (\ln EXP_t) = \alpha_1 + \beta_1 \ln GDP_t + \beta_2 \ln EXP_t + \beta_3 \ln IMP_t \]
\[ + \sum_{j=1}^{p} \gamma_{1j} \Delta (\ln EXP_{t-j}) + \sum_{j=0}^{q} \gamma_{2j} \Delta (\ln GDP_{t-j}) \]
\[ + \sum_{j=0}^{r} \gamma_{3j} \Delta (\ln IMP_{t-j}) + \nu_t \]  
\( (5) \)

\[ \Delta (\ln IMP_t) = \alpha_1 + \beta_1 \ln GDP_t + \beta_2 \ln EXP_t + \beta_3 \ln IMP_t \]
\[ + \sum_{j=1}^{p} \gamma_{1j} \Delta (\ln IMP_{t-j}) + \sum_{j=0}^{q} \gamma_{2j} \Delta (\ln GDP_{t-j}) \]
\[ + \sum_{j=0}^{r} \gamma_{3j} \Delta (\ln EXP_{t-j}) + \omega_t \]  
\( (6) \)

We use log-transformation of the three variables to improve the regression model assumptions. The number of lags is selected according to Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) criteria.

The ARDL bounds test can also be used to test the long-run (or the cointegrating) relationship between GDP, exports and imports based on a non-standard F-test by testing the null and the alternative hypotheses

\( H_0: \beta_1 = \beta_2 = \beta_3 = 0 \) (no cointegration)

\( H_A: \) At least one of \( \beta_1 \) or \( \beta_2 \) or \( \beta_3 \neq 0 \) (existence of cointegration).

using the critical values provided in Pesaran et al. (2001). There are two sets of critical values based on the assumptions that all variables are I(0) and the other is that all variables are I(1). If the calculated F-statistic is above the I(1) critical value, then the null hypothesis is rejected concluding support for cointegration. If the calculated F statistic is below the I(0) critical value, then the null hypothesis should not be rejected and concluding no support for cointegration. If however, the calculated F-statistic is between the I(0) critical value and the I(1) critical value, the test result is inconclusive.

In the presence of the cointegration between GDP, exports and imports, then the error- correction model is applied to estimate the speed of adjustment of the disequilibrium caused by previous period shocks that re-
converges to the long-run equilibrium. The error correction models which correspond to equations (4)-(6) can be written as

\[
\Delta(\ln GDP_t) = \alpha_1 + \sum_{j=1}^{p} \gamma_{1j} \Delta(\ln GDP_{t-j}) + \sum_{j=0}^{q} \gamma_{2j} \Delta(\ln EXP_{t-j}) + \sum_{j=0}^{r} \gamma_{3j} \Delta(\ln IMP_{t-j}) + \delta EC_{t-1} + u_t 
\]  
(7)

\[
\Delta(\ln EXP_t) = \alpha_1 + \sum_{j=1}^{p} \gamma_{1j} \Delta(\ln EXP_{t-j}) + \sum_{j=0}^{q} \gamma_{2j} \Delta(\ln GDP_{t-j}) + \sum_{j=0}^{r} \gamma_{3j} \Delta(\ln IMP_{t-j}) + \delta EC_{t-1} + v_t 
\]  
(8)

\[
\Delta(\ln IMP_t) = \alpha_1 + \sum_{j=1}^{p} \gamma_{1j} \Delta(\ln IMP_{t-j}) + \sum_{j=0}^{q} \gamma_{2j} \Delta(\ln GDP_{t-j}) + \sum_{j=0}^{r} \gamma_{3j} \Delta(\ln EXP_{t-j}) + \delta EC_{t-1} + w_t 
\]  
(9)

where \( EC_{t-1} \) is the error correction term derived from the long-run relationship (1) for equation (7), from the long-run relationship (2) for equation (8) and from the long-run relationship (3) for equation (9). The coefficients \( \gamma_{ij} \)'s measure the short-run dynamics associated with the long-run relationships and coefficient \( \delta \) is the speed of adjustment that measures the long-run effect.

Using the error correction models (7)–(9), we can also test three forms of Granger causality, namely (a) short run causality by performing an F-test on the short-run \( \gamma_{ij} \) coefficients; (b) a long-run causality using a t-test on the error correction coefficient, \( \delta \); and (c) a strong causality by testing a joint F-test of the significance of the short-run coefficients \( \gamma_{ij} \)'s and error correction coefficient \( \delta \) combined.

The following two points are worth noting in relation to the bounds test. (1) Even though the bounds test approach does not generally require the order of the integration of all the variables to be I(0) or I(1), it does require that none of the variables in the model equation are of order I(2) or higher. In order to ensure that none of the variables are integrated as I(2) or higher, we perform the unit root tests. (2) If some or all of the variables in a regression model are non-stationary in their level form, then the least squares estimation results using a regression model involving these variables may be
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spurious. The bounds test results will also reveal whether the variables GDP, exports and imports are cointegrated, the bounds test results can be used to verify whether the model estimation results are spurious or not. However, even if the variables in the regression model are integrated of order 1, which is I(1), if they are co-integrated, then the least squares estimation results would still be valid.

5. **Empirical Results**

Since the data for the initial years – 1970 and 1971 – are slightly out of place in relation to the remaining data, we have excluded these years’ data in the analysis from here onwards. Table 2 represents the unit-root test results for all the variables of interest. We applied the Augmented Dickey-Fuller (1979) test, Phillips-Perron (1988) unit root test and KPSS (Kwiatkowski et al. 1992) test. The first two tests test the null hypothesis, the time series has a unit root (series is non-stationary), while the KPSS test the null hypothesis that the series is stationary. As can be observed, all of the variables are stationary in their first difference. That is, all are I(1) and bounds test approach can be used for further investigation.

Table 3 presents the bounds test results for testing cointegration. As can be seen, the value of the F-test statistics is larger than the bounds test upper limit - I(1) critical value - at the 5 percent level of significance. This means that the variables GDP, exports and imports are cointegrated. Furthermore, the results presented in Table 3 also reveal that serial correlation is not a major issue with our bounds test results.

Table 4 presents the estimation results for the corresponding long-run equilibrium relationship and for the error correction coefficient estimates. As can be seen, all the error correction coefficients are in the range -1 to 0 as they should be and are all statistically significant. The signs of the estimates of the long-run coefficients between GDP and exports, and exports and imports are positive, and between GDP and imports are negative as they should be and are statistically significant at the 5 percent level. For example, the estimated export coefficient of 1.741 in line 1 of Table 4 means that one
percent increase in real exports will result in a 1.74 percent increase in real GDP. The estimated imports coefficient -1.437 in line 1 implies that one percent increase in real imports will result in 1.44 percent decrease in real GDP. The error correction coefficient -0.069 means that approximately 6.9 per cent of the disequilibrium caused by previous period shocks is corrected within one period.

Table 2. Unit-root Tests for stationarity, 1972-2017

<table>
<thead>
<tr>
<th></th>
<th>ADF Test</th>
<th>Phillips-Perron Test</th>
<th>KPSS Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test statistic</td>
<td>Critical value</td>
<td>p-value</td>
</tr>
<tr>
<td>Levels</td>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>LGDP</td>
<td>-3.453</td>
<td>-3.509</td>
<td>0.057</td>
</tr>
<tr>
<td>LExports</td>
<td>-2.399</td>
<td>-3.509</td>
<td>0.376</td>
</tr>
<tr>
<td>LImports</td>
<td>-3.143</td>
<td>-3.509</td>
<td>0.109</td>
</tr>
<tr>
<td>1st Difference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LGDP</td>
<td>-6.263</td>
<td>-2.927</td>
<td>0.000</td>
</tr>
<tr>
<td>LExports</td>
<td>-7.275</td>
<td>-2.927</td>
<td>0.000</td>
</tr>
<tr>
<td>LImports</td>
<td>-6.712</td>
<td>-2.927</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 3. ARDL Bounds test results for cointegration between GDP, exports and imports, 1972-2017

<table>
<thead>
<tr>
<th>Dependent Variable (1)</th>
<th>ARDL Bounds test</th>
<th></th>
<th></th>
<th>H0: No Serial correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F-test Statistic (2)</td>
<td>Critical value (5% level)</td>
<td></td>
<td>F-test Statistic (5)</td>
</tr>
<tr>
<td>LGDP</td>
<td>21.89</td>
<td>3.37</td>
<td>4.18</td>
<td>0.92</td>
</tr>
<tr>
<td>LExports</td>
<td>5.45</td>
<td>3.37</td>
<td>4.18</td>
<td>5.99</td>
</tr>
<tr>
<td>LImports</td>
<td>15.01</td>
<td>3.37</td>
<td>4.18</td>
<td>1.34</td>
</tr>
</tbody>
</table>
Table 4. Long-run estimation results, 1972-2017

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variables</th>
<th>Error correction term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant (1)</td>
<td>LGDP (2)</td>
</tr>
<tr>
<td>LGDP</td>
<td>19.968 (0.000)</td>
<td>1.741 (0.000)</td>
</tr>
<tr>
<td>LExports</td>
<td>-13.663 (0.001)</td>
<td>0.732 (0.003)</td>
</tr>
<tr>
<td>LImports</td>
<td>12.351 (0.001)</td>
<td>-0.580 (0.013)</td>
</tr>
</tbody>
</table>

Notes: p-values are in parentheses.

Table 5 presents the Granger causality test results using the error correction models, (7)-(9). Using models (1) and (7), we tested the following hypotheses that the long-run and short-run causality of exports causes GDP and imports causes GDP using the F- and t-tests, respectively.

Equation (7):
H₀: \( \gamma_j = 0, \ j = 0, 1, 2, \ldots, q \) (exports do not cause GDP)
Hₐ: At least one \( \gamma_j \neq 0, \ j = 0, 1, 2, \ldots, q \) (exports cause GDP);

and

H₀: \( \gamma_j = 0, \ j = 0, 1, 2, \ldots, q \) (imports do not cause GDP)
Hₐ: At least one \( \gamma_j \neq 0, \ j = 0, 1, 2, \ldots, q \) (imports causes GDP);

Equation (1):
H₀: \( \beta_1 = 0 \) (exports do not cause GDP)
Hₐ: \( \beta_1 \neq 0 \) (exports cause GDP);

and

H₀: \( \beta_2 = 0 \) (imports do not cause GDP)
Hₐ: \( \beta_2 \neq 0 \) (imports cause GDP);
Table 5. Granger causality test results, 1972-2017

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>LGDP</th>
<th>LExports</th>
<th>LImports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F-test</td>
<td>Conclusion</td>
<td>F-test</td>
</tr>
<tr>
<td>LGDP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LExports</td>
<td>40.57</td>
<td>GDP → EXP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LImports</td>
<td>14.23</td>
<td>GDP → IMP</td>
<td>32.99</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td>Short-run causality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-run causality</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Notes: p-values are in parentheses.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Similarly, using models (2) and (8), we test whether GDP and imports do not cause exports and using models (3) and (9), we test whether GDP and exports do not cause imports. As can be seen from Table 5, there is a long-run and short-run bi-directional causality between any two pair of the three variables, GDP, exports and imports.

Tables 4 and 6 present the long-run and short-run estimation results. As can be seen across all three sets of results, the error correction term is in the range -1 to 0 as they should be and are statistically significant (as all p-values are less than 0.05). The estimated error correction term [EC(-1)] coefficients -0.069 (GDP), -0.457 (Exports) and -0.799 (Imports) reflect a slow adjustment of GDP within a year to the long-run equilibrium and a speedy adjustment of exports and imports within a year to the long-run equilibrium caused by the previous period shocks.
**Table 6. Long-run and short-run estimation results, 1972-2017**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>ARDL(2,2,2)</th>
<th>ARDL(2,1,2)</th>
<th>ARDL(2,2,2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>3.626</td>
<td>-5.854</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>D(LGDP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D(LGDP(-1))</td>
<td>-0.450</td>
<td>-3.081</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>D(LGDP(-1))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D(LExports)</td>
<td>0.072</td>
<td>0.683</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>D(LExports(-1))</td>
<td>0.053</td>
<td>-0.275</td>
<td>0.291</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.037)</td>
<td>(0.051)</td>
</tr>
<tr>
<td>D(LImports)</td>
<td>-0.084</td>
<td>0.519</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>D(LImports(-1))</td>
<td>-0.029</td>
<td>0.302</td>
<td>-0.279</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.000)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>EC(-1)</td>
<td>-0.069</td>
<td>-0.457</td>
<td>-0.799</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

Notes: p-values are in parentheses.

**CONCLUSION**

In this chapter, using Autoregressive Distributed Lag framework, we examined the relationship between trade and economic growth, focusing on the causal relationship between economic growth, imports and exports in Bangladesh during the period 1970-2017. Our empirical results support the well-known export-led growth (ELG) and growth-led exports (GLE) hypotheses with respect to Bangladesh. The results also revealed significant short-run and long-run causality from imports towards economic growth,
confirming the presence of import-led growth (ILG) and reverse causality from economic growth to imports (GLI). These results indicate that international trade will continue to harness the economic growth in Bangladesh.

REFERENCES


