Economy
Vol. 7, No. 1, 59-68, 2020
ISSN(E) 2313-8181/ ISSN(P) 2518-0118
DOI: 10.20448/journal.502.2020.71.59.68

An Analysis of the Relationship among Economic Growth, External Debt and Exports in India (1970-2018)

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Abstract

This paper attempts to examine the relationship among debt servicing, exports and GDP for India during 1970 – 2018 using co-integration test, error correction model and Granger causality test. In the bi-variate model with constant trend specification GDP and exports seem to have no long-term relationship. However, change in GDP Granger causes change in exports. For the restricted constant trend specification, in the short run, GDP affects exports positively and significantly. GDP and debt services seem to have a positive and significant long-term relationship in the bivariate model. The tri-variate model including GDP, Exports and debt service reveals a long term relationship among the variables where both exports and debt services affect GDP positively and significantly. GDP, exports and debt stocks do not have any long term relationship with constant trend specification, but change in GDP is found to Granger cause change in exports. For the restricted constant trend specification, however, there seems to be a long term relationship among them. In the short run GDP affects exports positively and significantly. In general, results indicate a positive and significant impact of GDP on exports. A significant positive long run impact of external debt on economic growth is also observed when debt service is the indicator of external debt. The short run impacts of external debt in terms of both debt servicing and debt stocks, however, produce diverse and insignificant results.

Keywords: External debt, Economic growth, Exports, Co-integration, Granger-causality.
JEL Classification: F34; 047.

Citation | Smita Nath (2020). An Analysis of the Relationship among Economic Growth, External Debt and Exports in India (1970-2018). Economy, 7(1): 59-68.
History:
Received: 26 March 2020
Revised: 28 April 2020
Accepted: 4 June 2020
Published: 2 July 2020

Publisher: Asian Online Journal Publishing Group

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.
Transparency: The author confirms that the manuscript is an honest, accurate, and transparent account of the study was reported; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.
Ethical: This study follows all ethical practices during writing.

Contents

Contribution of this paper to the literature

This study contributes to exiting literature by examining the relationship among debt servicing, exports and GDP for India during 1970 – 2018 using co-integration test, error correction model and Granger causality test.

1. Introduction

The role of external debt on the economic development of a country is one of the widely discussed topics among the academicians and policy-makers. Essentially, foreign borrowing has an important contribution in the process of economic development of developing countries. It can promote growth by increasing investment and transfer of technology. Developing countries often borrow from the international capital market when they suffer from deficits in the current account. But sometimes the burden of foreign borrowing itself hampers the economic development of a country. This happens when foreign borrowing is not productively used by a country, and so, the debts go on increasing without a corresponding increase in the ability to service it.[1]

Naturally, a strand of literature on external debt is developed where the authors seek to study the relationship between external debt and economic growth of countries. However, the studies on impact of external debt on economic growth of countries provide mixed results. Some studies show positive impact of external debt on economic growth while others show negative impact. A number of studies note that the impact is dependent upon the threshold level of debt of a country whereas some studies reveal no significant impact of debt.[2]

A borrowing country faces an adverse situation due to the presence of external debt when it is unable to raise the amount to be repaid through its own resource raising methods and/or unable to find foreign exchange required to make payments.[3] Different proposals are suggested in the literature. However, it is argued that since external debt has to be repaid in terms of foreign currency, debtor countries should opt for raising foreign exchange reserves. In this regard the importance of exports for a debtor country is emphasized as export performance primarily determines the debt servicing capacity of a country.[4]

Again, it is believed that exports can affect economic growth which is embodied in the idea of export-led growth (ELG). The arguments in favour of this, as explained by the literature,[5] are the following. First, exports can be considered as an instrument of technology transfer and through this productivity increases for an exporter country, and so, economic growth is enhanced. Second, since more foreign exchanges are available through exports, a country can import necessary capital goods for production which affects growth positively. Third, exports determine the debt servicing capacity of a borrowing country. Therefore, when export performance of a country is better, more external debts, and so, more resources for investment would be available. Economic growth can be improved then. Fourth, when exports are higher, demand for the country's product will be higher and output will be higher. Finally, it is observed that countries with better export performance usually show better growth performance.

Gabriele (2006) described the development of ELG hypothesis starting with Adam Smith and David Ricardo. The arguments given by the economists till modern time in favour of this theory are explained. As noted by the author a huge number of empirical studies are done to examine the validity of the hypothesis; but the results are mixed. Further, an opposite causality from economic growth to exports is also observed, which is mentioned as the growth-led export (GLE) hypothesis. The argument given in favour of GLE hypothesis is that economic growth leads to improvement in human capital and technology. This is followed by productivity increase and reduction in cost of production. Exports would increase for the country then.[6]

There is another strand of literature that suggests that the role of debt servicing is to be incorporated in the analysis of relationship between exports and economic growth since export revenues are used to finance debt repayment of a borrowing country.[7] It can be opined that in the external debt economic growth relationship also the role of exports is important because export performance determines debt servicing capacity of a country. The relationship between external debt and economic growth is examined for India by a number of authors and some studies focus on the relationship between exports and economic growth for India.[8] However, the relationship among Economic growth, exports and debt servicing in India is not explored.

The objective of the present study is to examine the relationship among economic growth, external debt and exports for the Indian economy. For the study period 1970-2018 we attempt to examine the relationship among GDP, exports and debt servicing considering all in real terms.

The rest of the paper is organized as follows. Section II presents a brief survey of the literature. Data and methodology are given in Section III. Section IV reveals the scenario of Indian economy regarding GDP, exports and various indicators of external debt during the study period. The analysis of the relationship among the variables is presented in Section V. Some concluding remarks are made in Section VI.

2. A Brief Survey of the Literature

There are both theoretical and empirical studies on the relationship between external debt and economic growth. But since our analysis is empirical in nature we review the empirical studies here.[9]

[1] Mahmood, Arby, and Sherazi (2014) explained the debt situation of the SAARC countries by the vicious circle where a large fiscal deficit leads to large amount of external debt which requires large amount of debt servicing causing less domestic investment and economic growth leading to low resource mobilization and further expansion of fiscal deficit.

[2] For a survey of the studies see Abdelaziz, Rim, and Majdi (2019).

[3] See Woo and Nasution (1989).

[4] See for example Borensztein and Ghosh (1989); Chaudhary, Anwar, and Tahir (2000); Dhonte (1979); Diwan (1990); Goel (1989); Hemmer (1990); Parai and Mohanty (1985) etc.

[5] See for example Ajmi, Aye, Balcilar, and Gupta (2015).

[6] A list of empirical studies, comprising both cross section and time series analysis, done in the 1970s, 1980s and 1990s is available in Bahmani-Oskooee and Economidou (2009) where data, method used, variables included and findings are mentioned in each case. Ajmi et al. (2015) also provided a survey of empirical works on ELG and GLE hypotheses.

[7] See for example Ahmed, Butt, Alam, and Kazmi (2000).

[8] See the next Section for examples of such studies.

[9] For examples of theoretical works see Otani and Villanueva (1989); Bhandari, Haque, and Turnovsky (1990) and Rodríguez-Arana and Zumaya (2012).

Siddiqui and Malik (2001) examined the debt growth relationship for South-Asian countries. The results indicate that the impact of foreign debt on economic growth is positive and significant. Considering panel data for sixty countries over the period 1969-98 (Pattillo, Poirson, Ricci, Kraay, & Rigobon, 2003) noted that when debt is higher than the threshold level its impact on economic growth is significantly negative; but, when debt is lower than the threshold level the impact is usually positive but insignificant.

Dinneya (2006) addressed another aspect of the debt-growth relationship by exploring the roles of power change, quality of governance, political environment, and overall level of democratization etc. on this in the context of Nigerian economy. Cordella, Ricci, and Ruiz-Arranz (2010) examined how investment and growth are affected by the level of indebtedness of countries. Their study reveals that for highly indebted countries or for countries with low quality of policies and institutions investment does not seem to be affected by indebtedness whereas for less indebted countries or for countries with high quality of policies and institutions there is a negative relationship between them. Similar results are obtained between economic growth and debt of countries.

Hwang, Chung, and Wang (2010) found a two-way causality between financial development and economic growth for twenty Asian and Latin American countries during the period 1982-2004; it is also revealed that excessive debt hinders financial sector development and thus lower economic growth. Reinhart and Rogoff (2010) showed that for the advanced countries no relationship between GDP growth and debt/GDP ratio is established unless the debt/GDP ratios exceed the threshold levels (90%) over the period 1946-2009. For the emerging countries also similar results are noted for the period 1970-2009. Butts, Mitchell, and Berkoh (2012) found a positive and significant long run relationship between short term external debt and economic growth of Thailand during 1970-2003 and a short run change in GDP Granger causes short term debt. Bal and Rath (2014) from their study noted that central government debt, total factor productivity and debt services affected growth of the Indian economy in the short run during 1980-2011; in the long run also a relationship between economic growth and public debt is observed.

Ciftçioğlu and Sokhanvar (2018) for twelve Central and Eastern European countries for 1995-2014 noted that for eight out of twelve countries studied there is unidirectional causation from external debt to economic growth. Kharusi and Ada (2018) noted a significant and negative impact of debt-GDP ratio on growth rate of GDP for the period 1990-2015 in Oman. Using ordinary least squares method Saxena and Shanker (2018) found a negative impact of external debt on India's economic growth during 1990-91 – 2015-16. Abdelaziz et al. (2019) examined the impact of debt on investment and growth separately for twelve less indebted and eleven highly indebted countries using SUR method. For the split models as well as for the entire sample the results indicate a negative impact of external debt on investment and growth.

Now we focus on the empirical studies that examine the ELG and GLE hypotheses. Gyimah-Brempong (1991) examined the relationship between export instability and economic growth of the Sub-Saharan countries using cross-section data during the period 1960-86. For various indices of export instability a negative relationship is found between the variables. Kugler (1991) studying on six countries viz., France, Japan, Switzerland, UK, USA and West Germany for the period 1970-87 noted support in favour of export-led growth for France and West Germany only.Ghatak and Price (1997) examined the ELG hypothesis for India during the period 1960-1992 incorporating various types of exports. It is found that at the aggregate level ELG hypothesis is not supported; but at the disaggregate level for non-traditional exports ELG hypothesis is supported whereas for traditional exports it is not supported. El-Sakka and Al-Mutairi (2000) examined the relationship for the Arab countries during the period 1970-99. The results indicate no long term relationship between exports and economic growth for any of the countries. In the short run countries show mixed results.

Chandra (2003) examined ELG hypothesis for the Indian economy using terms of trade as a third variable in the period 1950-1996. It finds a long run relationship among the variables and a bi-directional causation between exports and GDP. Thus the study supports both ELG and GLE hypotheses. Gabriele (2006) noted a significant relationship between growth rate of GDP and growth rate of service exports in the period 1980-2000 in a study covering one hundred and fourteen developing countries. Kaushik and Klein (2008) found a long term relationship among export growth, export instability, investment and economic growth in case of India during 1971-2005 and a unidirectional Granger causality running from real exports to real GDP.

Using human development as a third variable Afzal, Rehman, and Rehman (2009) noted support of GLE hypothesis in Pakistan for the period 1970-71 – 2008-09. Bahmani-Oskooee and Economidou (2009) studied the long run relationship among GDP, stock of capital and labour, export and import for sixty two developing countries during the period 1960-99 and note that the results are country specific. In a multi-variable model Sulaiman and Saad (2009) observed a positive relationship between exports and economic growth of Malaysia for the period 1960-2005. Guru-Gharana (2012) used superior Granger causality test for the Indian economy and the results indicate support of ELG hypothesis for the period 1971-2008. The panel data analysis conducted by Ndoricimpa (2014) for seventeen COMESA countries during 1980-2011 showed support of ELG hypothesis for two countries and support of GLE hypothesis for two countries. It is also noted that ELG is not supported for the countries which export primary product.

Sannassee, Seetanath, and Jugessur (2014) conducted a meta-analysis to find the reason behind mixed results among different empirical works. The study comprising eighty two studies with four hundred and forty seven observations notes that the impact of exports on growth is less for the countries with low development level. Ajmi et al. (2015) studied the relationship for South African countries during 1911-2011. For linear Granger causality test no relationship is found. For non-linear Granger causality test using Hiemstra and Jones Test a unidirectional causation is found from GDP to Exports; again using Diks and Panchenko Test bi-directional causation is noted. Bastola and Sapkota (2015) working on Nepal for the period 1965-2011 found that in the short as well as long run exports affect GDP. Saleem and Sial (2015) from their study on Pakistan find evidence of support of both ELG and GLE hypotheses during 1973-2013. Berasaluce and Romero (2017) found no causal relation of exports and FDI on GDP for the Korean economy during 1980-2015.

The following studies examine relationship among economic growth, external debt and exports of countries. Ahmed et al. (2000) examined the causality between growth rates of economic growth and exports for each of eight

Asian countries over the period 1970-1997. It is found that export-led growth hypothesis is supported by their study but when growth rate of debt servicing is included in the model the results are not uniform for the countries. For the period 1970-71 – 2007-08 Afzal et al. (2009) studied the relationship among economic growth, external debt servicing and exports in Pakistan. Their study indicates unidirectional causalities running from GDP to exports and from debt servicing to GDP. The study made by Saad (2012) for Lebanon over the period 1970-2010 indicates a bi-directional causality between economic growth and external debt servicing, a unidirectional causality running from exports to economic growth and a unidirectional causality running from external debt servicing to exports. Dritsaki (2013) observed that in the short run there is a unidirectional causation from exports to economic growth and from economic growth to external debt for Greece during the period 1960-2011 and there is no causation from exports to external debt. In the long run also external debt depends upon economic growth.

3. Data and Methodology

We consider four regression models. Models 1 and 2 are bi-variate models whereas models 3 and 4 are tri-variate models. Model 1 studies the relationship between GDP and exports, model 2 examines the relationship between GDP and debt service. The relationship among GDP, exports and debt service is analyzed in model 3; model 4 explains the relationship among GDP, exports and debt stocks.

Data on the four variables GDP, exports, debt service and debt stocks for the period 1970 – 2018 are collected from World Bank's World Development Indicators 2019. Data on GDP and exports at 2010 US dollars are available from World Bank. Since data on debt service and debt stocks are available at current US dollars, those are converted into 2010 US dollars using GDP deflators.

First, logarithm of each variable is taken and then unit root test is conducted to determine the order of integration of each variable using augmented Dickey-Fuller (ADF) test and Philips-Perron (PP) Test where optimum lag length is determined by Hannan-Quinn information criterion (HQIC), Schwartz Bayesian information criterion (SBIC) and Akaike information criterion (AIC). When the variables in a model are found to be stationary at first difference Johansen methodology is used to examine whether the variables are co-integrated i.e., to check whether there exists a long run relationship between the variables.

For the cases where the variables are found to be co-integrated an error correction model (ECM) is applied to analyse the short run relationship between them. For the cases where the variables are not found to be co-integrated a vector autoregressive (VAR) model in first difference is used and Granger causality test is done. Soft ware stata has been used for the econometric computations.

4. Trends in GDP, Exports and Various indicators of External Debt in India

Figure 1 reveals the condition of the Indian economy in terms of real GDP, real exports, debt service and total debt stocks during 1970 – 2018. Figure 2 and 3 show the observations made on various ratios used as debt indicators.

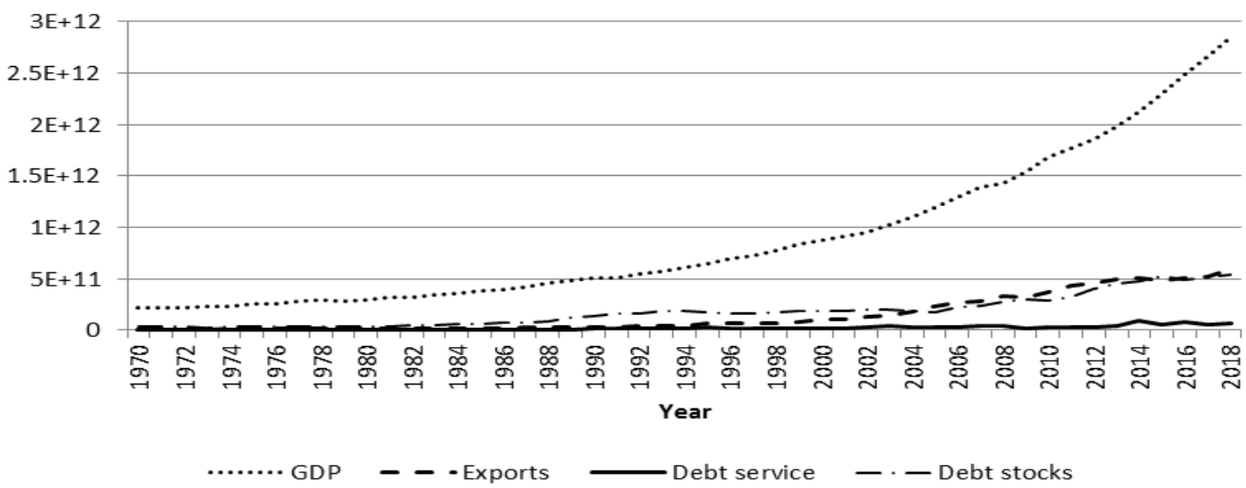

Figure-1: Trends in GDP, Exports, Debt Stocks and External Debt Service (constant 2010 US$).

India's debt service as a percentage of GNI remain more or less same during this period; it is around 2 per cent. The ratio of debt service to exports was 15 per cent in 1975 and in 2018 it was 11 per cent of that. Not only that in some years this were very high as evident from Figure 2. Debt stocks as percentage of GNI does not show much fluctuations, it increases from 14 in 1970 to 19 in 2018. Debt-reserve ratio is also considered as an indicator of external debt. In terms of that also much fluctuation is observed during this period. Mahmood et al. (2014) also pointed out that according to the traditional criteria India was within threshold levels of external debt.

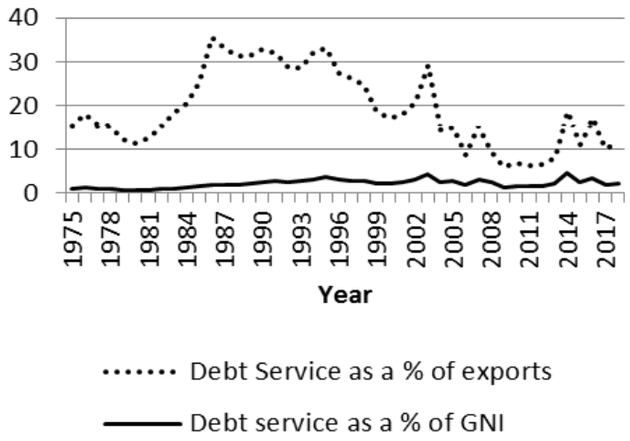

Figure-2. Trends in debt service ratios (%).

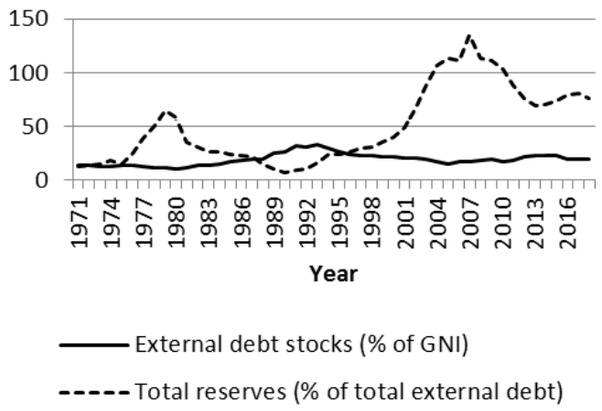

Figure-3. Trends in debt stocks-GNI ratio and reserves-debt ratio (%).

5. Relationship among External Debt, Exports and Economic Growth

We first determine the order of integration of each variable considered in our study. Figures 4(a) – 1(h) indicate that each variable in non-stationary at level whereas stationary at first difference.

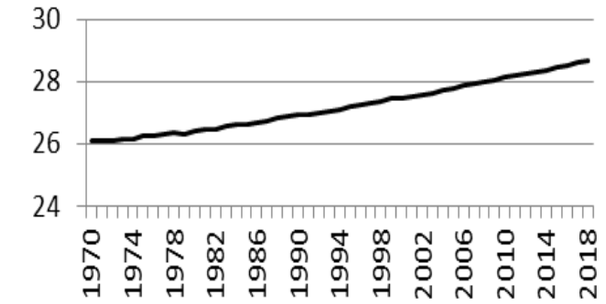

Figure-4(a). lgdp.

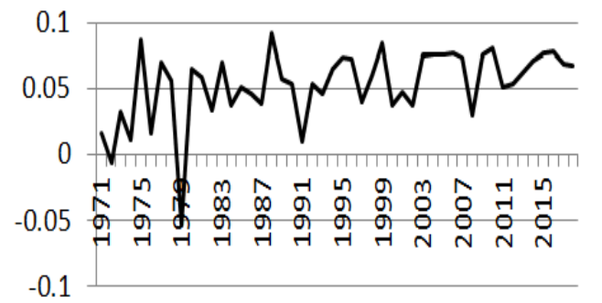

Figure-4(b). First Difference in lgdp.

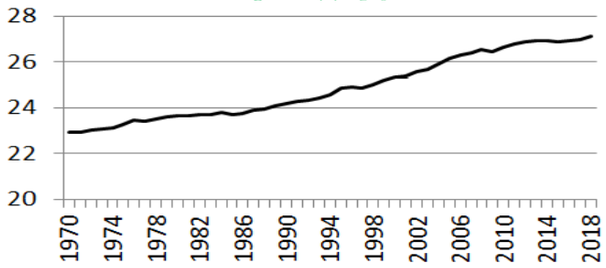

Figure-4(c). lexpotrs.

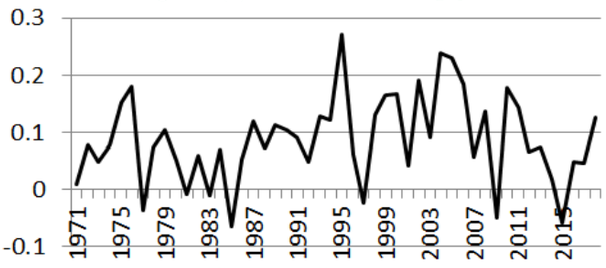

Figure-4(d). First Difference in lexports.

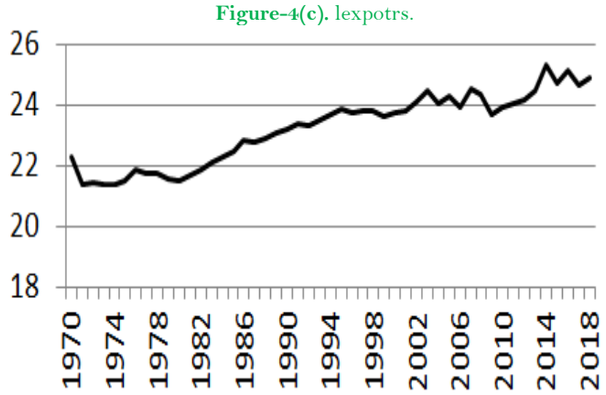

Figure-4(e). ldebetservice.

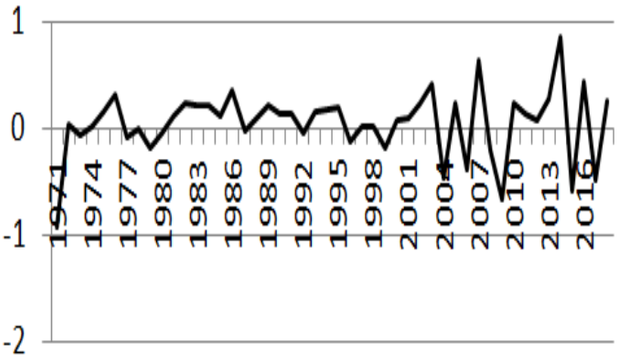

Figure-4(f). First difference in ldebtservice.

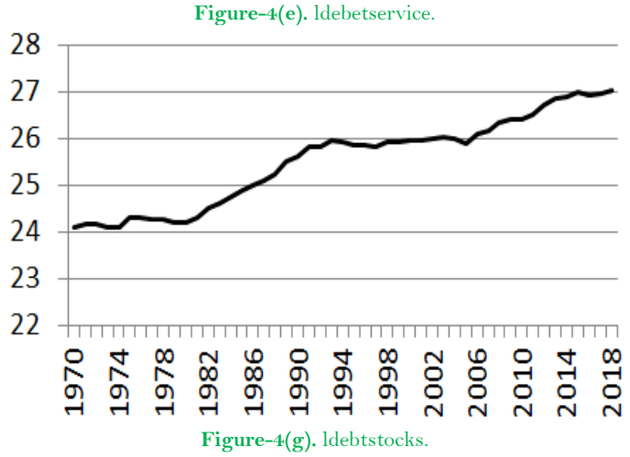

Figure-4(g). ldebtstocks.

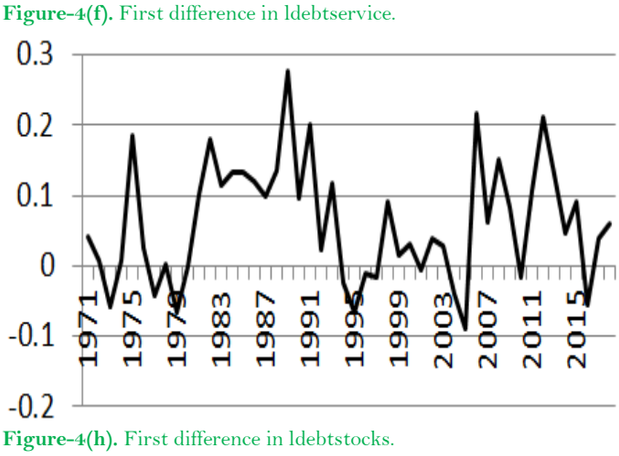

Figure-4(h). First difference in ldebtstocks.

Conducting Augmented Dickey-Fuller (ADF) Test and Philips-Perron (PP) Test from Table 1 we note that all the variables are in fact non-stationary at level but stationary at first difference,[10] where optimum lag lengths are determined by Hannan-Quinn information criterion (HQIC), Schwartz Bayesian information criterion (SBIC) and Akaike information criterion (AIC).[11]

Table-1. Unit root test results.

Model	Variable	ADF Statistic (1% critical value)	PP Statistic (1% critical value)
Intercept	lgdp	3.234 (-3.607)	4.138 (-3.594)
	dlgdp	-6.478 (-3.600)	-6.478 (-3.600)
	lexports	0.310 (-3.600)	0.588 (-3.594)
	dlexports	-5.693 (-3.600)	-5.693 (-3.600)
	ldebtservice	-.974 (-3.607)	-0.324 (-3.594)
	dldebtservice	-5.569 (-4.187)	-10.320 (-3.600)
	ldebtstocks	-0.527 (-3.607)	-0.201 (-3.594)
	dldebtstocks	-3.440 (-3.607)*	-4.847 (-3.600)
Intercept and Trend	lgdp	-1.649 (-4.187)	-2.398 (-4.168)
	dlgdp	-8.211 (-4.178)	-8.211(-4.178)
	lexports	-1.598 (-4.178)	-1.684(-4.168)
	dlexports	-5.681 (-4.178)	-5.681 (-4.178)
	ldebtservice	-2.302 (-4.187)	-4.199 (-4.168)
	dldebtservice	-5.469 (-3.607)	-10.176 (-4.178)
	ldebtstocks	-2.231 (-4.187)	-1.792 (-4.168)
	dldebtstocks	-3.393 (-4.187)	-4.794 (-4.178)

Note: *5% critical value is -2.94

5.1. Relationship between GDP and Exports

Model 1: $lgdp_t = \alpha_0 + \alpha_1 lexports_t + error_t$

Where lgdp and lexports are logarithm of GDP and exports respectively.

Table 2 presents the results of cointegration test between lgdp and lexports with constant trend specification.

Table-2. Johansen tests for cointegration between lgdp and lexports (Trend: constant).

Maximum rank	Trace statistic	5% critical value
0	12.5812*	15.41
1	1.9534	3.76
2		

Since, Trace statistic = 12.5812 < 15.41 = critical value, we fail to reject the null hypothesis of no cointegration between the variables which indicates that lgdp and lexports are not cointegrated, that is, there is no long term relationship between them. The Granger causality test results following VAR in first differences of the variables (dlgdp and dlexports) are shown in Table 3.

Table-3. Granger causality Wald tests for dlgdp and dlexports.

Null hypothesis	Chi2	df	Prob > chi2
dlexports does not Granger-cause dlgdp	1.1046	2	0.576
dlgdp does not Granger-cause dlexports	6.5669	2	0.037

When we have the null hypothesis H_0: dlexports does not Granger cause dlgdp, the p-value (0.576) is more than any pre-assigned level of significance, and so, we fail to reject the null hypothesis and conclude that dlexports does not Granger cause dlgdp. That is, the results indicate that dlexports will not be helpful for forecasting dlgdp. On the other hand, when the null hypothesis is dlgdp does not Granger cause dlexports, the p-value (0.3) is less than 5 per cent, and so, we reject the null hypothesis and conclude that dlgdp Granger causes dlexports. That is, the results indicate that dlgdp will be helpful for forecasting dlexports.

Table 4 presents the results of cointegration test between lgdp and lexports with restricted constant trend specification.

Table-4. Johansen tests for cointegration between lgdp and lexports (Trend: restricted constant).

Maximum rank	Trace statistic	5% critical value
0	33.3854	19.96
1	3.1104*	9.42
2		

[10] For ldebtservice there is a contradiction because it is found to be stationary at level according to PP test but non-stationary at level according to ADF test.

[11] Tests are conducted for all lag lengths determined by different criteria and the results are same. However, the test statistics reported in Table 1 are those for the AIC criterion when SBIC, HQIC and AIC suggest different lag lengths.

It is observed that the null hypothesis H_0: r = 0 (no cointegration) is rejected, whereas we fail to reject H_0: r ≤ 1. So, for restricted constant trend specification lgdp and lexports have a long term relationship. The estimated error correction model (ECM) for these cointegrated variables gives the following long run and short run relationships between the variables. The figures within brackets represent corresponding p-values.

Long run relationship: $ECT_{t-1} = lgdp_{t-1} - 0.19lexports_{t-1} - 20.25$
(0.19) (0.0)

Short run relationships:

$dlgdp_t = 0.03ECT_{t-1} - 0.19lgdp_{t-1} + 0.05lexports_{t-1}$
(0.0) (0.21) (0.27)

$dlexports = 0.01ECT_{t-1} + 0.93lgdp_{t-1} + 0.19lexports_{t-1}$
(0.48) (0.04) (0.18)

When dlgdp is the dependent variable estimated adjustment coefficient (0.03) is positive and statistically significant, which implies that any deviation from equilibrium value in the short run is not corrected. The estimated coefficient of lagged lexports is positive but statistically insignificant. When dlexports is the dependent variable the estimated adjustment has expected sign but is statistically insignificant. In the short run lgdp affects lexports positively as the estimated coefficient (0.93) is positive and statistically significant.

In the long run also exports positively affects gdp although the estimated coefficient is statistically insignificant. The estimated elasticity of gdp with respect to exports is 0.19.

5.2. Relationship between GDP and Debtservice

Model 2: $lgdp_t = \beta_0 + \beta_1\ ldebtservice_t + error_t$
where ldebtservice is logarithm of debtservice.

Table 5 reveals that the null hypothesis H_0: r = 0 is rejected whereas we fail to reject H_0: r ≤ 1 and conclude that there seems to be a long run relationship between lgdp and ldebtservice.

Table-5. Johansen tests for cointegration between lgdp and ldebtservice (Trend: constant).

Maximum rank	Trace statistic	5% critical value
0	16.7825	15.41
1	1.9844*	3.76
2		

The long run and short relationships given by the estimated error correction model for these two variables are as follows:

Long run relationship: $ECT_{t-1} = lgdp_{t-1} - 2.38ldebtservice_{t-1} + 26.5$
(0.0)

Short run relationships: $dlgdp_t = -0.01ECT_{t-1} - 0.19lgdp_{t-1} - 0.003ldebtservice_{t-1} + 0.05$
(0.0) (0.2) (0.79) (0.0)

$dldebtservice_t = 0.03ECT_{t-1} + 2.37lgdp_{t-1} - 0.26ldebtservice_{t-1} + 0.01$
(0.17) (0.15) (0.04) (0.89)

In this case the estimated adjustment coefficients have correct signs and it is statistically significant for dlgdp equation. Any short run deviation of lgdp from its equilibrium value is corrected at a speed of one per cent. In the short run debtservice is negatively affected by lagged value of it (estimated coefficient is − 0.26 and it is statistically significant). Other estimated coefficients are not statistically significant in the short run. But, we get one interesting result. In the short run, lagged ldebtservice negatively affects lgdp (estimated coefficient − 0.003) whereas, in the long run, debtservice positively and significantly affects gdp (estimated coefficient 2.38).

5.3. Relationship among GDP, Exports and Debtservice

Model 3: $lgdp_t = \gamma_0 + \gamma_1 lexports_t + \gamma_2 ldebtservice_t + error_t$
Table 6 presents the cointegration test results for this model and it is found that It is clear that

Table-6. Johansen tests for cointegration among lgdp, lexports and ldebtservice (Trend: constant).

Maximum rank	Trace statistic	5% critical value
0	30.5091	29.68
1	10.7893*	15.41
2	1.9519	3.76
3		

lgdp, lexports and ldebtservice are cointegrated, that is, there is a long run relationship among them.

The error correction model is estimated to analyse the short run and long run effects represented by the following equations:

Long run relationship: $ECT_{t-1} = lgdp_{t-1} - 0.42lexports_{t-1} - 0.30ldebtservice_{t-1} - 9.92$
(0.0) (0.0)

Short-run relationships:

$dlgdp_t = -0.09ECT_{t-1} - 0.12lgdp_{t-1} - 0.0008lexports_{t-1} - 0.008ldebtservice_{t-1} + 0.05$
(0.001) (0.399) (0.987) (0.502) (0.0)

$dlexports_t = 0.01ECT_{t-1} + 0.92lgdp_{t-1} + 0.20lexports_{t-1} - 0.04ldebtservice_{t-1} + 0.03$
(0.89) (0.03) (0.20) (0.25) (0.33)

$dldebtservice_t = 0.55ECT_{t-1} + 2.40lgdp_{t-1} + 0.21lexports_{t-1} - 0.22ldebtservice_{t-1} + 0.01$

(0.059) (0.121) (0.702) (0.093) (0.939)

The results can be interpreted in the following way. The estimated adjustment coefficients have correct signs and for dlgdp it is statistically significant also. Any short run deviation in lgdp from its equilibrium value is corrected at a rate 9 per cent per year. All other estimated coefficients are statistically insignificant excepting the coefficient of $lgdp_{t-1}$ for dlexports equation. It indicates a positive influence of lgdp on lexports in the short run.

In the long run, however, both lexports and ldebtservice are found to be statistically significant factors determining lgdp and each one positively influences lgdp.

5.4. Relationship among GDP, Exports and Debt Stocks

Model 4: $lgdp_t = \delta_0 + \delta_1 lexports_t + \delta_2 ldebtstocks_t + error_t$

where ldebtstocks is logarithm of debtstocks. Table 7 presents the cointegration test results for this model. It is clear that H_0: r = 0 is rejected and

Table-7. Johansen tests for cointegration among lgdp, lexports and ldebtstocks (Trend: constant).

Maximum rank	Trace statistic	5% critical value
0	17.4826*	29.68
1	5.1502	15.41
2	1.3765	3.76
3		

H_0: r = 0 cannot be rejected. Therefore, lgdp, lexports and ldebtservice are not cointegrated, that is, no long run relationship exists among them. Thus, a VAR in first difference of the variables is conducted to study the Granger causality results. Table 8 presents the test results. It is noted that only dlgdp is helpful for forecasting dlexports.

Table-8. Granger causality Wald tests for dlgdp, dlexports and dldebtstocks.

Null Hypothesis (H_0)	Chi2	df	p-value	Decision
dlexports does not Granger cause dlgdp	1.0389	2	0.595	H_0 is not rejected
dldebtstocks does not Granger cause dlgdp	.10549	2	0.949	H_0 is not rejected
dlexports and dldebtstocks do not Granger cause dlgdp	1.2127	4	0.876	H_0 is not rejected
dlgdp does not Granger cause dlexports	6.7948	2	0.033	H_0 is rejected
dldebtstocks does not Granger cause dlexports	2.202	2	0.333	H_0 is not rejected
dlgdp and dldebtstocks do not Granger cause dlexports	9.0833	4	0.059	H_0 is not rejected
dlgdp does not Granger cause dldebtstocks	.29255	2	0.864	H_0 is not rejected
dlexports does not Granger cause dldebtstocks	.37891	2	0.827	H_0 is not rejected
dlgdp and dlexports do not Granger cause dldebtstocks	.8498	4	0.932	H_0 is not rejected

Table 9 shows that with restricted constant trend specification lgdp, lexports and ldebtstocks are cointegrated. The ECM is then estimated to analyse the short run and long run effects represented by the following equations:

Table-9. Johansen tests for cointegration among lgdp, lexports and ldebtstocks (Trend: restricted constant).

Maximum rank	Trace statistic	5% critical value
0	108.7484	34.91
1	6.8255*	19.96
2	1.4957	9.42
3		

Long run relationship: $ECT_{t-1} = lgdp_{t-1} - 0.47 lexports_{t-1} - 0.68 ldebtstocks_{t-1} - 0.52$

(0.101) (0.106) (0.915)

Short-run relationships:

$dlgdp_t = -0.03 ECT_{t-1} - 0.16 lgdp_{t-1} + 0.03 lexports_{t-1} - 0.003 ldebtstocks_{t-1}$

(0.0) (0.27) (0.49) (0.94)

$dlexports_t = -0.015\ ECT_{t-1} + 0.94 lgdp_{t-1} + 0.15 lexports_{t-1} - 0.19 ldebtstocks_{t-1}$

(0.25) (0.03) (0.29) (0.13)

$dldebtstocks_t = -0.007 ECT_{t-1} + 0.49 lgdp_{t-1} - 0.04 lexports_{t-1} + 0.32 ldebtstocks_{t-1}$

(0.65) (0.34) (0.82) (0.03)

The results reveal that for dlgdp equation only the estimated adjustment coefficient has correct sign and is statistically significant. The speed of adjustment is 3 per cent. In the short run, lgdp positively affects lexports and the estimated coefficient is significant at 5 per cent level. All other estimated coefficients are statistically insignificant. The short run impact of ldebtstocks on both lgdp and lexports is negative. The impact of lgdp on both lexports and ldebtstocks is positive. The impact of exports on ldebtstocks is negative and on lgdp is positive.

In the long run also the estimated coefficients are not statistically significant; however, the impact of both exports and debtstocks on gdp is positive. So, similar to model 3 we find that debtstocks affects GDP negatively in the short run but positively in the long run. The impact of exports on GDP is positive in the short as well as long run.

6. Concluding Remarks

This paper attempts to examine the relationship among external debt, exports and economic growth for the Indian economy during the period 1970 – 2018. Using the techniques like cointegration, error correction model

and Granger causality analysis our study considers four models. In the model with constant trend specification where GDP and exports are the variables, the results indicate that there is no long-term relationship between them. However, dlgdp Granger causes dlexports; in contrast to that for the restricted constant trend specification there is a positive long term relationship (although not significant) and in the short run lgdp affects lexports positively and significantly. Thus for both specifications we find a support of GLE hypothesis.

For the second model where GDP and debt services are the variables, the results reveal a positive and significant long-term relationship between them; in the short run, however, debt services negatively affect GDP although it is not statistically significant.

The third model includes GDP, Exports and debt service. The results indicate that a long term relationship exist among the variables where both exports and debt services affect GDP positively and significantly. In the short run, surprisingly, both exports and debt services affect GDP negatively although not significantly. The error correction terms have expected signs. GDP has a positive and significant impact on exports. Other coefficients are not statistically significant.

The fourth model is a variant of the third model where debt stock is used as an indicator of external debt. In this case with constant trend specification there seems to be no long term relationship among the variables dlgdp is found to Granger cause dlexports. For the restricted constant trend specification, however, there seems to be a long term relationship among the variables. Here also exports and debt stock affect GDP positively although not significantly. In this case also short run impact of debt stocks on GDP is negative and that of exports is positive but not significant. GDP affects exports positively and significantly.

External debt is often used to supplement investment which is expected to impact economic growth positively. However, it can upset the process of economic growth under certain situations. The idea of export-led growth suggests that by boosting exports countries can improve economic growth; again export revenues finance repayment of external debt to foreign countries. Higher levels of exports indicate better debt servicing capacity and more debts would be available from the lenders. There is a hypothesis of growth-led exports also which argues that economic growth affects exports positively. So, it can be said that external debt, exports and economic growth are inter-related in a country and it is both important and interesting to study the relationship for India.

In general, results indicate that GDP has a positive and significant impact on exports in all models including exports. Hence it can be said the GLE hypothesis is supported in case of India for the period 1970-2018. ELG hypothesis is not supported in the short run in any of the model. For model 3, where debt servicing is included, in the long run also there is a significant positive relationship between GDP and exports. For model 2 and model 3 there is a positive and significant relationship between economic growth and external debt in the long run. A significant positive long run impact of external debt on economic growth is observed in the Indian economy in both the bivariate as well as trivariate model where debt service is the indicator of external debt. Ahmed et al. (2000) also noted positive impact of exports and external debt on economic growth and negative impact of debt servicing on exports during 1970 -1997 where growth rates of the three variables are considered in their study.

The short run impacts of external debt in terms of both debt servicing and debt stocks, however, produce diverse results in our study and the effects are not statistically significant also.

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