



How trade openness influenced economic growth in India: An empirical investigation

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Abstract

Objectives: To analyze the dynamic impacts of trade openness on economic growth in India. **Methodology:** This study extensively examines the dynamic impact of trade openness on economic growth in India using ARDL Bounds Test approach. A complex trade openness index is constructed using PCA (Principal Component Analysis) and a time dummy variable is used in an effort to capture the Economic Reform Policy dynamics of 1991 in India. Per capita GDP growth rate has been used as a standard measure of economic growth. Annual time series data has been used for estimation over the period of 1960-2018. **Findings:** It is found that the trade openness has negative impact on economic growth in India in both the short and long run. The result conforms to several findings on the same topic. **Applications:** This study incorporates measures to control for the shocks by the new economic policy of 1991. It is also discussed why trade openness might have had a negative impact on the economy of India in spite of it being a desirable phenomenon.

Keywords: ARDL; India; economic growth; development; trade openness; new economic policy of 1991

1 Introduction

“As we learned after President Herbert Hoover signed the Smoot-Hawley tariff at the outset of the Great Depression, vibrant international trade is a key component to economic recovery; hindering trade is a recipe for disaster.”

- Asa Hutchinson

(Governor, Arkansas)

It is needless to mention that foreign trade is one of the most important economic components to determine the strength and position of a country in terms of economic growth. Henceforth, the relationship between trade openness and economic growth has been a large scale debated topic for a long time. The liberal school of thought openly supports that higher degree of openness accelerates economic growth whereas, many economists suggest that protectionism improves the economic growth performance. The main reason behind the support of trade openness is the failure of import-substituting industrialization (ISI) strategies taken up by several developing countries after the World War II. The strategy's shortcomings like situations leading to misallocation of resources and the fact that this strategy only favored a few powerful

interest groups in many developing countries, led to the abandonment and many countries opted for trade liberalization measure in the 1970s. The High-Performance Asian Economies like Hong Kong, China, Singapore took up the strategy of Export-oriented Industrialization and witnessed accelerated economic growth. In the 1990s, the Washington Consensus, a collection of 10 major development policy recommendations from organizations such as the IMF and the World Bank acknowledged trade openness as crucial to accomplish higher economic growth. According to World Development Reports⁽¹⁻⁴⁾, “outward-oriented countries” performed better than “inward-oriented countries” even with hostile market conditions.

Empirical studies have suggested the importance of international trade in economic growth^(5,6). Endogenous growth theory has put forward results on positive growth effect of trade through enhancing scale of spillover, innovation incentives and technology diffusion⁽⁷⁻⁹⁾. However, endogenous growth models suggest that the trade contributions to economic growth differs depending on whether the impacts of comparative advantage orient the economy’s resources towards activities initiating long-run growth or away from such activities. There are theoretical studies suggesting that trade may negatively impact economic growth or there exists no relationship at all⁽¹⁰⁻¹²⁾. The rationale behind is, because of technological and financial constraints, developing countries may lack the efficiency required to adopt technologies of advanced economies and hence, higher trade openness negatively impacts growth in developing economies⁽¹³⁾.

Back in 1991, India was struggling with the most adverse economic and currency crisis ever. The Indian government adopted New Economic Reforms in 1991 with an aim to improve the country’s economy. Several barriers and restrictions were taken off. The Economic Policy 1991 marked a new era of Liberalization, Privatization and Globalization (LPG) for the country. This was a milestone in India’s modern economic history as an adverse Balance of Payments (BoP) crisis prompted far-reaching economic reforms, unlocking its growth potential.

This paper aims to present an analysis on the impacts of trade openness on economic growth exclusively in India over the period 1960-2018. As a contribution to the existing literature on the subject, a dummy variable has been used to control for time shocks and policy dynamics (years pre and post 1991 Economic Reform) and a unique combination of several variables has been employed to account for a broad range of economic factors to provide a more insightful. The largest possible dataset has been used. A composite trade openness index has been constructed by using various proxies of trade openness, i.e. import divided by GDP, export divided by GDP and export plus import divided by GDP⁽¹⁴⁾ literatures. A series of steps has been taken to analyze the robustness of the model. Finally, an in-depth discussion has been presented.

2 An overview of the Indian economy since 1947 and the economic reform of 1991

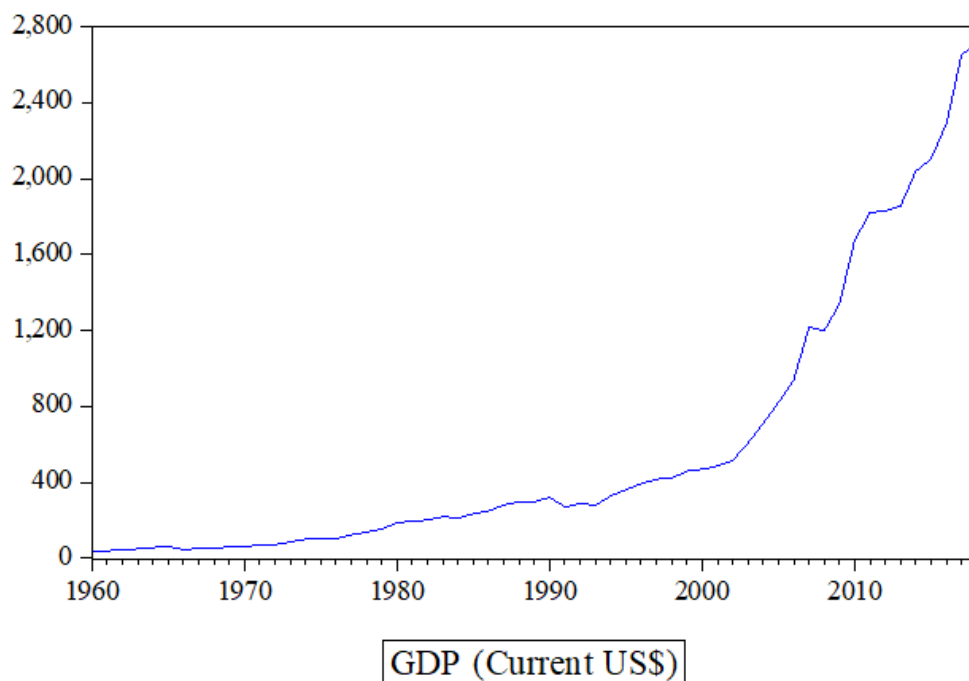
Prior to independence, India was mostly a colonial economy dependent on the agricultural sector. Since 1947, India’s foreign trade has shown a significant positive trend. But the Government had a major challenge regarding the economic development of the country. The reason behind was it did not have proper resources to trigger development, both in aspects of natural resources and financial and industrial development. Since 1951, India developed itself as a planned economy. The period of 1949-1970 saw a very slow export growth rate. Because of continuous increasing imports and dormant exports, import-substitution policy was taken up in 1960s to limit imports. In the late 1960s, significant steps were taken like establishment of Indian Institute of Foreign Trade and other such institutions for promoting foreign trade. In 1970s, a higher growth rate of imports was witnessed, compared to exports⁽¹⁵⁾. In the second half of 1980s, the Indian export grew at a significant rate of 17.8%.

Indian economy faced serious threat from an acute crisis in early 1991. There were several reasons. Firstly, it was the unsustainable fiscal profligacy of the eighties financed in part by external borrowing at hard commercial terms. The total expenditure of the center, states and the union territories increased to around 33% of GDP by 1990-1991 from approximately 20% in the seventies whereas, revenues accounted for only 21% of GDP in 1990-1991 creating a massive fiscal deficit of 12%. Secondly, the Gulf War of 1990 increased the cost of imported crude oil, reduced exports to the gulf area and eliminated inward remittances from emigrant Indian workers in West Asia. Thirdly, with unstable government and rising political uncertainties, the confidence of external creditors staggered. The inflation rate rose. The outflow of non-resident Indians (NRI) deposits and lengthening (shortening) of the lag between exports (imports) and corresponding foreign exchange receipts (payments) in anticipation of a devaluation resulted in a steep downfall in foreign exchange reserves and BoP crisis⁽¹⁶⁾. In July 1991, the economic reforms were initiated by former Prime Minister Narsimha Rao and former Finance Minister Dr. Manmohan Singh. The government announced a series of policy reforms. The Indian currency (INR) was devalued initially, exchange rate was liberalized in March 1, 1992; industrial licensing was abolished except for investment in few industries; restrictions on large industrial houses were relaxed under the MRTP Act; entry requirements for FDI were eased. In 1992, the five years (1992-1997) export-import policy was initiated. According to this policy, 40% of the foreign exchange receiving at the official market exchange rate was required to be capitulated by the export. The government imports necessary commodities like petroleum, lifesaving drugs with the help of this. The existing import license system was replaced with tariff system. Capital

goods import duties were reduced from 25% to 15% (CMIE 2000). In August 1, 1998, all quantitative restrictions on imports (2300 commodities) from SAARC nations were abolished aiming to promote trade between SAARC countries (Ministry of Finance). The tariff rate in the country was reduced from 79.1% in 1990-1991 to 30% in 2001. Various export promotion schemes have been introduced ever since like Software Technology Parks (STPs), Special Import License (SIL), Special Economic Zones (SEZs) and others.

The Economic Reforms had significant impacts on the economy. Real GDP growth was at 5.7% per annum in the 1990s, which rose to 7.3% per annum in 2000s. The GDP was 320.979 billion (current US\$) in 1990 and rose to 458.82 billion (current US\$) in 1999 and 1.823 trillion (current US\$) in 2011 (World Bank Data). A significant growth in GDP can be observed after 1991 (Figure 1). The feature of the growth acceleration during the period was that the growth rate of industry and service increased while agriculture fell. The GDP growth was at 9% in the period of 2004-2008. All subsectors of the economy experienced growth during this period. However, the growth slowed down to 7.8% during 2009-2011 with global financial crisis being one of the main reasons behind it. The FDI inflows increased continuously from year to year which can be attributed to the liberalization of the economy as well as gradual opening up of the capital accounts⁽¹⁷⁾. Coming back to trade performance, within a decade of abolition of import licensing, tariff reduction and other liberalization measures, India witnessed a sharp increase in exports, imports and total trade⁽¹⁵⁾. Before the reforms, India's exports were limited to OECD and OPEC countries but after the reforms, the trade opened with other Asian countries and China became a major trading partner of India eventually. Therefore, it is of no debate that the introduction of reforms placed India at a significant position in the global economy.

More than two decades have passed since the initiation of the reforms. The problems of 1991 seem to recur again. In 1991-1992 the fiscal deficit was at 5.39% of GDP whereas it was at 6.9% in 2011-2012. The current account deficit in 1991 was at 3% of GDP whereas it was at 4.3% in March 2012. Short term external debt increased from 10% of GDP in 1991 to 22% in 2012. It was also concluded that export was rising at a decreasing rate but import was rising at an increasing rate and hence, balance of payment is was becoming unfavorable once again after globalization period⁽¹⁸⁾.



Source: World Bank World Development Indicator

Fig 1. GDP of India (in billion) (1960-2018)

3 Literature review

The existing literature do not provide a clear trade openness and growth relationship. Traditional trade theory suggests that trade openness helps a country achieve growth through investment in innovation, specialization, productivity improvement or

enhanced resource allocation. In development literature, the role of trade policy in economic development has been a matter of focus. According to the comparative advantage theory, in situation of international trade, a country would produce goods in which it has comparative advantage. It specializes in sector in which it has better factor endowments and produces commodities on huge scales. Consequently, productivity and export of this sector will go up boosting the overall economic growth. The Heckscher-Ohlin Model indicates that if two countries have different resources i.e. one is more capital intensive and the other is more labor intensive, then opening up trade can result to higher output in both the countries. Some new trade theories⁽¹⁹⁾ show that total output goes up as a country liberalizes its trade. Trade openness also facilitates technology transfer from the developed to the developing country which results in increase of factor productivity enhancing growth^(9,20,21). A country with more degree of openness has greater ability to take advantage of the technologies of advanced economies and grow faster. This theory was backed by Rivera-Batiz⁽²²⁾ and mentioned this as the spillover effect of the transmission of knowledge across the countries. He also stated about the re-allocation effect on economic growth explaining that trade openness can increase the quantity of human capital in the leading industries. However, he also mentioned that if the domestic human capital system is not able to efficiently adapt to the innovative knowledge generated by the trade openness, then trade openness will negatively relate to economic growth. Zahonogo⁽¹³⁾ has mentioned that for lower income countries, higher trade openness has negative impact on economic growth. He further mentions that the dearth of investment in human capital and well-functioning financial system may hamper the growth expected from trade openness through technological innovations. Grossman & Helpman⁽²³⁾ also mentioned about the competition effect that is linked with the issue of imitations (Developed economy innovates and less developed economy imitates). Edwards⁽²⁴⁾ says that the cost of imitation should also be taken into account in the trade-growth relationship. If the imitation cost is lower in less developed economies than in developed economies, then the less developed economies will grow faster and there will be a tendency towards convergence. Romer⁽²⁵⁾ mentions that an economy with larger stock of human capital (main resource for R&D) will experience accelerated growth. However, there are arguments which states that trade openness may be pernicious to economic growth. For example, when a country specializes in sectors where R&D are not the core ones⁽²⁶⁾. Chatterji et al.⁽²⁷⁾ mention that growth after trade liberalization depends on whether R&D and innovations are encouraged or not. It is also mentioned that increased competition from trade liberalization can discourage innovation by reducing expected profit levels. Additionally, Rodrik⁽²⁸⁾ noted that openness may result into economic instability by inducing inflation, balance of payments crisis and depreciating exchange rates. Trade liberalization reduces import tariffs making imports more lucrative than domestic productions. Levine & Renelt⁽²⁹⁾ supported this saying that higher openness negatively affects domestic investments. Moreover, how trade openness will impact growth depends on a number of factors such as macroeconomic stability and investment in physical and social infrastructure⁽³⁰⁾.

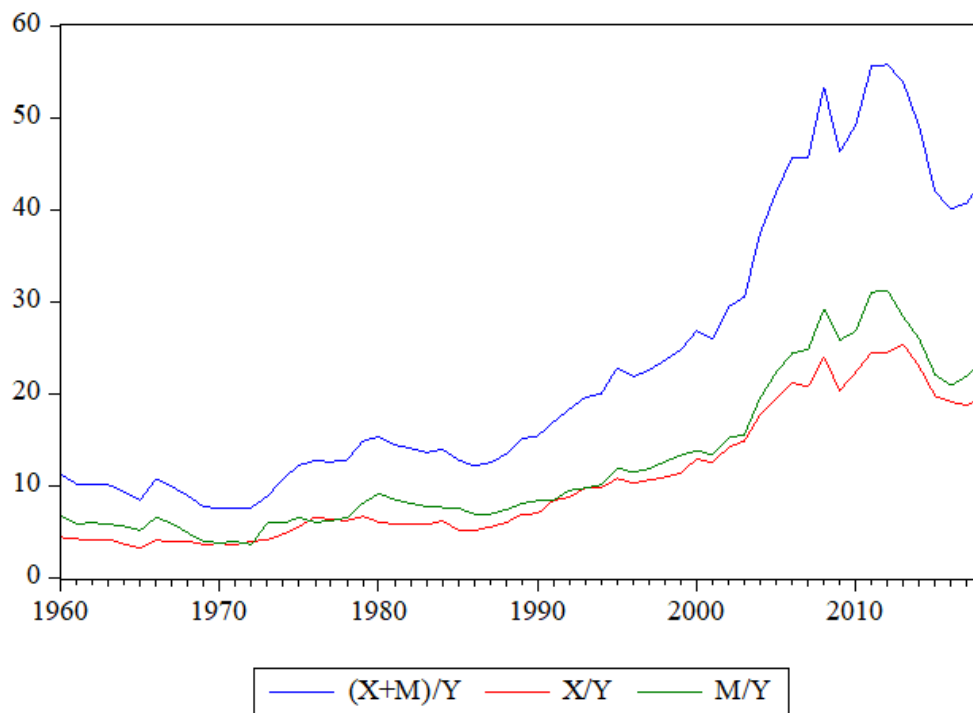
The existing empirical analysis on this subject has presented us with mixed results. Cross country studies put forward by Sachs and Warner⁽³¹⁾, Dollar⁽³²⁾, Wacziarg⁽³³⁾ and others conclude that growth is positively affected by trade openness. Marelli & Signorelli⁽³⁴⁾ found out that trade openness accelerates growth in India and China under a panel data analysis. Chandrashekhar et al.⁽³⁵⁾ conducted a study to analyze the relationship between financial development, trade openness and economic growth in India and the results supported the idea that a country may experience faster per-capita growth with a growing degree of trade openness through gains in country productivity associated with capital accumulation. Çevik et al.⁽³⁶⁾ observed a positive correlation between export growth and economic growth but also expressed doubt about the causal relationship. However, Vamvakidis⁽¹²⁾ and Ulaşan⁽¹¹⁾ found no link between trade openness and growth. Moyo et al.⁽³⁷⁾ showed that trade openness had a positive impact on economic growth at the 1% significance level in Ghana but a negative and insignificant effect in Nigeria. Rigobon & Rigobon & Rodrik⁽³⁸⁾ claimed a significant negative impact on income level by trade. Kim & Lin⁽³⁹⁾ used the instrumental-variable threshold regression approach to 61 countries and found out at a threshold income level above which trade accelerates growth and below that level, trade was found to have a detrimental effect on growth. Dufrenot et al.⁽⁴⁰⁾ indicated that the impact of trade openness on growth is less on higher growth countries than lower growth countries. Vlastau⁽⁴¹⁾ claims negative impact of trade openness on growth in his study with 34 African countries. Lawal et al.⁽⁴²⁾ conducted an empirical on Nigeria using ARDL method and negative long-run impact but a positive growth effect in the short-run. Malefane & Odhiambo⁽⁴³⁾, found out contradicting results for different proxies of trade openness, in South Africa. Pigka-Balanika⁽⁴⁴⁾ carried out a panel data analysis with both random effects and fixed effects model with 71 countries concluding the growth-enhancing effects of trade openness. But after the isolation of 30 SSA countries and analyzing using same techniques, no evidence of relationship between openness and growth were found. Ahmad et al.⁽⁴⁵⁾ concluded trade openness cast significantly positive impact on economic growth in Pakistan. However, Hye⁽⁴⁶⁾ found a negative association between trade openness and economic growth in Pakistan. Spanu⁽⁴⁷⁾ concluded in his study that trade openness has positive growth effects but wrong policies made them ineffective.

There exist mixed results on India as well. Topalova⁽⁴⁸⁾ claimed that trade liberalization improves firm's productivity which leads to the economic welfare. Ved & Sudesh⁽⁴⁹⁾ found a bidirectional causality between trade openness and economic growth

and claimed higher degree of trade openness leads to higher economic growth. Khan⁽⁵⁰⁾, Mallick⁽⁵¹⁾ also supported the claim that trade openness induced economic growth in India. However, Sarkar & Bhattacharyya⁽⁵²⁾ found evidence supporting the claim that openness had “unfavorable” impact on real growth rates. Hye & Lau⁽¹⁴⁾ also claimed that trade openness had detrimental effects on economic growth in the long run.

Though most empirical panel data analysis indicates positive impacts of trade openness on growth, Edwards⁽²⁴⁾ however, castigated for the poor data quality and inadequate control for endogeneity. Winters⁽⁵³⁾ also mentioned that the inconclusive result could be because of the fact that trade liberalizations are certainly combined with policies and linear regression measures fail to capture such dynamics. Misspecifications and diversity of liberalization indices are also responsible for the ambiguity⁽⁵⁴⁾.

Since, through the Economic Reform policy of 1991, India stepped into a new era of the global economy with liberalized trade policies and increase in other factors like trade volumes, growth rate, GDP (Figures 1 and 2) amongst others, this paper aims to analyze the short-run and long-run impact of trade openness on economic growth in the country.



Source: World Bank World Development Indicators

Fig 2. Trade Volume in India (1960-2018)

4 Empirical Analysis

4.1 Model specification and variable description

For estimating the impact of trade openness on economic growth in India, a composite trade openness index is prepared following Hye & Lau⁽¹⁴⁾ and five control variables are employed following several literatures. A time dummy variable is also used in an effort to capture the policy dynamics and control for the time shocks in India.

The general empirical model used is as follows:

$$GROWTH = \alpha_0 + \beta_1 TOI + \beta_2 GCON + \beta_3 INVAL + \beta_4 GCAP + \beta_5 POPGR + \beta_6 INF + \beta_7 TDUM + \varepsilon_t \quad (i)$$

Where,

GROWTH is GDP per capita growth rate which is used as a standard measure for economic growth and development; TOI is composite trade openness index prepared and the independent variable of interest. The control variables used are general

government final consumption expenditure as percent of GDP (GCON); industry value added as percent of GDP (INVAL); gross capital formation as percent of GDP (GCAP); annual population growth (POPGR) and annual inflation rate, GDP Deflator (INF). TDUM is the time dummy variable (TDUM = 0 if Year < 1991; TDUM = 1 if Year ≥ 1991). α_0 and ε_t are the constant and error term, respectively.

Government consumption (GCON) is used as a measure of fiscal policy; industry value addition (INVAL) is used a proxy for industrialization process; gross capital formation (GCAP) is used as a control for physical capital measure/investment; population growth (POPGR) is used as a proxy for human capital and annual inflation rate (INF) is used to control for macroeconomic stability.

Government consumption is expected to have a positive sign. For example, public investment projects like developing infrastructures would positively impact. However, excess government spending can increase a country's debt and thus, hampering the growth potential. Industry value addition is expected to have a positive sign following the fact that industrial and R&D development are major factors for growth in developing economies. Population growth, as a measure for human capital stock, is expected to have a positive impact provided the fact that in developing countries, "efficient" human capital is a source of growth. However, in country like India, where population explosion and inefficient labor are matters of concern, it would not be surprising to have a negative sign for population growth. The inclusion for a control for investment follows trade-induced investment-led growth hypothesis which says growth might be positively impacted by trade through the investment channel⁽⁵⁵⁾. Hence, gross capital formation is expected to have a positive sign. Annual inflation rate is expected to have a negative sign because hyperinflation thwarts growth of an economy. However, moderate inflation is argued to be an accelerating factor for economic growth, since it promotes consumption expenditure.

The method of estimation used here is the ARDL Bounds Testing technique. The reason being ARDL approach performs better irrespective of the integration order of variables and determines both long and short run coefficients simultaneously.

In accordance with Pesaran et al.⁽⁵⁶⁾, the ARDL specification of this study is specified as follows:

$$\begin{aligned} \Delta GROWTH = & \alpha_0 + \sum_{i=1}^n \beta_{1i} \Delta GROWTH_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta TOI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta GCON_{t-i} + \\ & \sum_{i=0}^n \beta_{4i} \Delta INVAL_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta GCAP_{t-i} + \sum_{i=0}^n \beta_{6i} \Delta POPGR_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta INF_{t-i} + \lambda_1 \\ & GROWTH_{t-1} + \lambda_2 TOI_{t-1} + \lambda_3 GCON_{t-1} + \lambda_4 INVAL_{t-1} + \lambda_5 GCAP_{t-1} + \lambda_6 POPGR_{t-1} + \\ & \lambda_7 INF_{t-1} + \theta TDUM + u_t \end{aligned} \quad (ii)$$

Where, Δ is the difference operator, n is the lag length and the other variables are already specified.

In order to carry out the ARDL bounds testing procedure, there are two stages. The first stage requires testing for cointegration relationship. This is done to establish whether there exists a linear combination for nonstationary processes.

Using parameters from equation (ii), the null hypothesis testing for no cointegration is given by:

$$\begin{aligned} H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = 0 \\ H_1 : \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq \lambda_7 \neq 0 \end{aligned}$$

The result of the cointegration test is determined by the computed F-statistic in software (E-Views). According to Pesaran and Pesaran⁽⁵⁷⁾, p.308 this F-statistic has a non-standard distribution irrespective of whether the regressors are integrated at order I(0) or I(1). There are two sets of critical value bounds for the F-statistic: the first set assumes that all the variables are I(0) while the other assumes all the variables are I(1). The decision to reject the null hypothesis of no cointegration depends on whether the F-statistic is greater than the I(1) bound. The second stage of the ARDL modelling deals with the estimation of the coefficients of the long-run relationships as well as interpreting the values of the estimated coefficients. Using Akaike Information Criterion (AIC) or Schwartz-Bayesian Criterion (SBC), the optimal lag length of the ARDL model is determined. One of the main advantages of using ARDL approach to cointegration is that the power of this test does not suffer in finite samples when invalid restrictions are imposed. For its finite sample properties, ARDL bounds test approach to cointegration performs better even in smaller samples.

Hence, when the sample size is small, this method of estimation is preferable since it is robust in small samples⁽⁵⁸⁾.

Following cointegration test in equation (ii), the error correction model (ECM) is specified as follows:

$$\begin{aligned} \Delta GROWTH = & \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta GROWTH_{t-i} + \sum_{i=1}^n \alpha_{2i} \Delta TOI_{t-i} + \sum_{i=1}^n \alpha_{3i} \Delta GCON_{t-i} + \\ & \sum_{i=1}^n \alpha_{4i} \Delta INVAL_{t-i} + \sum_{i=1}^n \alpha_{5i} \Delta GCAP_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta POPGR_{t-i} + \sum_{i=1}^n \alpha_{7i} \Delta INF_{t-i} + \\ & \theta TDUM + \phi ECT_{t-1} + \mu_t \end{aligned} \quad (iii)$$

In equation (iii), α_0 is the constant and $\alpha_1, \dots, \alpha_6$ are the short-run coefficients; ϕ is the coefficient capturing the long-run dynamics; ECT is the error correction term and μ_t is the residual error term. The validity of the error correction mechanism depends on the size and sign of the coefficient representing the speed of adjustment. ϕ is expected to have a negative value and be statistically significant.

4.1.1 Trade openness index

The available empirical literature shows the use of various proxies of trade openness to examine the impact of trade openness on growth and different indicators capture different aspects. Grossman and Helpman⁽⁵⁹⁾ claim trade openness impacts on economic growth by allocation of resources. Subsequently, through the level of export, the effect of resource allocation is captured and hence, export as a share of GDP is used as a trade openness proxy to capture the length of trade openness related to scale of economies. The import liberalization is believed to encourage new machinery transfer through imports which in turn, helps in production increase and leading to economic growth. The import share of GDP is seen as a trade openness proxy describing openness measurement which is associated to increased international competition. The overall trade share of GDP presents the technology spillover angle of trade openness.

From Table 1 we can see that all the three proxies are positively correlated to each other and hence it would be inconvenient to use all of them in the single model. Also, if we use only one proxy, we would be missing out information. Hence, a composite trade openness index (TOI) is constructed by calculating the weight of each indicator. The vital weights are calculated using Principal Component Analysis (PCA) (following Hye & Lau⁽¹⁴⁾).

Table 1. Principal component analysis

Eigen values: (Sum = 3, Average = 1)					
Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
1	2.989901	2.979881	0.9966	2.989901	0.9966
2	0.010021	0.009943	0.0033	2.999922	1.0000
3	7.80E-05	---	0.0001	3.000000	1.0000
Eigenvectors (loadings):					
Variable	PC 1	PC 2	PC 3		
(X+M)/Y	0.578307	-0.027495	-0.815356		
M/Y	0.576928	-0.692853	0.432562		
X/Y	0.576815	0.720555	0.384819		
Correlation Matrix					
	(X+M)/Y	M/Y	X/Y		
(X+M)/Y	1.000000				
M/Y	0.997718	1.000000			
X/Y	0.997137	0.989991	1.000000		

The eigenvalues display that the first principal component explains about 99.66% cumulative proportion of variation (Table 1). The second and third explains 0.34% and 0% standardized variations respectively. It is evident that the first principal component is superior against the other combination of variables because it displays higher level of variability. Hence, this study uses the first eigenvector values as a weight to build a composite trade openness index. The separate contributions of (X+M)/Y; M/Y and X/Y in standardized variance of the first principal component are 57.83%, 57.69% and 57.68% respectively.

4.2 Data type and source

The study involves time series analysis with annual data. The data source is World Bank World Development Indicators (February 2019).

4.3 Estimation and analysis

The variables are first tested for the presence of unit roots in order to determine stationarity. This is necessary in order to confirm whether all the variables are I(0) or I(1). I(2), then the F-test will have biased results. This study will employ Augmented Dickey Fuller (ADF) test and Phillips-Perron test for checking stationarity.

Based on the test results in Table 2, it can be concluded that GROWTH, POPGR and INF are I(0) while all the other variables are I(1). The unit root test results indicate that all the non-stationary variables at level became stationary after first differencing.

After confirming the order of the integration of the variables, the ARDL bounds test for cointegration was performed in order to determine whether there is any long-run relationship among the variables. The results of this test are reported below.

The results in Table 3 show that the F-statistic is higher than the critical value bounds at all significance levels. Consequently, the null hypothesis of no cointegration is rejected and it is concluded that there is long term relationship among the variables.

Table 2. Unit root test for variables

Augmented Dickey Fuller			Phillips-Perron		
Variables	Stationarity in Levels	Stationarity in First Differences	Stationarity in Levels	Stationarity in First Differences	
GROWTH	-6.200212***	-	-6.347637***	-	
TOI	-1.938467	-5.957219***	-2.136592	-5.953166***	
GCON	-3.071954	-6.447137***	-2.741125	-6.362229***	
INVAL	-1.634994	-4.206132***	-1.237253	-7.589787***	
GCAP	-3.931368	-8.267673***	-2.374215	-8.238057***	
POPGR	-2.864565***	-	-2.408156*	-	
INF	-4.811177***	-	-4.811177***	-	

Note: *, **, *** denote statistical significance at 10%, 5% and 1% levels respectively

Table 3. ARDL bounds test result

Table 1: ADF-5 bounds test result							
Dependent Variable		Function				F-Statistic	
GROWTH		F(GROWTH TOI, GCON, INVAL, GCAP, POPGR, INF)				14.460636****	
Critical Values							
1%		2.5%		5%		10%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
3.15	4.43	2.75	3.99	2.45	3.61	2.12	3.23

Note: *, **, ***, **** denote statistical significance at 10%, 5%, 2.5% and 1% levels respectively. The critical values are calculated in Eviews

The estimation of long-run and short-run coefficients for the model is carried out. The optimal lag length is determined using Akaike Information Criterion (AIC). The AIC selected ARDL (1,0,1,1,0,0,1) for the model. The dummy variable (TDUM) is used as a fixed regressor. The empirical results are reported in Table 4.

Table 4. Long-run and short-run estimations of ARDL model

Long-run Estimates; Dependent Variable: GROWTH	
Regressor	Coefficient
TOI	-2.751643***
GCON	-0.779283**
INVAL	0.834493**
GCAP	0.156453
POPGR	-7.060975
INF	-0.230591**
Short-run Estimates; Dependent Variable: ΔGROWTH	
Regressor	Coefficient
C	1.934218***
ΔGROWTH(-1)	-0.151225
ΔTOI	-3.167760***
ΔGCON	-2.567798***
ΔGCON(-1)	1.670668***
ΔINVAL	0.105540
ΔINVAL(-1)	0.855149*
ΔGCAP	0.180112
ΔPOPGR	-8.128770***
ΔINF	-0.555331***
ΔINF(-1)	0.289869**
TDUM	-2.031005*
ECT(-1)	-1.151225***

Note: *, **, *** denote statistical significance at 10%, 5% and 1% levels respectively.

The results of the long-run coefficients show that trade openness has a significant negative impact on economic growth in India. Gross capital formation has a positive impact on economic growth as expected but it is not significant. The coefficients of population growth and inflation rate are negative and statistically significant bolstering the claim that inflation and rapid

population growth have dampening effects on economic growth in India. Government consumption expenditure and industry value addition has negative and positive coefficient respectively and are statistically significant at 5% level.

The results for the short-run coefficients also display that the coefficient of trade openness index is negative and statistically significant at 1% level. This is suggestive of the fact that increased trade openness hampers growth. As per expectation, short-run coefficients of gross capital formations have positive sign whereas population growth and inflation have negative sign and are statistically significant. However, the lagged inflation variable has a significant positive coefficient Government consumption has negative coefficient and is statistically significant but the lagged term of it has a positive coefficient. Also, industry value addition has positive coefficient. Lastly, the short-run dynamics reveal that the coefficient of the lagged error correction term is significant with negative sign supporting the evidence of a stable long-run relationship among variables. This coefficient indicates that a deviation from the long-run equilibrium level is corrected by approximately 115% over the following year or in other words, there is long-run convergence towards the equilibrium.

4.4 Diagnostic tests

4.4.1 Normality

Normality is the assumption where the error term of the regression is normally distributed with zero mean (non-zero mean generally leads to biased results). This is necessary for 't' and 'F' statistics to be valid. Jarque-Bera test has been employed to check for normality.

The hypothesis is defined as follows:

H_0 : residuals are normally distributed; $E[\varepsilon_t] = 0$

H_1 : residuals are not normally distributed; $E[\varepsilon_t] \neq 0$

H_0 is rejected if $p < 0.05$ at 5% significance level.

From Figure 3, we observe that the p-value is $0.958080 > 0.05$. Hence, we fail to reject the null hypothesis and the assumption of normality is satisfied.

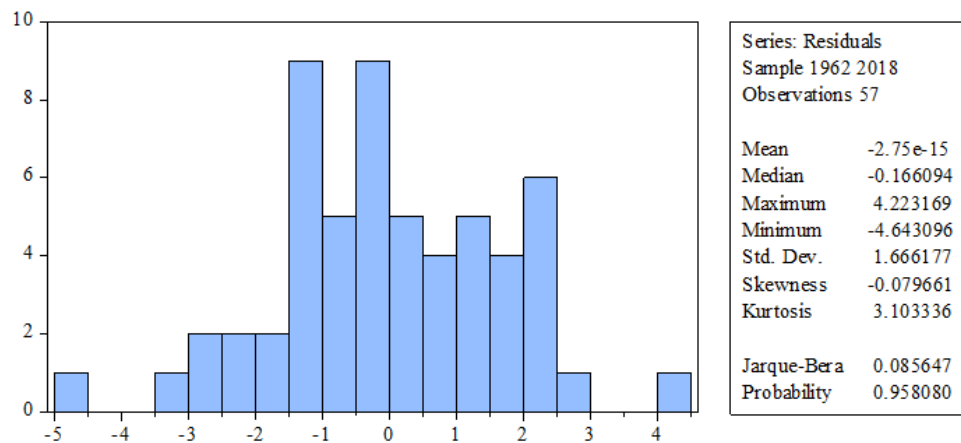


Fig 3. Jarque-Bera test for normality

4.4.2 Heteroskedasticity

When the variance of the residuals is not constant, it is known as heteroskedasticity or in other words, absence of homoskedasticity. This is a violation of one of the Gauss-Markov assumptions. Heteroskedasticity in a model is not desired because while the coefficient estimates can still be unbiased in presence of heteroskedasticity but are inefficient because the true variance and covariance are underestimated⁽⁶⁰⁾. Breusch-Pagan-Godfrey test is used for examining the presence of heteroskedasticity in this study. The hypotheses are defined as follows:

H_0 : residuals have constant variance(homoskedasticity); $\text{Var}[\varepsilon_t] = \sigma^2$ for all t

H_1 : residuals don't have constant variance (heteroskedasticity); $\text{Var}[\varepsilon_t] \neq \sigma^2$ for all t

H_0 is rejected if $p < 0.05$ at 5% significance level.

We find the p-value is $0.1166 > 0.05$. Hence, we fail to reject the null hypothesis and the assumption of no heteroskedasticity is confirmed.

4.4.3 Serial correlation

Serial correlation is the situation when error terms from different time periods are correlated. It occurs when the errors associated with a given time period carry over to future time periods. Serial Correlation might not affect the unbiasedness or consistency of the coefficient estimates but it affects their efficiency. Hence, serial correlation is not desired in the analysis. Breusch-Godfrey LM test is used for checking serial correlation. The hypotheses are as follows:

H_0 : no serial correlation; $\text{Cov} [\varepsilon_t, \varepsilon_{t-s}] = 0$

H_1 : existence of serial correlation; $\text{Cov} [\varepsilon_t, \varepsilon_{t-s}] \neq 0$

H_0 is rejected if $p < 0.05$ at 5% significance level.

The obtained p-value is $0.5224 > 0.05$. Hence, we fail to reject the null hypothesis satisfying the assumption of no serial correlation.

4.5 Parameters stability test

To examine for parameter stability, Cumulative Sum (CUSUM) test and Cumulative Sum of Square (CUSUMSQ) test are used. CUSUM test shows whether coefficients of regression are changing systematically whereas CUSUMSQ test shows if the coefficients of regression are changing suddenly. The hypotheses are as follows:

H_0 : parameters are stable

H_1 : parameters are not stable

H_0 is rejected if the blue line (representing CUSUM or CUSUMSQ) crosses any of the red lines (5% significance).

From Supplementary material (Appendix III and Appendix IV), we see that the blue line falls within the boundary of the red lines concluding that the parameters are stable.

4.6 Robustness check

In order to check whether the results change significantly, the whole estimation procedure has been repeated using different combinations of the variable used in the main model. The main independent variable has been kept fixed and I kept on adding a control variable in each subsequent step. It has been noticed that the results of the benchmark estimation do not change.

In the next stage, multiple linear regression technique has been employed using adding new control variables to the existing set of control variables. The added variables are broad money as a percent of GDP, real interest rate and domestic credit to private sector. These variables control for the size and development of the financial sector. The concerned outcome that trade openness negatively impacts growth, remains unaltered irrespective of the combination of the control variables.

In the final phase, the dataset has been divided into parts, pre-1991 and 1991 to 2018. Then, multiple linear regression has been carried out for both the cases using the initial combination of control variables. Some interesting results have been found. In the pre-1991 era, the results show that trade openness has positive coefficient, statistically significant at 1% level. In the other analysis, the coefficient is significantly negative. This bolsters the notion that the trade liberalization policy might have unfavorable effects on economic growth of India.

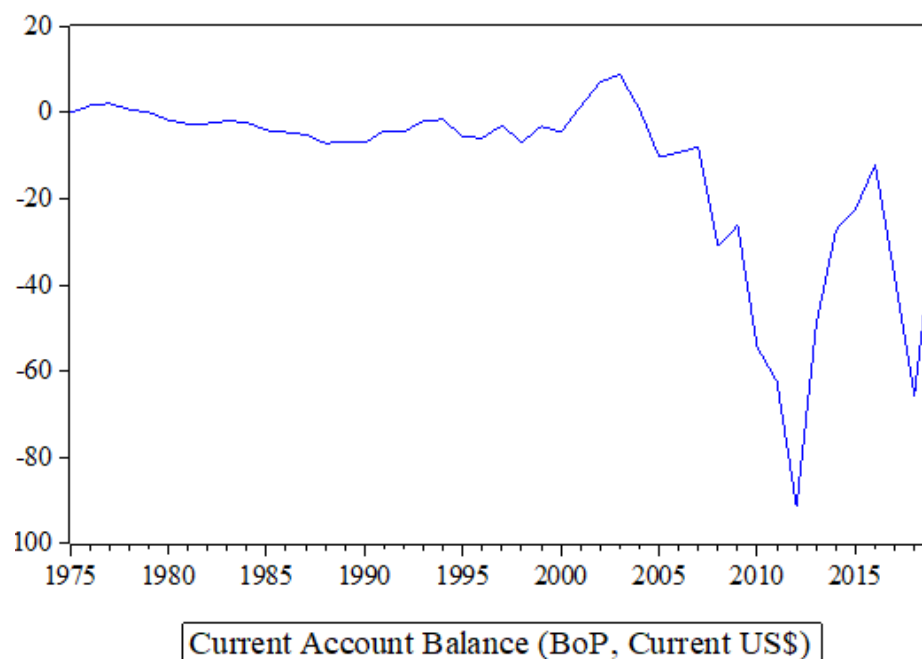
Hence, it can be concluded that the model used is robust.

5 Discussions

Popular hypotheses, studies and intuitions claim that trade is one of the crucial and necessary factors for economic prosperity. Yet time and again, several studies have shown the detrimental effects of trade on growth. The same has been concluded in this work as well. But what is the explanation of this in context of India? What could have possibly gone wrong when India has so much prospect?

One immediate setback from liberalizing trade could be increased unemployment of unskilled and rural labors due to competition from global market and accelerated urbanization. Dhamija⁽⁶¹⁾, in her study analyzed the impact of trade openness on India and has conformed to the claim. Other literature have shown the adverse impact of trade openness on employment^(62,63). Skilled labor force plays a crucial role in economic growth following trade openness policies because the utilization of imported innovative capital goods are optimal. However, a significantly large part of the Indian labor force is unskilled or hasn't gone through skills training. Increased trade might open up new opportunities for opulence in the economy, but the factor of wealth distribution cannot be ignored. Even if the economy grows in absolute terms, increased unemployment and poverty due to enhanced trade, would bring down the actual economic growth and development of India.

Trade liberalization not only increases exports but also imports. Uncontrolled import dependence may give rise to trade deficits and consequently, increase the foreign debts hampering growth. From Figure 2, it is evident that India has remained an



Source: World Bank World Development Indicators

Fig 4. Current account balance of India (in billions, 1975-2019)

import dependent economy mostly and hence, the economy suffered from a trade deficit throughout ([Figure 4](#)). In 2019, India's current account deficit was \$26.894 billion (World Bank Data). However, import of capital and technical innovations are more likely to enhance growth in the country through increased production. Likewise, export composition should be shifted from raw and semi-manufactured goods to highly value-added commodities in order to increase the profit margins and have larger impacts on growth. Import-export quality and diversity also have a role to play for determining the effect of trade. Huchet et al. ⁽⁶⁴⁾ supported the claim by saying increased trade volumes as percent of GDP might have dampening effect on growth when countries' export comprises of low-quality commodities or few commodities. India's chief imports include mineral fuels, oils and waxes and bituminous substances; pearls, precious and semi-precious stones and jewelry; electrical machinery and equipment; nuclear reactors, boilers, machinery and mechanical appliances; organic chemicals amongst others. Few of the items majorly exported by India are gems, organic chemicals, iron and steel, raw materials, electronics and others.

In a vast and developing economy like India, where there exist challenges towards macroeconomic stability, technological innovations, human capital development, rudimentary and small-scale industries and political instability amongst others, mere opening up trade would not lead to accelerated economic growth and development. If the policy implementations and the developmental factors are not taken care off and supervised efficiently, opening up trade could prove to be counterproductive.

6 Conclusion

This study investigates the impact of trade openness on economic growth in India using ARDL Bounds Test estimation technique. A composite trade openness index was constructed and as a contribution to the existing literature, different set of control variables were employed a time dummy variable was used in an effort to capture the reform policy dynamics of 1991 and the shocks caused by it.

The empirical analysis shows that the trade openness index negatively affects economic growth both in short and long run in India. This empirical result is supported by Kind ⁽⁶⁵⁾, who states that full trade liberalization in low income countries might reduce the R&D incentives as compared to higher income countries and imperfect knowledge spillovers can have a detrimental effect to the rate of economic growth. Kim ⁽⁶⁶⁾ also mentioned that more degree of trade openness has negatively impacted on economic growth and real income in less developed countries. Hye & Lau ⁽¹⁴⁾ also confirmed the dampening effect of trade on growth in the long run.

However, the controversy on the trade-growth nexus is far from over. Many studies found out that trade openness enhanced economic growth and on the other hand, there are studies which found no link between them. The reasons behind could be different estimation techniques, various set of control variables used and most importantly, the trade openness indices used. What captures the trade openness most accurately, is a matter of confusion till date. Apart from that, how trade liberalization affects growth also depends on the heterogeneity across countries including geographical position, country size, level of institutional development and quality amongst others. It could be a challenge and raise debates while attempting to find an accurate measure to control for these factors.

To this regard, it is worth noting that this study is not free of shortcomings. The trade openness index I have used does not account for trade policies, trade barriers and trade composition (quality of commodities, diversity). This analysis could be subjected to a degree of omitted variable bias because certain factors like geography, exchange rate volatility have not been included. Hence, future research should address these issues attempt to build up a more extensive trade openness index and use more sophisticated estimation techniques like instrumental variables or dynamic GMM estimation in order to obtain more robust results.

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