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Abstract

The paper examines the causal link between trade openness and economic growth for two Asian giants —India and China by applying Toda and Yamamoto's Granger causality test procedure. The trade openness has been measured by segregating openness into four indicators such as merchandise exports, merchandise imports, service exports and service imports, covering the period since ad-hoc liberalization *i.e.,* from 1981 to 2012. Results confirm export-led and import-led growth hypothesis for both countries in the merchandise trade, whereas service-led growth is visible only in the case of China. Thus, this study reveals that trade openness positively affects economic growth.

Keywords: Trade Openness, Economic Growth, Toda and Yamamoto causality test

JEL Codes: F43, C22

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1 INTRODUCTION

Trade openness acts as a catalyst in accentuating the economic growth of many developing countries. Trade liberalization policies adopted by countries in the 1980s and 1990s generated rapid expansion of exports and imports, accompanied by high rate of economic growth. Trade openness brings a structural change in the economy. It increases productivity through the efficient use of resources, economies of scale, foreign capital inflow, access to new technology, better quality of raw materials and incentives for investment which, in turn, imparts into economic growth.

In the open economy macroeconomics, trade openness is a key factor contributing to economic growth. However, causality exists between international trade openness and economic growth, which is the most debated issue in the literature of international economics. Studies have found either unidirectional or bidirectional causal relationship between the two. Economic growth and industrialisation can be a cause of trade expansion in the form of external earnings. Increase in productivity through economies of scale can be the result of openness. Similarly, openness leads to new investment, employment generation, rise in the real wages, thereby contributing to economic growth. Thus, the causality which proceeds from export to growth is asserted as the export-led growth (ELG) hypothesis when export expansion accelerates economic growth. This progression generates positive externalities through specialization, efficient allocation of resources, improved production techniques, competition, economies of scale, efficient management as well as provides foreign exchange for the import of capital and intermediate goods, thereby increasing capital formation and domestic production. However, causality can proceed from economic growth to openness which is referred to as growth-led export (GLE) hypothesis. High productivity reduces per unit cost of production, thereby increasing international export competitiveness. Nonetheless, if domestic production is greater than domestic demand, producers would try to sell their product abroad and growth would be internally realized in an open economy.

The intriguing question of the existence of ELG or GLE hypothesis underpins the basic objective of the undertaken study—to assess the causal link between trade openness and economic growth of India and China. This study segregates openness into four measures, such as merchandise exports, merchandise imports, service exports and service imports as a ratio to GDP, to measure the trade openness. Recent dynamics of trade are highly influenced by trade in services. Thus, through this segregation, the impact of each of these trade flows could be analyzed for both countries which would then suggest their trading pattern and trade-growth nexus. India and China have been chosen for the analysis as, recently, these two Asian countries are most rapidly growing developing countries. These two countries have opened up their trade in the last two or three decades and have indicated remarkable growth in a short span of time. The share of China in the total world trade is 32.04 percent, whereas that of India is 10.53 percent which ascertains the choice of these two countries for evaluating the causality between trade openness and economic growth (WTO, 2014).

The introduction is followed by literature review in Section Two. Section Three briefs trade policies of India and China. Section Four discusses methodology and data sources. Empirical results are analysed in the Section Five. The last Section provides concluding remarks with policy implications.

2 LITERATURE REVIEW

The nexus between trade openness and economic growth dates back to Adam Smith and Karl Marx. According to Marx, a relationship exists between exchange (trade) and production. Production decides exchange and exchange affects production conditions. Expansion of production needs a growing market which, in turn, promotes expansion of further production. Thus, production and exchange are interrelated processes. The classical school of economics believed that following two ways exist through which foreign trade promotes economic growth.

1. Improved optimal distribution of resources and productivity, thereby stimulating economic growth.
2. Technological gains.

Classical economist Adam Smith’s ‘Vent on Surplus’ theory in 1776 emphasized the productivity doctrine on the assumption of a country possessing excess productive capacity. Export promotion can be increased without necessarily reducing domestic production, thereby leading the country on the path of economic growth. In 1817, Ricardo's Comparative Cost doctrine was based on the specialisation, a movement along a static Production Possibility Frontier with given resources and techniques. The distinction between these two prominent classical theories was indicated by J.S. Mill who considered comparative advantage theory as direct and Smithenian increase in productivity as indirect effects (Myint, 1958). According to the neo-classical theory of trade (Hechscher-Ohlin), trade openness directly influenced the real and nominal return on abundant factor and inversely affected return on scarce factor in 1938. Hence, openness would increase the wages of labour in a labour abundant country, thereby, reducing income inequality. The Harrod-Domar model suggested that if the productivity of labour remains constant, trade increases efficiency in the use of resources by declining incremental capital-output ratio, which results into an increasing the growth rate. The neo-classical growth model pioneered by Solow in 1956 asserted that the impact of openness on growth has no permanent effect. The steady state growth is independent of it as trade policies do not have any effect on technology being an exogenous factor. The new-growth school comprised the theories of Romar in 1986 and Lucas in 1988. The endogenous growth model highlighted learning by doing where technology is considered as an endogenous factor. With openness, developing countries enhanced productivity and efficiency through technology spillovers and external stimulations.

Grossman and Helpman (1991) argued that openness enhances economic growth through the following channels:

1. Enlarging the available variety of intermediate goods and capital equipments which expand productivity of a country's other resources.
2. Accessing improved technology from developed countries.
3. Intensifying capital utilisation.
4. Providing large market for domestic producers and reaping benefits from increasing returns to scale.

Levine and Renelt (1992) showed that trade openness affected growth through investment. Trade liberalization allows open access to investment goods and provides incentives for FDI. Thus, it leads to a faster long run economic growth. Dollar (1992) applied distortions in the real exchange rate as a means for measuring trade. He found a negative correlation between the real exchange rate distortions and growth which implied a positive trade-growth relation. However, he was criticised by Rodriguez and Rodrik (2001) and Baldwin (2003).

Edwards (1993a) examined the relationship between openness and economic growth for specific countries and performed a cross-country analysis. Group of individual countries included particular cases of inward- and outward-looking countries. The study concluded that import substitution strategy did not generate long term growth of output. Conversely, outward-oriented strategy was effective in achieving the same. On the other hand, cross-country literature suggested a positive relationship between openness and growth and evidenced that openness induces growth. It was criticised as it failed to test the robustness of cross-country statistical results. Thus, he attempted to act toward this criticism in his other study. He formulated nine measures of openness related to total factor productivity growth and regressed them on 10 year average of Total Factor Productivity from 1960 to 1990, including 93 developed and developing countries. The study concluded that six out of nine measures of openness were statistically significant, showcasing positive relationship (Edwards, 1997).

Sachs and Warner (1995) suggested a positive and significant relationship between openness and growth from 1970 to 1989, using five different indicators of openness such as Non-Tariff Barriers (NTBs), average tariff rate, black market premium, socialistic and government monopolies of exports. They concluded that openness index and the growth rate of per capita GDP exhibited statistically significant positive relationship. Harrison (1996) employed panel data to analyse the effect of trade openness on growth and compared the prediction of several measures of trade openness. According to Granger causality test results, openness and growth indicated bidirectional causality. Frenkel and Romar (1999) modelled geographical factor as an instrumental variable. They regressed per capita income on the ratio of export and import. They found that OLS underestimates the effect of trade on growth, whereas trade exerted positive effect on growth, considering an instrumental variable. Dollar and Kraay (2001) applied a unique feature of analysing within country decadal changes in the growth rates and volume of trade. They estimated openness via lagged values of trade as a fraction of GDP, assuming that trade values are correlated with lagged GDP but not with future GDP growth. They argued that a possibility of reverse causation from growth to trade in the case of an instrumental variable. The study revealed a strong and significant relation between changes in trade and in growth.

Rodriguez and Rodrik (2001) have criticised Dollar (1992), Edward (1993a, 1997), Sachs and Warner (1995) and Frenkel and Romar (1999). Rodriguez and Rodrik (2001) critically evaluated the new trade theories which attempted to answer the question of whether a country with lesser policy induced barriers grow faster than other country with controlled characteristics. They opined that large literature on this issue is uninformative. They observed the world trade data from 1975 to 1994 of growth rate per capita GDP, average tariff rate (ratio of total import duties to volume of imports) and coverage ratio for NTBs and detected an inverse relationship between trade barriers and economic growth in the long run. Neither average tariff rate nor coverage ratio could be a perfect indicator of openness. They stated that free trade raises income, but it does not lead to sustained growth in the long run.

Srinivasan and Bhagwati (2001) rejected a cross country regression methodology due to reasons of weak theoretical foundation, poor quality of database and improper econometric techniques. They also argued that the conclusion of Rodriguez and Rodrik (2001) was valid only for the standard Solow model and not for the Harrod-Domar model. They favoured export promotion strategy and argued that import substitution strategy would reduce social returns and create social loss. They supported Krueger (1997) who demonstrated superior growth performance of countries with outward-oriented strategies, leading to a positive link between trade openness and growth performance. Anderson and Babula (2008) mentioned three channels through which trade affects productivity growth. First, it gives access to foreign intermediate inputs and technology as well as expands market size for new products and import variety of other products which are domestically unavailable, thereby increasing the productivity of the manufacturing sector. Second, expansion in market size raises expected profit from research and development. Third, trade facilitates international diffusion of general knowledge.

There are various studies which emphasized on the problems of using Granger causality. First, the existence of stochastic trends in the variables and the exclusion of relevant variables induce spurious significance and inefficient estimates. Hence, numerous studies adopted the methodology of Toda and Yamamoto (1995)—a modified version of the Wald test—because this method has certain advantages over the Granger causality test. Moreover, Rambaldi and Doran (1996) proved that this method can be computed using the Seemingly Unrelated Regression (SUR) model. Zapata and Rambaldi (1997) emphasised the advantages of this procedure and stated that it does not require the knowledge of cointegration properties of the variables. This test can be conducted even if there is no cointegration and/or stability. Although this method was introduced in 1995, empirical application for investigating causality became popular only recently.

Shan and Tian (1998) employed causality procedure propounded by Toda and Yamamoto in a VAR model for Shanghai to test the ELG hypothesis, using monthly time series data for 1990:1 to 1996:12. Results indicated one-way causality running from GDP growth to export. Yamada (1998) re-examined the ELG hypothesis from exports to labour productivity for three developed countries and found causality from exports to labour productivity, using Toda and Yamamoto method. Asghar (2008) applied the method developed by Toda and Yamamoto and used modified Wald (MWALD) test for restrictions on the parameters of a VAR model. Sililo (2010) enquired a directional link between stock market development and economic growth in Zambia for 2002 to 2009. He applied and compared the results of both Granger causality as well as the Toda and Yamamoto method to investigate the causal relationship and concluded that the results of Toda and Yamamoto method were more reliable. It suggested that the economic growth caused stock market development. In contrast, Granger causality test indicated that economic growth and stock market development were independent of each other. Oladipo (2010) applied the methodology of Toda and Yamamoto to reveal the direction of causal relationship between savings and economic growth in Nigeria between 1970 and 2006. He explored unidirectional causality between savings and economic growth. Sevitenyi (2012) applied the methodology of Toda and Yamamoto for the annual data from 1961 to 2009 and detected unidirectional causality between government expenditure and economic growth in Nigeria. Amiri and Ventelou (2013) used the same method to test the long-term causality between GDP and Health Care Expenditure (HCE) in the

OECD countries from 1970 to 2009. He explored bidirectional causality between GDP and HCE.

In India, various attempts have been made to examine the causality between openness and growth and the validity of ELG and GLE hypothesis. Kónya and Singh (2006) addressed export/import-led growth hypothesis and growth-led export/import hypothesis for India. The study applied standard cointegration, Granger causality and Toda and Yamamoto's MWALD test to export, import and GDP from 1950–51 to 2003–04. They opined that exports and imports Granger cause GDP. However, the converse causality did not hold. Thus, they supported ELG and import-led growth hypothesis (ILG) in India. Bhattacharya and Bhattacharya (2011) investigated whether the volume of merchandise trade influences economic growth from 1996–97 to 2008–09. They found a unidirectional causality and emphasised the existence of the ELG hypothesis. However, Kaur and Sidhu (2011) employed the same data span and encountered the existence of bidirectional causality between GDP and export growth as well as export and GDP growth. Mishra (2011) reinvestigated the dynamics of the relationship between exports and economic growth for India from 1970 to 2009. The study applied standard cointegration technique and Vector Error Correction Model (VECM) based on Granger causality test and rejected the ELG hypothesis for India. In contrast, Pradhan (2011) supported the ELG hypothesis, however, rejected GLE hypothesis for India. Sahni and Atri (2012) used OLS to examine the mechanisms of the ELG hypothesis in India from 1980-81 to 2008-09. The study postulated a positive significant relation between export and GNP which supported the ELG hypothesis for India.

Many studies have attempted to test these hypotheses for China. Lie *et al.* (1997) examined the causal link between trade openness and economic growth from 1983 to 1995 and concluded that higher degree of openness resulted into higher level of economic growth in China. Shan and Sun (1998) applied the methodology of Toda and Yamamoto for China using monthly data from 1987 to 1996 to test the validity of the ELG hypothesis and inferred bidirectional causality between exports and real industrial output. Chuang (2000) investigated data for Taiwan from 1952 to 1995 and suggested that export promotes economic growth, accelerating human capital accumulation. Narayan and Smyth (2004) used cointegration and error-correction modelling to examine causal relationship between export, human capital accumulation and real income from 1960 to 1999. Their study supported short-run neutrality between export and real income. Tsen (2006) investigated Granger causality among exports, domestic demand and economic growth for time series data from 1978 to 2002. His results showed bidirectional Granger causality among these variables.

Given the ambiguity regarding the causal link between trade openness and economic growth, it would be worthwhile to study such relationship for India and China. Yamada (1998) proposed to conduct Toda and Yamamoto's causality test for high-performing Asian economies with export expansion. It is observed that few attempts have been made to examine the causality using the methodology of Toda and Yamamoto. Thus, this study undertakes Toda and Yamamoto's causality test for India and China.

3 TRADE POLICIES OF INDIA AND CHINA IN A NUTSHELL

To understand the relationship between openness and growth it is important to know the trade policies of these countries.

3.1 India

In India, the history of protection dates back to World War II when the control on imports was introduced to conserve foreign exchange. However, after the independence, India adopted progressive liberalization from the 1st Five Year Plan (1951–56). Nonetheless, the Balance of Payment (B-o-P) crisis in 1956–57 was responsible for the reversal of liberalization process. Indian trade policy was characterised by high tariff with complete import restrictions on the consumer goods. India adopted comprehensive import control until 1966. In 1966, under the pressure of the World Bank, India devalued Rupee and again took steps towards liberalization of imports and reduction of the subsidies on exports but this fetched domestic criticism. Thus, policy makers reversed the policy of import liberalization. The asperity of the import controls was reflected in the decline in the magnitude of non-oil and non-cereal imports. Since, consumer goods imports were banned, the incidence of decline was mainly borne by machinery, raw materials and components. Hence, Indian manufacturing industries suffered because of the problem of poor quality inputs and technological backwardness. Thus, the liberalization strategy was initiated again in 1976.

In 1976, the Government of India introduced Open General Licensing (OGL) whereby items in the OGL list no longer required a license from the Ministry, with large concessions on the tariff rates. The decline in the share of canalised import significantly expanded the room for imports of machinery and raw materials. However, export incentives were introduced after 1985, which helped to indirectly expand imports. Broad banding was introduced in 1986 in 28 industry groups, which enabled firms to switch production between similar production lines. Moreover, 31 industries were completely de-licensed by 1990; the investment limit below which no industrial licence would be required was raised to Rs. 500 million in the backward areas and Rs. 150 million in the urban areas. This ad-hoc liberalization was accompanied by expansionary fiscal policy. However, unsustainable internal and external borrowings to support fiscal expansion resulted into B-o-P crisis in 1991. The Indian government turned this crisis into an opportunity and launched a comprehensive and systematic liberalization programme. The Indian government gradually shifted to more open economy with market forces. Trade liberalization programme was initiated in July 1991. The reform virtually abolished import licensing on intermediate inputs and capital goods and simultaneously removed quantitative restrictions. However, consumer goods constituting nearly 30 percent of tariff lines remained under the ambit of licensing. Moreover, trade liberalization was accompanied by the coinciding liberalization of the foreign exchange regime which proved to be an excess layer of restriction on imports. In 1993, importers were authorised to purchase foreign exchange in the open market at a higher price. It is believed that India managed to survive the B-o-P crisis in 1991 due to external sector reforms. One of the important policy initiatives for export promotion was the introduction of the scheme of the Special Economic Zones (SEZs). The SEZ Act of 2005 boosted confidence among the investors. There were 130 SEZs which were already exporting goods worth $48 billion, and investments in these zones were over $43 billion in 2009–2010.

3.2 China

China's trade reform regime has three main dimensions: increasing the number and type of eligible enterprises, developing indirect trade policy instruments and developing the exchange rate policy. These were linked to pricing and enterprise reform within the economy that allowed prices to play a crucial role in the resource allocation. Prior to late 1970s, China's trade was completely determined by their economic planning. The State Planning Commission controlled exports as well as imports. Approximately 90 percent of all imports were designed to increase the supply of machinery and equipments, raw materials and intermediate goods which were domestically scarce. Similarly, the export was made comprehensive, specifying the physical quantities of more than 3,000 individual commodities.

The exchange rate and international prices played an insignificant role in determining the composition of China's exports and imports. Hence, this composition adversely affected the allocation of resources and economic growth. This illogical pattern of trade was gradually discontinued in the 1980s and was completely abandoned in the late 1990s. However, the government continued to maintain direct controls on important commodities. China not only adopted tariff barriers and NTBs but also other array of tools such as limiting the number of authorized companies to carry trade activities, limiting the range of goods, import licensing etc. Thereafter, the Chinese government encouraged exports through export promotion system by giving incentives and simultaneously offering domestic protection in early 1990s. The introduction of special arrangements for processing trade was a milestone feature of the reform. Moreover, imports of intermediate inputs for the use of production of exports and for capital goods inputs, especially for joint ventures with foreign enterprises, were completely liberalised. Initially, the favourable treatment was extended only to enterprises operating in the free trade zones, but the coverage was rapidly expanded to other enterprises. China announced a reduction in tariff and shifted to a liberal trading system to comply with international standards. In contrast, the government also took some important steps to gradually reduce the scope of NTBs. The Chinese government officially announced the abolition of import substitution list and removed restrictions on various items as well as import licenses. A two-tier system of the foreign exchange rate distorted trade by discouraging both exports and imports. Hence, the exchange rate was unified in 1994 which removed this distortion. In the late 1990s, the China's trade reform process was highly influenced by its negotiations with the WTO. By the time China became a member of the WTO in 2001, it completely transformed its import regimes. The average statutory tariff was reduced from approximately 56 percent in 1982 to 15 percent in 2001. The share of all imports which were subject to licensing was reduced from 46 percent to merely 4 percent for all commodities. Import quotas and trading rights were discontinued at the end of 2004, whereas import prohibitions and licensing have been drastically reduced. The procedure of import licensing has been simplified. However, China maintains import prohibitions, largely for health and safety reasons under international conventions. Import quotas have been phased out; however, tariff rate quotas still remain for some farm products and fertilizers. Furthermore, China has also taken serious measures to simplify the administration of border measures such as Standards, Sanitary and Phytosanitary (SPS) measures. More than 70 percent standards were revised to ensure their conformity with international standards, whereas approximately 20 percent were abolished. However, the large number of laws governing SPS measures made the SPS regime more intricate. Duty drawback policy supported China's export processing programmes which resulted into the rapid expansion of China's exports. However, the export regime remained complicated with export taxes, export prohibitions, export licensing and export quotas, etc. These restrictions basically were to avoid domestic shortages. In the process of liberalising its foreign trade activities, the Chinese government has strengthened macroeconomic control and improved the administrative system governing foreign trade.

4 DATA AND METHODOLOGY

The causal relationship between trade openness and economic growth has been examined for India and China. GDP per capita at constant 2005 US $ prices (GDP) is used to capture the economic growth of a country. Investment also channelizes the economic growth of a country, and thus gross capital formation (GCF) as a percentage of GDP has been included in the model. Openness measure constitutes various aspects of trade such as export openness, import openness, etc. Rather than considering total trade to GDP ratio as a measure of openness, the study has used disaggregated trade as merchandise exports, merchandise imports, service exports and service imports. The aim of such disaggregation is to separately analyse the effect of all these trade flows on the GDP per capita. Thus, merchandise exports, merchandise imports, service exports and service imports as a percentage of GDP (MEO, MMO, SEO and SMO, respectively) are the variables capturing the trade openness aspect in the study. The study uses the annual time series from 1981 to 2012. The data have been sourced from the World Development Indicators of the World Bank, except for services, exports and imports, which are extracted from UNCTAD for both the countries. Natural logs of all these variables are used for econometric analysis (UNCTAD, 2014, World Bank, 2014).

Methodology

In a bi-variable case, the causal relationship between variable X_t and Y_t can be analysed using the standard Granger causality test developed by Granger (1969). X_t is said to Granger cause Y_t if the lagged values of X_t improve the forecasting performance of Y_t. The null hypothesis of X_t not Granger causing Y_t is tested by the individual significance of the coefficients of lagged values of X_t using t-test and by joint significance of coefficients of lagged values of X_t using F-test. If both these test reject the null hypothesis, then X_t is said to Granger cause Y_t. More formally, in this test, two simple VAR models are estimated as follows:

$$Y_t = \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{p} \beta_j X_{t-j} + \mu_{1t} \qquad \text{.........................} \quad (1)$$

$$X_t = \sum_{i=1}^{q} \gamma_i Y_{t-i} + \sum_{j=1}^{q} \lambda_j X_{t-j} + \mu_{2t} \qquad \text{.........................} \quad (2)$$

where, the two error terms μ_{1t} and μ_{2t} are uncorrelated. In equation (1) Y_t is explained by the past values of X_t if $\sum_{j=1}^{p} \beta_j \neq 0$ and Y_t is said to Granger cause X_t if in equation (2) $\sum_{i=1}^{q} \gamma_i \neq 0$. This joint significance is tested through the standard F-test.

However, Granger causality test has some limitations:

1. *Stationary Variables*: This test requires the time series included in the model to be stationary at level. If the variables are integrated, this test fails to

estimate the causal relation between the variables. It also assumes the two error terms to be uncorrelated.

2. *Specification Bias*: It is sensitive to model building and the number of lags to be included in the model.
3. *Spurious Regression*: Most of the time series are non-stationary, and thus the problem of spurious regression amplifies while running the causality test.

Against this backdrop, Toda and Yamamoto (1995) developed the MWALD test which avoids the problems of testing for causality with respect to power and size properties of unit root and cointegration tests. It involves the estimation of a VAR model in levels which reduces risks associated with misidentification of the order of integration of the respective time series and cointegration among the variables. It artificially augments the correct lag order of the VAR (k) by the maximum order of integration (d_{max}) and ensures that the usual test statistics for Granger causality have the standard asymptotic chi-square (χ^2) distribution. The theorem proposed by them proves that the Wald statistic converges to χ^2 distribution regardless of whether the processes in the VAR are stationary, I(1), I(2), and possibly around a linear trend or whether they are cointegrated. Thus, the advantage of this test is that researchers do not have to test for cointegration or transform a VAR into an error correction framework to test for causality.

Toda and Yamamoto (1995) suggest that under a VAR ($k+d_{max}$) model with two variables Y_t and X_t, causality would be tested using the following equations:

$$Y_t = \alpha + \sum_{i=1}^{k+d_{max}} \delta_i Y_{t-i} + \sum_{j=1}^{k+d_{max}} \gamma_j X_{t-j} + \mu_{1t} \qquad \text{..........................} \quad (3)$$

$$X_t = \beta + \sum_{i=1}^{k+d_{max}} \theta_i Y_{t-i} + \sum_{j=1}^{k+d_{max}} \phi_j X_{t-j} + \mu_{2t} \qquad \text{..........................} \quad (4)$$

where, in equation (3), X_t Granger causes Y_t if $\sum_{j=1}^{k} \gamma_j \neq 0$ and X_t Granger causes Y_t if in equation (4) $\sum_{i=1}^{k} \theta_i \neq 0$. The null hypothesis can be tested using a MWALD statistic as $H_0: \gamma_1 = \gamma_2 = ... = \gamma_k = 0$ for equation (3) and $H_0: \phi_1 = \phi_2 = ... = \phi_k = 0$ for equation (4). Then, calculate the F-statistic for the MWALD test. If the computed F-value exceeds the critical F-value, reject the null hypothesis and conclude that X_t weakly Granger causes Y_t and Y_t weakly Granger causes X_t. This test involves two steps as follows:

1. Determine lag length k based either on Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) and the maximum order of integration, d_{max}, through the Augmented Dickey-Fuller (ADF) unit root test of the variables in the system. A level VAR can then be estimated with a total of $k+d_{max}$ lags.
2. Apply a standard Wald test to the first k VAR coefficient matrix to make a Granger causal inference.

The equation of the interest for this particular study is the GDP as a function of other variables. Symbolically,

$$GDP = f(GCF, MEO, MMO, SEO, SMO) \quad \text{..........................} \quad (5)$$

where,

GDP = Log of GDP per capita

GCF = Log of Gross Capital Formation as percentage of GDP

MEO = Log of Merchandise exports as percentage of GDP

MMO = Log of Merchandise imports as percentage of GDP

SEO = Log of Service Export as percentage of GDP

SMO = Log of Service Import as percentage of GDP

Thus, based on this particular relation, the causality will be tested for GDP with each variable in a VAR system. Results of Toda and Yamamoto Granger causality test have been discussed in the next section.

5 EMPIRICAL RESULTS

The ADF test of unit root is computed for all variables in both countries. The null hypothesis of the test is that the series contains a unit root *i.e.,* the variable is non-stationary against the alternative hypothesis of series being stationary. Based on this test, the maximum order of integration of all variables is identified for India as well as for China (Appendix I). From Table 1, it is clear that the maximum order of integration for India is 2, whereas that for China is 3. Based on the AIC and SBC lag selection criterion, lag of 4 was chosen as the optimal lag order for the model of India and China.

Table 1: Order of Integration based on ADF Unit Root Test

Variable	India	China
GDP	I(2)	I(0)
GCF	I(2)	I(1)
MEO	I(0)	I(1)
MMO	I(2)	I(3)
SEO	I(2)	I(2)
SMO	I(2)	I(3)

Results of Toda and Yamamoto (1995) MWALD test are given in Table 2 for India and China. In India, results reveal that GDP and GCF have no causal relationship with each other as the null hypothesis cannot be rejected. It means that GCF and GDP growth do not help predict future values of each other. Similar is the case with SEO and SMO where there is no cause and effect relationship between GDP and these variables. In the post-liberalization period, India experienced a shift in the

Table 2: Toda and Yamamoto Test Results for India

Null Hypothesis	**India**		**China**	
	F-Statistic	**P-value**	**F-Statistic**	**P-value**
GDP Does Not Granger Cause GCF	0.6504	0.6899	1.1769	0.3938
GCF Does Not Granger Cause GDP	1.5686	0.2329	1.6986	0.2157
GDP Does Not Granger Cause MEO	0.1630	0.9824	1.3062	0.3387
MEO Does Not Granger Cause GDP	3.3836	0.0310*	3.3888	0.0399*
GDP Does Not Granger Cause MMO	0.6047	0.7225	1.8504	0.1820
MMO Does Not Granger Cause GDP	4.4686	0.0114*	4.6952	0.0142*
GDP Does Not Granger Cause SEO	2.1165	0.1211	1.2400	0.3658
SEO Does Not Granger Cause GDP	0.6823	0.6672	5.3188	0.0092*
GDP Does Not Granger Cause SMO	1.1526	0.3872	0.8152	0.5953
SMO Does Not Granger Cause GDP	0.3483	0.8985	3.1695	0.0485*

Note: * indicates statistical significance at 5 percent level of significance.

comparative advantage from the labour-intensive services to the knowledge- and skill-based services which resulted in an increase in the income of skilled worker from the services sector. This increased income inequality within the skilled and unskilled workers in the urban areas as well as widened the regional disparity between the urban and rural areas (De and Raychadhuri, 2008). Such rise in inequality did not replicate in the per capita GDP growth, especially in the services sector; therefore, services sector could not have indicated any causal relationship with GDP per capita growth in India. However, the null hypothesis of MEO not Granger causing GDP has been rejected at the 5 percent level of significance. It implies that past values of merchandise exports predict the GDP per capita growth of future period, whereas the null hypothesis of GDP not Granger causing MEO has not been rejected. It connotes that GDP per capita growth does not enhance the prediction of merchandise exports in the future period. Thus, results indicate a unidirectional causality between merchandise exports and GDP per capita growth, supporting the ELG hypothesis in India. Similarly, MMO Granger causes GDP with the 5 percent significance level. In contrast, GDP does not Granger cause MMO. It asserts that past values of merchandise imports have some explanatory power for predicting the future GDP per capita growth. Therefore, a unidirectional causality between merchandise imports and GDP per capita growth has been evidenced for India. During the liberalization period, India's import of intermediate goods, raw materials and capital goods have increased. These goods are utilised for the production of final goods which might have resulted in the high GDP per capita in the merchandise sector. Conversely, the imports of consumer and primary goods decreased over this period, which would otherwise have adversely affected the GDP growth. The decrease in the imports of consumer and primary goods also connotes that these goods are domestically produced, leading to employment generation in these industries. The rising imports of intermediate, capital and raw materials have channelized GDP growth indicated by the causal link between merchandise imports and the per capita GDP growth. It could thus be inferred that growing dominance of intermediate and capital goods in India's merchandise imports fuelled India's GDP per capita growth in the post-liberalization period. Hence, we can say that India experiences ILG.

In the case of China, none of the variable pair has demonstrated bidirectional causality. GDP and GCF have no causal relationship with each other as the null hypothesis cannot be rejected. Although the null hypothesis of GDP not Granger causing any of MEO, MMO, SEO and SMO has not been rejected, a significant unidirectional causality between MEO, MMO, SEO, SMO and GDP at the 5 percent level of significance has been identified. In China, merchandise exports and service exports help predict GDP per capita growth in the future period. Besides this, even merchandise imports and service imports have causal relationship with GDP per capita growth. China's exports basket of services includes labour-intensive services such as transport, travel and construction, etc. These services necessitate skilled and unskilled workers, generating employment opportunities and thereby growth in GDP per capita. Thus, even for China, the study supports the ELG hypothesis. In addition, merchandise imports and service imports have improved the productivity, leading to growth in GDP per capita. Therefore, it can be inferred that trade openness has transmitted into the economic growth for India and China.

6 CONCLUSIONS

The causal relationship between GDP per capita growth and merchandise export-import and service export-import has been analysed, using the MWALD test suggested by Toda and Yamamoto (1995). Results supported the ELG hypothesis for India in the case of merchandise exports. Similarly, unidirectional causal relationship between merchandise imports and GDP per capita growth has been evidenced, confirming the ILG hypothesis in India. However, the reverse causality between growth and export/import did not appear in the empirical investigation. Similarly, the Toda and Yamamoto test results for China indicated unidirectional causality between merchandise export-import and service export-import and GDP per capita growth. This suggests the existence of the ELG hypothesis in China. The GLE hypothesis has not been manifested in the case of China. The study could have evidenced more accurate results if the standard cointegration and Granger causality test along with Toda and Yamamoto test would have been applied. However, such method was not employed for the analysis due to the mixture of different orders of integration of the variables. The study did not find any evidence of service-led growth in India possibly due to type-II error of hypothesis testing.

The study supports the ELG hypothesis for both these labour-abundant Asian countries. Cheap availability of labour, favourable trade environment and simultaneous export oriented policies increased the export competitiveness of the developing countries such as India and China in the world market. Increase in demand from international market enabled the utilisation of excess capacity and improvement in the efficiency, thereby reaping gains from economies of scale. In contrast, export-oriented production and investment improved technology and inculcated learning-by-doing approach in the production process of Emerging Market Economies (EMEs). Being EMEs, India and China experienced GDP growth due to increase in imports. This could be attributed to a decline in tariff and quantitative restrictions on the imports of intermediate and capital goods which enable better access of inputs to manufacturing firms. This lays the foundation for increase in productivity, efficiency and competition. Besides, importing such products improves technology available to firms and ensures the efficient use of available resources.

However, a word of caution is necessary as heavy dependence on intermediate imports may detriment economic growth in the long term by consuming more foreign reserves. Thus, countries should find their own alternatives by innovating new and updated technologies by investing more in research and development activities. Similarly, countries should promote their competitive export sectors by tapping foreign market, enhancing human capital and technological development to increase foreign exchange. Trade in services has contributed to the increase in GDP per capita growth, which in turn has increased the trade of these countries. Counties should undertake measures to develop efficient service sector as this sector has proved to be an engine of growth. Therefore, balanced emphasis should be given to all sectors contributing to economic growth as it is essential for sustained economic development of a country.

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Appendix I

Augmented Dickey Fuller Test Results

Variable	Integration	India		China	
		DF Test Statistic	P-Value	DF Test Statistic	P-Value
GDP	Level	- 0.6192	0.9666	- 3.8561	0.0293
	First Difference	- 2.7469	0.2852	N.A.	N.A.
	Second Difference	- 3.6373	0.0461	N.A.	N.A.
	Third Difference	N.A.	N.A.	N.A.	N.A.
GCF	Level	- 1.7119	0.6840	- 2.4078	0.4155
	First Difference	- 2.7527	0.2830	- 3.7419	0.0381
	Second Difference	- 4.4318	N.A.	N.A.	N.A.
	Third Difference	N.A.	N.A.	N.A.	N.A.
MEO	Level	- 3.6312	0.0459	- 3.4830	0.0633
	First Difference	N.A.	N.A.	- 3.6163	0.0473
	Second Difference	N.A.	N.A.	N.A.	N.A.
	Third Difference	N.A.	N.A.	N.A.	N.A.
MMO	Level	- 2.1558	0.5127	- 2.8588	0.2415
	First Difference	- 2.7021	0.3025	- 2.4965	0.3816
	Second Difference	- 4.2160	0.0149	- 2.9157	0.2209
	Third Difference	N.A.	N.A.	- 3.5198	0.0500
SEO	Level	- 2.5820	0.3483	- 0.2839	0.9852
	First Difference	- 2.2943	0.4595	- 2.9049	0.2244
	Second Difference	- 3.9270	0.0249	- 4.1675	0.0163
	Third Difference	N.A.	N.A.	N.A.	N.A.
SMO	Level	- 2.6135	0.3361	- 1.7049	0.6867
	First Difference	- 1.9906	0.5764	- 2.5775	0.3504
	Second Difference	- 4.2676	0.0127	- 3.4731	0.0656
	Third Difference	N.A.	N.A.	- 4.4655	0.0100

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