

# Macroeconomic Determinants of India's Export Growth (1970–2024): A VECM and Innovation Accounting Approach

**Dr. P. H. Shanavas<sup>1</sup>, Sreya Suresh K P<sup>2</sup>, Dr. Johnson K A<sup>3</sup>**

<sup>1</sup> Associate Professor, Department of Economics, Krishna Menon Memorial Government College, Kannur, Kerala, India

<sup>2</sup> Postgraduate student of Economics, Krishna Menon Memorial Government Women's College, Kannur, Keralam, India.

<sup>3</sup> Associate Professor, Department of Economics, EK Nayanar Memorial Government College, Elerithattu, Nilishwar, Kasaragod, Kerala, India

## **Abstract:**

The study explores the dynamic relationship between India's exports, economic growth, world exports and trade openness in the period 1970–2024 using annual time series data. The study uses cointegration and VECM frameworks and distinguishes the long-run equilibrium relationships from the short-run changes. Granger causality tests are employed to assess the directionality of the predictions. The relative impact of macroeconomic shocks and their transmission mechanisms are examined with IRFs and FEVD. The results show a steady long-run relationship among the major variables. The short run interactions and adjustments are also found to be significant. Innovation-accounting results reveal that exports are mostly driven by their own innovations over the projection horizon, but external and domestic macroeconomic shocks have measurable and durable consequences.

**Keywords:** Export Performance; Trade Openness; Cointegration; VECM; Granger Causality

## **1. Introduction**

India's position in world trade has changed dramatically in the last three decades. India, until the economic reforms of 1991, pursued a relatively inward-looking trade policy dominated by import substitution, heavy regulation and limited openness to international markets. The Liberalization, Privatization and Globalization (LPG) reforms launched in 1991 represented a turning point in India's trade policy framework. The LPG measure removed trade barriers, liberalized industrial licensing, stimulated foreign investment and supported export-oriented growth. Hence, India's integration in the global economy has been gradually increasing. India's proportion of world merchandise exports has been marginally improved from less than 1 per cent in the early 1990s to just over 1.8 per cent in recent years. In terms of volume, India's exports of goods and services have expanded substantially, reaching approximately US\$830 billion in 2024 despite global economic uncertainty (WDI, World Bank).

In the post Liberalization phase, there was a significant change in the trend, composition and destinations of India's exports. The importance of primary commodities in Indian export baskets reduced significantly,

and manufactured products and high-value services gain importance. Engineering goods, chemicals, pharmaceuticals, petroleum products, and electronic goods become major export categories. India has emerged as a major exporter of commercial and information technology services, business process outsourcing, financial services, and software-related activities.

India's trade connection with the growing economies in Asia, Africa and the Middle East have increased over the years. This helped the country to diversify its trade while retaining traditional markets like the US and European Union. The successive Foreign Trade Policies have focused on export competitiveness, market diversification, infrastructure development and trade facilitation. The Ministry of Commerce and Industry, Export Promotion Councils, Directorate General of Foreign Trade (DGFT) and Export-Import Bank of India provided policy support, financial aid, market intelligence and trade facilitation services to the exporters.

Performance of India's export sector is influenced not only by the country's domestic production capacity and policy measures but also by developments in the global economic environment. As large economies such as the US, the European Union, China, Japan and other emerging countries grow, demand for imports of products and services also rises. International price movements, including commodity prices, energy costs and world market conditions affect export earnings and profitability. Changes in Exchange rates also affect international competitiveness directly through the changes in relative prices of domestic goods in foreign markets.

India's international trade is also regulated by multilateral agreements, regional trade agreements, bilateral arrangements, tariffs and non-tariff measures. Moreover, better integration into global production networks offers chances for industrial upgrading and export diversification. Global supply chains are affected by geopolitical tensions, trade disputes, natural disasters and pandemics, which have had a negative impact on India's export.

## **2. Literature Review**

The export led growth hypothesis occupies a central position in the international trade and development literature. Krueger (1985) critically addressed the argument on import substitution and export promotion techniques and argued that inward-looking policies resulted in breeding inefficiency, weak competitiveness and slower economic growth. Conversely, developing countries who are adopting outward-oriented export promotion strategies are able to increase their resource allocation, productivity and structural change. Similarly, Mah (2011) studied the experience of export-led growth in South Korea and illustrated the role of state-guided export promotion policies in the transition of the country from an agrarian economy to a leading industrial exporter.

Yin and Yin (2005) emphasize the theoretical justification for export promotion policies, arguing that export promotion measures help overcome structural rigidities such as foreign exchange shortages and technological backwardness. Enisan and Okunlola (2022) pointed out that export promotion policies and agricultural expansion were the twin reasons which considerably reduced poverty in Nigeria in the short run and long run. In a related study, Chala, Norton & Grant (2010) found that selective export promotion strategies that promote investment in non-traditional export sectors had higher inter-industry linkages and greater effects on poverty reduction in Ethiopia. Shanavas, Anjali, Mufeeda (2026) examined that exports

of cereals from India are considerably influenced by dynamic global demand, trade policies and seasonal variations. Swaminathan et al. (2016) argued that agricultural export promotion results in rural employment, higher farm income and integration with global markets. Gupta et al. (2019) emphasized the need to boost competitiveness and productivity in export involvement at the firm level.

A considerable amount of literature has studied the macroeconomic factors of export performance. Tolulope & Olalekan (2017) in their study on Sub-Saharan African Countries stressed the relevance of commercial bank credit, macroeconomic stability and exchange rate management as a boost to the export competitiveness. Sein & Sah (2025) argued that exchange rate volatility negatively impacts GDP, whereas inflation shows a positive correlation. Therefore, their study point out that the stability in exchange rates is essential for sustainable growth.

### 3. Research Gap and Purpose

While much study has been completed on export-led growth, there are certain gaps persist. While there are many research on company level export performance or certain sectors (agricultural, manufacturing or SMEs), there are few comprehensive macro-economic studies. Existing studies do not separate the long-run equilibrium relationships from short-run dynamic adjustments and dynamic feedback loops across multi-decade sample periods. This study fills this gap by using a Vector Error Correction Model (VECM) and innovation accounting framework (1970–2024) to determine long-run cointegration and structural equilibrium among India's exports, domestic GDP, World GDP and trade openness, short-run dynamic adjustments and the speed of convergence toward equilibrium after exogenous macroeconomic shocks. The study also uses directional Granger causality and dynamic interdependencies across trade factors at both domestic and international levels. The study also includes the examination of shock persistence and variance decomposition to assess the relative impact of supply and demand factors to the forecast error over a 10-year horizon.

### 4. Data & Econometrics Methodology

The present analysis is completely based on secondary data acquired from several dependable sources at the national and international level. The annual time series data on India's exports, GDP, trade openness and macro-economic indicators were acquired mainly from the RBI, Ministry of Commerce and Industry, Government of India and World Bank's World Development Indicators publications and databases. The data used on World GDP and global trade variables were gathered from the World Bank and IMF data sets. This study uses analytical and empirical research design based on time series econometric methodologies to evaluate the factors of India's export performance. The analysis is performed in three stages that correspond to the aims of the study. The analysis is carried out in three stages in line with the aims of the study since export success is a function of both long-run structural determinants and short-run macroeconomic dynamics.

The first step considers the long run determinants of India's exports using annual data on exports, India's GDP, World GDP and trade openness. The export function in its baseline form is:

$$EXP_t = f(GDPIND_t, GDPWORLD_t, TO_t)$$

To reduce heteroscedasticity and facilitate elasticity interpretation, the variables are transformed into natural logarithms. The long-run export model is specified as:

$$\text{LEXP}_t = \beta_0 + \beta_1 \text{LGDPIND}_t + \beta_2 \text{LGDPWORLD}_t + \beta_3 \text{LTO}_t + \varepsilon_t$$

where:  $\text{LEXP}_t$  = Log of India's exports;  $\text{LGDPIND}_t$  = Log of India's Gross Domestic Product;  $\text{LGDPWORLD}_t$  = Log of World Gross Domestic Product.  $\text{LTO}_t$  = Log of India's Trade Openness and  $\varepsilon_t$  = Error term.

Due to the non-stationary nature of macroeconomic time series data, the Augmented Dickey-Fuller unit root test is used to test the stationarity properties of all the variables. The variables identified to be integrated of order one is then tested in a Johansen Cointegration Analysis to ascertain if a long run equilibrium connection exists among exports and their determinants.

A Vector Error Correction Model is calculated to account for both long-run equilibrium relationships and short-run corrections. The VECM framework allows us to investigate the speed of adjustment of the exporters to short term shocks. We estimate the Impulse Response Functions and Forecast Error Variance Decomposition to better study the dynamic interactions among factors. The IRFs show the response of exports to the shocks in GDP and trade openness. FEVD shows the percentage of forecast error variance in exports that can be attributed to each explanatory variable. The computed models are validated by several diagnostic tests. The Variance Inflation Factor is used to analyze multicollinearity. The Breusch–Pagan Test detects heteroscedasticity while the Shapiro–Wilk Test tests for normality of residuals. Durbin–Watson Test is applied for Testing Serial Correlation. These diagnostic approaches provide the reliability, robustness and validity of the calculated models and their accompanying inferences.

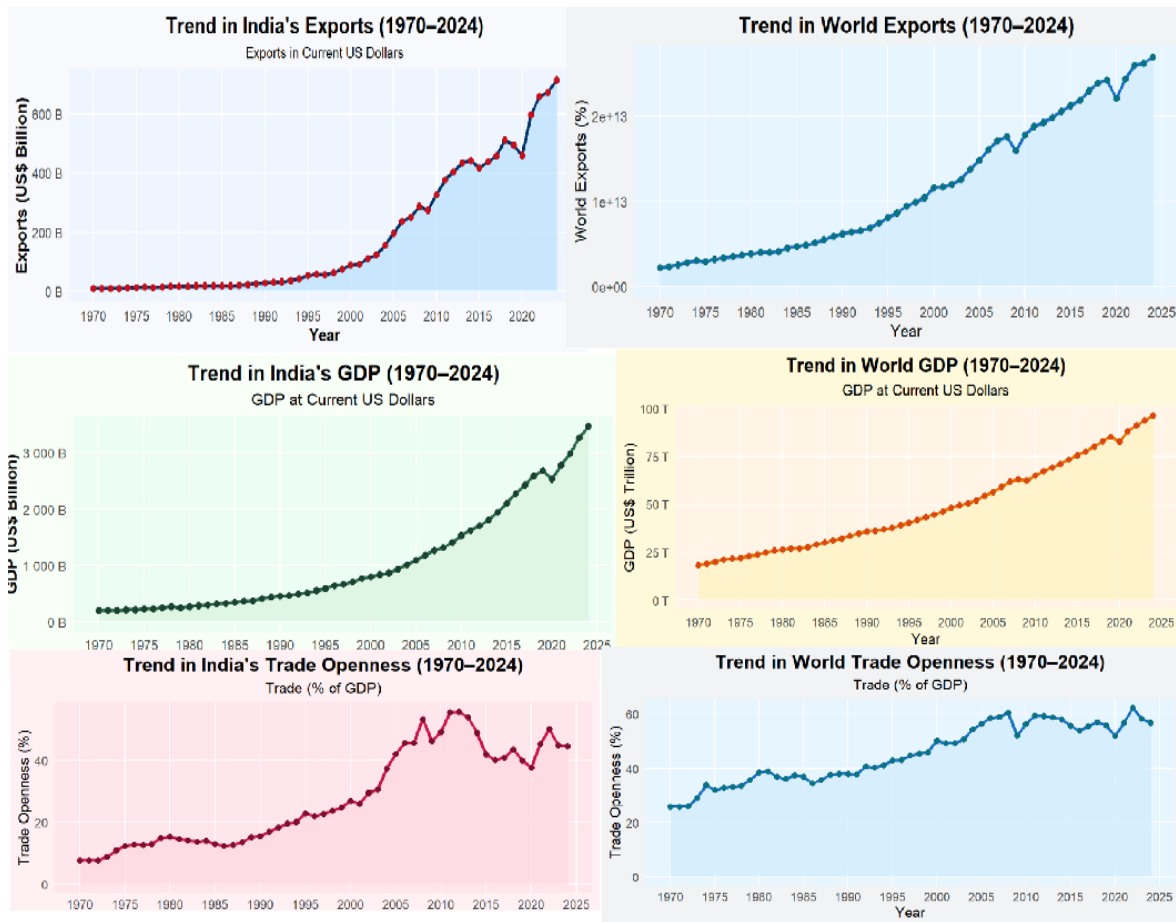
## **5. Empirical Results and Discussions**

### **5.1 Evolution of Major Macroeconomic and Trade Indicators**

The evolution of Exports, GDP and Trade Openness of India and the World over the period 1970–2024 are presented in figure 1. All the six series exhibit upward long-run trajectories, showing the expansion of both the Indian and global economies and the progressive deepening of international trade integration.

India's exports increased substantially over the study period. India's GDP growth was accompanied by a large increase in trade openness, particularly after the economic reforms of 1991. World GDP and world exports have shown sustained long run expansion. With the deepening of globalization, trade liberalization, technical advancement, and the expansion of global value chains, rapid expansion was evident in mid 1990s and later.

**Fig 1 Trends in Exports, GDP and Trade Openness**



As the figure 1 indicates, all the six series have exhibit periods of temporary disturbance, yet the general upward tendencies are maintained. The most noteworthy events during this period include, the Global Financial Crisis of 2008–09 and the COVID-19 pandemic in 2020 when international trade, economic activity and trade openness collapsed. But the eventual rebound in both domestic and global indicators shows the resilience in international trade and economic activity after the big shocks.

## 5.2 Descriptive Statistics

The descriptive statistics of the variables selected for the empirical analysis are presented in Table 1. The time period is selected as 1970–2024. The descriptive statistics show a significant increase of Indian and also the world economy throughout the study period. India's exports rose from US\$7.87 billion to US\$715.33 billion while India's GDP expanded from US\$201.53 billion to US\$3.48 trillion. Exports and world GDP also grew strongly, reaching US\$26.93 trillion and US\$96.49 trillion respectively by 2024. India's trade openness was 27.80 percent on average as against 45.38 percent for the global economy. This means that India's integration in international trade grew significantly throughout the study period, but nevertheless lagged below the world average.

**Table 1. Descriptive Statistics of the Variables, 1970–2024**

| Variable                       | Mean   | Median | Minimum | Maximum | SD     |
|--------------------------------|--------|--------|---------|---------|--------|
| India's Exports (US\$ billion) | 181.62 | 57.02  | 7.87    | 715.33  | 212.50 |

|                                                                                     |       |       |       |       |       |
|-------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|
| World Exports (US\$ trillion)                                                       | 11.57 | 9.47  | 2.24  | 26.93 | 7.89  |
| India's GDP (US\$ trillion)                                                         | 1.06  | 0.67  | 0.20  | 3.48  | 0.92  |
| World GDP (US\$ trillion)                                                           | 48.76 | 43.48 | 18.25 | 96.49 | 22.95 |
| India's Trade Openness (%)                                                          | 27.80 | 22.87 | 7.66  | 55.79 | 15.51 |
| World Trade Openness (%)                                                            | 45.38 | 44.84 | 25.79 | 62.42 | 10.74 |
| Source: Authors' calculations based on World Development Indicators of World Bank . |       |       |       |       |       |

The relatively high standard deviations of the level variables primarily reflect their pronounced long-term expansion and therefore provide an initial indication of the trending nature of the series. The subsequent unit-root and cointegration analysis is consequently essential for determining their time-series properties and establishing the appropriate VECM specification.

### 5.3 Unit Root Analysis

Stationarity of the variables selected for the study are analysed using ADF (Dickey & Fuller, 1979) and PP (Phillips & Perron, 1988) tests. The unit-root results indicate that all six variables are non-stationary in their level forms. The ADF and PP statistics at levels do not provide sufficient evidence to reject the null hypothesis of a unit root for India's exports, world exports, India's GDP, world GDP, India's trade openness, or world trade openness. The unit root test reveal the variables are stationary after first differencing, with five of the six variables being stationary. The only exception is India's GDP where the ADF statistic at first difference (-1.973) does not reject the unit-root null but the PP statistic (-3.574) shows stationarity. GDP of India has been considered as I(1) process for the study on the basis of evidence of PP test. The results of the cointegration test strongly support the classification of the variables as mostly I(1) processes, which is an essential condition for proceeding with cointegration analysis using the VECM.

**Table 2. Unit Root Test Results**

| Variable               | ADF Level | PP Level | ADF First Difference | PP First Difference | Integration Order |
|------------------------|-----------|----------|----------------------|---------------------|-------------------|
| India's Exports        | -0.089    | 0.254    | -4.858               | -5.991              | I(1)              |
| World Exports          | -1.688    | -1.585   | -6.265               | -7.757              | I(1)              |
| India's GDP            | 1.849     | 2.597    | -1.973               | -3.574              | I(1)*             |
| World GDP              | 0.148     | 0.452    | -4.065               | -6.486              | I(1)              |
| India's Trade Openness | -1.784    | -1.776   | -5.075               | -6.540              | I(1)              |
| World Trade Openness   | -2.437    | -2.284   | -7.411               | -8.080              | I(1)              |

**Notes:** \*India's GDP is classified as I(1) based on the PP test, although the ADF test does not reject the unit-root null at the first difference.

**Source:** Computed from World Development Indicators data using R.

### 5.4 VAR Lag Selection and Cointegration Analysis

The unit-root results indicate that the variables are I(1), providing the basis for testing whether the chosen macro variables share common long-run stochastic trends. Johanson and Juselius (1990) cointegration procedure was used to understand the long run relationship. The appropriate lag length was examined using various selection criteria. The lag-order results show some divergence, while the AIC selects eight lags, the Schwarz criterion and FPE select one lag. Given the relatively observations and the substantial



loss of degrees of freedom associated with a high-order VAR, the more parsimonious lag length of one is adopted for the subsequent analysis.

**Table 3: VAR Lag Length Selection Criteria**

| Lag | AIC       | HQ       | SC (BIC)  | FPE         |
|-----|-----------|----------|-----------|-------------|
| 1   | -27.4568  | -27.1605 | -26.6695* | 1.1942E-12* |
| 2   | -27.1933  | -26.6601 | -25.7762  | 1.5791E-12  |
| 3   | -27.0211  | -26.2508 | -24.9741  | 1.9525E-12  |
| 4   | -26.8237  | -25.8164 | -24.1468  | 2.5715E-12  |
| 5   | -27.1507  | -25.9064 | -23.8440  | 2.1202E-12  |
| 6   | -26.9220  | -25.4407 | -22.9855  | 3.3075E-12  |
| 7   | -27.7283  | -26.0100 | -23.1620  | 2.0709E-12  |
| 8   | -28.3104* | -26.3550 | -23.1142  | 1.9651E-12  |

Note: Asterisks indicate the lag selected by the respective information criterion

Source: Author's computation using R.

The Johansen results provide strong evidence of long-run dependence among the variables. The trace statistic rejects the null hypothesis of no cointegration ( $r = 0$ ), at most one ( $r = 1$ ), and at most two ( $r = 2$ ). The null of at most three cointegrating relationships cannot be rejected at the 5 percent level. The maximum-eigenvalue test produces the same rank decision. Both procedures therefore identify three cointegrating relationships ( $r = 3$ ) among India's exports, domestic GDP, world GDP, and trade openness.

**Table 4. Johansen Cointegration Rank Tests**

| Null hypothesis | Trace statistic | 5% critical value | Max-eigen statistic | 5% critical value |
|-----------------|-----------------|-------------------|---------------------|-------------------|
| $r = 0$         | 92.502          | 53.12             | 42.12               | 28.14             |
| $r \leq 1$      | 50.385          | 34.91             | 28.29               | 22.00             |
| $r \leq 2$      | 22.092          | 19.96             | 19.75               | 15.67             |
| $r \leq 3$      | 2.342           | 9.24              | 2.34                | 9.24              |

Note: Johansen tests estimated with a constant term. The underlying VAR uses one lag.

Source: Author's computation using R.

The finding of a cointegration rank of three implies that the four-variable system is characterized by three independent stationary long-run combinations and one common stochastic trend. This indicates that India's export performance, domestic economic activity, global economic conditions, and trade openness are not driven by completely independent long-run trends. Instead, deviations among these variables are constrained by multiple equilibrium relationships.

## 5.5 The VECM Analysis

The evidence of cointegration provides the econometric justification for estimating a Vector Error Correction Model rather than an unrestricted VAR in differences. The VECM framework (Christopher Sims, 1980; Lutkepohl, H. 2005) allows the analysis to distinguish between short-run responses and long-run equilibrium adjustment. The associated error-correction terms indicate how deviations from the long-run relationships are corrected over time.

**Table 4: VECM Analysis - Error Correction Term (Long-Run Adjustment)**

|                                       | ECT Coefficient | t-Statistic | p-value   |
|---------------------------------------|-----------------|-------------|-----------|
| $\Delta \text{LEXP}$                  | 0.15798         | 3.499       | 0.0010*** |
| $\Delta \text{LGDP\_India}$           | 0.10735         | 6.994       | 0.0000*** |
| $\Delta \text{LGDP\_World}$           | 0.03328         | 3.385       | 0.0014*** |
| $\Delta \text{LTO\_India}$            | 0.06400         | 1.336       | 0.1880    |
| *** $p < 0.01$                        |                 |             |           |
| Source: Author's computation using R. |                 |             |           |

The results reveal that the error correction term is statistically significant in the export equation (ECT = 0.158,  $p < 0.01$ ), the domestic GDP equation (ECT = 0.107,  $p < 0.01$ ), and the world GDP equation (ECT = 0.033,  $p < 0.01$ ). This suggests that these variables actively participate in the adjustment process whenever deviations from the long-run equilibrium occur. For instance, the statistically significant ECT coefficient in the export equation is 0.158, implies that approximately 15.8 per cent of the deviation of exports from the long-run equilibrium is corrected within one period. In contrast, the error correction term is not significant in the trade openness equation (ECT = 0.064,  $p = 0.188$ ).

The table 5 reports the short-run coefficients from the VECM. None of the lagged changes in domestic GDP, world GDP, trade openness, or exports is statistically significant in the export-growth equation. The coefficient on lagged domestic GDP growth is positive (0.2265) but statistically insignificant ( $p = 0.614$ ), while the coefficient on world GDP growth is negative (-1.0728) and also insignificant ( $p = 0.130$ ).

**Table 5. VECM Analysis-Short-Run Dynamics**

| Variable                                                                        | $\Delta \text{LEXP}$ | $\Delta \text{LGDP\_India}$ | $\Delta \text{LGDP\_World}$ | $\Delta \text{LTO\_India}$ |
|---------------------------------------------------------------------------------|----------------------|-----------------------------|-----------------------------|----------------------------|
| $\Delta \text{LEXP}(-1)$                                                        | 0.0132(0.954)        | 0.1435 (0.073)              | 0.0918 (0.073)              | -0.1288(0.600)             |
| $\Delta \text{LGDP\_India}(-1)$                                                 | 0.2265 (0.614)       | -0.2215 (0.151)             | -0.0564 (0.565)             | -0.3033 (0.525)            |
| $\Delta \text{LGDP\_World}(-1)$                                                 | -1.0728(0.130)       | -0.3292 (0.171)             | 0.2491 (0.107)              | 0.3914 (0.599)             |
| $\Delta \text{LTO\_India}(-1)$                                                  | 0.2227 (0.318)       | -0.0425 (0.574)             | -0.0951 (0.054)             | 0.2632 (0.267)             |
| $R^2$                                                                           | 0.5704               | 0.8192                      | 0.7626                      | 0.1847                     |
| Note: Entries are estimated coefficients; p-values are reported in parentheses. |                      |                             |                             |                            |
| Source: Author's computation using R.                                           |                      |                             |                             |                            |

Similarly, the lagged change in India's trade openness is positive but statistically insignificant (0.2227;  $p = 0.318$ ). The relatively weak short-run coefficients contrast with the significant error-correction mechanism reported above, shows that the principal adjustment among the variables operates through the long-run equilibrium relationship rather than through immediate year-to-year responses.

## 5.6 Granger Causality Analysis

Following the VECM estimation, joint Granger-causality tests (Clive Granger, 1969) were employed to examine whether lagged information in one variable contributes to predicting movements in the remaining variables. The results indicate significant predictive interactions within the system. This result shows the



importance of global economic conditions in shaping the dynamics of India's exports and other domestic trade-related variables.

**Table 4.12: Joint Granger Causality Tests**

| Null Hypothesis                                                                                                                                                                                     | F-Statistic | p-value | Decision     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------|--------------|
| $\Delta \text{LGDP\_India}$                                                                                                                                                                         | 1.994       | 0.0689  | Reject $H_0$ |
| $\Delta \text{LGDP\_World}$                                                                                                                                                                         | 4.193       | 0.0006  | Reject $H_0$ |
| $\Delta \text{LTO\_India}$                                                                                                                                                                          | 2.844       | 0.0114  | Reject $H_0$ |
| $\Delta \text{LEXP}$                                                                                                                                                                                | 2.800       | 0.0126  | Reject $H_0$ |
| <b>Notes:</b> $H_0$ : The excluded variable does not Granger-cause the remaining variables in the system. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. |             |         |              |
| Source: Author's computation using R.                                                                                                                                                               |             |         |              |

World GDP exhibits the strongest predictive role, with the null hypothesis rejected at the 1 per cent level. India's past exports and trade openness also contains significant predictive information for the remaining variables, with the corresponding null hypotheses are rejected at the 5 per cent level. Domestic GDP exhibits comparatively weaker predictive evidence. Therefore, the results indicate that global economic conditions and trade openness playing prominent roles.

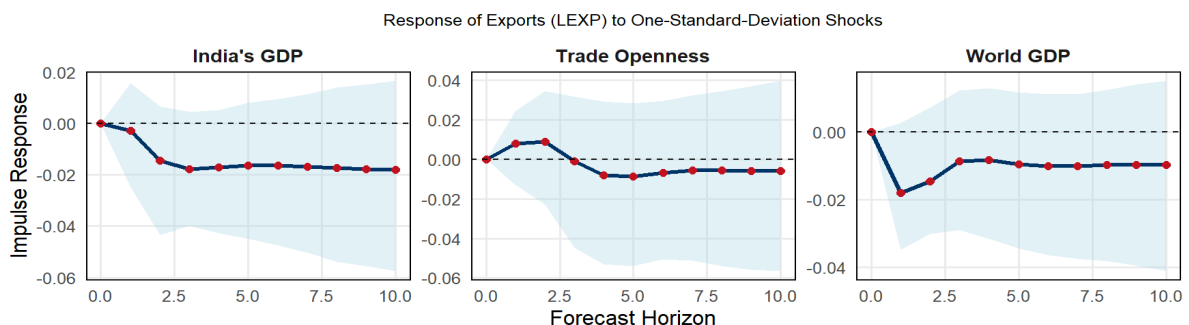
## 5.7 Innovation Accounting

The innovation accounting techniques were employed to analyse the temporal response of exports to unexpected innovations and assessing the relative contribution of different shocks to export fluctuations. For this, Impulse Response Functions (IRFs) and Forecast Error Variance Decomposition (FEVD) are employed (Pesaran & Shin, 1998). The IRFs trace the direction, magnitude and persistence of India's export response to innovations in domestic GDP, world GDP and trade openness. The FEVD, in turn, quantifies the relative importance of these innovations in explaining the forecast error variance of exports over different horizons.

### 5.7.1 Impulse Response Analysis

The IRFs were derived from the estimated VECM to examine the response of India's exports to one-standard-deviation innovations in India's GDP, world GDP and India's trade openness. A ten-period forecast horizon was considered to capture both the immediate and medium-term responses. The results are presented in Figure 2.

**Fig 2 Impulse Response Functions of India's Exports**



Source: Author's computation using R.

A positive innovation in India's GDP generates an initially negative response in exports. The negative response becomes more pronounced during the second and third periods before gradually stabilizing over the subsequent periods. The response remains relatively small in magnitude but persists throughout the forecast horizon. Exports show an initially negative reaction to an innovation in world GDP, with the largest negative movement during the initial time. The magnitude of the response subsequently declines and gradually approaches a stable path. The response of exports to a positive innovation in India's trade openness is initially positive. This response persists during the first few periods before turning negative and subsequently remaining relatively small.

These impulse responses indicate that India's exports respond to innovations in domestic economic activity, global economic conditions and trade openness, but the magnitude of these responses is relatively moderate. The responses generally diminish over the forecast horizon. This indicates that temporary shocks do not generate permanent departures from the long-run equilibrium path identified through the Johansen cointegration analysis.

### 5.7.2 Forecast Error Variance Decomposition of India's Exports

A Forecast Error Variance Decomposition (FEVD) is employed to quantify the contribution of innovations in Exports, India's GDP, World GDP and Trade Openness over the ten-period horizon. The FEVD results reveal a very high degree of persistence in India's export performance. At the first-period horizon, 100 percent of the forecast error variance is attributable to innovations in exports themselves.

As the forecast horizon increases, the contribution of own export innovations declines only marginally, reaching 95.33 percent by the tenth period. Thus, even over the longer forecast horizon, export-specific innovations remain overwhelmingly dominant in explaining fluctuations in India's exports. Among the external variables, India's GDP makes the largest contribution by the end of the forecast horizon. Its contribution increases progressively from 0.06 percent in period 2 to 2.74 percent in period 10. The contribution of world GDP increases to 2.58 percent by period 3 but subsequently declines, reaching 1.42 percent by period 10. The contribution of trade openness remains the smallest throughout the forecast horizon.

**Table 4.14: Forecast Error Variance Decomposition (FEVD) of India's Exports**

| Forecast Horizon | Exports (LEXP) | India's GDP (LGDP_IND) | World GDP (LGDP_WORLD) | Trade Openness (LTO_IND) |
|------------------|----------------|------------------------|------------------------|--------------------------|
| 1                | 100.00         | 0.00                   | 0.00                   | 0.00                     |
| 2                | 96.94          | 0.06                   | 2.53                   | 0.48                     |
| 3                | 95.72          | 1.02                   | 2.58                   | 0.67                     |
| 4                | 95.64          | 1.80                   | 2.09                   | 0.48                     |
| 5                | 95.52          | 2.15                   | 1.79                   | 0.54                     |
| 6                | 95.42          | 2.32                   | 1.65                   | 0.60                     |
| 7                | 95.38          | 2.44                   | 1.58                   | 0.59                     |
| 8                | 95.37          | 2.55                   | 1.52                   | 0.56                     |
| 9                | 95.35          | 2.65                   | 1.47                   | 0.53                     |
| 10               | 95.33          | 2.74                   | 1.42                   | 0.52                     |

Notes: Entries represent percentages of the forecast error variance of India's exports.

Source: Author's computation using R.

The results therefore suggest that India's export dynamics are characterized by strong persistence, with external macroeconomic shocks playing a comparatively smaller role in explaining short- and medium-term fluctuations. Among the external determinants, domestic GDP assumes increasing importance over the longer forecast horizon, while world GDP has a relatively greater contribution during the earlier periods. Trade openness, despite its theoretically important role in India's integration with global markets, accounts for only a small proportion of export forecast variance in the estimated system. The VECM results and innovation accounting therefore suggests that India's export performance reflects a combination of long-run equilibrium forces and substantial own-sector persistence, with domestic and global macroeconomic conditions exerting relatively modest but identifiable influences.

## 6. Policy Implications and Conclusion

The strong persistence of export performance suggests that export policy should focus not merely on short-term incentives but on strengthening the underlying productive and competitive capacity of the export sector. Policies capable of generating sustained improvements in productivity, product quality, technological capability, logistics and market diversification may have greater long-term significance than temporary export incentives. The relatively small contribution of trade openness to export forecast variance suggests that openness by itself may not be sufficient to generate sustained export expansion. The benefits of international integration are likely to rely on whether domestic firms have the productive and technological capacity to leverage international market opportunities. The study concludes that India's export performance is best understood as the result of a long-run interaction between domestic production capacity, global economic conditions and international integration, working through a highly persistent export process. This study finds evidence of co-integration between exports and GDP, although export fluctuations are highly persistent and only gradually influenced by domestic income, global income and trade openness. The evidence points towards a mutually reinforcing relationship in which exports and economic growth adjust together over time, while the strength and timing of these interactions depend on the broader domestic and international economic environment.

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