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EXPORT-LED GROWTH IN INDIA: WHAT DO THE VARS REVEAL?

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EXPORT-LED GROWTH IN INDIA: WHAT DO THE VARS REVEAL?

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Abstract

This study examines the long-run relationships among exports, imports, gross domestic capital formation, trade policy and GDP in India for the period 1965-66 to 1997-98 within the framework of Vector Autoregressions (VARs) augmented with an error correction mechanism. Overall, the estimates of forecast error variance decomposition (FEVD) do not lend support to the export-led growth hypothesis but brings out a strong relationship among imports, exports, trade policies, investments and GDP in India.

Introduction

As a better strategy to stimulate growth some economists [Krueger (1978), Bhagwati (1988) and Balassa (1989) etc.] have advocated export promotion more than import substitution. It has been argued that export promotion leads to specialisation in production, resulting in productivity gains. Export-led strategy is expected to lead to a more efficient allocation of resources by shifting factors of production to more a productive export sector. Further, it is seen that rising export earnings lead to an improvement in balance of payments, lighten the debt burden and support higher growth rates by increasing import capacity. Growth of exports and imports also increases access to the benefits of international trade, including new ideas, modern technology, competition, economies of scale and creation of domestic industries around new markets. Thus, a trade policy formulated to promote exports and regulate imports directly and indirectly influences economic growth. Along with exports and imports, gross investment is also seen as an essential factor for enhancing growth, as it provides the necessary inputs for expanding production of exports and demand for imports.

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The proposition that international trade promotes growth of national economies has been analysed in considerable detail since the early 1970's and more so after the East Asian miracle. Until recently, in countries such as Malaysia, Indonesia, Thailand, Taiwan, Philippines and South Korea, which experienced consistent high growth rates for more than a decade, the process of development has been understood to be export-led, i.e., no other variable has been so dynamic as a factor of economic growth as growth of exports. However, in most of these economies, imports have been a crucial factor in the increase in exports. The evidences in the literature have been quite mixed, however.

Starting with simple correlations and regressions, the literature of late, has witnessed application of a wide range of time series techniques such as vector autoregression (VARs), causality, cointegration and error correction methods. While the correlation and regression techniques are inadequate for establishing the underlying causal relationship between exports and growth, the time series models employed in this context are also not free from limitations. The VARs consider a system of relationships, which while being flexible are general in character. The causality tests are confined to stationary bivariate systems. While dealing with relationships involving non-stationary variables, cointegration and error correction techniques however, are more appropriate, especially for inferring long-run causal nexus. But these techniques proceed on the assumption that the variables concerned do not exhibit any trend breaks. This assumption is somewhat unrealistic and misleading, given the fact that the policy changes initiated under the structural adjustment programme pursued by various countries may have caused discrete but pronounced changes in the export-growth nexus. In other words, the exogenous changes in trade regimes, deregulated environment and global integration of economies might have resulted in trend breaks in export growth as well as economic growth. Therefore, the issue of trend breaks should be properly addressed while examining the export-led growth hypothesis. There are no studies to date in this direction. The present study makes a modest attempt to fill the gap, by testing for unit roots in the variables when exogenous as well as endogenous trend breaks occur.

In the light of the above, it is felt that an appropriate way of looking at the export-growth nexus is not by confining to bivariate relationships, but by formulating an unrestricted VAR system

consisting of exports, imports, growth, capital formation and trade policy as integral components. The export-growth link may then be examined within the VAR framework, accommodating for trend breaks in the components of the system. The present study, therefore, looks at this pertinent issue and attempts to re-examine the long-run linkage between export growth and economic growth within the framework of VAR, augmented by an error correction mechanism, by employing unit root tests, due to Perron (1989; 1997). The remainder of the paper is planned as follows: The second section presents a review of select studies relevant to the context, the third section describes the data and methodology employed, the fourth section presents the empirical analysis followed by the conclusions of the study in the fifth section.

Review of Previous Work

While the early studies adopted the neo-classical production function framework, the recent ones relied upon testing for causal directions and searching for long-run relations using a theoretical time series techniques. As a background to this study, an attempt is made here to present a brief review of selected studies.

In a seminal paper, Feder (1982) provides an analytical basis for an empirical study on the relationship between exports and economic growth. The study identifies two channels by which exports influence growth: First, through positive externalities of the export sector on the non-export sector. Second, through greater productivity differential in the export sector as compared to the non-export sector. Both the channels are tested in a neo-classical production framework using ordinary least squares (OLS) regressions for a cross-country data of 31 countries, including India during 1964-73. The empirical evidence offers support for both the channels tested, although the evidence is shown to be stronger in the first case than in the second. The study does not take into consideration 'imports' while assessing the impact of exports on growth.

Negating the general argument of dependency and world-system theory that various forms of external economic dependence have negative effects on the growth of nations, Jafee (1985) shows how export dependence, a widely used measure of international economic dependence, affects economic growth using the analysis of covariance in the case of less developed countries (LDCs) during

1960-77. Another study by Moshos (1989) brings out the effects of export expansion on economic growth in a switching regression framework. The study adopts an aggregate supply analysis in which labour and capital are construed as determinants of output. The study uses cross section data of 71 developing economies during 1970-1980. The results indicate existence of a critical development level below and above which the responses of output growth to its determining factors differ substantially. The evidence contradicts the view that among more advanced developing economies, the effect of export expansion on growth is stronger than among less developed economies.

Serletis (1991) investigates the relationship between export growth and GNP growth using annual Canadian data from 1870-1995. The study examines whether knowledge of past export growth promotes prediction of future GNP growth, beyond predictions that are based on past GNP growth alone. The results reveal that exports and growth are not cointegrated, implying that the GNP trend is not a linear combination of export and import trends. The findings suggest that export growth and GNP growth are independent.

Following Feder (1982), Esfahani (1991) examines, among others, the inter-relationship between exports, imports and output growth in a simultaneous-equation framework. In particular, the paper examines the consequences of adding imports to the list of input requirements for output growth because of a binding foreign exchange constraint and also on account of a strong correlation between exports and imports. Using the data set comprising a sample of 31 countries, including India over three time periods (1960-73, 1973-81 and 1980-86), the study mainly shows the positive impact of exports on GDP due to import-reduction rather than the Feder's type externality effect.

Rejecting both the export-led growth and growth-led export hypotheses, Dodaro (1993) suggests a reconsideration of the whole relationship between exports and economic growth in LDC's. The empirical analysis involves OLS estimations for a total of 87 LDCs, including India during the period 1967-1986. Mallick (1994) estimates the causal relationship between exports and economic growth in India employing Granger, Sims and Modified Sims tests over the period 1950-51 to 1991-92. The model includes an important link variable 'imports' which enters into the production

function to determine output growth, and hence the relationship between exports and economic growth. The results support the feedback hypotheses between income and export growth. Both the studies ignore testing for the stationary properties of exports and growth.

Thornton (1995) investigates the long-run relationship between real exports and GDP in Mexico during 1895-1992. The study finds a positive and significant Granger causal relationship running from exports to economic growth. Oxley (1995), using cointegration and Granger causality tests, rejects the hypothesis of export-led growth in favour of reverse causality running from economic growth to exports in Portugal during 1865 to 1985. Henriques and Sadorsky (1996) attempt to answer the question: 'Does rapid income growth lead to rapid trade expansion, or is it the other way round?' by testing three competing but not mutually exclusive hypotheses, viz., i) export-led growth hypothesis, ii) growth-driven exports hypothesis, and iii) feedback (between the two) hypothesis. The empirical evidence for the Canadian data supports the growth-driven hypothesis, implying that changes in GDP precede changes in exports.

In another study, Dutt and Ghosh (1996) explore the long-run relationship between exports and economic growth using the cointegration framework for 26 high, low and middle income countries, including four newly industrialised countries (NIC's) of Asia 1953-1991. They conclude that the causality structure of exports and economic growth is economy-specific and therefore attempts at generalization are inappropriate. A similar caution has been provided in Henriques and Sadorsky (1996). Using cointegration and error correction framework Kamaiah and Mohsin (1997) examine the export promotion hypothesis in Asian countries and show mixed evidence.

Oluwole and Akorlie (1997) find significant variation in the real output levels due to changes in exports, imports, gross investment and trade policy, in 12 Sub-Saharan African countries during 1965(1991 using VAR technique augmented with error correction term. Forecast error variance decomposition (FEVD) is used to separate the effects of each variable on others and on its own. The study concludes that sizeable variations in real output growth in ten of the twelve countries are due to changes in trade

policies and exports, with some contributions from shocks to gross investment.

Using Johansens' multiple cointegration test, the long-run relationship among real output, exports and imports for four less developed countries, viz., India, Fiji, Nigeria and Papua New Guinea, is estimated by Adjaye and Charaborthy (1999). The study period is 1960-1994 in the case of India and Nigeria, 1973-1993 for Papua New Guinea and 1969-1993 for Fiji. Real output, exports and imports are found to be cointegrated in Nigeria and Fiji, and the error correction mechanism suggests that Granger causality runs from exports and imports to real output in these two countries. Further, the results report that there is causality from real output to exports for Nigeria and Fiji, while in the case of India and Papua New Guinea, there is no evidence of causal relationship between these two variables. In addition, the study provides evidence for exports being an important source of foreign exchange for importing the much-needed capital inputs for higher economic growth.

Nidugala (2000) analyses the role of exports in India's economic growth employing a modified version of Esfahani's study (1991). He tries to examine the stability of the relationship between exports and growth through switching regressions in the Indian context. An attempt is also made to test whether the monetary and fiscal factors, structure of the economy and supply shocks (both domestic and external) have any significant impact on India's economic growth during the period 1960-1989. The study shows that exports play a crucial role in influencing GDP in the 1980's. However, during the period 1961-62 to 1979-80, the influence of exports is found to be weak. There is also evidence of a positive relationship between exports and growth in the 1980's due to a higher level of development and change in the composition of exports in favour of manufactured exports by the Indian economy. The study suffers from the same limitation as in Mallick (1994).

Sampath and Anwar (2000) also test for export-led growth hypothesis using data of 97 countries for the period 1960-1992, using the unit root and cointegration tests. The causality between exports and GDP for those countries wherein exports and growth are related in the long-run is also tested. The results indicate that in 30 countries economic growth has a positive impact on exports, while in 29 countries the reverse is found.

Anorou and Ahmad (2000) show a positive relationship between openness and economic growth in select ASEAN countries for 1960(1997 by using Johansen's cointegration technique. The causal relationship between economic growth and openness is examined with the help of Granger causality based on vector error correction model (VECM). The study finds a long-run relationship between economic growth and openness, and shows that there is feedback causality running from both sides. The results support both the openness-driven economic growth and growth-driven openness hypotheses.

The studies reviewed above and a close look at the literature reveal that variables such as trade policy, imports and gross investment which have gained prominence in the 1990s have not been paid adequate attention while dealing with the issue of export-led growth hypothesis. Since the 1980s, many economies have resorted to the Fund-Bank sponsored Structural Adjustment Programme (SAP) and strived towards integration of their domestic economies with the global economy to reap the benefits of international trade. This obviates the role of trade policy to enhance the performance of any economy. Similarly, in the existing literature in India, imports, exports and gross investment have not been used together while assessing their impact on economic growth. Since such a study has not been attempted in India, the present study is undertaken. Keeping in view this observation as well as the recognition of the need to subject the concerned variables to trend break analysis, the present study attempts to investigate the long-run relationship and short-run interactions among exports, imports, gross investment, trade policies and economic growth during 1965-66 to 1997-98.

Methodology and Data

The methodology used in this study is on the lines of Olugbengo et al (1997) and Anorou and Ahmad (2000). Further, an innovation in the present study is the application of unit root tests which take care of trend breaks in the variables [Perron (1989,1997)]. An unrestricted VAR model consisting of GDP, exports, imports, gross domestic capital formation and trade policy is formulated. The VAR model is augmented by an error correction term, which is to be obtained from a cointegrating relationship.

Annual time series data for the period 1965-66 to 1997-98 (in nominal terms) are used in this study. The data are compiled from the *Economic Survey* of the Government of India. Here, gross domestic capital formation is proxied by gross investment. It has been considered as an important factor for promoting economic growth. To analyze the impact of the trade policies on economic growth, trade policy dummy variable is introduced in the VAR system. Thus the trade policy (TP) dummy variable divides the sample period into two sub-periods viz.: 1965-66 to 1991-92 and 1992-93 to 1997-98. The trade policy dummy variable assumes a value of zero ($TP = 0$), for the 1965-66 to 1991-92 period, and unity ($TP = 1$) for the years 1992-93 to 1997-98. The presence of both exports and trade policy variables in the same VAR system is intended to provide useful reference to discuss the causal impact of export earnings and trade orientation on growth of GDP.

The variables are checked for stationarity to avoid spurious results. Considering the size and power problems (Maddala and Kim, 1998) of the conventionally used unit root tests like Dickey-Fuller and Augmented Dickey-Fuller, the present study employs USB (Bhargava, 1986), KPSS (1992), Perron's (1989) exogenous and Perron's (1997) endogenous structural break unit root tests to examine the stationary properties of the series: exports, imports, capital formation and GDP. The unit root tests are followed by the Johansen-Juselius (1990) cointegration procedures to test for the existence of a stable long-run relationship among the variables. Thereafter, the VARs augmented with error correction terms (residuals) derived from the estimated long-term cointegration relationships, is estimated to confirm the export-led growth hypothesis using the technique of FEVD. The estimated VAR models with the error correction term are of the following general form:

$$\Delta \text{GDP}_t = \alpha_0 + \alpha_1 \Delta \text{Ex}_{t-1} + \beta_1 \Delta \text{Im}_{t-1} + \phi_1 \Delta \text{Ca}_{t-1} + \varphi_1 \Delta \text{EC}_{t-1} + \psi \text{TP} + \varepsilon_t$$

where Δ is the difference operator, GDP is Gross Domestic Product; Ex is exports, Im is imports, Ca is gross domestic capital formation, EC_{t-1} is the lagged error correction term, TP is trade policy dummy variable and ε_t is white noise error term.

Empirical Analysis

The R_1 and R_2 test statistics of the URSB (Bhargava, 1986) test (see Appendix A.1) fail to reject the null hypothesis of a unit root for all the variables in levels. In the first differences, the R_1 and R_2 statistics are significant suggesting that the variables are integrated of order one [I (1)] i.e. stationary. The KPSS (1992) unit root also confirms that the series under consideration is I (1) (see appendix-A.2). Similarly, the BLS (1992), Perron's exogenous (1989) and Perrons' (1997) and endogenous structural break unit root tests also reveal that the variables are non-stationary in levels but stationary after first differencing (see Appendices A.3, A.4 and A.5). The trend breaks in the variables are also reported in the Appendices-A.4 and A.5. Thus the various tests show variables considered here are all I (1).

Since all the series are found to be I (1), the next step is to search for cointegrating relationships among the variables. Here the Johansen-Julesius test which provides the most efficient estimate of the cointegrating significant vectors and also identifies the number of cointegrating relationships among the non-stationary variables, is employed.

In Appendix B.2, the eigen values and the likelihood ratio (LR) statistics for determining the number of cointegrating vectors (v) wherein the null hypothesis of no cointegration ($v = 0$) versus the alternatives of $v \leq 1$, $v \leq 2$, $v \leq 3$, $v \leq 4$ have been tested. The results reported in appendices B.2 and B.3 reveal that the null hypothesis of no cointegration ($v = 0$) is rejected at the 5% level of significance. But the null hypothesis that $v \leq 3$ is accepted at the 5% level confirming that there are only three cointegrating vectors among the variables. The sharp fall in the eigen values confirms this result. From the above analysis, it may be inferred that GDP, exports, imports, gross domestic capital formation and trade policies are cointegrated with three cointegrating vectors. Further, the cointegration LR test (see appendix-B.3) based on the trace statistics also confirm the existence of three cointegrating vectors.

While the estimated cointegrating vectors show the long run equilibrium relationship among GDP, exports, imports, capital formation and trade policy, the dynamic adjustments that occur in the short run leading to stable long-run relations in response to

various shocks to the system remain unspecified. The dynamic relations among the series can be established in the VAR model by conducting variance decomposition (VDCs) tests of the forecast errors at different time horizons.

The results of the FEVD are reported in table 1. As noted earlier, the FEVD measures the effects of a shock in each of the variables on own as well as the rest of the variables in the system. The numbers in table 1 represent the fraction of the forecast error variance in the variables generated by innovation in each of the variable in the system as given in column 1. Considering the annual data, we have chosen eight-year forecast time horizon for the FEVDs.

The results of the exports (ΔEx) variance decompositions show that the export growth is largely explained (67% for time horizon 2) by its own shocks. Even after an eight-years period, more than 50% of the variance is explained by its own shocks. The results also show that import shocks have some influence (26.4% for time period 2) in explaining the export growth. The import innovations are more significant in export forecast error variance even after eight year (33.8%). However, gross domestic capital formation (ΔCa) and ΔGDP have no such strong influence upon the export growth. The trade policy reforms affect the export growth to some extent (3.8% for time horizon 2) in a shorter period, but it explains 10.5% for horizon 8. Therefore, export forecast error decompositions establish the long-run relationship between export and trade policy.

Coming to imports (ΔIm) variance decompositions, it is largely explained by its own shocks and shocks to exports. Shocks to capital formations and GDP account for only 1.1% and 1.3% in the variance of the import growth. However, export innovations account for 39% of the forecast error variance of the import after eight years showing the long-run relationship between the exports and imports. There is immediate impact of the trade policy on the imports (7.2% for the time horizon 2) but it slows-down over a long period.

In the case of gross domestic capital formation (ΔCa), shocks to imports have a substantial influence (64.9% for time horizon 2 and 40.6% even after eight years of time horizon). This

supports the view that India imports heavy capital, technology and other raw materials that are used for capital formation. The shocks to exports explain 13.6% for period two, but it increases to 31.8% after eight years. However, growth of gross domestic capital formation is little explained by its own shocks (16.4% for time horizon 2) and it only accounts for 12.7% after eight years. Nonetheless, GDP and trade policies (TP) have a negligible impact on the gross domestic capital formation (2.3% and 1.9% for time horizon 2 respectively).

Turning to GDP forecast error variance decompositions, it is largely explained by the shocks to imports (71.4% for time horizon 2). Innovations to imports explain GDP growth by more than 50% even after eight years of period. Innovations to the exports account for 13.8% for the time period two but it explains 29.4% of GDP growth after eighty year of horizon period. This supports the export-led growth hypothesis in the long time horizon. From the table, it is clear that the growth of GDP is more influenced by shocks to imports, to exports and to trade policies (6.4% for period 2 and 13.8% for period 8). This establishes a strong relationship among exports, imports, trade policy and growth. Trade policies are more influenced by the own shocks and those to exports and imports.

The trade policy forecast error variance decompositions show that it is more explained by own innovations (54.5% for period 2). Nonetheless, the export and import innovations account for equally 20.9% each for period two. As the time horizon increases, shocks to exports and imports explain the trade policy variable to a considerable extent (34.1% and 33.3% after 8 years). This establishes a strong inter-relationship between exports and imports, and trade policy. In sum, both exports and imports influence the trade policy in the long run.

In sum, the variance decomposition tests indicate that export and import are endogenous to the system as they are largely explained by their own shocks. In case of trade policy also, it is endogenous but at the same it is influenced to a great extent by the shocks to exports and imports. The strong inter-relationships among trade policy and exports and imports which influence the growth of GDP supports the theory of trade promotion and economic growth. The findings also support that trade policies directly and indirectly affect the growth of exports and imports and thereby influence GDP over a period of time.

Concluding Remarks

The forecast error variance decomposition (FEVD) tests reveal that exports and imports are endogenous to the system. The results also indicate that there is a strong relationship among exports, imports and capital formation. In fact, imports and exports have significant impact on the capital formation in both short and long runs. The relationship among imports and GDP growth has also been found to be strong. Both imports and exports have significant effect on the GDP growth in the relatively long period. Even the FEVD statistics show a strong relationship between exports, imports and capital formation. On the whole, the results of the study do not lend support to the export-led growth hypothesis, but at the same time bring out the fact that there exists a strong relationship among exports, imports, gross investment and GDP each of which is influenced by the other in the short and long run as well.

Appendix

A.1 : URSB¹ Unit Root Test Statistics

Variables	Levels		First Differences			
	R_1	R_2	R_1	R_2	CV(R_1)	CV(R_2)
Ex	0.03	0.06	0.90*	1.84*	0.26	0.35
Im	0.03	0.10	0.38*	0.69*	0.26	0.35
Ca	0.03	0.06	1.34*	1.72*	0.26	0.35
GDP	0.03	0.07	0.27*	0.73*	0.26	0.35

Note : R_1 and R_2 are the test statistics of URSB unit root test.

*Significant at 5% level, CV refers to critical values at 5% level.

A.2 : KPSS Unit Root Test Statistics

Variables	Levels		First Differences	
	ETA (μ)	ETA (τ)	ETA (μ)	ETA (τ)
Ex	0.761	0.222	0.715*	0.195*
Im	0.777	0.226	0.577*	0.193*
Ca	0.743	0.212	0.737*	0.153*
GDP	0.899	0.206	0.724*	0.211*

Note: * refers to significant at 5% level. Here the estimated values of the ETA (μ), ETA (τ) in the first differences is less than the table values accepting the null hypothesis of no unit root in the series. KPSS procedure calculates ETA (μ) and ETA (τ) statistics. The null hypothesis in ETA (μ) test is that the given series is stationary around a level. But in ETA (τ) the null hypothesis is trend stationary. Critical values are obtained from KPSS (1992).

A. 3: BLS Unit Roots Test Statistics

Variables	Levels		First Differences	
	Test	ADF#	ADF#	ADF#
With Constant, No Time Trend				
Ex	1	0.319	-14.617*	
	2	0.215	-1.230*	
	3	0.595	-5.087*	
Im	1	0.173	-7.681*	
	2	0.619	-0.609*	
	3	1.045	-3.822*	
Ca	1	0.395	-22.502*	
	2	0.078	-1.014*	
	3	0.420	-4.784*	
GDP	1	0.245	-3.164*	
	2	1.315	-0.385*	
	3	1.932	-2.313*	
With Constant and Time Trend				
Ex	1	-3.484	-30.483*	
	2	-0.821	-4.853*	
	3	-1.499	-29.040*	
Im	1	-1.939	-16.482*	
	2	-0.436	-3.606*	
	3	-2.450	-23.196*	
Ca	1	-1.462	-43.609*	
	2	-0.688	-3.932*	
	3	-1.605	-30.865*	
GDP	1	-0.876	-12.840*	
	2	-0.049	-4.592*	
	3	0.549	-31.447*	

Note : *Test 1, 2 and 3 refer to BLS unit root test 1, 2 and 3.
 Significant at 5% level; # refers to sequential Augmented Dickey-Fuller
 test statistics.
 Critical values are obtained from BLS (1992)

A. 4: Perron's Exogenous Structural Break Test Statistics for Unit Roots

Variables	Levels		First Differences	
	t-statistics	TB	t-statistic	TB
Ex	2.454 (-3.68)	1994	-5.318 (-3.68)	1994
Im	2.822 (-3.68)	1994	-5.545 (-3.68)	1994
Ca	0.063 (-3.68)	1994	-7.327 (-3.68)	1994
GDP	2.918 (-3.68)	1994	-4.845 (-3.68)	1994

Note : The values inside the parenthesis refer to the critical values at 5% level, TB refers to time break. Here we have taken only model 'b' of Perron's exogenous structural break unit root test statistics as the model 'a' and 'c' are reporting inconsistent results. Critical values are obtained from Perron (1989).

A.5 : Perron's Endogenous Structural Break Test Statistics for Unit Roots

Variables	Levels			First Differences	
	Models	t-statistics	TB	t-statistic	TB
Ex	IO1	-0.27	1991	-5.45**	1990
	IO2	-3.00	1987	5.75**	1985
	AO	-3.55	1988	-6.18*	1987
Im	IO1	-0.58	1978	-5.02***	1967
	IO2	-1.03	1980	-5.32***	1967
	AO	-3.95	1983	-8.41*	1981
Ca	IO1	-0.51	1994	-14.36*	1995
	IO2	-2.75	1990	-11.03*	1994
	AO	-2.97	1991	-9.21*	1985
GDP	IO1	0.92	1996	-4.93***	1993
	IO2	0.20	1990	-5.31***	1985
	AO	-3.28	1991	-4.57***	1987

Note : * significant at 1% level, ** significant at 5% level and *** significant at 10% level.

TB refers to time break Critical values are obtained from Perron (1997). Perron's Endogenous tests for unit root and trend break implements several tests on breaking trend functions when the date of possible change in the intercept and the slope is not fixed a priori. The three tests implemented in this study are:

IO1: Innovational outlier with a change in the intercept

IO2: Innovational outlier with a change in the intercept and slope

AO: Additive outlier with a change in the slope only but both segments of the trend functions are joined at the time break

The method employed to choose the optimal break date is that of minimising 't' statistics.

B.1 : Engle-Granger Cointegration Procedure

Variables	Levels		First Differences	
	URSB		KPSS	
	R_1	R_2	ETA (μ)	ETA (τ)
μ_1	0.898*	0.737*	0.244*	0.204*
μ_2	1.083*	1.086*	0.492*	0.181*
μ_3	0.829*	0.496*	0.448*	0.121*
μ_4	0.588*	0.447*	0.342	0.185*

Note : *Significant at 5% level. In URSB the estimated values are greater than the critical values to reject the null of unit root but in KPSS the estimated values are less than the critical values to accept the null of no unit root.

B.2 : Cointegration LR Tests Based on Maximum Eigen Value of the Stochastic Matrix: Exports, Imports, Capital, GDP and Trade Policy

Eigen Value	Null	Alternative	LR Statistics	Critical Values
0.981	$v = 0$	$v = 1$	127.51*	37.07
0.913	$v \leq 1$	$v = 2$	78.31*	31.00
0.552	$v \leq 2$	$v = 3$	25.70*	24.35
0.344	$v \leq 3$	$v = 4$	13.50	18.33
0.009	$v \leq 4$	$v = 5$	0.29	11.54

Note: *Significant at 5% level

B.3 : Cointegration LR Tests Based on Maximum Trace of the Stochastic Matrix: Exports, Imports, Capital, GDP and Trade Policy

Eigen Value	Null	Alternative	Trace Statistics	Critical Values
0.981	$v = 0$	$v \geq 1$	245.33*	82.23
0.913	$v \leq 1$	$v \geq 2$	117.82*	58.93
0.552	$v \leq 2$	$v \geq 3$	39.50*	39.33
0.344	$v \leq 3$	$v \geq 4$	13.80	23.83
0.009	$v \leq 4$	$v \geq 5$	0.29	11.54

Note: *Significant at 5% level

Table-1**Forecast Error Variance Decomposition at Various Time Horizons**

Variance of	Time horizon	% of Forecast Error Variance Explained by				
		ΔEx	ΔIm	ΔCa	ΔGDP	TPD
ΔEx	2	67.1	26.4	2.6	8.2	3.8
	4	56.4	32.3	3.2	1.1	7.0
	6	52.1	33.8	2.7	2.1	9.2
	8	50.3	33.8	2.3	4.6	10.5
ΔIm	2	31.0	59.2	1.1	1.3	7.2
	4	33.6	52.2	1.1	2.4	0.5
	6	6.6	47.0	1.1	3.2	1.9
	8	9.0	43.3	1.0	3.8	2.6
ΔCa	2	13.9	64.9	16.4	2.3	1.9
	4	26.4	52.1	14.9	3.3	3.2
	6	29.7	48.6	13.7	3.8	4.1
	8	31.8	46.3	12.7	4.1	4.8
ΔGDP	2	3.8	71.4	5.2	2.9	6.4
	4	16.7	65.7	3.9	2.4	11.0
	6	23.5	57.3	2.9	2.9	13.1
	8	29.4	50.7	2.3	3.6	13.8
TPD	2	20.9	20.9	2.1	1.4	54.5
	4	25.5	30.1	1.6	2.2	40.4
	6	30.2	32.4	1.3	3.0	32.4
	8	34.1	33.3	1.2	3.6	27.6

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