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Impact of Trade Openness, FDI Inflows and Total Exports on Economic Growth of India: An Econometric Approach

Papia Mitra[1], Gholam Syedain Khan[2]
[1](*Research Fellow, University of Calcutta-Calcutta Stock Exchange-Centre of Excellence in Financial Markets, Department of Commerce, University of Calcutta, India)*
[2] *(Assistant Professor, Department of Commerce, St. Xavier's College, Kolkata, India)*

Abstract: *The problem of the study is to ascertain the significance of trade openness, FDI inflows and the total exports on GDP growth of India. This study examines the short run and long run relationship between growth in concerned macroeconomic variables and economic growth (Real GDP at Factor Cost) by applying Johansen Cointegration Test followed by Vector Error Correction Mechanism (VECM) and Granger-Causality Test. The study incorporates Impulse Response Function (IRF) and Variance Decomposition Analysis to find out the response of GDP to the shock imposed on the concerned explanatory variables. The study covers the period 1975-76 to 2011-12, taking secondary annual data. The Granger-Causality, Impulse Response Analysis and Variance Decomposition results claim that the unidirectional short run relationship exists between exports and GDP. Cointegration tests suggest presence of stable long run relationship among the variables.*

Keywords: *Econometrics, Net FDI Inflows, Real GDP at Factor Cost, Total Exports, Trade Openness*

I. Introduction

India's economic growth in the first three decades of the post-independence period had recorded 4% per annum and accelerated moderately to 5.4% in the 1980s. The global financial crisis in 1991 raised the GDP growth to 6.6% during the period 1992-97. However, the East Asian Crisis led to poor harvests, combined with restless coalition governance and fiscal imbalance which in turn reduced the GDP growth to an average of 5.4% in the period 1997-2003. The National Democratic Alliance (NDA) governments of 1998-2004 revived the economic reforms, which is further followed by global economic boom, thereby fostering the GDP growth to an average of 9% per annum during the period 2003-08. However, in 2009-12, the Indian economy was affected unfavourably due to the Global Economic Crisis. During this period, the average GDP growth came to 7.5% per annum. In 2011-12, GDP growth was reduced to 6.5%. However, the first half of 2012-13 recorded a growth of 5.5%.

The trade volume can be defined as the sum of merchandised exports and imports. In the first year of the 21st century, India's trade volume was recorded a growth of 27% of GDP, twice as large as the previous decade (13% in 1990). This happened due to trade liberalization policy of the central government. India's trade volume rose to 50.7% of GDP in 2008. In this year, the total exports also recorded $179 billion. However, it is only a meagre of 1% of the world exports. In the first decade of the century, the country had experienced a significant comparative advantage in industries such as metal, tobacco and mineral and foodstuff and beverages. However, its competitiveness had been weakened due to the strong competition from China and other ASEAN countries. However, India experienced a fast labour productivity growth in this century, which is positively related to the fast export growth.

Since, the decade of 1980s, India adopted outward-oriented strategy. Before this decade, it was dependent on inward-oriented controlled strategy. The adoption of outward-oriented strategy at a very late stage led to fewer exports.

During the take-off period (1951-1965), India adopted a comparatively liberal policy in foreign investment. However, there were very few countries that were willing to invest in India probably due to historical reasons. The fundamental economic policy still was import substitution. The exports were also restricted. In the mid 1960s, the exports increased mainly because of the devaluation of rupee against US dollar followed by devaluation of rupee against sterling in 1973. However, the exports were restricted by the rise in taxes and fall in subsidies. Due to this, exports and imports rose to 4.7% and 8.7% of GDP respectively in 1980s. Since 1990s, India adopted the trade liberalization and export-oriented policies. The import tariffs were reduced. The export restrictions were removed and further, rupee been devaluated.

India in the recent period of globalization has emerged as the destination for FDI inflow. Much of the FDI flowed to the infrastructural and energy sectors. Metallurgy, power and fuel sectors recorded fair growth in FDI inflows. The most neglected sectors are transport, industrial machinery and food processing. The services sector (including the telecommunications) increased its share in the period 1992-94. However, its growth was disturbed due to fall in demand. However, India is the leading nation pertaining to IT Industry in the Asia-

Pacific rim. Telecommunications is one of the fastest growing industries in the country. The Automobile Industry also experienced huge FDI inflows in the recent years, so as Indian Pharmaceutical Industry.

Over the last decade of the previous century, FDI approvals varied from state to state across the country. Karnataka, Maharashtra, Tamil Nadu and Gujarat together accounted for more than one-third of the total FDI approvals. The shares were 7.6%, 13.7%, 6.7% and 5.3% respectively. However, West Bengal (3.7%), Orissa (3.8%), Andhra Pradesh (4.2%) and Madhya Pradesh (4.5%) are the relatively neglected states. Bihar and Uttar Pradesh have a negligible amount of inflows. Among the investing countries in India, USA ranked one with investment of over Rs. 570 billion (as of May 2002) followed by Mauritius, UK, Japan, South Korea, Germany, Netherlands, Australia, France and Malaysia. Mauritius and UK have increased their share in investment approval.

II. Theoretical Background & Literature Review

2.1. Total Exports and Economic Growth

Export promotion is one of the vital factors of economic growth. The export growth has an accelerating impact on the efficiency of the factors of production through its positive impact on capital formation. The export expansion increases the supply of foreign exchange reserves, thereby, inducing more imports of basic and capital goods and hence, the economy grows faster. Further, global competition induces the industries that export goods to keep the cost of production comparatively low and to improve the technological change, thereby, accelerating economic growth.

On the other hand, the economic growth also accelerates the export expansion. When a developing economy grows, majority of its sectors opt for capital intensive technology. This causes the growth in these sectors but a fraction of population becomes unemployed, thereby, reducing the domestic demand in the economy. In such an unbalanced growth situation, the output continues to grow and exceeds the domestic demand that induces the exports to rise.

However, economic growth can also affect adversely the export growth. If due to economic growth, the domestic demand tends to rise in favour of the exportable goods, the total exports fall though the output rises. On the other hand, if the export grows, probably because of inward foreign direct investment inflows, the export growth will reduce the output growth due to various distortions [Bhagwati, 1979].

The empirical studies tried to find out the significance of export-led growth employing various econometric tools. Pakistan, during the period 1980-2009 recorded a significant and positive impact of export growth on economic growth suggesting the policymakers to focus on the export-led growth. However, export-led growth also improves the efficiency of the factors of production due to gains obtained from the economies of scale, by capturing a larger foreign market [Makki and Somawaru, 2004]. Bangladesh experienced a long run unidirectional causality from exports to economic growth [Mamun and Nath, 2005]. However, Love and Chandra [2005] reported both short run and long run unidirectional causality from income to exports in Bangladesh. On the other hand, Iran economy gets benefit from the Import-substitution and Export- promotion strategies. Both the strategies statistically significantly affect the economic growth in Iran [Mahdavi and Javadi, 2005].

2.2. FDI Inflows and Economic Growth

FDI has become one of the effective methods of drawing flows from the foreign sources. The use of this technique turned out to be significant for the developing countries to improve their capital base. FDI inflows statistically significantly make positive impact on economic growth of most of the developing economies [Muhammad, 2007]. FDI also improves the factor productivity, employment generation, expands exports and transfers sophisticated technologies to the sectors and countries that require them the most. The theories of modernization propose that the capital investment through FDI inflows in various sectors of an economy fosters economic growth. Countries that have well-developed financial system grow significantly from FDI inflows [Alfaroa et al. 2004]. However, empirical studies on the economy of India and China claim that a 1% rise in FDI inflow results to a 0.07% and 0.02% rise in GDP of China and India respectively. Moreover, foreign investors prefer to invest in China, compared to India due to the former's bigger market share than India, easy accessibility of export market, well-developed infrastructure, cost-effectiveness and good macroeconomic climate. India, on the hand, has a good management system, transparency in work, cultural affinity and regulatory environment [Agrawal and Khan, 2011].

The attractiveness of the host market has a positive and significant impact on FDI inflows into the economy. India fails to attract FDI inflows due to low saving and investment rates, that need a hike of 30% of GDP to compare itself with the high-growth Chinese and East-Asian economies [Pradeep Kumar, 2011]. However, in Malaysian economy, unidirectional causality exists with GDP causing FDI in short run. For Pakistan, FDI inflows have no statistically significant impact on economic growth, both in short run and in long run [Kakar and Khilji, 2011].

2.3. Trade Openness and Economic Growth

The relationship between trade openness and GDP is a widely debated topic in the recent period. The development theorists say that trade openness fosters technological changes by increasing the global competition, leading to increased innovation. Trade openness (liberalization) also improves the skill of the factors of production, thereby, increasing the output at same level of employment. Free trade also implies abolition of trade restrictions like tariffs, quotas etc. This reduces the additional direct costs of the producers, thereby increasing the output and stimulating growth. These arguments are based on the comparative advantage theory proposed by David Ricardo and John Stuart Mill which was later on modified into Hecksher-Ohlin Model (1933), Stolper-Samuelson (1941) and Rybzsnski Effects (1955).

Trade restrictions coupled with uneven exchange rate destroy the competitiveness of exports. Also the barrier to sufficient imports of the basic and capital goods reduces the growth of output and thereby, the exports. This causes extremely low capital utilization [Ghartey, 1987].

Empirical study on the Ghanaian economy claims that trade openness fosters economic growth in long run [Aseidu, 2013]. The Nigerian economy can accelerate the economic growth by implementing comprehensive trade openness programme [Adebiyi, 2006]. Export promotion enhances growth in Pakistan [Khan, 1995]. However, the gained welfare effect in Pakistan has been attained through trade openness [Iqbal and Zahid, 1998]. Further, the trade openness helps the Pakistan economy to eradicate poverty [Mohsin et al, 2001].

III. Objectives Of The Paper

The paper tries to analyze the following:-

- The long run and short run relationship between the Economic Growth and growths in Total Exports, Trade Openness and Net FDI Inflows by applying Cointegration Test, Vector Error Correction Mechanism, Granger-Causality Test.
- Measurement of unexpected changes in one variable (GDP) and predicting its effects on the future values of the other variables (Exports, Openness and FDI) through Impulse Response Function (IRF) and Variance Decomposition Analysis.

IV. Data Source And Research Methodology

The study is entirely based on secondary data of the concerned variables. The objectives of the study are examined by using yearly time series data covering the period from 1975-76 to 2011-12. Relevant data for the study are obtained from the official website of the Reserve Bank of India (RBI) and Index Mundi.

The study has used the following specifications in order to evaluate the effects of growth in macroeconomic variables on economic growth. The following mathematical model is used for analysis:

GDP = f (FDI, EXP, OPEN)

(1)

Where,

GDP = Growth in Real Gross Domestic Product at Factor Cost as a proxy to economic growth

FDI = Growth in Net Foreign Direct Investment Inflows

EXP= Growth in Total Export Expenditure

OPEN = Growth in Trade Volume (Total Exports + Total Imports) as a proxy to trade openness

In order to fulfil the objectives of the paper, some statistical tests are used.

4.1. Test for the stationarity of the data series by applying Augmented Dicky-Fuller (ADF) Test

The unit root test is applied to avoid the possibility of spurious regression which is often realized when any statistical test is done on the non-stationary data series. In order to avoid such misleading results in any statistical test, the first and foremost job is to make the data series stationary. If the original series turn out to be non-stationary, then we transform the data series into difference form and say that it is integrated of order one [I(1)]. However, in this paper, the concerned variables are already transformed into difference form to calculate their respective growth rates. Hence, they should be integrated of order zero [I (0)].

The models in which ADF test is applied are as follows:

$$\Delta Y_t = \alpha_i + \beta_i t + \Upsilon_i Y_{t-1} + \delta_1^{\,i} \Delta Y_{t-1} + \ldots\ldots\ldots + \delta_{p-1}^{\,i} \Delta Y_{t-p+1} + \epsilon_{1t} \qquad (2)$$

i=1,…, 4 (there are 4 variables); 'Y' denotes the endogenous variables.

Here, αs are the constants, βs are the coefficients of the trend term (t) and p is the lag order of the autoregressive process. The following null hypothesis is tested:-

H_0: $\Upsilon_i = 0$ against

H_1: $\Upsilon_i < 0$ i=1,….., 4.

In order to find test the above hypothesis, a computed t-statistic has been formulated as
$ADF\tau = \hat{\Upsilon}_i / SE(\hat{\Upsilon}_i)$ where $\hat{\Upsilon}_i$ is the estimated Υ_i.
If the absolute value of the computed ADF test statistic turns out to be greater than that of its critical value at 5% level of significance, we reject our null hypothesis where the null hypothesis is the presence of unit root or absence of stationarity. If the original series turns out to be non-stationary then we again go for unit root test at first difference. This process will continue until and unless the series turns out to be stationary.

4.2. To find out the optimal lag-length of the Vector Autoregression (VAR).
The lag length determination is important as when the lag length differs from its true value, the estimates of a VAR turn out to be inconsistent, so are the impulse response functions (Braun & Mittnik, 1993). The optimal lag length is chosen using Akaike Information Criterion (AIC) due to its superiority (Gonzales and Petrakis, 2002) defined as:

$$\mathbf{AIC = \log|\sum| + (2k^2p)/T} \quad (3)$$

Where k= no. of variables in the model, p= no. of lag terms in the model, T= no. of observation, $\sum$= variance-covariance matrix

4.3. To find out long run relationship between GDP and growth in other macroeconomic variables applying Multivariate Cointegration test.
Cointegration analysis is inherently multivariate, as a single time series cannot be cointegrated. If two time series data are non-stationary, i.e. they have trend and their pattern of trend is also similar, then we say that their linear combination, i.e. the error term is stationary. Hence, we can perform any econometric test on the non-stationary process itself. In that case, the two variables are cointegrated. In other words, if the two variables are non-stationary but they are cointegrated then we can say that their linear combination is stationary and hence, any econometric test can be applied on the non-stationary series itself. Hence, if the two time-series variables are integrated of same order, then they must be cointegrated.
We formulate two statistics, Eigen value and trace statistic defined as:
Trace statistic: $$\mathbf{Trace = -T \sum Log\,(1-\lambda^1_t)} \quad (4)$$
$t=r+1,...., p$
Where $\lambda^1_{r+1},....., \lambda^1_p$ are (p-r) no. of estimated eigen values.
Maximum Eigen value statistic: $$\mathbf{\lambda_{max}\,(r, r+1) = -T \log\,(1-\lambda^1_{r+1})} \quad (5)$$
If the absolute value of the computed trace statistic is greater than its critical value, then we reject our null hypothesis of no cointegration and claim that there exists at least one-way cointegration relation between the variables at 5% level of significance. Again we apply the same logic for the Eigen value as well. In some cases Trace and Maximum Eigen value statistics yield different results. In that case, the results of trace test should be preferred.
Under this situation, all the variables (macroeconomic variables and GDP) are taken together to find out the long run relationship among them. Overall there are 4 variables (3 explanatory variables + 1 explained variable). Hence, there can be at most 3 cointegrating equations among them.

4.4. As per Engel and Granger (1987), if the variables are cointegrated, then there must prevail an error correction mechanism (ECM).
This implies that the changes in explained variables are the functions of the level of disequilibrium in the cointegrating relation, which is reflected by the error correction term and the changes in other explanatory variables. ECM is appropriate to find out the short run dynamics. The equation of the Restricted VAR Model is:

$$\mathbf{\Delta GDP_t = \mu_1 + \sum \alpha_{1i} \Delta FDI_{t-1} + \sum \beta_{1i} \Delta EXP_{t-1} + \sum \gamma_{1i} \Delta OPEN_{t-1} + \sum \delta_{1i} ECM_{r,\,t-1} + \epsilon_{2t}} \quad (6)$$

i = 1, 2,....., m; r = no. of cointegration relation

4.5. Measuring unexpected changes in one variable (the impulse) in t-th period and its effect on the future values of the other variable (the responses).
The impulse response function (IRF) measures the response of the explained variable in the VAR model to the shocks in the error terms. It detects the effect of one period shock on the current and future values of the endogenous variables.
Unrestricted VAR Model:

$$\mathbf{GDP_t = A_{10} + \alpha_{11} FDI_{t-1} + ... + \alpha_{1(t-p)} FDI_{t-p} + \beta_{11} EXP_{t-1} + ... + \beta_{1(t-p)} EXP_{t-p} + \gamma_{11} OPEN_{t-1} + ... + \gamma_{1(t-p)} OPEN_{t-p} + \epsilon_{3t}} \quad (7)$$

Where 'p' denotes the optimum lag length.
In this paper, there are two variables (GDP and Y) such that the IRF would be:

$$\mathbf{GDP_t = \alpha_1 + \epsilon_{GDP,t} + \mu_1 \epsilon_{GDP,t-1} + \mu_2 \epsilon_{GDP,t-2} + ... + \mu_i \epsilon_{GDP,t-i}} \quad (8)$$

$$X_t = \alpha_2 + \epsilon_{X,t} + \gamma_1\epsilon_{X,t-1} + \gamma_2\epsilon_{X,t-2} + \ldots\ldots\ldots + \gamma_i\epsilon_{X,t-i} \quad (9)$$

'X'denotes the determinants of GDP.

The above equations represent the response of the dependent variable, GDP and X, to the previous innovations that had occurred to the endogenous variables included in the unrestricted VAR model (ϵ_{GDP}'s and ϵ_X's). The coefficients (μ's and γ's) present the amount of responses.

4.6. Variance Decomposition of GDP.

To find out the extent to which the shocks on macroeconomic variables (EXP, FDI and OPEN) are responsible for the volatility of economic growth observed by the end of 10 periods using Variance Decomposition of GDP.

4.7. Finding out the causal relationship among the aforesaid variables applying Granger-Causality Test.

The following Vector Autoregressions (VAR) are tested:

$$\Delta GDP_t = \sum\alpha_i^1\Delta GDP_{t-i} + \sum\beta_j^1\Delta X_{t-j} + U_{1t} \quad (10)$$

$$\Delta X_t = \sum\lambda_j^1\Delta X_{t-j} + \sum\delta_i^1\Delta GDP_{t-i} + U_{2t} \quad (11)$$

i=1,2…..m; j= 1,2,…..n

The error terms are uncorrelated. We jointly test for the estimated lagged coefficients $\sum\alpha_i$ and $\sum\lambda_j$ are different from zero by running an F-test. When the null-hypothesis of insignificance of the model is rejected at 5% level of significance, we claim that there prevails causal relationship among the variables. However, it is a short run approach.

V. Empirical Analysis

5.1. Unit root test

Table II represents the unit root test results. All the variables turn out to be stationary at level itself. This is so because the concerned variables are transformed into first difference in order to calculate their growth rates. Hence, the variables in the analysis are integrated of order zero, I (0) at 5 percent level of significance, i.e. they are the random walk processes. Consequently, the presence of significant co-integration relationship among the variables could be determined.

5.2. Detection of Multicollinearity

Since, there are more than one explanatory variable, hence, before running regression, we need to find out whether the explanatory variables suffer from the multicollinearity problem or not. It is found out that the variables are very weakly correlated as they are converted into difference form to find out the growth rate. Hence, we need not go for any further transformation.

5.3. Multivariate cointegration analysis

The result of the multivariate cointegration test has been represented in table V. Here, all the concerned variables are taken together to find out presence of any long run relationship among them. The optimal lag length chosen by AIC is 1. Johansen & Juselius (1990) trace statistic test of cointegration investigates presence of 2 cointegrating equation among the concerned variables. However, the maximum Eigen value test claims no cointegration relation among the variables. In such situations, when the two test statistics give different results, it is better to go for the trace statistic results. Thus, the null hypothesis of no cointegration is strictly rejected at 5% level of significance, implying long run cointegration among the variables. The existence of long run relationship among the variables rules out the spurious correlations. Thus, there exists at least one-way causality among the variables in long run.

The normalised cointegrating equation is:

$$\mathbf{GDP = 0.01EXP - 0.03FDI + 0.09OPEN} \quad (12)$$

$$\mathbf{(0.16) \quad (-4.35) \quad (1.35)}$$

The values in the parenthesis represent the estimated t-statistics of the estimated slope coefficients. The above long run equation claims that there is positive and statistically insignificant relationship among EXP and GDP and OPEN and GDP. However, FDI has a negative but statistically significant impact on GDP. This result suggests that the policymakers should concentrate on expansionary trade policy in order to accelerate the economic growth in long run, though its impact will not be significant.

5.4. Vector error correction mechanism

Table VI represents the estimated coefficients of the error correction terms (long run impact) and the lagged values of all the time series data (short run impacts). All the variables have been converted in difference form by the software itself. There is presence of 2 cointegrating equation among the variables. Hence, for each explained variable, there are 2 error correction terms. However, we are concerned about the first model in the

system where D (GDP) is the explained variable. For D (GDP), among two coefficients of the error correction terms, one turns out to be negative and statistically significant. This implies this error correction term gets adjusted to move towards the long run equilibrium. The speed of adjustment of error term is 55% (0.55*100). However, the other coefficient of the error correction term is though negative but statistically insignificant, implying insignificant covergence towards the long run equilibrium. However, out of 4 lagged explanatory variables, only 1 turns out to be statistically significant. The overall ECM model turns out to be moderately significant which is clear from the R-squared and Adjusted R-squared statistics (R-squared = 0.51 and Adjusted R-squared = 0.40).

In order to obtain p-values and to further confirm short run impact of the macroeconomic variables on the explained variable we will follow VECM equation and conduct Ordinary Least square Analysis at 95% confidence interval. The lagged value of FDI is the only variable that is statistically significant to predict the present value of GDP at 5% level of significance. However, all the other variables are statistically insignificant in explaining variation in the present value of GDP. Durbin-Watson test of autocorrelation reveals that the problem of autocorrelation is not so serious as the value of the statistic is close to 2 (D-W statistic = 2.21). However, the presence of autocorrelation has been tested by applying LM test. The null hypothesis of no autocorrelation is accepted at 5% level of significance for the optimal lag length 1. This clarifies that the model is free from serial correlation.

5.5. Impulse response analysis

Table VIII shows the impulse response results showing the multivariate analysis. For the analysis, 10 years has been chosen as the lead length, i.e. if the impulse is given in the present period, how the variables will respond to it 10 years in future. With impulse given on FDI, the response of GDP is positive in all the periods. Only in period 3, it accounts no such responses. However, after period 7, the response remains constant at a positive value. However, when impulse is generated on trade volume (OPEN), the response of GDP is always positive with the maximum in period 2. However, its magnitude falls overtime. This result hold true when impulse is generated on EXP as well. However, in period 2, the response of GDP is maximum and its magnitude is far higher than the previous situation. However, if we go through the responses of the macroeconomic variables on shock generated on GDP, it can be concluded that FDI has no response on the impulse generated on GDP. This is true for trade volume (OPEN) as well. However, positive shock on GDP affects the exports growth (EXP) positively with the exception in period 3, where the response becomes negative with a very less magnitude. Overtime, the response falls and remains constant after period 8.

5.6. Variance decomposition analysis

Impulse Response Analysis gives information on the magnitude of external shock spill over effects on economic growth. On the other hand, variance decomposition of GDP (table IX) represents the extent to which these shocks are responsible for the volatility of economic growth observed by the end of 10 periods. EXP is the most significant variable to forecast the error variance of GDP. In period 2, it forecasts 14.21% of the error variance of GDP. In the last period of the analysis (period 10), its significance falls to 8.42%. On the other hand, in period 2, FDI forecast 3.67% of the error variance of GDP. Overtime its importance rises and in the last period (period 10), it explains 11.10% of the error variance of GDP. However, the growth in trade volume (OPEN) is the least significant variable in this context and its importance falls overtime.

5.7. Granger-causality test

Table XI shows the granger-causality test results. It shows the short run relationship among GDP and the explanatory variables. However, none of the macroeconomic variables granger causes economic growth. However, EXP granger causes GDP at 10% level of significance. There is a reverse causality between GDP and EXP with GDP granger causing EXP at both 1% and 5% levels of significance. Hence, in short run, the explanatory variables have no causal relationship with the GDP.

TABLE I: Direction of Granger-Causality

GDP ⟶ EXP

D(GDP) = C(1)*[GDP(-1) - 0.13*OPEN(-1) + 0.02*FDI(-1) - 5.13] + C(2)*[EXP(-1) - 3.08*OPEN(-1) - 0.22*FDI(-1) + 56.52] + C(3)*D[GDP(-1)] + C(4)*D[EXP(-1)] + C(5)*D[OPEN(-1)] + C(6)*D[FDI(-1)] + C(7).....VEC Model

VI. Conclusion

The present study tried to explore the short run and long run relationship between the growth rates of the selected macroeconomic variables and the economic growth with respect to India incorporating certain statistical tools. It also tried to analyse the impact of the shocks generated on the macroeconomic variables on economic growth.

All the variables are converted into first difference form in order to calculate their growth rates. Hence, they are integrated of order zero [I(0)]. Moreover, they do not suffer from serious multicollinearity problem as well. The Multivariate Cointegration Test claims for a presence of two cointegrating equations among the variables. However, FDI has a negative and statistically significant impact on economic growth, whereas, the other two variables (OPEN and EXP), though have positive impact on economic growth, yet they turn out to be statistically insignificant. We further test for the dynamic stability of the long run equilibrium. For that, we apply Vector Error Correction Model (VECM) to find out whether the error terms of the cointegrating equations get adjusted to converge towards the long run equilibrium. If they get converted, then in second step, we try to calculate their speed of adjustment. Since, there are 2 cointegrating equations, thus, there should be 2 error correction terms. For the convergence to take place, at least one of the coefficients of the error correction terms must be negative and statistically significant. In this analysis, only one error correction term fulfil both the criterion simultaneously. Thus, it can be concluded that the long run equilibrium is dynamically stable. The regression analysis results say that all the explanatory variables are statistically insignificant to explain the variation in GDP. Further, Impulse Response Analysis supports for positive impact of a shock generated on the macroeconomic variables on economic growth. However, the reverse relationship is true for none of the variables other than EXP. This result hold true for Granger-Causality test as well, where there exists unidirectional causality between GDP and EXP with EXP granger causing GDP. All other variables have no relationship with economic growth in short run. However, Variance Decomposition Analysis also claims the same result. The significance of EXP to forecast the error variance of GDP gets reduced overtime.

Hence, from the above study, it is can be concluded that none of the variables (EXP, OPEN and FDI) has positive and statistically significant impact on economic growth. This is true in both the time horizons. However, the policymakers must discourage FDI as it has negative and significant impact on economic growth in long run. In short run, there is no relationship between them. The limitation of the paper is that, it is concerned with only three explanatory variables to explain economic growth. However, there are many other variables that may affect the economic growth like fiscal balance, current account balance, inflation, money supply, industrial and agricultural production, domestic capital formation etc. Further research can be done on this area by incorporating these macroeconomic variables. This may improve the statistical results of the study.

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Appendix

TABLE II: Unit Root Test Results

	CONSTANT + LEVEL				
VARIABLES	ESTIMATED T-STATISTIC	CRITICAL VALUE (5% LEVEL OF SIGNIFICANCE)	CRITICAL VALUE (1% LEVEL OF SIGNIFICANCE)	P-VALUE	DECISION
GDP	-7.00	-3.54	-4.24	0.00	Reject Ho
EXP	-5.93	-3.54	-4.24	0.0001	Reject Ho
OPEN	-5.16	-3.54	-4.24	0.001	Reject Ho
FDI	-6.81	-3.54	-4.24	0.00	Reject Ho

TABLE III: Correlation Matrix (Detection of Multicollinearity)

	EXPORT	FDI	OPEN
EXPORT	1	-0.199026	0.30258
FDI	-0.199026	1	0.208966
OPEN	0.30258	0.208966	1

TABLE IV: Optimal Lag Length

Lag	AIC
1	32.85144
2	33.0711
3	33.21798

TABLE V: Multivariate Cointegration Test Result

OPTIMAL LAG LENGTH: 1							
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (at 5% level of significance)	Prob (Trace Statistic).	Maximum Eigen Value	Critical value (at 5% level of significance)	Prob (Trace Statistic)
None *	0.52	56.73	47.85	0.006	24.94	27.54	0.10
At most 1 *	0.40	31.79	29.80	0.03	17.75	21.13	0.14
At most 2	0.21	14.04	15.49	0.08	8.00	14.26	0.38
At most 3	0.16	6.04	3.81	0.01	6.04	3.84	0.01

*Rejection of Null Hypothesis at 5% level of significance

TABLE VI: Vector Error Correction Results

Dependent Variable: D(GDP)	Coefficients	t-statistic	P-Value
Cointegration Eq 1	-0.548101	-2.902879	0.0073
Cointegration Eq 2	-0.010659	-0.603462	0.5512
D[GDP(-1)]	-0.201144	-1.15391	0.2586
D[EXP(-1)]	0.016765	0.387511	0.7014
D[FDI(-1)]	0.010945	2.717605	0.0113
D[OPEN(-1)]	-0.03095	-0.552536	0.5851
Constant	0.031544	0.06101	0.9518
R^2	0.51		
Adjusted R^2	0.40		
F-stat	4.72		
D-W stat	2.21		

TABLE VII: VEC Residual Serial Correlation (LM Test) Results

Lags	LM-Stat	Prob
1	21.48884	0.1605
2	20.96715	0.1798
3	15.93765	0.4573

TABLE VIII: Impulse Response Analysis

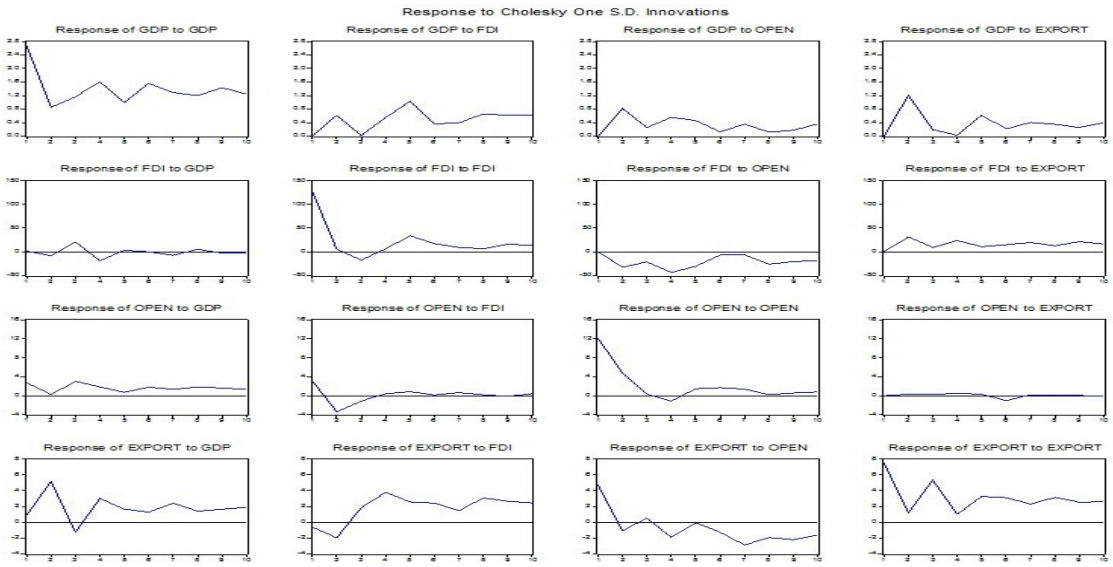

TABLE IX: Variance Decomposition of GDP

Period	S.E.	GDP	FDI	OPEN	**EXPORT**
1	2.656498	100	0	0	**0**
2	3.211019	75.48469	3.672077	6.636222	**14.20701**
3	3.431304	77.64147	3.219906	6.375016	**12.76361**
4	3.869084	78.29839	4.560378	7.096981	**10.04425**
5	4.198667	72.09028	9.903308	7.26123	**10.74518**
6	4.503179	74.75322	9.273055	6.394589	**9.579133**
7	4.731192	75.14179	9.092017	6.358284	**9.407908**
8	4.939896	74.83765	10.13549	5.891625	**9.135241**
9	5.1901	75.42868	10.59909	5.453134	**8.519092**
10	5.399762	74.99223	11.10052	5.486104	**8.421141**

TABLE X: Granger-Causality Test Results

Null Hypothesis:	**Obs**	**F-Statistic**	**Probability**
GDP does not Granger Cause EXPORT	**35**	**7.05789**	**0.01221**
EXPORT does not Granger Cause GDP		3.09821	0.08794
GDP does not Granger Cause FDI	35	2.89225	0.09871
FDI does not Granger Cause GDP		0.19215	0.66408
OPEN does not Granger Cause GDP	35	2.01811	0.1651
GDP does not Granger Cause OPEN		0.099	0.75508