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INWARD FDI AND ITS DYNAMIC CAUSAL RELATIONSHIPS WITH EXPORTS AND IMPORTS IN INDIA DURING THE POST-REFORMED PERIOD: A QUANTITATIVE ANALYSIS

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Abstract:

The paper attempts to investigate into the causal linkages between exports, imports and inward FDI in the liberalized regime in India during 1991-92 to 2012-13. Granger Causality Test has been used to examine the causal linkages. The empirical analysis has confirmed that both exports and imports influence inward FDI and there is dynamic short-run causal relationship observed during the period of the study.

Keywords: Inward FDI, Exports, Imports, Granger Causality Test & Post- Reformed Period

Introduction:

The colonial pattern of trade has changed to suit the needs of a developing economy since independence. Extension of production capacity is a prerequisite for an economy that decides to get on with a programme of development. For this, imports of machinery and equipment, which cannot be produced in the initial stages at home, are essential. Such developmental imports either help to create new capacity in some lines of production or enlarge capacity in the other lines of production. And, it is generally agreed that free trade will increase welfare for the countries engaged in it.

A transformed investment climate, an improved business confidence and a wave of entrepreneurial optimism were generated after the reforms initiated in the early 1990s. With the initiation of reforms, the Indian economy has been increasingly becoming global.

An important dimension of global integration is trade, which has risen steadily as a proportion of GDP. Capital flows, as a proportion of GDP, had been on a clear uptrend during that decade. This is a natural outcome of the improved investment climate and recognition of the robust macroeconomic fundamentals like high economic growth, relative price stability, healthy financial sector and high returns on investment.

Among the components of capital inflows, foreign investment has continued to be a relatively stable component. The relative stability of investment flows is primarily due to steadily rising FDI inflows. The most welcome feature of the increased capital flows was the 150 per cent. Increase in the net FDI inflows in 2006-07 to US$ 23 billion from US$ 15 billion in 2005-06. This trend continued in the first six months of the financial year 2007-08 with gross FDI flows reaching at US$ 11.2 billions. FDI inflows were broad-based and spread across a wide range of economic activities like manufacturing, construction, banking services, financial services and information technology services. FDI inflow data from different sources reveal the fact that FDI inflow in the agriculture and allied sector is very little in the liberalization period but in case of industry, it is better than agriculture after liberalization. Whereas in services FDI inflow increases over time in the post reform period and there is a steady improvement especially in the IT and ITES sector even after global financial subprime crisis held in September 2008. With outward FDI also increasing steadily over the last five years, the overall net flows (FDI balance in BoP) have grown at a slower rate.

It is generally claimed that FDI inflows in India has contributed to expanding exports, creating employment and also providing an important channel for global integration and technology transfer. The country expects to achieve export-led growth for which special focus has been given in the EXIM Policies (2002-09). The composition of exports shows a perceptible shift in this decade from light manufactures to heavy manufactures, petroleum crude and products, and services.

In the Indian context, the focus on import substitution has led to the setting up of industries in India with greater access to free flow of technology. FDI inflows might have a role to play here. The composition of imports shows that petroleum, oil and lubricants (POL), taken together, continue to be the single major item of imports. With the rise in crude oil prices, growth in POL imports continued to be high in 2007-08 though it moderated in the first half of 2008-09. The high growth in import of capital goods was contributed by both electrical and non-electrical machinery, reflecting higher domestic investment, resurgence of manufacturing, and rising needs of the export sector. A high import-oriented sector generally justifies FDI inflows in that sector.

An overview of trade (i.e., exports and imports) and FDI inflows appears to point to a close link between international trade and investment. The closer the relationship between trade and investment, the greater is the chance of the host country realizing the benefits from trade and investment liberalization. Trade liberalization implies a freer movement of goods and services, while investment liberalization implies a better environment for the movement of resources. Increasing international trade, according to comparative advantages, is the key condition for countries to realize gains from trade. This paper tries to find out if there are linkages between India's exports, imports and FDI inflows in the liberalized regime.

Review of Literature:

Geweke (1982) suggests a decomposition method where he has found that the causality from FDI flows to trade openness is stronger than that from trade to FDI flows. The *Proximity-Concentration Hypothesis* (*Krugman*, 1983; *Horstmann* and *Markusen*, 1992; *Brainard*, 1993, 1997) suggests that greater transaction costs, resulting from higher trade barriers and transportation costs, lead to horizontal cross-border production expansion and, thus, stimulate international investment. In this view, international trade is more or less a substitute for international investment. On the contrary, the *Factor-Proportion Hypothesis* (*Helpman*, 1984; *Markusen*, 1984; *Helpman* and *Krugman*, 1985; *Ethier* and *Horn*, 1990) appears to predict that international trade and investment are complements as firms take advantage of factor price differences through cross-border vertical production integration.

A few studies have found a one-way causal relationship between exports and inward FDI, indicating that exports stimulate FDI (*Jun* and *Singh*, *1996*; *Khan* and *Leng*, 1997; *Zhang* and *Felmingham*, 2001). Few other studies indicate that there may be a bi-directional causal link, i.e., exports stimulate FDI inflows and FDI inflows promote exports (*Baliamoune-Lutz*, 2004; *Liu et al.*, 2002; *Zhang* and *Felmingham*, 2001). *Brauerhjelm*, *Oxelheim*, and *Thulin* (2005) have investigated into the relationship between domestic investment and FDI outflows. They have found evidence of complementary relationships coinciding with industrial vertical integration practices as well as of substitution relationships coinciding with industrial horizontal integration.

Pacheco-López (2005) has found that there exists a bi-directional causality between FDI and exports and FDI and imports in Mexico. It is also interesting to note that some studies have concluded that positive association between inward FDI and exports is unfounded, indicating that foreign firms are not likely to stimulate exports

(*Alici* and *Ucal*, 2003; *Sharma*, 2003; *Zheng et al*., 2004). *Aizenman* and *Noy* (2005) observe that it is common to expect bi-directional linkages between FDI and trade in goods. However, it is difficult to indicate whether inflows and outflows of FDI have different effects on trade in different types of goods. They have suggested that there is a strong relationship between FDI flows and trade, especially in manufacturing goods. *Wong* and *Tang* (2007) have examined the causality between FDI and exports using the electronics exports data of Malaysia.

The majority of the above-mentioned empirical studies have applied causality tests based on time series data to examine the nature of any causal relationship between FDI and exports. Some studies have not considered the endogenous nature of the export process and are subject to simultaneous bias (*Hood* and *Young*, 1979). Several are cross-country studies have assumed a common economic structure and similar production technology across countries, which may in fact not be true (*Hejazi* and *Safarian*, 2001; *Liu et al*., 2001). Lack of comparability in terms of time and country has been an obstacle to the meaningful conclusion with respect to the available empirical studies, although a majority of such studies indicate a one-way causal relationship between inward FDI and the host country's export performance.

Data:

The data used for this study are secondary in nature. Quarter-wise data of exports (X), imports (I) and inward FDI for 1991-92 to 2012-2013, have been considered which give 88 observations. Such data have been collected from various publications of the Reserve Bank of India (RBI), like RBI Bulletin, RBI Annual Reports, etc.

Methodology:

The study has used the *Granger Causality Test* in a bivariate Vector Autoregressive (VAR) framework to examine the causal links between inward FDI and exports over the period 1991-92 to 2012-13. Causal links between inward FDI and imports have also been examined in the same manner for the same period. The period corresponds to the liberalization period during which there were market-oriented reforms in wide-ranging sectors with an emphasis on liberalizing investment and trade regime in order to make the Indian economy increasingly integrated with the global economy.

Sims (1980) was the first to introduce the VAR technique in econometric modelling to analyze the dynamic impact of random disturbances on the systems of variables. In a standard VAR model, each endogenous variable in the system is modelled as a function of its own past lags and the past lags of other endogenous variables. In *Sims*' VAR Methodology, all variables are treated as endogenous in order to identify and eschew spurious regressions.

Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and *Kwiatkowski*, *Phillips, Schmidt* and *Shin (KPSS) Tests* have been performed to test the non-stationarity property of the series. *Engle* and *Granger* (1987) have said that a non-stationary (or unit root) series is said to be integrated of order "d", if it can be made stationary by differencing it "d" times, expressed as X~I(d).

The *ADF Test* consists of running of ordinary least square (OLS) regression of the first difference of the series against the series lagged once, lagged difference terms, a constant and a time trend. The ADF Regression for a time series Y_t is as below.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t ....(1)$$

Y_t is variable interest, Δ represents differencing operator, t acts as time trend variable, *m* is the number of lags, which are added to the model to ensure that the residuals ε_t are 'white noise'. *Schwarz Bayesian (or Information) Criterion (SBC or SIC)* and/or *Akaike Information Criterion (AIC)* are/is used to determine the optimal lag length or *m.* In the above equation, the null hypothesis (δ = 0) is tested, i.e., a unit root exists in Y (i.e., Y is non-stationary) against the alternative hypothesis (δ < 0). The null hypothesis will be rejected if the t-test statistic from the ADF Test is negative and significantly less than the critical value tabulated in *MacKinnon* (1991). Non-rejection of the null hypothesis implies that the series is non-stationary, whereas rejection of the null hypothesis indicates that the time series is stationary.

PP Test has also been performed to infer whether a variable has a unit root. The null hypothesis is that the variable contains a unit root and the alternative hypothesis is that a stationary process has generated the variable. It is based on the OLS estimator $\hat{\alpha}$ of α in the model.

$$y_t = \mu + \alpha y_{t-1} + \varepsilon_t ....(2)$$

The KPSS Test is a Unit Root Test in which the null hypothesis is opposite to that in the *ADF Test*. The null hypothesis is that the series is stationary. The alternative hypothesis is that the series is I(1). The basic idea behind this test statistic is very simple. If y_t can be written as $y_t = \mu + u_t$ (where u_t is some zero-mean stationary process), then not only does the sample average of the y_ts provide a consistent estimator of □ , but also the longrun variance of u_t is a well-defined, finite number. Neither of these properties holds under the alternative hypothesis.

The test itself is based on the following statistic:

$$\eta = \frac{\sum_{i=1}^{T} S_t^{\,2}}{T^2 \bar{\sigma}^2} ....(3)$$

$S_t = \sum_{s=1}^{t} e_s$ and $\bar{\sigma}^2$ is an estimate of the long-run variance of $e_t = (y_t - \bar{y})$. Under the null hypothesis, this statistic has a well-defined (non-standard) asymptotic distribution, which is free of nuisance parameters. H_o (null hypothesis) is rejected if η is higher than the appropriate critical value.

Next, it is to be considered whether all the variables that are included in the system are cointegrated, i.e., tied in a long-run relationship. Cointegration Test is done to determine the long-run economic relationship between the variables (*Thomas*, 1993), besides minimizing the spurious regression risk. In this study, the Error-correction Cointegration technique of *Johansen* (1988) and *Johansen and Juselius* (1990) has been applied to identify the cointegration relationship between the variables. *Johansen and Juselius*' (1990) approach to the number of cointegrating vectors is applicable only if two variables are I(1). The Cointegration Test of maximum likelihood (based on the *Johansen-Juselius Test*) is developed following a VAR approach initiated by *Johansen*

(1988). According to *Johansen* (1988), a p-dimensional VAR model, involving up to k-lags, can be specified as below.

$$Z_t = \alpha + \prod_1 Z_{t-1} + \prod_2 Z_{t-2} + ...\prod_k Z_{t-k} + \varepsilon_t ....(4)$$

Z_t is a $(p \times 1)$ vector of p potential endogenous variables and each of the $\prod_i$ is a $(p \times p)$ matrix (in our study 2×2) of parameters that can be estimated and ε_t is the 'white noise' term and α is a $(p \times 1)$ vector of constants.

Equation (4) can be formulated into a Vector Error Correction Model (VECM) form as below.

$$\Delta Z_t = \alpha + \prod_k Z_{t-k} + \sum_{i=1}^{k-1} \theta_i \Delta Z_{t-i} + \varepsilon_t ....(5)$$

Δ is the first difference operator, $\prod$ and θ are $(p \times p)$ matrices of parameters that can be estimated, k is the order of the VAR translated into a lag of $k-1$ in the ECM, and ε_t is the 'white noise' term. Π is a vector which represents a matrix of long-run coefficients and it is of paramount importance and the coefficient matrix Π is called the impact matrix and it contains information about the long-run relationships between the variables in the data vector. The long-run coefficients are defined as a multiple of two $(p \times r)$ vectors, α and β', and hence $\Pi = \alpha\beta'$, where α is a vector of the loading matrices and denotes the speed of adjustment with disequilibrium, while β' is a matrix of long-run coefficients so that the term $\beta' Z_{t-1}$ in equation (5) represents up to $(p-1)$ co integration relationships in the Cointegrating Model. Evidence of the existence of cointegration is the same as evidence of the rank r for the Π matrix. *Johansen* and *Juselius* (1990) have shown that the rank of r of Π in equation (5) is equal to the number of cointegrating vectors in the system. It has full rank i.e., $r = n$ then it is said that there are n cointegrating relationships and that all variables are I(0). Co integrated variables share common stochastic and deterministic trends and tend to move together through time in a stationary manner even though the two variables in the study are non-stationary. There are three possible cases.

- ✓ The rank of Π can be zero. This takes place when all the elements in the matrix Π are zero. This means that the sequences are unit root processes and there is no cointegration. The variables do not share common trends or move together over time. In this case, the appropriate model is a VAR in first differences involving no long-run elements.
- ✓ The rank of Π could be full in this study, if rank =2. In this case, the system is stationary and the two variables can be modelled by VAR in levels. It represents a convergent system of equations with all the variables being stationary. In this study, if $\Pi = 2$ then all the components of Z_t are I(0) rather than I(1) and the cointegration analysis is irrelevant.
- ✓ Finally, the rank of Π can be reduced $[1 \le Rank\Pi \le (p-1)]$. In this case, even if all the variables are individually I(1), the level-based long-run component would be stationary. In this case, there are $p-1$ cointegrating vectors. The appropriate modelling methodology here is VECM.

Johansen and *Juselius* (1990) have developed two Likelihood Ratio Tests. The first Likelihood Ratio Test is based on the maximal eigen value which evaluates the null hypothesis of 'r' cointegrating vector(s) against the alternative hypothesis of 'r+1' cointegrating vector(s). The second Likelihood Ratio Test is based on the Trace Test which evaluates the null hypothesis of at most 'r' cointegrating vector(s) against the alternative hypothesis of more than 'r' cointegrating vector(s). If the two variables are I(1), but cointegrated, the *Granger Causality Test* will be applied within the framework of ECM in which the long-run components of the variables obey equilibrium constraints, while the short-run components of the variables have a flexible dynamic specification.

$$\Delta LnFDI_t = \sum_{j=1}^{p-1} \beta_{11,j} \Delta LnFDI_{t-j} + \sum_{j=1}^{p-1} \beta_{12,j} \Delta LnX_{t-j} + \alpha_1 ECT_{t-1} + \varepsilon_{1t} ....(6a)$$

$$\Delta LnX_t = \sum_{j=1}^{p-1} \beta_{21,j} \Delta LnX_{t-j} + \sum_{j=1}^{p-1} \beta_{22,j} \Delta LnFDI_{t-j} + \alpha_2 ECT_{t-2} + \varepsilon_{2t} ....(6b)$$

$$\Delta LnFDI_t = \sum_{j=1}^{p-1} \beta_{11,j} \Delta LnFDI_{t-j} + \sum_{j=1}^{p-1} \beta_{12,j} \Delta LnI_{t-j} + \alpha_1 ECT_{t-1} + \varepsilon_{1t} ....(7a)$$

$$\Delta LnI_t = \sum_{j=1}^{p-1} \beta_{21,j} \Delta LnI_{t-j} + \sum_{j=1}^{p-1} \beta_{22,j} \Delta LnFDI_{t-j} + \alpha_2 ECT_{t-2} + \varepsilon_{2t} ....(7b)$$

Δ is the first difference operator and ε_{1t} and ε_{2t} are 'white noise'. ECT is the error-correction term, and p is the order of the VAR which is translated to lag of $p-1$ in the ECM. α_1 and α_2 represent the speed of adjustment after the inward FDI and Exports deviate from the long-run equilibrium in the period t –1. The coefficients of lagged value $\beta_{12,j}$ for $j=1,......p-1$ in equation (6a) represent short-run effects of export performance on inward FDI. The coefficients of lagged value $\beta_{22,j}$ for $j=1,.......p-1$ in equation (6b) represent short-run effects of inward FDI on export performance. The coefficients of lagged value $\beta_{12,j}$ for $j=1,......p-1$ in equation (7a) represent short-run effects of import performance on inward FDI .The coefficients of lagged $\beta_{22,j}$ for $j=1,.......p-1$ in equation (7b) represent short-run effects of inward FDI on import performance. A test of joint significance of these lagged terms constitutes a short-run *Granger Causality*.

If the variables contain a cointegrating vector, causality exists in at least one direction. According to *Engle* and *Granger* (1987), if two series, say X and Y, are integrated of order one [i.e., I(1)] and cointegrated, then there is possibility of a causal relationship in at least one direction. The direction of a causal relationship can be detected in the vector-error correction model (VECM). *Engle* and *Granger* (1987) have found that, in the presence of cointegration, there always exists a corresponding error-correction representation, captured by the ECT. This means that changes in the dependent variable are a function of the level of disequilibrium in the cointegrating relationship as well as changes in the other explanatory variable(s). The ECT captures the long-run adjustment of the cointegration variables. As such, in addition to the direction of causality, the incorporation of the ECT in the VECM allows to detect both short- and long-run causal relationships between the variables. On the other hand, if no cointegrating vector exists in the model, the standard VAR should be applied to test the causal relationship between the variables.

In order to examine the causal linkages between the variables, the *Granger Causality Test* is conducted. The direction of the impact of each of the variables is also determined from the analysis. In a vector autoregressive setting, the results from the

Granger Causality Test are highly sensitive to the order of lags in the autoregressive process. Hence, a critical element in the *Granger Causality Test* is the determination of the lag length of the VAR[1]. VAR lag order selection between inward FDI and Exports and between inward FDI and Imports is shown in Tables 1 and 2 respectively. In order to capture the impact of the variables observed in the past time period in explaining the future performance, the optimal lag length p would be chosen and the criteria used in selecting the VAR model and optimal lag length require the combination of information criterion (minimum AIC or SBIC or HQIC or FPE value). Thus, the said selection criteria would guarantee that neither too short lag length is chosen to result in serially correlated errors nor too many lags are included that might induce specification bias for having inefficient parameters (*Hendry* and *Mizon*, 1993). Having chosen the optimal lag length, short-run and long-run causality tests are carried out using the *Engle* and *Granger* (1969) method.

Table 1: VAR Lag Order Selection Criteria (inward FDI inflows and Exports) [Lnfdi and Lnx]

Lag	LL	LR	df	p	FPE	AIC	HQIC	SB(I)C
0	-96.371				.096218	3.33461	3.3621	3.40504
1	48.4837	289.71	4	0.000	.000812	-1.44013	-1.35765	-1.22885
2	54.0587	11.15	4	0.025	.000771	-1.49351	-1.35606	-1.14139
3	55.877	3.6367	4	0.457	.000831	-1.41956	-1.22712	-.926585
4	72.9862	34.218	4	0.000	.000534	-1.86394	-1.61652	-1.23011*
5	80.9323	15.892*	4	0.003	.000469*	-1.99771*	-1.6953*	-1.22303

Table 2: VAR Lag Order Selection Criteria (inward FDI inflows and Imports) [Lnfdi and Lni]

Lag	LL	LR	df	p	FPE	AIC	HQIC	SB(I)C
0	-104.936				.12109	3.56453	3.59183	3.63434
1	66.7602	343.39	4	0.000	.000452*	-2.02534*	-1.94342*	-1.8159*
2	68.436	3.3516	4	0.501	.000489	-1.94787	-1.81133	-1.59881
3	71.9139	6.9558	4	0.138	.000498	-1.93046	-1.73931	-1.44178
4	78.1732	12.519*	4	0.014	.000463	-2.00577	-1.76001	-1.37747

* indicates lag order selected by the criterion.
LR: Sequential Modified LR Test Statistic (each test at the 5% level of significance)
FPE: Final Prediction Error
AIC: Akaike Information Criterion
SBC or SIC: Schwarz Bayesian (or Information) Criterion
HQIC: Hannan-Quinn Information Criterion

Data Analysis:

Table 3 presents the results of the *ADF*, *PP* and *KPSS Tests* of unit root by lag length chosen on the basis of minimum values of *Akaike Information Criterion (AIC)* and *Schwarz Bayesian (or Information) Criterion (SBC or SIC)*. The tests are performed on both the level and the first differences of the logged variables.

The variable *FDI* is stationary in level according to the *ADF Test*, the *PP Test*, and the *KPSS Test*. In the *ADF Test,* the null hypothesis of unit root can be rejected at levels of significance varying from 5% to 10%; in the *PP Test,* the null hypothesis of unit root can be rejected at levels of significance varying from 1% to 10%; while in the *KPSS Test,* the null hypothesis of stationarity cannot be rejected at levels of significance varying from 1% to 10% since the computed test statistic is less than the appropriate critical value.

The variable *Export* is stationary at level according to the *PP Test* and the *KPSS Test*, whereas the variable *Import* is stationary at level according to the *KPSS Test*. Based on all the three types of Unit Root Tests, it is found that the variable *FDI* is I(0). Based on all the three tests, it is found that the variable *Export* is I(0). Based on the *PP Test* and the *KPSS Test*, it is found that the variable Import is I(0). *Maddala* (2001) has pointed out that the *ADF Test* and the *PP Test* are not strong measures and, thus, should be disregarded. These tests will accept the null hypothesis of the existence of a unit root, only if there is strong evidence that it is based on the frequency. To circumvent this problem, the *KPSS Test* has been developed.

The Cointegration Test is not feasible in this study. It is feasible, if the variables are non-stationary at their levels. Generally, a set of variables is said to be cointegrated, if a linear combination of the individual series, which are I(d), is stationary. In other words, before testing the cointegration (i.e., to establish an existence or otherwise of a long-term equilibrium relationship) between two economic time series, say X and Y, it is first necessary to test whether they are integrated of the same order. This suggests that it would not be feasible to consider the cointegration analysis, which implies that a long-run relationship does not exist between inward FDI and Exports and between inward FDI and Imports. The prerequisite for the Cointegration Test is that the given two variables should be I(1). In the absence of the above prerequisite in India's data series pertaining to Exports and Imports, the Cointegration Test has been omitted.

Table 3: Test of Unit Root Test Hypothesis (1991Q1 - 2006 Q4) with Trend

		ADF Statistic		**PP Test**		**KPSS**	
Series		Test Statistic	Lags	Test Statistic	Lags	Test Statistic	Lags
LnFDI	Level	-3.747**	2	-4.870***	3	.20109**	3
	First Difference	-8.707***	0	-8.674***	3	.187456**	3
LnEXPORT (X)	Level	-1.241	4	-4.468***	3	.195768**	3
	First Difference	-3.744**	4	-15.287***	3	.177877**	3
LnIMPORT (I)	Level	-1.751	3	-2.534	3	.186195**	3
	First Difference	-10.449***	0	-10.578***	3	.119781**	3

Notes:

(a) The critical values are those of McKinnon (1991).

1 % ADF-Critical Value = -4.126; 5% ADF-Critical Value = -3.489; 10% ADF-Critical Value = - 3.173 in case of LnFDI (Logarithmic Value of FDI)

1 % ADF-Critical Value = -4.130; 5% ADF-Critical Value = -3.491; 10% ADF-Critical Value = - 3.175 in case of LnEXPORT (Logarithmic Value of Export)

1 % ADF-Critical Value = -4.128; 5% ADF- Critical Value = -3.490; 10% ADF- Critical Value = - 3.174 in case of LnIMPORT (Logarithmic Value of Import)

1 % PP-Critical Value = -4.121; 5% PP- Critical Value =-3.487; 10% PP- Critical Value =-3.172 in case of *LnFDI, LnEXPORT and LnIMPORT*

1 % KPSS-Critical Value = 0.216; 5% KPSS- Critical Value = 0.146; 10% KPSS- Critical Value = 0.119 in case of LnFDI, LnEXPORT and *LnIMPORT*

(b) ***, and ** represent the rejection of unit root hypothesis at the 1%, 5% and 10% levels of significance respectively.

(c) Number of Truncation Lags in the *PP Unit Root Test*, determined by the *Newey-West Criterion*, and Lag Length for the *ADF Test* are so chosen that the *Akaike Information Criterion (AIC), Schwarz Bayesian (or Information) Criterion (SBC or SIC), Hannan-Quinn Information Criterion (HQIC)* and *Final Prediction Error (FPE)* are minimized.

Causality Test:

Although it has been concluded that there is no cointegration between inward FDI and Exports and between inward FDI and Imports, it does not mean absence of causality or relationship in the short run. In cases where inward FDI and Exports and inward FDI and Imports do not move together in the long run (i.e., there is no cointegration), it is possible for the variables to affect each other in the short run. The conventional *Granger Causality Test* is the most appropriate tool to determine the causal relationship. Since the variables are I(0), the *Granger Causality Test* can be performed as the level form in the framework of the VAR model. The VAR estimates are computed between inward FDI inflows and Exports and between inward FDI and Imports.

A time series, X, is said to *Granger-cause* another time series, Y, if use of past values of X improves the prediction of the current values of Y. In other words, if the changes in X precede the changes in Y, X is said to *Granger-cause* the changes in Y. This is tested by running a regression of Y on the past values of Y and X. The *Granger Causality Test* is validated only on the assumption that the variables are stationary. In this analysis, since the variables are level stationary, the *Granger Causality Test* is applied to the logarithm of the variables, which are stationary. The following equations are used:

$$LnFDI_t = \sum_{j=1}^{p} \alpha_{11,j} LnFDI_{t-j} + \sum_{j=1}^{p} \alpha_{12,j} LnX_{t-j} + \varepsilon_{t1} ....(8)$$

$$LnX_t = \sum_{j=1}^{p} \alpha_{21,j} LnX_{t-j} + \sum_{j=1}^{p} \alpha_{22,j} LnFDI_{t-j} + \varepsilon_{t2} ....(9)$$

LnFDI and LnX represent the time series of inward FDI inflows and Exports respectively which are in the logarithm form. ε_{t1} and ε_{t2} are 'white noise'. p is the lag length of VAR[2]. A test of joint significance of these lagged terms ($\alpha_{12,j} = 0\ j = 1,.......p$ and $\alpha_{22,j} = 0\ j = 1,.......p$) constitutes a short-run *Granger Causality Test.*

$$LnFDI_t = \sum_{j=1}^{p} \alpha_{11,j} LnFDI_{t-j} + \sum_{j=1}^{p} \alpha_{12,j} LnI_{t-j} + \varepsilon_{t1} ....(10)$$

$$LnI_t = \sum_{j=1}^{p} \alpha_{21,j} LnI_{t-j} + \sum_{j=1}^{p} \alpha_{22,j} LnFDI_{t-j} + \varepsilon_{t2} ......(11)$$

LnFDI and LnI represent the time series of inward FDI inflows and Imports respectively which are in the logarithm form. ε_{t1} and ε_{t2} are 'white noise'. p is the lag length of VAR. A test of joint significance of these lagged terms ($\alpha_{12,j} = 0\ j = 1,.......p$ and $\alpha_{22,j} = 0\ j = 1,.......p$) constitutes a short-run *Granger Causality Test.*

The null hypothesis (i.e., *FDI Granger causes Exports*) is tested using the logarithm values of inward FDI and Exports, when both are stationary in their level form in the *Standard Granger Causality Regression*. The null hypothesis is accepted or rejected on the basis of chi-squared test based on *Wald Criterion* to determine the joint significance of the restrictions in the null hypothesis. If the null hypothesis is rejected, it can be concluded that the *FDI Granger causes Exports*. The lag length is justified by a minimum *FPE*, *SIC* and *Likelihood Ratio* test statistics. The test result suggests lag order of 5 as the optimal lag.

The small p value (0.000) in the first row of Table 4 indicates that the coefficients of the lags of Lnx (Exports) are not jointly zero in the equation for Lnfdi (inward FDI, indicating that the evidence favours the alternative hypothesis (i.e., *Lnx causes Lnfdi*), whereas the p value (0.977) (see Table 4) indicates that the coefficients of Lnfdi are jointly zero in the equation for Lnx. In this case, the null hypothesis (i.e., *Lnfdi does not cause Lnx*) cannot be rejected. Here, the presence of unidirectional causality from Exports to inward FDI is observed.

The null hypothesis (i.e., *FDI does not Granger cause Imports*) is tested using logarithm values of inward FDI and Imports, when both the variables are stationary in their level form in the *Standard Granger causality Regression*. The lag length is justified by a minimum *FPE*, *SIC* and *Likelihood Ratio* test statistics. The test result suggests lag order of 1 as the optimal lag.

The small p value (0.000) in the first row of the Table 5 indicates that the coefficients of the lags of Lni (Imports) are not jointly zero in the equation for Lnfdi, indicating that the evidence favours the alternative hypothesis (i.e., *Lni causes Lnfdi*). The p value (0.533) in Table 5 indicates that the coefficients of Lnfdi are jointly zero in the equation for Lni. In this case, the null hypothesis (i.e., *Lnfdi does not cause Lni*) cannot be rejected. Here, the presence of unidirectional causality from Imports towards inward FDI is observed.

Table 4: Granger Causality Wald Tests (Inward FDI inflows and Exports)

Equation	**Excluded**	**chi2**	**df**	**Prob >chi2**
Lnfdi	Lnx	34.498	5	0.000
Lnfdi	ALL	34.498	5	0.000
Lnx	Lnfdi	.80831	5	0.977
Lnx	ALL	.80831	5	0.977
Causality Inference: Exports → Inward FDI inflows				

Table 5: Granger Causality Wald Tests (Inward FDI inflows and Imports)

Equation	**Excluded**	**chi2**	**df**	**Prob>chi2**
Lnfdi	Lni	12.531	1	0.000
Lnfdi	ALL	12.531	1	0.000
Lni	Lnfdi	.38899	1	0.533
Lni	ALL	.38899	1	0.533
Causality Inference: Imports→Inward FDI inflows				

Results:

All the three variables, i.e., Exports, Imports and inward FDI are checked for stationarity using the *ADF, PP* and *KPSS Tests*. It has been found that the variable inward FDI is I(0) on the basis of all the three tests. The variable Exports is I(0) on the basis of the *PP* and *KPSS Tests*. The variable Imports is I(0) on the basis of the *KPSS Test*. Since the variables, Exports and Imports are either I(0) or I(1), depending on the particular unit root procedure(s), no cointegration has been performed as the variables are not integrated of the same order. The *Granger Causality Test* has been conducted, revealing a strong positive unidirectional causality existing from Exports to inward FDI and from Imports to inward FDI in the post-liberalization period.

Conclusions:

The causal relationship that runs from Exports to inward FDI implies that the performance of Indian exports can stimulate more inward FDI. This indicates that countries with export potential attract FDI. However, there is no evidence of long-run reverse causality from inward FDI to Exports because inward FDI has been increasingly directed towards non-tradables and services in tandem with the progressive liberalization of the financial and retail sectors in India and not much of inward FDI is observed in the case of merchandize goods. For example, foreign banks are expanding their banking and financial services throughout India and the outlets of foreign-owned hypermarkets are being set up in major townships. Uneven distribution of inward FDI throughout the country may be another reason behind non-causality from FDI inflows to Exports. A study conducted by *Jun* and *Singh* (1996) reveals that exports generally, especially manufacturing exports, are a significant determinant of FDI inflows for countries in which inward FDI is high.

A causal relationship between Imports and inward FDI inflows can be established from the fact that imports stimulate inward FDI inflows in the long run, which is supported by the theoretical analysis that a rise in imports in the host country justifies investment and production by MNCs (*Pacheco-López*, 2005). However, inward FDI do not promote imported inputs because most MNCs produce manufactured goods that are highly dependent on generic inputs with the exception for products that require high technology, e.g., electronics (*Sieh-Lee* and *Yew*, 1997). Thus, at the input end, the local industry has links with multinational trade and investment activities.

This paper provides evidence on the causal linkages between inward FDI, Exports and Imports for India. The major findings indicate that there is short-run causal relationship running from Exports as well as Imports to inward FDI, which clearly support the theoretical argument that trade liberalization in India can attract inward FDI that can foster technology transfer and lead India's transition towards high-technology industrialization. So far as the non-causality from inward FDI inflows to Exports in the long-run is concerned, it can be said that inward FDI are increasingly directed towards the services sector and the branches of foreign banks and the retail outlets of foreign-owned hypermarkets as a result of progressive liberalization of the financial and retail sectors by the Indian government. Moreover, continuous encouragement of inward FDI is needed and for that purpose greater incentives must be given to foreign firms, especially export-oriented foreign firms. Also, greater the investment in knowledge-based industry, greater will be the export performance. Increased competition from foreign rivals may force domestic firms to inject more resources to make their production become more competitive in the global market. Therefore, the Indian Government's efforts to attract FDI will positively encourage domestic firms to reduce inefficiency in production and improve the quality of products which will lead to increase in export performance of the domestic firms.

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