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The Relationship between FDI outflows, Exports and GDP in India: An Application of the Autoregressive Distributed Lag Model

Surendra Singh

Department of Economics, University of Allahabad, Allahabad, India

Corresponding author: surendra0hld@gmail.com

ABSTRACT

This study examines the long-run relationship between foreign direct investment outflows, exports and aggregate measure of GDP in India for the time period 1980 to 2014. In order to assess the long-run relationship, ARDL/Bounds testing approach to cointegration has been applied. At the end of the analysis, VAR Granger causality/Block exogeneity Wald test has also been applied to test for the causal relationship between the variables of interest. The results indicate that all the variables are cointegrated when FDI outflows have been taken as a dependent variable. The positive and statistically significant coefficient of export suggests that FDI outflows and export complement each other, both in the long and short-run. GDP is found to have a negative but statistically insignificant impact on FDI outflows. The dummy that is used to incorporate the shift in policy after the economic reforms of 1991 is found to have a positive but insignificant impact on FDI outflows. The results of the Granger causality test indicate a unidirectional causality running from exports to FDI outflows. A similar type of causality is found between exports and GDP running from GDP to exports. The results of the Granger causality test also suggest that there exists chain relationship among the variables i.e., GDP causes exports and exports, in turn,causes FDI outflows. It can be also inferred that export is a precondition for Indian firms to conduct overseas FDI operations.

Keywords: ARDL cointegration, export, outbound FDI flows, causality, India

In the literature of international economics, FDI and exports are thought as alternative modes of serving foreign markets. A firm may supply the foreign demand either through exports or producing its product locally, subject to the transportation cost, economies of scale, the trade and investment policies of both the host and the parent country. Economists are not unanimous about the relationships between foreign direct investment outflows and exports and it still remains an unsettled issue. While some, such as Mundell (1957), Vernon (1966), Helpman *et al.* (2003) and Dasgupta (2009) argue that outward FDI substitutes export, others, such as Kimura and Kiyota (2006) and Liu *et al.* (2015) argue in the favour of complementary relationship between these two variables. There have been very few studies (Dasgupta (2009) and Liu *et al.* (2015)) that have explored the relationship between FDI outflows and exports in the context of emerging nations like India and China. This study is an attempt to fill the gap by studying the long-run relationship between these two variables in the context of India.

FDI outflows from India have increased remarkably after the introduction of liberalisation, privatisation and globalisation (LPG) in the Indian economy, especially after 2002. The share of outbound FDI stock in the Indian GDP was just 0.04% in 1980 and it remained less than 1% of the GDP till 2002. After 2003, the share of outbound FDI stock in the Indian GDP has increased substantially thanks to the robust overseas expansion of Indian MNCs. The compound annual growth rate of FDI outflows from India was 11.10% between 2003 and 2014. Corresponding to the very high growth in GDP, Indian economy experienced abnormally vast FDI outflows before the financial crisis of 2008 and a negative growth for a large span of 5 years after the crisis. It makes a case for us to include GDP as a variable in our study while studying the long-run relationship between FDI outflows and exports. Going by the tradition, we also included a dummy variable to incorporate the policy shift of 1991 in our model.

This paper contributes to the existing literature in the sense that it uses ARDL/Bounds testing approach cointegration to evaluate the relationship between FDI outflows, exports and GDP of India. It first explores the long-run relationship between the variables of interest and then tests for Granger causality. This is also the prime objective of this study. The remainder of the paper has been structured as follows. Section 2 provides a brief review of related literature. Data description and econometric methodology that has used in this paper are described in section 3. Section 4 presents and discusses the empirical results. Section 5 concludes the paper.

REVIEW OF LITERATURE

There has been a lot of debate on the effect of FDI on exports since the late 1950s. A lot of theoretical and empirical work has been done by researchers and academicians from across the world to explain whether outward FDI substitutes or complements foreign trade. Here we have reviewed some of the vast literature pertaining to this FDI versus exports debate.

Mundell (1957) was the first person who explained theoretically the relationship between FDI and trade. Assuming the classical assumptions such as perfect competition, no transportations costs, identical demand and production functions and constant returns to scale, he showed with help of the standard Heckscher-Ohlin model of international trade that FDI and trade are perfect substitutes. According to his proposition, trade and FDI flows depend on the differences in factor endowment and factor prices across countries. He further hypothesised that factor prices can be equalised across countries either through international trade flows or international factor mobility. In this case, FDI, which is a part of factor mobility across countries, is a substitute for trade.

Vernon (1966) in his famous product life cycle theory views the life production cycle of a product in three stages: introduction, maturity and product standardization. The relationship between FDI and trade alters with the phases of the life cycle of the product. In the first stage, the product is produced in the home country to fulfil the domestic demand. The surplus product is exported to the foreign markets. As the product matures, the demand for the product arises in the foreign markets. A certain degree of standardization takes place. Firms in the foreign markets start producing the product at lower cost. It is hypothesised in the model that the firm, which introduces the product in the mother country, starts producing the product in different locations throughout the world to maintain market share in global markets as well as to reduce the cost. Consequently, FDI substitutes exports.

Balasubramanyam *et al.* (1996) investigate the role of FDI in growth in the context of the 46 developing countries characterised by differing trade policy regime. Using OLS and generalised instrumental variable (GIVE) on cross-section data spanning from 1970 to 1985, they test the hypothesis advanced by Jagdish Bhagwati (1978), according to which the growth enhancing effects of FDI are stronger in countries which pursue an export promotion (EP) policy than in those following an import substitution (IS) one. They use the CUSUMSQ test of structural stability to divide the total sample of 46 countries in the two group i.e. EP and IS groups. As per the test, 18 countries were included in the first group and 28 in the second group. The results of their analysis provide strong support to Bhagwati's hypothesis. They find that FDI is a potent driving force in the growth process in EP countries (with the relevant elasticity being to the order of 1.83) it exerts no significant influence upon growth in IS countries.

Liu *et al.* (2001) examine the causal linkages between FDI and trade in China based on a panel of data covering 19 home countries/regions over the period 1984-1998. They apply multivariate Granger causality tests within the vector autoregressive (VAR) framework to find whether FDI and trade complement or substitute each other in China. Their first finding suggests that growth of China's imports Granger causes the growth of FDI from the home country, which is consistent with Vernon's product life-cycle hypothesis. The second finding suggests that there is a one-way complementary causal link from growth in inward FDI stock in China to the growth of China's exports to the home country, which is largely consistent with the predictions of Helpman and Krugman (1985). The last finding shows a one-way complementary causal link from the growth of China's exports to imports. These results indicate at a virtuous procedure of development for China: more imports lead to more FDI; which in turn leads to more exports. Furthermore, more exports will lead to more imports.

Using data on export sales and foreign subsidiary sales of US firms in 38 countries across 52 industries, Helpman *et al.* (2003) try to estimate the effects of trade frictions (such as transport cost and tariffs), economies of scale and intra-industry firm heterogeneity in productivity among firms on exports versus FDI sales. They identify a new industry characteristic- the heterogeneity in productivity levels across firms- as a determinant of the composition of trade. Their findings validate predictions of their proximity-concentration trade-off model that firms substitute FDI sales for export sales when costs of international trade are relatively high and returns to scale are relatively low. Further, they show that firm heterogeneity in productivity plays a very crucial role in defining the structure of international trade. They show that only the most productive firms engage in international activities and further, of those firms who serve foreign markets, only the most productive engage in foreign direct investment.

Using fixed effect models and Granger causality tests on an annual panel of 81 countries for the time period of 1982-1998, Aizenman and Noy (2006) investigate the intertemporal linkages between foreign direct investment and disaggregated measures of international trade. Their study encompasses a heterogeneous set of developed and developing country. It turns out in their study that there is a positive and statistically significant association between gross FDI flows and trade in the developing countries whereas the association between these variables is positive but statistically insignificant for the developed countries. They also find that FDI is positively correlated with trade in foodstuffs and manufacturing but negatively correlated with trade in fuels in the developing countries. They find qualitatively similar but somewhat weaker results for the developed countries. Their results are consistent with the notion that the feedback effects of trade and FDI are stronger in developing than in industrialized countries. Further, they decompose the causality between trade and FDI flows and find that most of the linear feedback between trade and FDI can be accounted for by Granger causality from FDI gross flows to trade openness (50%) and from trade to FDI (31%). Simultaneous correlation between the two only accounts for 19% of the total linear feedback between the two variables.

Using longitudinal panel data for Japanese firms for the time period 1994-2000, Kimura and Kiyota (2006) examine the relationship between foreign direct investment, exports and firm productivity. Their finding is consistent with the theoretical predictions of Helpman *et al.* (2004), according to which low productivity firms sell in the domestic market only, higher productivity firms export, whereas the highest productivity firm engages in FDI. They further add that due to the high possibility of intra-firm trade between headquarters and foreign affiliates, highest productivity MNEs may engage in both exports and FDI. In other words, exports and FDI are complementary not substitutes.

Chang and Gayle (2009) examine the export versus FDI decisions by a firm in terms of the transport costs and fixed cost of duplicating production unit in the host country with the presence of market demand volatility. Their study uses balanced panel data of US MNCs' direct sales through export and sales through foreign subsidiaries to 56 countries for the time period 1999 to 2004. Demand volatility is measured by taking the standard deviation of the annual time series real GDP. Their empirical results suggest that an exporting firm facing demand volatility may undertake FDI to serve the foreign country with local production.

Using vector autoregressive (VAR) model and Granger causality test, Dasgupta (2009) examine the long run causal effects of Indian exports, imports and FDI inflows on outflows of FDI over the period 1970-2005. The results of her analysis indicate at unidirectional causality from export and import to FDI outflows. These results confirm the proposition that trade is a driving force behind the current FDI outflows. The coefficient of exports has a negative sign which means that the Indian firms seem to undertake horizontal outward FDI to exploit firm specific advantages in the host economy, leading to the substitution of exports of final products by the parent firms. On the other hand, the coefficient of imports has a positive sign which means that Indian firms are undertaking overseas outward FDI projects to acquire sources of raw materials and inputs from abroad directly resulting in higher imports in the home country. This study also reveals that FDI inflows do not Granger cause FDI outflows from India indicating that effects of FDI inflows on the determination of outbound FDI are still limited in India.

Applying cointegration and Granger causality tests, Shawa and Shen (2013) analyse the causality relationship between FDI, export and GDP growth of Tanzania over the period 1980 to 2012. The results of their study indicate that though there exists a long run relationship between the variables in question, no causality was confirmed between GDP and FDI. Only a unidirectional relationship was found between FDI and export with causation running from FDI to export and not otherwise. They suggest more conducive policy framework to attract more FDI in order to boost exports in Tanzania.

Applying ARDL model to cointegration and Granger causality test within VECM, Belloumi (2014) examines the dynamic causal relationship between economic growth, foreign direct investment, trade openness, labour, and capital investment in Tunisia for the period of 1970– 2008. The results of ARDL bounds tests indicate that there is along run relationship among the variables when foreign direct investment is the dependent variable. Whereas the variables of interest are not bound together when the other variables are taken as dependent variables. The estimated coefficients of the long run relationship are found significant for capital investment and labour but insignificant for others. According to them, the negative coefficient of labour indicates a growing unemployment problem in the Tunisia. The results of the Granger causality test indicate that there is no significant causal relationship between FDI and economic growth, trade and economic growth.

Liu *et al.* (2015) purpose a pendulum gravity model to understand the relationship between exports and outward foreign direct investment (OFDI). To empirically establish how the complementary and substitute effects evolve at different stages of development, they use to panel data sets. The first data set encompasses OFDI and export data for China versus a group of OECD countries and the second data set includes the data for the same variables for the USA versus a group of developing countries. The results of the first panel data set analysis reveal a pattern of complementation between exports and OFDI for China whereas evidence in the favour of substitution effect is found for OECD countries. On the other hand, the results of the second-panel data set analysis suggest a pattern of substitution between exports and OFDI for USA and complementarity between these variables for the group of developing countries. To sum up, the findings of the study suggest that the development stage of outward FDI is crucial in determining a complementary or substitute effect between exports and outward FDI. In the early phase, OFDI complements exports, whereas, in the maturity stage, OFDI substitutes exports.

To sum up, we may conclude that there is no unanimity among researchers about the relationship between FDI outflows and exports. Further, there are very few studies that have explored the long-run relationship between the two variables in the context of developing countries like India. To the best of my knowledge, there is only one study (Dasgupta 2009) that has tried to explain the relationship between FDI outflows and exports in India. But the study doesn't test for acointegrating relationship between these variables. The present study fills this gap by applying the ARDL/Bounds test approach to cointegration to explore the long-run relationship between these variables.

DATA AND ECONOMETRIC METHODOLOGY

Data

The data set comprises of annual time series data for India ranging from 1980 to 2014. The data on Export and GDP has been taken from the online database of the World Bank whereas that of OFDI has been taken from UNCTAD's database. All the Variables are in terms of the constant US $ of 2005. The data on outward foreign direct investment has been considered as a flow measure because it is more comprehensive than the stock measure.

The data are transformed into natural logarithms to achieve stationarity in variance as well as to account expected nonlinearity in the relationship. The letter L preceding each variable indicates at the logarithmic form of the variable. Apart from primary variables of interest, we have included a dummy variable to encompass the policy change in favour of liberalisation and globalisation. The dummy takes the value of 0 for the time period preceding the new industrial policy (1991) and 1 for the following period.

ARDL Model Specification

As mentioned earlier and as the table (1) shows our variables of interest are amixture of I(0) and I(1) series. So the conventional cointegration test methods such as Johansen-Juselius (1990) are not appropriate to the current situation as they require the same order of integration. The ARDL/Bounds testing methodology of Pesaran and Shin (1999) and Pesaran *et al.* (2001) is perfectly suited to the current situation. The ARDL/Bounds testing methodology has a number of features that give it some advantages over the conventional cointegration testing. Firstly, as opposed to the conventional cointegration procedures such as Johansen and Juselius (1990), this method can be used with a mixture of I(0) and I(1) data series. Secondly, it involves just a single equation set up, making it simple to implement and interpret. Thirdly, different variables can be assigned different lag lengths as they enter in this model. Lastly, this test is relatively more efficient in small sample sizes. Though pre-testing of variables for unit roots is not necessary for this procedure, it is prudential to check that none of the variables is I(2). This procedure to cointegration will crash in the presence of I(2) series.

Bounds Testing Procedure

The ARDL/Bounds testing procedure starts with estimating conditional (unrestricted) vector error correction model (VECM) of the following form by OLS technique.

$$\Delta LOFDI_t = C_0 + \beta_1 LOFDI_{t-1} + \beta_2 LGDP_{t-1} + \beta_3 LExport_{t-1} + \sum_{i=1}^{p} \delta_i \Delta LOFDI_{t-i} + \sum_{j=1}^{q} \gamma_i \Delta LGDP_{t-i} + \sum_{m=1}^{q} \varphi_i \Delta LExport_{t-i} + \Omega Dummy_t + \varepsilon_t \quad \ldots(1)$$

$$\Delta LGDP_t = C_0 + \beta_1 LGDP_{t-1} + \beta_2 LOFDI_{t-1} + \beta_3 LExport_{t-1} + \sum_{i=1}^{p} \delta_i \Delta LGDP_{t-i} + \sum_{j=1}^{q} \gamma_i \Delta LOFDI_{t-i} + \sum_{m=1}^{q} \varphi_i \Delta LExport_{t-i} + \Omega Dummy_t + \varepsilon_t \quad \ldots(2)$$

$$\Delta LExport_t = C_0 + \beta_1 LExport_{t-1} + \beta_2 LGDP_{t-1} + \beta_3 LOFDI_{t-1} + \sum_{i=1}^{p} \delta_i \Delta LExport_{t-i} + \sum_{j=1}^{q} \gamma_i \Delta LGDP_{t-i} + \sum_{m=1}^{q} \varphi_i \Delta LOFDI_{t-i} + \Omega Dummy_t + \varepsilon_t \quad \ldots(3)$$

Where LOFDI refers to the log of FDI outflows, L Export refers to Log of real exports, LGDP refers to the log of real GDP and Dummy is policy dummy. Δ is the difference operator. ε_t is the error term.

It also involves determining an appropriate lag length on the basis of Akaike information criterion or some other information criterion. Here a test for serial independence of the error term and dynamic stability of the model is necessary. In order to test for the existence of a long-run relationship among the variables an F-test for the joint significance of the coefficients of the variables at the lagged levels is conducted, i.e., thenull hypothesis (H0: $\beta 1= \beta 2= \beta 3= 0$) against the alternative hypothesis (H1: $\beta 1\neq \beta 2\neq \beta 3\neq 0$) is tested. Since exact critical values for the F-test aren't available for an arbitrary mix of I(0) and I(1) variables, Pesaran *et al.* (2001) provide two bounds on the critical values for the asymptotic distribution of the F-statistic: a lower value (lower bound) assuming the regressors are I(0) and an upper value (upper bound) assuming all regressors as I(1). If the computed F-statistic exceeds the upper bound, we conclude that our variables are cointegrated.

On the other hand, if the F-statistic falls below the lower bound we conclude that the variables are I(0), so no cointegration is possible. Finally, if the F-statistic falls between the bounds, the test is inconclusive.

Once the cointegration is established, the conditional ARDL (p1, q1, q2) long-run model for OFDI can be estimated in the following forms:

$$\mathrm{LOFDI}_t = \mathrm{C}_0 + \sum_{i=1}^{p} \beta_1 \mathrm{LOFDI}_{t-i} + \sum_{i=0}^{q1} \beta_2 \mathrm{LGDP}_{t-i} + \sum_{i=0}^{q2} \beta_3 \mathrm{LExport}_{t-i} + \delta\ \mathrm{Dummy}_t + \varepsilon_t \qquad \ldots(4)$$

Where LOFDI, LGDP and LExport denote log of outward FDI flow, real GDP and real exports respectively. Dummy represents the policy change. It involves selecting an appropriate lag length using Akaike information criterion (AIC) or some other information criterion. In the final step, we estimate an error correction model (ECM) to obtain the short-run dynamic parameters. It is specified in the following form:

$$\Delta\mathrm{LOFDI}_t = \mu + \sum_{i=1}^{p} \delta_i\, \Delta\mathrm{LOFDI}_{t-i} + \sum_{j=1}^{q} \varphi_j \Delta\mathrm{LGDP}_{t-j} + \sum_{m=1}^{q1} \gamma_m \Delta\mathrm{LExport}_{t-m} + \theta\mathrm{Dummy}_t + \Omega\mathrm{ecm}_{t-1} + \varepsilon_t \qquad \ldots(5)$$

Where, δ, ϕ, γ and θ, are the short run dynamic coefficients of the model's convergence to the long-run equilibrium, and Ω is the speed of adjustment.

Granger Causality

Once the long-run relationship between FDI outflows, real GDP and exports are established, our next step is to examine the Granger-causal relationship among the variables of interest. Variable X is said to "Granger-cause" variable Y if and only if the forecast of Y can be improved by using the past values of X together with past values of Y, then by not doing so (Granger 1969). Granger causality may be unidirectional or bidirectional (feedback). In the case of unidirectional causality, one variable say X, causes another variable Y but Y doesn't cause X in return. Whereas in the case of bi-directional causality both variables cause each other or in another word, there exists a feedback effect between them. If neither of them causes another, then the two series are said to be statistically independent. The traditional causality test proposed by Granger (1969) suffers from the specification bias and the problem of spurious regression. Firstly for the specification bias, as pointed out by Gujarati (1995), this test is sensitive to model specification and number of lags. It would reveal different results if it was relevant and was not included in the model. Secondly, if the variables are integrated, the F-test procedure is not valid, as the test statistic doesn't have the standard distribution (Gujarati 2006).

To overcome these problems Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) propose a simple procedure based on an augmented VAR which gives the asymptotic distribution of the Wald statistic (an asymptotic $\chi 2$ –distribution), also known as modified Wald test statistic (MWald). This test is regarded superior to the ordinary Granger-causality tests since it doesn't require pre-testing for unit roots and can be applied irrespective of the order of integration of the series. The Toda Yamamoto (1995) procedure first involves the maximum order of integration (d_{max}) of the series that are to be included in the model. It is found by using any of the unit roots tests. Secondly, an optimal lag length of k^{th} order for vector autoregressive model needs to be specified. This condition is met by using any of the information criteria. Thirdly, this procedure intentionally over-fits the underlying model with additional d_{max} *order of integration.* The d_{max} is the maximal order of integration of the series in the model. The VAR equation for testing Granger-causality in our model is specified as below:

$$\begin{bmatrix} LOFDI_t \\ LGDP_t \\ LExport_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \beta_{11,i} & \beta_{12,i} & \beta_{13,i} \\ \beta_{21,i} & \beta_{22,i} & \beta_{23,i} \\ \beta_{31,i} & \beta_{32,i} & \beta_{33,i} \end{bmatrix} \begin{bmatrix} LOFDI_{t-i} \\ LGDP_{t-1} \\ LExport_{t-i} \end{bmatrix} + \sum_{j=1}^{d_{max}} \begin{bmatrix} \beta_{11,k+j} & \beta_{12,k+j} & \beta_{13,k+j} \\ \beta_{21,k+j} & \beta_{22,k+j} & \beta_{23,k+j} \\ \beta_{31,k=j} & \beta_{32,k+j} & \beta_{33,k+j} \end{bmatrix} \begin{bmatrix} LOFDI_{t-k-j} \\ LGDP_{t-k-j} \\ LExport_{t-k-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{bmatrix} \qquad \ldots(6)$$

Where all the variables are the same as previously specified, k is the number of lags for VAR, α is the vector of constants, β_s are all parameter matrices; d_{max} is the highest order of integration for the variables. We have used the VAR Granger/Block exogeneity Wald test to examine the causal relationship among our variables of interest. We use the modified Wald test statistic (χ^2) to test the null hypothesis of Granger non-causality.

EMPIRICAL RESULTS AND DISCUSSION

Unit Roots Tests

Before proceeding with the ARDL bounds test it is reasonable to conduct unit roots tests on our variables to make sure that none of them is I(2). In the presence of I(2) variables, the computed F-statistic provided by Pesaran *et al.* (2001) is not valid because the bounds test assumes that our variables of interest are either I(0) or I(1).

We have applied both Augmented Dickey-Fuller (ADF) test and Phillips-Perron test to check the order of integration of the variables. The test results include both a constant and trend for the levels and for the first difference of the variables. The results of both ADF and Phillips-Perron tests are represented in Table 1.

The results of both ADF and Phillips-Perron tests show that while LOFDI is stationary at levels at the 5% level of significance, the other two variables are stationary at the first difference, i.e., while outward FDI flow is integrated of order 0, GDP and exports are integrated of order 1. The ADF test results for the LOFDI at the first difference indicate that it has unit root at the first difference but the Phillips-Perron test gives contrasting result. We will take it as I(0) as it is stationary at the levels according to the both tests. The results of the unit roots tests make a case for applying the ARDL/Bounds testing method here. While the conventional cointegration tests are not appropriate in the current situation, the ARDL/Bounds tests procedure is perfectly suited to it.

Bounds Testing for Cointegration

In the first step of ARDL/bounds testing analysis, we tested for the long run relationship between OFDI, GDP and exports using equations (1) to (3). We have applied a general to specific modelling based on the short data span and AIC respectively to select a maximum lag order of 2 for the conditional ARDL-VECM. Following the procedure suggested by Pesaran and Pesaran (1997), OLS regressions were estimated for the equations from (1) to (3) and then coefficients were tested for the joint significance. We test the null hypotheses that the coefficients of the lagged level variables are zero (i.e. No long-run relationship exists between the variables of interest) with the help of F-statistic. Table 2 presents the results of the bounds test with the calculated F-statistic and the upper and lower bounds.

The first equation estimates the parameters of LGDP, LExport and the dummy on the LOFDI.

Table 1: Augmented Dickey-Fuller and Phillips-Perron tests on variables

Log Levels			1st Differences			I (d)
Variable	ADF stat	P Perron stat	Variable	ADF stat	P Perron stat	
LODFI	-3.5863**	-3.5863**	ΔLOFDI	1.7954	-8.7183***	I (0)
LGDP	-1.0387	-0.8149	ΔLGDP	-5.6277***	-6.8093***	I (1)
LExport	-2.9247	-2.9703	ΔLExport	-4.8420***	-4.8550***	I (1)

Note: All variables are in logs. Δ is difference operator.

Table 2: ARDL Bounds Test for Cointegration

Dep. Variable	AIC Lags	F-statistic	I(0) Bound*	I(1) Bound*	Outcome
LOFDI= F(LGDP, LExport, Dummy)	2	5.2275	3.79	4.85	Cointegration
LGDP=F(LOFDI, LExport, Dummy)	2	1.8689	3.79	4.85	No Cointegration
LExport=F(LGDP, LOFDI, Dummy)	2	2.9556	3.79	4.85	No Cointegration

*Note: * denotes lower bound and upper bound at 5% level of Significance.*

The computed F-statistic for equation (1) is 5.2275, which is higher than the upper bound critical value 4.85 at 5% level of significance; thereby rejecting the null hypothesis of no cointegration. It shows that there exists a long run relationship between FDI outflows GDP and exports when FDI outflow is the dependent variable. The other two equations don't exhibit any sign of cointegration as the computed F-statistic for these variables is less than the lower bound. In other words, these variables are not cointegrated when other two variables were used as dependent variables. This gives us an intuitive idea about the relationship between the variables of interest. In other words, we can say FDI outflows are influenced by exports and GDP rather than the other way round.

Long-run relationship

Once the long-run relationship is established between the variables for equation (1), we estimate the long-run coefficients using equation (4) by applying the following ARDL (1,0,0) specification. The results are shown in the Table 3.

The estimated coefficients of the long-run relationship show that real exports have a positive and very significant impact on the FDI outflows from India. It turns out that in the long run, other things remaining the same, 1% increase in the exports leads to 5.27% increase in the FDI outflows from India. It also indicates at the complementary relationship between FDI outflows and exports as the coefficient of exports has a positive sign. This finding is quite contradictory to results of Dasgupta (2009), who in her study; found that FDI outflows from India substitute exports. This finding is consistent with results of Liu *et al.* (2015), who also found a complementary relationship between outbound FDI and exports for China. It may be concluded from this finding that at least in the early phase of large FDI outflows from developing countries like India, both outbound FDI and exports complement each other. The most reliable and suitable factor that is attributing to this phenomenon is that most of the Indian firms are engaged in brown field FDI, where instead of setting up subsidiaries overseas, they focus on the forward and backward vertical integration. It saves them from risks associated with setting up subsidiaries abroad on one hand and on the other, they secure their positions in the global markets by owning the supply and demand chain.

Table 3: Estimated Long Run Coefficients using the ARDL Approach

(ARDL (1, 0, 0) selected based on AIC and BIC (Schwarz criterion). Dependent Variable is $LOFDI_t$.)

Variable	Coefficient	t-statistic	Probability
C	26.3593	0.4594	0.6499
$LGDP_t$	-5.1332	-1.2517	0.2223
$LExport_t$	5.2763	2.3804	.0252**
Dummy	0.6961	0.7004	0.4901
R-squared	0.8796		
F-statistic	45.6672		0.0000
DW-statistic	1.5863		

*** denotes 5% level of significance.*

The estimated coefficient of the real GDP has a negative sign and it is highly insignificant. It shows in the context of India, as the real GDP increases by 1%, FDI outflows decreases by 5.135%, holding other factors constant. This may be due to the fact that as domestic economy grows in a healthy growth rate, Indian MNCs prefer to operate from the home country which reduces FDI outflows from India. One another reason which may attribute to the negative impact of real GDP on FDI outflows may be that given the vast amount of cheap labour in India, Indian firms may have an advantage in producing in their parent country rather than performing the vertical FDI activities abroad. This favourable impact of cheap labour will boost the domestic GDP on one hand and on the other; it will limit the vertical FDI activities of the Indian firms. Another reason which is associated with horizontal FDI activities is that most of the Indian MNCs don't possess that type of ownership advantage as their global counterparts in term of technology and managerial skills etc., which hampers their overseas expansion. So instead of going global they operate from the home and serve the foreign markets through exports.

The estimated coefficient of the dummy which is used to show a policy change in favour of globalisation and liberalisation after the new industrial policy of 1991 is positive though highly insignificant. It implies that though the policy shift has a positive impact in determining FDI outflows from India, its impact has been statistically insignificant. Although the policy shift has made India relatively more open economy, it is yet show its impact on the competitiveness of Indian firms so that they may be able to invest overseas in real productive activities like their global counterparts. The R-squared value is .8796 which is lower than the Durbin-Watson statistic value 1.5863, thereby ruling out any possibility of spurious regression among the variables of interest. The F-statistic is highly significant showing that the model fits very well in the long-run.

Short-run Relationship

The results of the short-run dynamic coefficients associated with the long-run relationships obtained from error correction model (ECM) equation (5) are presented in table (4). The results of the ECM model show that short-run dynamic impacts have the same signs as the long run although their magnitude has changed to some extent.

Table 4: Error Correction Representation for the Selected ARDL Model

(ARDL (1, 0, 0) selected based on AIC and BIC (Schwarz criterion). Dependent Variable is $LOFDI_t$.)

Variable	Coefficient	t-statistic	Probability
C	21.9182	0.4574	0.6513
$\Delta LGDP_t$	-4.2683	-1.1972	0.2424
$\Delta LExport_t$	4.3873*	2.0417	0.0519
ΔDummy	0.5788	0.7086	0.4851
Ecm(-1)	-0.8315***	-4.0812	.0004
Cointeq = LNOFDI - (-5.1332*LNGDPREAL + 5.2763*LNEXPORT + 0.6961*DUMMY + 26.3593)			

Note: ****, ** and * denotes 1%, 5% and 10 % level of significance respectively.*

Like the long-run, none of the coefficients except the LExport is significant at the conventional levels of significance. The variable of LExport is significant at marginally more than 5% level of significance. It has a lower impact on FDI outflows in the short-run as compared to the long-run. Holding other things constant, every 1% increase in real exports in the short-run, increase FDI outflows by 4.39%, which is less than the 5.275% increase in the long-run. The coefficients of both real GDP and dummy are highly insignificant in the short-run also. Real GDP has a negative impact on FDI outflows in the short-run; although its magnitude has also been less than that of in the long run. In the short-run, every 1% increase in GDP leads to 4.27% decrease in FDI outflows. The impact of the policy shift is approximately same in the both long-run and short-run.

The equilibrium correction coefficient (*ecm-1*) is estimated -0.83 and it is highly significant with expected sign. It implies a fairly high speed of adjustment to the equilibrium after a shock. Approximately 83% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

The regression for the ARDL equation (1) passes the diagnostic tests against the heteroscedasticity, serial correlation and non-normality (see table 5).

Table 5: ARDL-VECM Model Diagnostic Tests

Serial Correlation χ^2 (2)	0.0419 (0.9470)*
Heteroscedasticity χ^2 (4)	1.0533 (0.4001)*
Normality	1.38 (0.1512)*

*Note: * figures in parenthesis shows the P-values.*

Table (5) shows that there is no problem of autocorrelation in the data as we fail to reject the null hypothesis at even 10% level of significance. To check heteroscedasticity we used the Breusch-Pagan-Godfrey test and failed to reject the null hypothesis of no heteroscedasticity at the conventional 5% or 10% level of significance. Besides serial correlation and heteroscedasticity, our model also passes the normality test as we fail to reject the null hypothesis of normality.

Causality test Results

In this final stage of our empirical analysis, we test for the causal relationship among our variables of interest. This test is essential in the sense that it informs us about the direction of causality among the variables. As stated earlier, this test has three possible outcomes: Uni-directional, bi-directional and neutral relationship. Table 6 presents the results of Granger causality test.

The results show that the value of the χ^2 statistic is 6.899 for real exports with respect to LOFDI. The p-value indicates that it is significant at 5% level of significance, therefore we reject the null hypothesis of LExport doesn't cause LOFDI. In

Table 6: VAR Granger Causality/ Block Exongeneity Wald Test Results

Dependent	Excluded Variables	χ^2	Degrees of Freedom	P-value
LOFDI	LGDP	0.145750	2	0.9397
	LExport	6.899252	2	0.0318**
	All value taken together	13.66879	4	0.0084***
LGDP	LOFDI	0.090369	2	0.9558
	LExport	2.777327	2	0.2494
	All value taken together	2.893163	4	0.5759
LExport	LOFDI	1.239700	2	0.5380
	LGDP	5.978593	2	0.0503*
	All value taken together	7.725471	4	0.1022

****, ** and * indicate the level of significance at 1%, 5% and 10% level of significance respectively.*

other words, we can assert that FDI outflows from India are influenced by Indian exports. On the contrary, no causal relationship was found from real GDP to FDI outflows. We didn't find any type of causal relationship between LGDP, LOFDI and LExport when LGDP was taken as dependent variable. However, we found unidirectional causal relationship between LExport and LGDP running from LGDP to LExport. Although Indian exports are causing FDI outflows from India, there is no possibility of causality running from LOFDI to LExport. This may be due to the fact that most of the Indian firms don't supply intermediate goods to their foreign subsidiaries from their domestic firms. To sum up, the results point out at two unidirectional causalities; one running from LExport to LOFDI and another form LGDP to LExport. We can infer from this relationship that as India's GDP grows, Indian firms first supply the foreign markets through exports. Later as they secure their position in the foreign market, they invest abroad and supply the foreign markets through local productions. They also conduct overseas operations to keep a hold of the raw and intermediate goods that they import from the foreign markets. Here we can carefully assert that GDP causes exports and exports cause FDI outflows from India. This is indicative of chain relationship among our variables.

CONCLUSION

In this paper, we have proposed ARDL/Bounds testing approach to cointegration with a view to examining how FDI outflows, GDP and export interact with each other in the long-run. The bounds test suggests that all variables are cointegrated when we used outbound FDI as the dependent variable. The results indicate that, though all the variables are helpful in explaining the long-run movement in FDI outflows, none except exports are significant. The estimated coefficient of exports shows that there is a complementary relationship between exports and FDI outflows from India. This is in contradiction with the theory proposed by various economists about the relationship between these two variables. But it is consistent with few empirical studies. The coefficient of the GDP is insignificant with a negative sign. It suggests that as domestic economy grows, Indian firms prefer to operate from home. The dummy, which represents the policy shift in favour of liberalisation, is found insignificant. It shows that though the policy change has a positive impact on FDI outflows it is not statistically significant. The signs of all the coefficients remain same in the error correction model as in the long-run, but their magnitude is found less intensive in the short-run. The associated equilibrium correction is also found significant confirming the existence of long-run relationships. The equilibrium correction is fairly fast which shows that approximately 83% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

In the final stage of the empirical work, we test for Granger causality following the methodology suggested by Toda and Yamamoto (1995). The results of the test suggest a unidirectional causality running from exports to FDI outflows, which is consistent with our previous results. We didn't find any evidence of causality between OFDI and GDP. A unidirectional causality running from GDP to exports is also confirmed in the study. The clear-cut inference from the Granger causality results indicate the chain relationship among our variables of interest: as the GDP grows, exports also grows, which in turn increases FDI outflows from India. It can be also inferred that export is a precondition for Indian firms to conduct overseas FDI operations.

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