Chapter 5

An analysis of the Causal Relationship between Investment and Trade in SAARC Region

5.1 Introduction

Chapter four of the present study analysed the impact of FDI on trade in SAARC region with the help of gravity model. It was concluded from the analysis that there is a complementary as well as supplementary relationship between trade and FDI in the SAARC group of countries. However, it was not clear as to what causes what. That is whether trade is leading to higher volume of FDI inflows or FDI is enhancing the trade volume for these countries. It was also not clear whether any causal relationship exist between these two variables. It is this issue that is taken up for analysis in this chapter. The main purpose of this investigation is to find out which is more important for the economy of the region, so that the policy makers can formulate policy accordingly.

As mentioned in the earlier chapter, the traditional theories of FDI maintain that there can be two way relationships between trade and FDI. In the initial stage, foreign markets are generally catered through exports. Once, the foreign firm gain knowledge about the economic and political behaviour of the domestic market, they establishes production subsidiaries in the domestic market. The subsidiary of the foreign firm may export to other countries. Thus, there can be a two-way causal linkage between trade and FDI i.e. trade will first causes FDI and later FDI may eventually lead to trade. However, the relationship between these depends mainly on the nature of the FDI.

As per factor proportion theory propounded by Heckscher (1919) and Ohlin (1933), it is the differences in endowments of factors of production (and implicitly their relative prices) that explain trade. They stated that countries would export goods and services that utilized greater quantities of their relatively abundant factors, and import other goods and services (that is, those that were relatively scarce factors). This model suggest that international trade of goods involves an indirect exchange of factors between the trading countries. The theory also suggests that, even under the assumption that factors of production are perfectly immobile between countries, factors do move between countries in the form of exports and imports of commodities.

Further, Mundell (1957) maintained that tariff protection would lead to perfect substitution between FDI and international trade. Mundell argued that international trade and the international mobility of factors of production which includes FDI are substitutes rather than compliments for each other where there are barriers to trade. Trade impediments stimulate factor movements and that increased impediments to factor movements stimulate trade.

Helpman (1984) and Helpman and Krugman (1985) argued that the degree of specialization is a positive function of relative factor endowments. If there are significant differences in factor endowments, the capital-abundant country tends to export services into the labour-abundant country in exchange for finished varieties of a differentiated good or a homogeneous good. Thus, FDI generates complementary trade flows from the labour-rich country.

Ethier (1986) asserted that both a greater uncertainty faced by the firm and a greater similarity in factor endowments between countries, make FDI more likely, leading to two-way FDI and a relatively higher intra-industry and intra-firm trade. Similarly, Barrios (1997) found that, for countries having common border engaged in a process of economic integration, both intermediate imports and exports of the final good would lead to higher integration.
Some of the recent theories have divided the motives for undertaking FDI into three major categories; first, the horizontal motives, second, the vertical motivations. Finally the knowledge-capital model as proposed by Markusen and Maskus (2001) combines both the horizontal and vertical models into a single model. Theoretically, horizontal FDI replicate the whole production process in the foreign country and thereby avoid trade costs and leads to a supplementary relationship with trade. On the other hand, vertical FDI and trade are complementary because vertical FDI is driven by the distance of production costs rather than trade costs. In the case of vertical FDI the same product is produced in different countries.

Based on the above theoretical foundation several researchers have empirically tested the causal linkages between trade and investment. Rubio and Munoz (2001) studied the causal relationship between outward FDI and exports, in empirical analysis. The study found existence of long-run Granger-causality from outward FDI to exports during the reference period. However, no short run Granger-causality was found between these two variables. The study argued that with the increase in the capital outflow in the liberalisation process might lead to higher export.

Pacheco- Lopez (2005) analysed the liberalisation of FDI in Mexico since the late-1980s, and its relationships with relationship between exports and imports. The study analysed the relationship of FDI with export and import using granger causality method. The study found bi-directional Granger causality between exports and FDI. The study also explored that FDI has a close relationship with imports in case of Mexico. With the increase in FDI, the import content has been intensified.

Lee and Song (2008) used granger causality method to analyse trade and FDI relation in Korea. The study used annual data for the period 1970-2004. The study found two way linkages between trade and FDI. The study found that trade led to higher FDI between Korea and USA and China while FDI caused trade between Korea and Japan.

Kiran (2010) investigated the relationship between trade and FDI in case of Turkey using granger causality methodology. The study considered the time period 1998 to 2004. The study found no causal relationship exists between foreign direct investment.

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2 See Markusen (1984); Markusen and Venables (1998) for horizontal motives and see Helpman (1984); Helpman and Krugman (1985) for vertical motives
and trade in Turkey. The study suggested improvement of educated labour force, developed financial system and political instability, before allowing foreign investment.

Shaikh (2010) used quarterly time series data from 1998 to 2009, to examine the causal relationship between FDI, international trade and economic growth in Pakistan. The study used granger causality method for the analysis. The study found positive impact of FDI on the trade growth of Pakistan. The study found existence of two way causal connections between economic growth, export and FDI, with unidirectional of import to export and FDI.

Rahman (2011) analysed the relationship between foreign investment and international trade in Bangladesh covering the time period between 1972 -2007. The study used granger causality model for the analysis. The study found no causality between trade and FDI in Bangladesh.

Cho (2013) studied the relationship between FDI and international trade for India with four East Asian countries namely China, Japan, Korea and Singapore. The study also covered four more countries for the analysis which are also major trading partners of India. These countries are USA, UK, Germany and Netherlands. The study applied the granger causality method for analysis. The study used quarterly data the time period from 2004 -2012. In Korea-India, Japan-India and Singapore-India bilateral relationships, the causality between trade and FDI could not be found. As against that for the cases of USA-India, UK-India and Germany-India, the relationship was found to be two-way and one-way causality respectively.

Sharma and Kaur (2013) conducted a comparative study between India and China for the causal relationship between trade and FDI. The study employed granger causality method using annual data for the time period between 1976- 2011. The study found unidirectional causality running from FDI to imports and FDI to exports in case of China. The study also established existence of bi-directional causality between imports and exports in case of China. But for India the current study found bi-directional causality between FDI and imports, FDI and exports, and exports and imports.
Even though a large body of literature is available that explains the linkages between trade and FDI, they are unambiguous for explaining the causal relationship. Some studies have reported that trade is influencing higher FDI inflows while have advocated about the opposite, i.e. high inflow of FDI is leading to the higher volume of trade. Further, interaction between FDI and trade has become more complicated with the trend of economic integration. Both existence and nonexistence of causal relationships were reported by different studies. Further, only a few studies were conducted for the SAARC member countries.

It is also pertinent here to note that, researchers have paid very little attention to address this issue in case of SAARC region. It is in this context that the main objective of this chapter is to investigate whether any causal relationship exist between international trade and FDI with the countries in SAARC region.

The rest of the chapter is organised as follows. In the next section the econometric model to analyse the causality between trade and FDI in the SAARC region is provided. The same section also presents the result and finding of the model. The final section concludes the chapter.

5.2 The Econometric Methodology

5.2.1 Data Sources

Various sources have been consulted for collection of data. We have used UN COMTRADE for collecting Export and import data for all the selected countries. UN COMTRADE was accessed from the World Integrated Trade Solution (WITS) online database. Data for FDI inflows in the selected countries were extracted from UN statistics. The time period covered in the study is from 1980 to 2012.

Econometric software e-views and stata were used to analyse the econometric model.

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3 See Cho (2013) for more details
4 For SAARC region as a whole consistent data is available for a long period during 1980 to 2012. Accordingly, causal relationship was estimated.
5.2.2 The Model

In order to assess causal relationship between trade and FDI in SAARC region Granger causality model has been used. The Granger causality test was designed and developed by Granger (1969), Engel and Granger (1987) and Johansen (1991).

Under the Granger causality analysis there can be three different directions.

A) One way causality: Under one way causality or in a single equation model, \( Y \) is the dependent variable and \( X \) independent. Here, there is a causality relationship from \( X \) towards \( Y \) (\( X - Y \)). Independent variable is the cause and causes a one-way effect on dependent variable, which shows the presence of one-way causality and the relationship is determined as (\( Y - X \)).

B) Two-way causality: There can be a reciprocal effect between variables. Both the variables follow each other.

C) Lack of Causality: There is no relationship among variables, therefore no causality exist among them.

Macroeconomic time series data are usually found without stationary. Such time series data are made stationary by calculating logarithms or taking first or second differences. There are various tests used to check the stationary of the data. In the current study, we will use Augmented Dickey-Fuller unit root test to determine the stationary of the variables. Akaike and Schwarz criteria are used while determining the appropriate lag length for delayed variable. The model this test is as follows...

\[
\Delta Y_t = \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i} + \epsilon_t \\
\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i} + \epsilon_t \\
\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \beta_t + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i} + \epsilon_t
\]

\(^5\) This section is largely drawn from Cho (2013)
For the analysis two way model was developed. In the first model it was assumed that FDI is causing higher trade. In the second model the study assumed trade is causing higher inflow of FDI. Finally, in the third model both ways causality was assumed.

Relying on the method above three estimation equations could be established as follows. Let, $X_t, Y_t$ be a stationary time series with zero means respectively ($u_t = 0$, $V_t = 0$). The simple causal equation is (1). The definition Granger causality is as follows: If $Y_t$ is causing $X_t$ provided some $Y_j$ is not zero. Similarly if $X_t$ is causing $Y_t$ if some $C_j$ is not zero. If both of these events occur, there is said to be a feedback relationship between $X_t$ and $Y_t$ (Granger 1969, p. 431). In this study, if the level data of and are stationary and have co-integration, an unrestricted VAR Granger equation 1 is applied.\\n
Secondly, if the level data of $X_t$ and $Y_t$ are not stationary but have co-integration, an error correction VAR Granger Equation 2 is applied.

Thirdly, if the level data of $X_t$ and $Y_t$ are stationary but have no co-integration, instead of level data the first-difference data with an unrestricted VAR Granger Equation 3 is applied. After checking if the data is stationary or not the next step is to investigate the bi-variate co-integration between each trade and FDI. The data is converted to the natural logarithm and the first-difference natural logarithm using Johansen’s co-integration test. To determine the long-run economic relationship between the variables co-integration test has been conducted. In this study, the Error-correction co-integration technique of Johansen (1988) and Johansen and Juselius (1990) has been applied to identify the co-integration relationship between the variables.

Above two steps provides the proper data and analysis method. Engel and Granger (1987) and Johansen (1991) recommend that when each time series data are stationary and there is the presence of co-integration between both data, the natural logarithm conversion data as a level data are better for the unrestricted VAR Granger causality test. They also recommended when each time series data are not stationary, but there is the presence of co-integration between both, the natural logarithm conversion data (level data) could be used with vector error correction VAR Granger causality test. The reason is that the possibility of spurious regression is low in that case.

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6 Cho (2013) also used same model
5.2.3. Estimation

A. Unit Root and Co-integration Test

To examine whether the data are stationary, the Augmented Dickey and Filler (ADF) and Philips Perron (PP) unit root test was conducted. Table 5.1 presented the results of the ADF test on the natural logarithms conversion data and the first-difference of the natural logarithms conversion data. The results for the order of integration of the variables do not seem to be clear cut. Overall results of the unit root test suggest that the trade and FDI level data are not stationary at any significant level. The variables are found stationary after first differencing according to ADF test but found stationary in levels according to PP test. These findings show that the variables are inconclusive either I (0) or I (1) depending on the specific unit root test procedures. Perron (1989) argues that the presence of structural change in ADF test can reduce the power of the test and that the changes in the deterministic components of the time series can lead to biased results. Therefore, in order to capture the effect of any possible structural breaks, we also use the minimum LM unit root test suggested by Lee and Strazicich (2003). This test is not affected by the breaks in examining the stationary properties and allows for two endogenously determined breaks in the intercept and trend.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Log (Level)</th>
<th>Log (First Difference)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade</td>
<td>4.37</td>
<td>-6.11***</td>
</tr>
<tr>
<td>FDI</td>
<td>2.32</td>
<td>3.19**</td>
</tr>
</tbody>
</table>

Note: *, **, *** mean statistically significant at 10%, 5% and 1% respectively.

Source: Appendix 1

The study confirms that the variables under examination are integrated in order one. However, the co-integration test is performed to determine the nature of the long run relationship. The testing of hypothesis is null for non-co-integration against the alternative hypothesis, which mean the existence of co-integration. The pioneering work on co-integration analysis was done by Engle and Granger (1987). After this, the researchers like Stock and Watson (1988) and Johansen (1988) tried to extend the work. This study tests the presence of co-integrating relationship between FDI and IPI using the Johansen (1988) Maximum Likelihood Method within a Vector Auto Regressive (VAR) framework. This procedure has superior properties to other methods of testing co-integration.
Table 5.2: The Results of Johansen Co-integration Tests

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigen values</th>
<th>Trace Statistic</th>
<th>Max-Eigen Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.84</td>
<td>58.23 (14.49)*</td>
<td>58.14 (14.26)*</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.002</td>
<td>0.08 (3.84)</td>
<td>0.08 (3.84)</td>
</tr>
</tbody>
</table>

Note: Parentheses are critical values, * denotes rejection of hypothesis at the 0.1 level

Source: Appendix 1

Table 5.2 explains the results of both the trace test and the maximum eigen value test. Results of Johansen Co-integration tests suggest that a co-integration between each of their trade and FDI level data. The eigen value gives us the amount of variance in the data which is explained by the principle components. In mathematical terms the principal components are the eigen vectors of the co-variance matrix. Those statistics verify if the resultant dynamic system is stable or not. In a co-integration test, it is supposed that the combination of integrated variables/series give you a stationary process. So, if all the roots of the system are inside the unit circle, then, the process is stationary and consequently the series are co-integrated - they have a long-term inter-correlation - one form of verify it is via the eigen values or the trace test. The roots are the eigen values of the system. If they are less than one in module, then the stationary condition is achieved.

B. Granger Causality Test

According to the results of the ADF and Johansen co-integration tests, the appropriate Granger causality equations have been selected. The results of estimation are presented in Table 5.3. The probability value of co-integrating vector is less than 0.05 so we can reject the null hypothesis. The chi squared test also confirms the rejection of null hypothesis. The chi squared test is used to test whether the observed variables or results differ significantly from those that are expected from the model. Chi-square is the sum of the squared difference between observed (o) and the expected (e) data (or the deviation, d), divided by the expected data in all possible categories.

Table 5.3: The Granger Causality Estimation Results

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Chi-Sq.</th>
<th>Prob.</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI does not Cause TRADE</td>
<td>8.29</td>
<td>0.0016</td>
<td>Rejected***</td>
</tr>
<tr>
<td>Trade does not cause FDI</td>
<td>3.72</td>
<td>0.0379</td>
<td>Rejected**</td>
</tr>
</tbody>
</table>

Note: *, **, *** mean statistically significant at 10%, 5% and 1% respectively

Source: Appendix 1

The results of estimation are presented in Table 5.3. The estimation results show that there is no bi-directional relation between trade and FDI in SAARC region. The result
reveals that in case of SAARC region neither trade is leading to higher FDI inflows nor higher FDI inflows in the region is leading to higher trade volume. There is no causal relationship between these two variables. Increase in the trade volume has not affected the volume in the inflows of FDI. Increase in the FDI flows has also not resultant higher trade volume.

5.3 Conclusion

In order to capture whether trade is leading to higher volume of FDI inflows or FDI is enhancing the trade volume the current chapter of the study investigated if any causal relation exist between trade and FDI in terms of SAARC countries. The Granger causality method was employed to analyse the relationship for the time period from 1980 to 2012.

The ADF and PP unit root tests are performed to determine whether the data series are stationary in levels or require first differentiation. The findings show that these unit root test procedures give inconclusive results. The series are found stationary after first differencing according to ADF test but found stationary in levels according to PP test. Following Perron (1989), we take into account possible structural breaks in the data to avoid from the biased results. The maximum LM unit root test of Lee and Strazicich (2003) which allows for two endogenously determined breaks in the intercept and trend is used in the analysis. The findings indicate that the series are stationary in the levels with two structural breaks. To test causality relation among the variables, Granger causality test based on VAR model is applied. As per the findings it is clear that there is no causal relationship between FDI and trade in SAARC region. That is, neither trade is leading to higher FDI inflows nor high FDI inflows are enhancing the trade volume. Although theory states that greater inflow of FDI will lead to greater trade. This is not so in case of SAARC group of countries. This is, despite the fact that FDI policies in SAARC countries are now more liberal than before. One possible reason for the result may be that, the institutional variables in SAARC region in general are not conducive for larger FDI flows. It is a matter of investigation. It is this issue that is taken up for analysis in the next chapter.
References


