Economic Determinants and Trade Potential of Bilateral Trade Flows: A Panel Data Analysis

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Abstract:  
This study analyzes the economic determinants of bilateral trade flows and trade potential of Pakistan with ECO member countries by using panel data for years 2003-2014. Gravity trade model is estimated through panel least squares technique and trade potential is calculated through Predicted to Actual trade ratio method. The results show that Pakistan’s bilateral trade flows with ECO member countries are positively correlated with GDP, trade openness, and border while negatively correlated with distance, per capita GDP, exchange rate, inflation rate, and landlocked. The study also reveals that Pakistan has potential to expand its trade with Azerbaijan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan. Supportive measures are needed to exploit the unrealized potential of trade in ECO region. Trade should be further liberalized through reduction in tariff barriers and non-tariff barriers.

Keywords: ECO, Bilateral Trade Flows, Panel Data, Trade Potential, Gravity Trade Model

JEL Classification Codes: F14, F17, C33

I. Introduction  
International economics explains that economic activity is affected by different factors i.e. differences in productive resources, change in consumer preferences, and policies of international institutions etc. On the basis of these differences, countries do trade with each other, achieve economies of scale in production by specialization, and get
mutual benefits from trade by creating comparative advantage in production. Present study is based on the Economic Cooperation Organization (ECO). ECO was originally established by Pakistan, Turkey and Iran in 1964 as Regional Cooperation for Development (RCD). Its basic areas were trade, banking, communications, political and cultural affairs, industry, transportation and railway. RCD was renamed in 1985 to Economic Cooperation Organization (ECO). It was recognized after the collapse of Soviet Union to collaborate with the separated states. Central Asian States and Afghanistan were included in ECO in May 1992 so, ECO members were increased from 3 to 10 including Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Turkey and Uzbekistan. Major aims and objectives of ECO include sustainable economic development, better living standard of people, promotion of economic, social, technical, cultural and scientific cooperation, elimination of trade barriers for the expansion of intra-regional trade, better infrastructure for transportation and communication, development of industrial potential, enhancement of agricultural, natural, energy and human resources, privatization and economic liberalization. Trading opportunities are very good in ECO region. ECO has become a flourishing regional organization and its international importance is increasing but at the same time, the organization faces very hard challenges. There is lack of proper institutions and infrastructure that’s why resources are not fully utilized in the region. ECO countries are dependent for their exports and imports on industrial economies therefore joint trade among the member countries has been sluggish over time. Trade potential of the region has not yet explored fully so the need of the time is to collaborate with each other so that higher intra-regional trade target could be accomplished within the ECO region.

In year 2012, ECO regions’ total foreign trade was projected to 1,111 billion US$, including merchandise trade value of worth 865 billion US$ and services trade value of worth 246 billion US$. In total world trade, share of the region was recorded as 2.3% and 1.5% in merchandise and services trade respectively. From 1994 to 2012, contribution of the region has increased in world merchandise trade with 12.1% growth rate. Exports and imports balance of merchandise trade was 8.3 billion US$ in 2012. Merchandise trade per capita was estimated to 1,991 US$ in 2012, with highest figure of 8,146 US$ for Kazakhstan and lowest figure of 217 US$ for Afghanistan. Merchandise trade to GDP ratio was highest with 112% for Kyrgyz while below 80% for other countries and lowest for Pakistan with 30%. Among ECO countries, share of merchandise trade was highest for Turkey with 45%, then Iran with 19%, Pakistan with 16%, and lowest share below 1% for Tajikistan and Afghanistan. Merchandise trade balance was positive for Azerbaijan, Iran, Kazakhstan, and Turkmenistan in 2012 with maximum figure of 48 billion US$ for Kazakhstan, 47 billion US$ for Iran, and negative figures recorded for Turkey with -84 billion US$. From total merchandise trade, share of inter-regional trade in 2012 touched to 8.9%. Azerbaijan, Kyrgyz, and Tajikistan showed negative variations while other countries showed positive change in ratio of inter-regional merchandise trade. In year 2012, among ECO countries, Turkey was recorded to have highest rank in both exports and imports with 32 and 21 respectively in world merchandise trade. Afghanistan was assigned lowest rank in exports with 172 and Tajikistan was assigned lowest rank in imports with 135.ECO intra-regional trade has never exceeded 6% which shows that trade among ECO countries is not exploited to its potential. Reasons for the insignificant level of trade may be due to less surplus of
II. Review of Empirical Studies

In this section, we have displayed review of empirical studies based on gravity trade model. Numerous studies have applied gravity trade model to probe the economic determinants of trade, trade potential, institutional determinants of trade, institutional homogeneity effect on the level of trade, economic integration, and several other fields of international economics. Studies on ECO region are very limited in Pakistan particularly by using panel data and gravity trade model. Present study on ECO region would be a contribution in the existing literature. Table 1 presents review of assorted studies based related to the issue concerned.

Table 1: Review of Empirical Studies

<table>
<thead>
<tr>
<th>Reference(s)</th>
<th>Variables Studied</th>
<th>Data Type</th>
<th>Data Sources</th>
<th>Technique</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lai et al. (2016)</td>
<td>Exports GDP, Distance Per Capita GDP Unemployment rate Inflation rate Trade openness Exchange rate Total population</td>
<td>Panel data of 7countries for years 1995-2012</td>
<td>WDI, US foreign exchange, Indonesian tourism website</td>
<td>Pooled OLS</td>
<td>Per capita GDP + Exchange rate - Inflation rate - Trade openness + Total population +/-</td>
</tr>
<tr>
<td>Magerman et al. (2016)</td>
<td>Exports GDP Distance Border Language Colony Member of WTO and RTAs</td>
<td>Panel data of 209 countries for years 1998-2011</td>
<td>UN COMTRADE CEPII WDI</td>
<td>OLS, BB, LSDV, PPML, GPML</td>
<td>GDP + Distance - Border + Language + Colony + Member of WTO and RTAs +</td>
</tr>
<tr>
<td>Doumbe and Belinga (2015)</td>
<td>Trade flows GDP Per capita GDP Distance Language Colony</td>
<td>Panel data of 29 countries for years 2008-2012</td>
<td>Economic Outlook database of IMF and CEPII</td>
<td>OLS</td>
<td>GDP + Per capita GDP + Distance - Language + Colony +</td>
</tr>
<tr>
<td>Mohmand et al. (2015)</td>
<td>Exports GDP Trade openness Distance Border RTA, Religion Language</td>
<td>Panel data of 142 countries for years 1995-2011</td>
<td>UN COMTRADE WDI, CEPII WTO</td>
<td>PMLE</td>
<td>GDP + Trade openness + Distance - Border - RTA + Religion + Language +</td>
</tr>
<tr>
<td>Sultan and Munir (2015)</td>
<td>Total Trade, Exports, Imports</td>
<td>Panel data of 38 countries for years</td>
<td>GDP + Per Capita GDP Differential +</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

exportable products inefficient process of production, financial constraints, tariffs and non-tariff barriers, customs procedures, gap in communication and transportation facilities, and political issues etc. The rest of the paper is structured as: Section 2 explains review of empirical studies. Section 3 explains model, data and methodology. Section 4 describes the results and discussions while the section 5 concludes along with policies recommendations.
<table>
<thead>
<tr>
<th>Source: Authors’ compilation</th>
</tr>
</thead>
</table>

In all these studies, different specifications of gravity trade model have been estimated through least squares technique by using cross sectional and panel data and different explanatory and dummy variables. All studies show expected signs for basic gravity variables of GDP and distance. Trade volumes are positively correlated with GDP while negatively correlated with distance. Border and language dummy variables are also positively correlated with trade in almost all the studies. Other explanatory variables like trade openness, exchange rate, population and per capita GDP differential are also included in these studies. Trade openness variable has showed positive sign in almost all studies showing that more the country is open for trade, larger will be the trade volume.
Exchange rate showed mixed signs both positive and negative depicting the impact of appreciation and depreciation of currency on the level of trade. Per capital GDP differential has also showed mixed signs both positive and negative supporting Heckscher-Ohlin model in case of positive sign and Linder hypothesis in case of negative sign.

III. Model, Data and Methodology
A. Model Specifications for Economic Determinants of Trade

Following model specifications are used to find the economic determinants of bilateral trade flows of Pakistan with ECO countries. In each model, bilateral trade flows is used as dependent variable; and GDP, per capita GDP, and distance are used as independent variables along with other explanatory variables. All variables are in log form except the dummy variables.

Model 1: Basic Gravity Model

In this model, basic gravity trade model is estimated with the traditional gravity variables of GDP, per capita GDP and distance.

\[
\log(\text{TRD}_{ij}) = \alpha + \beta_1 \log(\text{GDP}_i \cdot \text{GDP}_j) + \beta_2 \log(\text{PCGDP}_i \cdot \text{PCGDP}_j) + \beta_3 \log(DST_{ij}) + \mu_i \tag{1}
\]

Model 2: Augmented Gravity Model

In this model, gravity trade model is estimated by including more explanatory variables of exchange rate, trade openness and inflation rate.

\[
\log(\text{TRD}_{ij}) = \alpha + \beta_1 \log(\text{GDP}_i \cdot \text{GDP}_j) + \beta_2 \log(\text{PCGDP}_i \cdot \text{PCGDP}_j) + \beta_3 \log(DST_{ij}) + \beta_4 \log(\text{EXR}_i) + \beta_5 \log(\text{EXR}_j) + \beta_6 \log(\text{TRO}_i) + \beta_7 \log(\text{TRO}_j) + \beta_8 \log(\text{INF}_i) + \beta_9 \log(\text{INF}_j) + \mu_i \tag{2}
\]

Model 3: Augmented Gravity Model (With Dummy Variables)

In this model, gravity trade model is estimated by including dummy variables of adjacency and landlocked along with all other variables.

\[
\log(\text{TRD}_{ij}) = \alpha + \beta_1 \log(\text{GDP}_i \cdot \text{GDP}_j) + \beta_2 \log(\text{PCGDP}_i \cdot \text{PCGDP}_j) + \beta_3 \log(DST_{ij}) + \beta_4 \log(\text{EXR}_i) + \beta_5 \log(\text{EXR}_j) + \beta_6 \log(\text{TRO}_i) + \beta_7 \log(\text{TRO}_j) + \beta_8 \log(\text{INF}_i) + \beta_9 \log(\text{INF}_j) + \beta_{10} \log(\text{ADJ}_i) + \beta_{11} \log(\text{LNL}_i) + \mu_i \tag{3}
\]

Where:
- \(\text{TRD}_{ij}\) = Total amount of imports and exports between country i and country j
- \(\text{GDP}_i\) = GDP of country i
- \(\text{GDP}_j\) = GDP of country j
- \(\text{PCGDP}_i\) = Per capita GDP of country i
- \(\text{PCGDP}_j\) = Per capita GDP of country j
- \(\text{DST}_{ij}\) = Distance between country i and country j
- \(\text{EXR}_i\) = Exchange rate of country i
- \(\text{EXR}_j\) = Exchange rate of country j
- \(\text{TRO}_i\) = Trade openness of country i
- \(\text{TRO}_j\) = Trade openness of country j
- \(\mu_i\) = Error term
INF$_i$ = Inflation rate of country i 
INF$_j$ = Inflation rate of country j 
ADJ$_{ij}$ = Dummy variable of adjacency/common border between country i and country j 
LNL$_i$ = Dummy variable of landlocked countries 
$\mu_{ij}$ = Error term 
i\text{th country is trading partner (ECO member country), } i = 1, 2, 3, 4, 5, 6, 7, 8, 9 
j\text{th country is Pakistan}

B. Model for Trade Potential

Concept of trade potential is used widely in international trade relations by the researchers. In the present study, trade potential is calculated for Pakistan with ECO member countries by using Predicted to Actual trade ratio (P/A) method to forecast the future trade direction. In present study, trade potential is calculated by Hodrick-Prescott (HP) Filter method.

It can be written as:

$$\sum_{t=1}^{T} (y_t - T_t)^2 + \lambda \sum_{t=2}^{T-1} (T_{t+1} - 2T_t + T_{t-1})^2$$

(4)

Where:

$T$ = Sample size 
$\lambda$ = Non-negative smoothing parameter 
y = ($y_1, \ldots, y_T$) is the series of data that is to be smoothed 

Studies of Abbas and Waheed (2015), Nasiri and Hassani (2013), Gul and Yasin (2011), Batra (2006), and Rahman (2003) have used Predicted to Actual trade ratio (P/A) method to find the trade potential.

C. Data and Methodology

In present study, panel data of ECO region (10 countries) are used from years 2003-2014 (12 years). Panel data provide more efficient results due to more degree of freedom and more reliability. Panel least square technique is used to estimate the different specifications of gravity trade model to find the economic determinants of trade. Concept of trade potential is used widely in international trade relations by the researchers. In the present study, trade potential is calculated for Pakistan with ECO member countries by using Predicted to Actual trade ratio (P/A) method to forecast the future trade direction. Data of all the variables are gathered from UN COMTRADE, WDI, Penn World Table, and CEPII. Table 2 presents description of variables used in this study.
Table 2: Description of Variables: Unit, Sources and Expected Signs

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Unit</th>
<th>Data Source</th>
<th>Expected Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td>Bilateral trade flows obtained by adding bilateral imports and bilateral exports</td>
<td>US$</td>
<td>UN COMTRADE</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product used as a proxy for economic size of the country</td>
<td>Current 2005 US$</td>
<td>WDI</td>
<td>Positive</td>
</tr>
<tr>
<td>DST</td>
<td>Distance from capital to capital used as a proxy for trade costs</td>
<td>Kilometer</td>
<td>CEPII</td>
<td>Negative</td>
</tr>
<tr>
<td>PCGDP</td>
<td>Per capita Gross Domestic Product used as a proxy for level of development of the country</td>
<td>Current 2005 US$</td>
<td>WDI</td>
<td>Positive</td>
</tr>
<tr>
<td>EXR</td>
<td>Exchange rate captures the relative price effect and used as a proxy for prices</td>
<td>National Currency per US$</td>
<td>Penn World Table 7.1 and WDI</td>
<td>May be Positive or Negative</td>
</tr>
<tr>
<td>TRO</td>
<td>Trade openness measured by trade to GDP ratio is used to check the degree of economic openness of a country</td>
<td>Trade as Percentage of GDP</td>
<td>WDI</td>
<td>Positive</td>
</tr>
<tr>
<td>INF</td>
<td>Inflation rate as measured by GDP deflator captures the changes in overall level of prices in the country</td>
<td>Annual Percentage</td>
<td>WDI</td>
<td>May be Positive or Negative</td>
</tr>
<tr>
<td>ADJ</td>
<td>Adjacent /common borders assumes the value of 1 if countries share same border and value of 0 otherwise</td>
<td>1 and 0</td>
<td>CEPII</td>
<td>Positive</td>
</tr>
<tr>
<td>LNL</td>
<td>Landlocked means lack of oceans, sea and water reservoirs assumes the value of 1 if countries are landlocked and value of 0 otherwise</td>
<td>1 and 0</td>
<td>CEPII</td>
<td>Negative</td>
</tr>
</tbody>
</table>

IV. Results and Discussions

In this section, we are discussing the results of economic determinants of bilateral trade along with the trade potential between Pakistan and other ECO countries.

A. Descriptive Statistics of Key Variables

Table 3 presents the descriptive statistics of all economic variables. Average bilateral trade flows of Pakistan with ECO member countries remains at 309 US$ during 2003-2014 with maximum of 2860 US$ and minimum of 0.311 US$. Standard deviation is the measure of dispersion which shows how much the data differ from the mean value. Higher standard deviation shows greater dispersion from the mean and lower standard deviation shows less dispersion from the mean. The standard deviation of bilateral trade flows is 574 which show greater dispersion from the mean value.

Skewness is a measure of symmetry. It describes asymmetry from the normal distribution in a set of statistical data. Negative or positive skewness depends on the data points if data are left skewed then it is negative skewness and if data are right skewed then it is positive skewness. Value of skewness for bilateral trade flows is 2.4 while for normal distribution, skewness should be zero. Kurtosis is a measure of whether the data are heavy-tailed or light-tailed in relation to a normal distribution. High kurtosis shows heavy tails or outliers and low kurtosis shows light tails or lack of outliers. Value of kurtosis of bilateral trade flows is 8.9 while for normal distribution, kurtosis should be 3.
significant in all three models. Model 1 shows that bilateral trade flows will increase by flows of Pakistan with ECO.

This shows that data of ECO countries of all economic variables follow non-normal distribution. Jarque-Bera test also confirms the same results as probability value of all variables is less than 5% level of significance which leads to reject the null hypothesis.

**B. Correlation Matrix**

Table 4 presents the correlation matrix of all variables. Correlation matrix explores the degree of association between variables. There is perfect correlation of 1 with own variable i.e. trade has perfect correlation with trade and same for all other variables. Bilateral trade flows has negative correlation with per capita GDP, trade openness and inflation rate of Pakistan has zero correlation with distance, land lockedness and positive correlation with other remaining variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>TRD</th>
<th>GDP</th>
<th>GDP</th>
<th>PCGDP</th>
<th>PCGDP</th>
<th>DST</th>
<th>EXR</th>
<th>EXR</th>
<th>TRO</th>
<th>TRO</th>
<th>INF</th>
<th>INF</th>
<th>ADJ</th>
<th>LNL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRD</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>0.21</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>0.15</td>
<td>0.21</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PCGDP</td>
<td>-0.05</td>
<td>0.71</td>
<td>0.41</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCGDP</td>
<td>0.12</td>
<td>0.21</td>
<td>1.00</td>
<td>0.41</td>
<td>1.00</td>
<td></td>
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<tr>
<td>DST</td>
<td>-0.10</td>
<td>0.80</td>
<td>0.90</td>
<td>0.76</td>
<td>0.00</td>
<td>1.00</td>
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</tr>
<tr>
<td>EXR</td>
<td>0.10</td>
<td>0.36</td>
<td>0.11</td>
<td>0.12</td>
<td>0.11</td>
<td>0.11</td>
<td>1.00</td>
<td></td>
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</tr>
<tr>
<td>EXR</td>
<td>0.14</td>
<td>0.19</td>
<td>0.34</td>
<td>0.39</td>
<td>0.91</td>
<td>0.00</td>
<td>0.12</td>
<td>1.00</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>TRO</td>
<td>-0.44</td>
<td>-0.58</td>
<td>-0.20</td>
<td>-0.37</td>
<td>-0.20</td>
<td>-0.37</td>
<td>-0.43</td>
<td>-0.20</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>TRO</td>
<td>0.02</td>
<td>-0.02</td>
<td>-0.15</td>
<td>-0.05</td>
<td>-0.10</td>
<td>0.00</td>
<td>-0.05</td>
<td>-0.30</td>
<td>0.03</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INF</td>
<td>-0.25</td>
<td>-0.07</td>
<td>-0.23</td>
<td>-0.12</td>
<td>-0.20</td>
<td>-0.07</td>
<td>-0.23</td>
<td>-0.32</td>
<td>0.02</td>
<td>0.25</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INF</td>
<td>0.09</td>
<td>0.03</td>
<td>0.11</td>
<td>0.04</td>
<td>0.17</td>
<td>0.00</td>
<td>-0.04</td>
<td>0.01</td>
<td>-0.06</td>
<td>0.25</td>
<td>0.07</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADJ</td>
<td>0.72</td>
<td>0.13</td>
<td>0.00</td>
<td>-0.15</td>
<td>0.00</td>
<td>-0.22</td>
<td>0.58</td>
<td>0.00</td>
<td>-0.37</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>LNL</td>
<td>-0.25</td>
<td>-0.88</td>
<td>0.50</td>
<td>-0.48</td>
<td>0.00</td>
<td>-0.70</td>
<td>0.58</td>
<td>0.00</td>
<td>0.81</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.36</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations

GDP and per capita GDP of Pakistan have zero correlation with distance and strong positive correlation of 0.94 and 0.91 respectively with Pakistan’s exchange rate. GDP, per capita GDP, exchange rate, trade openness and inflation rate of Pakistan has zero correlation with adjacency and land lockedness.

**C. Economic Determinants of Bilateral Trade Flows: Pakistan with ECO Countries**

Table 5 presents the panel data results economic determinants of bilateral trade flows of Pakistan with ECO countries. Product of GDP coefficient is positive and significant in all three models. Model 1 shows that bilateral trade flows will increase by
1.81% on average with 1% increase in GDP of both countries. Model 2 shows that bilateral trade flows will increase by 2.27% on average with 1% increase in GDP of both countries. Model 3 shows that bilateral trade flows will increase by 1.78% on average with 1% increase in GDP of both countries. Product of GDP shows economic size of a country in terms of market size and production capacity. Higher GDP means higher production capacity, large domestic markets, and large varieties of goods available for trade; so, if GDP of a country increases, its trade volume also increases. Economic growth is also measured by the level of GDP; higher the GDP of a country, higher will be the economic growth of that country and higher will be the trade volume. Economic size does matter for trade i.e. three European countries, Germany, France and UK are the largest trading partners of U.S. because of their higher economic size in terms of their higher GDPs. Germany, being a large economy accounts for 21% of GDP of Western Europe; it also accounts for 19.9% of U.S. trade. On the other hand, Sweden, being a smaller economy accounts for only 2.7% of European GDP; it accounts for only 3% of U.S. trade (Krugman, 2012). Thus, large economies tend to import more because of their higher incomes and also tend to export more because of their large variety of output or production; so, larger the economy, larger will be the trade (Krugman, 2012). Studies of Doumbe and Belinga (2015), Rizwan ul hassan and Shafiq ur rehman (2015), Parasai (2014), Khan et al. (2013), Gul and Yasin (2011), and Rahman (2009) confirmed the positive relationship between product of the GDPs and trade flows. Studies of Batra (2006) and Rahman (2003) also confirmed the positive relationship between product of the GNPs and trade flows.

Product of per capita GDP coefficient is negative in all three models. In model 1, per capita GDP coefficient is insignificant. Model 1 shows that bilateral trade flows will decrease by 0.96% on average with 1% increase in per capita GDP of both countries. In model 2 and 3, per capita GDP coefficient has become significant with the inclusion of more variables in the model. Model 2 shows that bilateral trade flows will decrease by 1.54% on average with 1% increase in per capita GDP of both countries. Model 3 shows that bilateral trade flows will decrease by 0.86% on average with 1% increase in per capita GDP of both countries. Per capita GDP shows the level of development, infrastructure, and purchasing power of a country. These are very essential for bilateral trade as more developed the countries, more will be the trade flows. With the development of a country, transportation facilities become better which enhance the level of trade. People demand more exotic foreign varieties which may lead to the innovation or invention of new products. Present study shows contradictory results in case of per capita GDP. The possible reason of negative coefficient of per capita GDP may be that increasing population with increasing demand and increasing consumption of domestic goods lead to greater part of the production absorbed by the domestic market which shrinks the surplus available for export resulting in lower trade. Studies of Bojnec and Ferto (2015), Parasai (2014), and Hatab et al. (2010) support the negative sign of per capita GDP coefficient.

Distance coefficient is negative and significant in all three models. Higher the distance among trading countries, lower will be the trade volume as transportation cost increases. Model 1 shows that bilateral trade flows will decrease by 2.06% on average with 1% increase in distance of both countries. Model 2 shows that bilateral trade flows
will decrease by 2.03% on average with 1% increase in distance of both countries. Model 3 shows that bilateral trade flows will decrease by 1.89% on average with 1% increase in distance of both countries. The further the distance between two trading countries, the lesser the bilateral trade between them (Tinbergen, 1962; Poyhonen, 1963; Bergstrand, 1985). All empirical studies conducted on the gravity trade model confirmed the negative relationship between trade volume and distance.

Table 5: Panel Data Results of Economic Determinants of Bilateral Trade

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-41.82892 (0.0220)</td>
<td>-43.71698 (0.0392)</td>
<td>-36.02344 (0.0091)</td>
</tr>
<tr>
<td>$GDP_iGDP_j$</td>
<td>1.809070 (0.0006)</td>
<td>2.270421 (0.0000)</td>
<td>1.783358 (0.0000)</td>
</tr>
<tr>
<td>$PCGDP_iPCGDP_j$</td>
<td>-0.956498 (0.1720)</td>
<td>-1.541505 (0.0143)</td>
<td>-0.856959 (0.0217)</td>
</tr>
<tr>
<td>DST&lt;sub&gt;ij&lt;/sub&gt;</td>
<td>-2.062870 (0.0716)**</td>
<td>-2.030107 (0.0301)**</td>
<td>-1.897464 (0.0007)**</td>
</tr>
<tr>
<td>EXR&lt;sub&gt;i&lt;/sub&gt;</td>
<td>-0.392984 (0.0044)*</td>
<td>-0.350392 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>EXR&lt;sub&gt;j&lt;/sub&gt;</td>
<td>-3.029581 (0.0077)*</td>
<td>-3.462930 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>TRO&lt;sub&gt;i&lt;/sub&gt;</td>
<td>-1.159258 (0.0851)**</td>
<td>0.385146 (0.4758)</td>
<td></td>
</tr>
<tr>
<td>TRO&lt;sub&gt;j&lt;/sub&gt;</td>
<td>1.230067 (0.4806)</td>
<td>1.445876 (0.2850)</td>
<td></td>
</tr>
<tr>
<td>INF&lt;sub&gt;i&lt;/sub&gt;</td>
<td>-0.292795 (0.0017)</td>
<td>-0.232557 (0.0129)</td>
<td></td>
</tr>
<tr>
<td>INF&lt;sub&gt;j&lt;/sub&gt;</td>
<td>-0.075448 (0.6755)</td>
<td>-0.070707 (0.6322)</td>
<td></td>
</tr>
<tr>
<td>ADJ&lt;sub&gt;ij&lt;/sub&gt;</td>
<td>2.763838 (0.0000)</td>
<td>2.763838 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>LNL&lt;sub&gt;ij&lt;/sub&gt;</td>
<td>-0.561125 (0.3421)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.891019</td>
<td>0.906095</td>
<td>0.932069</td>
</tr>
<tr>
<td>DW</td>
<td>2.458827</td>
<td>1.796679</td>
<td>2.031982</td>
</tr>
<tr>
<td>F-Statistic</td>
<td>152.0724</td>
<td>76.22736</td>
<td>98.33320</td>
</tr>
<tr>
<td>Prob. (F-Statistic)</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations, P-values in parenthesis. *, **, *** represents the 1%, 5% and 10% level of significance respectively.

Exchange rate coefficients for both trading countries are negative and significant in model 2 and 3. Higher the exchange rate per unit of US$ in Pakistan or other ECO member countries, lower will be the trade volume. Model 2 shows that bilateral trade flows will reduce by 0.39% on average with 1% increase in exchange rate of ECO member country and will reduce by 3.03% on average with 1% increase in exchange rate of Pakistan. Model 3 shows that bilateral trade flows will reduce by 0.35% on average with 1% increase in exchange rate of ECO member country and will reduce by 3.46% on average with 1% increase in exchange rate of Pakistan. Exchange rate coefficient captures the effect of currency appreciation and depreciation in the country. If there is
increase in exchange rate or depreciation in the currency of a country then its exports become cheaper and imports become costly; thus, depreciation encourages exports and discourages imports. Depreciation of currency has also many adverse effects including rise in prices and foreign debt. Import flows are negatively correlated with exchange rate. According to the J curve approach, exchange rate and net exports are inversely related. The J curve shows the response pattern of net exports to currency depreciation. Currency depreciation raises the cost of imports. In Pakistan, the export revenues are usually less than the import payments causing deficit in the balance of payments. Studies of Lai et al. (2016), Abbas and Waheed (2015), Sultan and Munir (2015), Iqbal and Islam (2014), Ravi Shankar and Stack (2014), Malik and Chaudhary (2012), Jafari et al. (2011), and Hatab et al. (2010) support the negative sign of exchange rate coefficient.

Trade openness coefficient is negative and significant for ECO member countries in model 2 showing that bilateral trade flows will reduce by 1.15% on average with 1% increase in trade openness of ECO member countries. Study of Malik and Chaudhary (2012) supports the negative sign of trade openness coefficient. Trade openness coefficient is positive and insignificant for Pakistan in model 2 showing that more the country is open for trade; more will be the trade volume and bilateral trade flows will increase by 1.23% on average with 1% increase in trade openness of Pakistan. In model 3, trade openness coefficient is positive and insignificant showing that bilateral trade flows will increase by 0.38% and 1.44% for ECO member countries and for Pakistan respectively due to trade openness. Developing countries have experienced rapid trade liberalization either unilaterally or as part of multilateral initiatives with the World Bank, WTO and the IMF. Economy is open due to trade liberalization and eliminations of trade barriers resulting in an increase in trade volume. The country having less import restriction or import tariffs will trade more. Trade reforms are expected to increase exports and imports both. Studies of Lai et al. (2016), Sultan and Munir (2015), Mohmand et al. (2015), Gul and Yasin (2011), Hatab et al. (2010), Rahman (2009), and Rahman (2003) confirmed the positive relationship between trade volume and trade openness.

Inflation rate coefficients are negative for both trading countries but significant for ECO member countries and insignificant for Pakistan in model 2 and 3. Higher the inflation rate, lower will be the trade volume. Model 2 shows that bilateral trade flows will reduce by 0.29% on average if inflation rate increases in ECO member countries and will reduce by 0.075% on average by 1% increase in inflation rate in Pakistan. Model 3 shows that bilateral trade flows will reduce by 0.23% on average if inflation rate increases in ECO member countries and will reduce by 0.071% on average by 1% increase in inflation rate in Pakistan. High inflation rate reduces purchasing power and leads to currency depreciation. Exports become cheaper and imports become costly. Price of imported goods goes up leading to imported inflation. Due to cheaper exports, domestic aggregate demand rises causing demand pull inflation. The exporting firms get better due to more competitive in the international market.

Moreover, real interest rate falls due to high inflation and it deteriorates the capital account of the balance of payments as well. High inflation creates uncertain business environment which distress the investment efforts as firms are unable to forecast
accurately their receipts and expenditures. Studies of Lai et al. (2016), Malik and Chaudhary (2012), and Rahman (2003) support the negative sign of inflation rate coefficient.

Adjacency or common border dummy variable is positive as expected and significant in model 3. Countries sharing the same border tend to trade more. Adjacent countries trade more than non-adjacent countries (Leamer 1993; Helliwell 1997). Studies of Megerman et al. (2016), Wang (2016), Alvarez et al. (2015), Bojnec and Ferto (2015), Mohmand and Wang (2013), Mukhanov (2013), and many other studies conducted on gravity trade model confirmed the positive relationship between trade volume and adjacency.

Landlocked dummy variable is negative as expected sign and insignificant. If a country is landlocked, it may increase the transportation cost due to lack of ocean ports resulting in lower trade volume. Frankel and Romer (1999) used landlocked dummy variable and found negative impact on the trade volume. Studies of Ravi Shankar and Stack (2014), Parasai (2014), and Batra (2006) also confirmed the negative relationship between trade volume and landlocked.

Overall results show good fit as coefficient of determination $R^2$ shows that most of the variation in bilateral trade flows is due to the explanatory variables. GDP, distance, exchange rate, inflation rate and common border are found to be the major significant determinants of bilateral trade flows. There is little problem of auto correlation in model 1 but this problem is removed in model 2 and 3 due to the inclusion of more explanatory variables. Probability value of F-statistic is zero in all three models which shows that overall models are significant.

D. Trade Potential: Pakistan with ECO Countries

Concept of trade potential is used widely in international trade relations by the researchers. In the present study, trade potential is calculated for Pakistan with ECO member countries by using Predicted to Actual trade ratio (P/A) method to forecast the future trade.

- If $P/A > 1$, it exhibits Pakistan has more potential with respective country to trade in future
- If the value of $P/A < 1$, it shows Pakistan has less potential with respective country to trade in future
- If the value of $P/A$ ratio is equal to one or near one, it means Pakistan has reached its potential trade with respective country.

Trade potential is calculated by using equation (4) of Hordrick-Prescott Filter method. Table 6 shows the trade potential of Pakistan with ECO countries. Estimated results show that Pakistan’s potential to actual ratio of trade is greater than one for Azerbaijan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan which shows that Pakistan has potential to expand its trade with these countries. P/A ratio is less than one for Kyrgyz and Turkey which shows that Pakistan has less potential to trade with these
countries. P/A ratio is near one for Afghanistan and Iran which shows that Pakistan’s actual trade has reached its potential with these countries.

Table 6: Trade Potential of Pakistan

<table>
<thead>
<tr>
<th>Years</th>
<th>Country</th>
<th>P/A (Average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-2014</td>
<td>AFG_PAK</td>
<td>1.012402</td>
</tr>
<tr>
<td>2003-2014</td>
<td>AZE_PAK</td>
<td>129.8148</td>
</tr>
<tr>
<td>2003-2014</td>
<td>IRN_PAK</td>
<td>1.023486</td>
</tr>
<tr>
<td>2003-2014</td>
<td>KAZ_PAK</td>
<td>5.449408</td>
</tr>
<tr>
<td>2003-2014</td>
<td>KGZ_PAK</td>
<td>0.485233</td>
</tr>
<tr>
<td>2003-2014</td>
<td>TJK_PAK</td>
<td>1.535353</td>
</tr>
<tr>
<td>2003-2014</td>
<td>TKM_PAK</td>
<td>3.148006</td>
</tr>
<tr>
<td>2003-2014</td>
<td>TUR_PAK</td>
<td>0.866284</td>
</tr>
<tr>
<td>2003-2014</td>
<td>UZB_PAK</td>
<td>8.003414</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations

These results give rise to important policy implications that Pakistan should expand its trade with the countries of Azerbaijan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan where sufficient potential exists by using all means and resources.

V. Conclusion and Policy Recommendations

The main objectives of present study are to explore the economic determinants of bilateral trade flows of Pakistan and to calculate the trade potential of Pakistan with ECO countries. Panel data of 10 ECO member countries are used from year 2003 to 2014. The study discovers out that GDP, distance, exchange rate, inflation rate, and common border of trading countries are very highly significant factors affecting the bilateral trade flows. The study finds positive impact of GDP, trade openness, and common border on bilateral trade flows while negative impact of per capita GDP, distance, exchange rate, inflation rate, and landlocked on bilateral trade flows. Positive sign of common border shows that adjacent countries tend to trade more due to lower transaction costs than non-adjacent countries. Landlocked effect is negative as transportation costs become high due to lack of oceans and sea ports which reduces the trade volume. For economic determinants of trade, result of third specification is more efficient as compare to all other specifications as it includes maximum explanatory variables and explains 93% of the variations in bilateral trade flows caused by the explanatory variables and it has no problem of autocorrelation as Durbin-Watson value is 2 and overall model is also significant according to Probability value of F-statistic.

Moreover, trade potential calculations show that Pakistan’s trade with adjacent countries of Afghanistan and Iran has reached its potential and Pakistan has potential to expand its trade with Azerbaijan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan so Pakistan should use all means and resources to exploit this unrealized trade potential with these countries. Supportive measures are needed to exploit the unrealized potential of trade and investment in ECO region. Trade should be further liberalized through reduction in tariff barriers and non-tariff barriers. Trade facilitation mechanism should be improved in ECO member countries especially in Uzbekistan, Tajikistan, Turkmenistan, and Kyrgyzstan because it is difficult to do business in these countries due to inefficient
transport infrastructure and their complex administrative requirements forced on international trade transactions.

References
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