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Aims and Scope

Journal of International Economics is devoted to the publication of professional and academic research in all the areas of international economics. It is published in the months of January and July. The journal broadly covers areas such as cross country growth models, population and migration patterns, international trade, trade policy and relations, trade organizations and bodies, foreign investment flows, balance of payments and exchange rate mechanism, multinational corporations and cross border manufacturing, etc.

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Journal of International Economics

Contents

From the Editor's Desk...

As this issue of the journal goes into print there are many issues that are in focus in the domain of international economics. The trade wars unleashed by America have been a matter of heated polemics for the past few months. Articles and editorials were written and are being written vehemently criticizing, the 'Trump Doctrine', as it is called now. Critics opined that, that the policy of imposing heavy tariffs would kill the liberal world order. The decision to impose tariffs on steel and aluminum imports from China and other countries being seen as a retrograde step threatening the free trade ideology as professed by GATT and then by its successor WTO. Indeed, the global trade is witnessing serious turbulence. Trade experts went to the extent of remarking that this is reminiscent of the infamous Smoot Hawley Tariff which raised the average tariff rate to 48 per cent. The fact that Smoot Hawley Tariff was followed by retaliation from other countries is well known. It is here, where everyone concerned with global trade is worried about. The American trade policy is likely to witness a surge of retaliation thus putting the free trade ideology, being assiduously professed in the era of globalization. As expected, China and EU retaliated by their own list of tariffs

To talk about Indian Scenario, there were many concerns as usual. In case of trade war, although steel and aluminum tariffs have been imposed on India, it is reported that the impact of this would not be much because, steel and aluminum exports from India to US, are not very huge. However, India also is not behind in the race to impose tariffs. It has retaliated by raising levies on certain US products such as, almonds, apples, lentils. India also imposed tariffs on import of Harley Davidson motorcycles. This has not gone down well with Trump government. But the real matter of concern for India, is the restrictions on US visa holders, many of them being service sector professionals. India has vehemently criticized this move.

For the past few months India also has been rattled by the movement of Oil prices in the aftermath of OPEC restricting its output. From 2014-16, India witnessed a comfortable current account deficit because of falling oil prices. This in turn meant lesser inflation. All this changed in the past one year, with oil prices again moving northward. Although OPEC has decided to increase the output, it needs to be seen how oil prices will be in the coming months. One more issue which is a cause of concern for India is the flight of FII in the wake of Federal Reserve hiking its interest rates. If this trend continues, Indian economy may further witness the flight of capital, which is not a happy augury.

In this issue of the journal we have as usual made an attempt to select those articles that would be a value addition to all those who want to read good literature on issues pertaining to international economics. The papers in this issue discuss topics such as invisibles in balance of payments, trade openness, India's exports to Gulf Cooperation

Council and other topics. We have also published a review of the book titled, 'Black Money and Tax Havens'.

We request our regular contributors to continue to show the same enthusiasm in contributing articles. We further request to keep sending review of books that talk about issues pertaining to international economics.

Dr G Rajesh

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Trade Openness Driver of Economic Growth in BRICS Nations

Anju Rani[1] and **Amandeep Kaur**[2]

Foreign trade has been one of the most significant determinants of economic growth and development in a country. It has been identified as a promoter of structural change in the economy, enhancing processes already underway due to technological advances and allowing domestic resources to shift from less productive to more productive uses and refers to the increasing integration of economies around the world, particularly through trade and financial flows. The regional economic groupings are playing an important role in shaping the future of the countries, especially in the field of trade (Sawhney, 2010). Brazil, Russia, India, China and South Africa are together known as BRICS, the group's five members are all developing or newly industrialised countries, but they are distinguished by their large, fast-growing economies and significant influence on regional and global affairs with almost 3 billion people, with a combined GDP (PPP) US$34.415 trillion, and estimated US$4 trillion in combined foreign reserves. Significant trade liberalisation within the last one and half decade has been adopted by these nations so that the progress in both intra-regional and international trade has been experienced at the desired paces across the member nations by dismantling all tariff and non-tariff barriers to trade in the region, so in our paper an attempt has been made to study the effect of openness on economic growth for the BRICS nations.

Keywords: International Trade, BRICS Nations, Trade Openness, Elasticity

Introduction

"More open countries...have experienced faster productivity growth throughout the decades 1960 to 1990." - Edwards

International trade has been the main driver of growth and development in the last few centuries. Trade openness has been identified as a promoter of structural change in the economy, enhancing processes already underway due to technological advances and

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allowing domestic resources to shift from less productive to more productive uses. It refers to the increasing integration of economies around the world, particularly through trade and financial flows. The trade channel is considered as one of the traditional modes of the integration of global economy. The mobility of capital has provided a new dimension to the concept of openness and economic integration that dominate over conventional trade (kaur, 2013). In economic literature, the term openness' has become common usage since the 1980s, reflecting the technological advances that have made it easier and quicker to complete international transactions, both trade and financial flows. It indicates that, they can have an access to more capital flows, technology, cheaper imports, and larger export markets. The Classical and Neoclassical era advocated the benefits of international trade as it helps in extending the market which will increase division of labour, thereby increasing productivity and also provide comparative cost advantage. Trade openness provides a channel for extending the domestic market and might also help to disseminate technological know- how, leads to competition, innovates new products and transfer of new technology (Krugman, 1979; Grossman & Helpman, 1991). Liberalization promotes trade, which in turn fuels the engine of growth. Empirical studies have indicated that trade openness leads to efficient investment, which extends the market size so trade liberalization process has a positive impact on growth. The quest for growth in developing and emerging economies has encouraged them to reduce trade barriers in order to allow for comparative advantages to develop. The world has become increasingly interdependent with passage of time. This trend has been carried forward with regional integration among different nations. The regional economic groupings are playing an important role in shaping the future of the countries, especially in the field of trade (Sawhney, 2010). Brazil, Russia, India, China and South Africa are together known as BRICS, have opened up their economy and adopted export led growth which have contributed to their significant growth rates. The BRICS economies differ greatly in terms of their growth, but Asian economic block their importance is expected to continue to rise in future and may outperformG6 nations. Significant trade liberalisation within the last one and half decade has been adopted by these nations so that the progress in both intra-regional and international trade has been experienced at the desired paces across the member nations by dismantling all tariff and nontariff barriers to trade in the region, in this backdrop the study examine the relationship of economic growth and trade openness in BRICS Nation at aggregate and Disaggregate Level during 1991-2016.

Trade Openness and BRICS Nations

Openness also indicates the dependence of the country on the foreign trade. The size of openness rates indicates the importance level of the foreign trade for economy of the country. With the openness of the country, an increase can be seen in foreign currency revenues and expenditures at the export and import volume increase results. The share of foreign trade in GDP will increase with the foreign trade volume increase. The paper examines the trade of the BRICS (Brazil, Russia, India, China and South Africa), a particularly interesting set of countries to consider given their increasingly important role in the world economy as a result of their rapidly growing share in

global trade in the last two decades. In 1990, the BRICS accounted for only 3% of global trade, but this share had doubled by the turn of the century, and by 2011 they accounted for 19% and 16% respectively of global exports and imports of goods and services. A double-digit year-on-year growth in merchandise trade had made China the largest exporter and the second largest importer of merchandise goods by then. Russia and India have also entered the list of the world top 20 merchandise exporters and importers. The merchandise trade balance is in surplus in the case of China, Russia and Brazil whilst it is in deficit in the case of India and South Africa. In 2014 imports and exports between the Euro zone and the BRICS reached a total value of 551 million and 340 million euro respectively (European Commission Directorate General for Trade). These countries' export-oriented growth has led to an increase in trade with the US in recent years. Based on these indicators, in our study the effect of openness on economic growth will be searched for BRICS countries.

Trade Policies in BRICS Nations

To understand the relationship between openness and growth, it is important to know the trade policies of member countries.

- ***Brazil*:** The trade liberalization in Brazil started from late 1980s. Brazil Implemented tariff reduction in three phrases in 1988-89, 1991-93 and 1994. Due to these reforms, the nominal average tariff came down from more than 50 percent in themid1980s to almost 13 percent in 1995.The Effective Rate of Protection (ERP) in manufacturing reduced from 86% in 1987 to 18% in 1997 and closed to 0 in the case of agriculture (Sally, 2009). At the end of the Uruguay Round Brazil bound all its tariffs, though at a high average of about 30%. Basic NTBs, especially quantitative import restrictions, came down along with tariffs. Reduction in trade barriers and trade protection played an important role in increasing productivity and labour gains especially in the case of firms having low productivity (Scholar, 2004). In 1994 the launch of negotiations for a Free Trade Agreement of America (FTAA) took place. Presently, Brazil is the member of various regional trading agreements.
- ***Russia:*** The Russian government preferred export restraint rather than import protection due to two main political economy reasons. Firstly, huge disparity between domestic and international prices and secondly, export restraints were always better than import restraint because once import restraints granted; it is very difficult to remove them. The rigid protectionism and state owned monopoly on foreign trade were the two main characteristics of Soviet Union. The pegged domestic prices and overvalued exchange rate hardly changed before 1991. After 1991, Russia's trade policy shifted its focus from rigid protectionism to liberal free market policies. By the mid of 1990s Russian trade policies were formalized in the form of agreements on economic partnership and cooperation with most of western developed countries. Because, western developed countries were most attractive source of inflow of foreign currency. Another shift in trade policy was experienced after 1998 crisis when domestic production of Russia started to grow which resulted in the increasing role of state and trend towards import substitution.

This is due to devaluation of Rubble which enhanced competitiveness of Russian goods domestically as well as internationally. Russian government started to apply wide range of existing trade and political instruments to encourage trade. Russian negotiations, followed by an entry in the WTO, compelled Russian government to adjust its laws according to the WTO standards.

- ***India:*** At the time of independence in 1947, foreign trade of India was typical of colonial and agricultural economy. Trade relations were mainly confined to Britain and other commonwealth countries. Exports consisted chiefly of raw materials and plantation crops, while imports were composed of light consumer goods and other manufactures after independence, India adopted progressive liberalization from 1st plan (1951-56). Nonetheless, the Balance of Payment (B-o-P) crisis in 1956-57 was responsible for the reversal of liberalization process. Indian trade policy was characterised by high tariff with complete import restrictions on consumer goods. India adopted comprehensive import control until 1966. In 1966, under the pressure of the World Bank India devalued Indian Rupee and again took steps towards the liberalization of imports and reduction in the subsidies on exports but this fetched domestic criticism. Thus, policy makers reversed the policy of import liberalization. However, in 1976, the liberalization strategy was initiated again as in the late 1970s, industries suffered adverse effects of import restrictions. In 1976, the Government of India introduced Open General Licensing (OGL) whereby items in the OGL list were no longer required a license from the Ministry with large concessions on the tariff rates. External trade liberalisation strategy began in the mid-1980s. Over the last sixty years, India's foreign trade has undergone a major change in terms of growth, composition and direction. The exports cover a wide range of traditional and non-traditional items, while imports consist mainly of capital goods, petroleum products, raw materials, and chemicals to meet the ever-increasing needs of a developing and diversifying economy. From mid-1991, the Government of India introduced a series of reforms to liberalize and globalize the Indian economy adapting to the path of openness. The major trade policy changes in the post-1991 period included simplification of procedures, removal of quantitative restrictions, and substantial reduction in the tariff rates. The main focus of these reforms has been on Liberalization, openness and export promotion activity. By 1990, 31 sectors were freed from industrial licensing. This ad-hoc liberalization was accompanied by expansionary fiscal policy. However, unsustainable internal and external borrowings to support fiscal expansion resulted into B-O-P crisis in 1991. Indian government turned this crisis into an opportunity and lunched a comprehensive and systematic liberalization programme. The Indian government gradually shifted to more open economy with market forces.
- ***China:*** Prior to late 1970s China's trade was completely determined by their economic planning. The State Planning Commission controlled exports as well as imports. 90 percent of all imports were designed in such a way that it increased the supply of machinery, equipment's, raw materials and intermediate goods which were domestically scarce. The exchange rate and international prices played very

little role in determining composition of China's exports and imports. Hence, this composition adversely affected allocation of resources and economic growth. China not only adopted tariff and NTBs but also adopted other array of tools such as controlling number of authorized companies to carry out trade, controlling on range of goods, import licensing etc. Thereafter, in early 1990s, the Chinese Government encouraged export through export promotion system by giving incentives and, at the same time, offering domestic protection. China announced reduction in tariff and shifted to a liberal trading system and came closer to international standard. On the other hand, government also took some important steps to gradually reduce scope of NTBs. The Chinese government officially announced abolition of import substitution list, removed restrictions on various items, removed import licenses and simultaneously adopted policy of exchange rate regimes. By the time China became a member of the WTO in 2001 which transformed the import regimes completely. The average statutory tariff was reduced from almost 56 percent in 1982 to 15 percent in 2001.

- ***South Africa:*** Export pessimistic attitude of 1950s and 1960s was responsible for South Africa's Import substitution industrialization (ISI) strategies prior to 1970s. Protection during ISI was based on quantitative restrictions rather than tariffs. However, decline in the contribution of ISI strategies towards growth, heavy dependence on gold reserves and export-led growth of some other countries initiated South Africa to shift its approach to more open regime. During 1980s South Africa reduced its quantitative restrictions. Moreover, import surcharges were also gradually removed by 1995 with reduction in the quantitative restrictions. In 1994, democratic election in South Africa coincided with shift in South Africa's development strategy from export promotion to greater openness through tariff liberalization. With South Africa taking part in Uruguay rounds, the government also initiated to be a part of the free trade agreements. The trade reforms simplified South Africa's tariff structure, replaced non-ad-valorem tariff rates to ad-valorem rates. Export subsidies, import surcharges and NTBs were phased out.

Review of Literature

Reviewing the existing literature on openness and growth many theoretical and empirical studies have been under-taken to assess the role of foreign trade and trade openness in BRICS. Bharali and Chakraborty (2016), has analysed the relationship between trade openness and long-run economic growth through heterogeneous panel of BRICS countries over the sample period 2004-2012 and found that, trade openness must be promoted in BRICS nations to enhance economic growth. Mercan *et al.,*(2013) has studied the effect of trade openness on economic growth was searched for the most rapidly developing countries (emerging markets; Brazil, Russia, India, China and Turkey, BRIC-T) via panel data analysis by using the annual data of the period from 1989 to 2010 and found that the effect of openness on economic growth was positive, and statistically significant in line with theoretical expectations. Dash and Sharma (2008) has applied Engle and Granger two-step co-integration analysis for the

time period 1950-2007 and recognized that trade has a positive impact on economic growth. Yanikkaya (2002) explained that trade liberalization does not have a simple and straightforward relationship with growth using a large number of openness measures for a cross section of countries over the last three decades. The regression results for numerous trade intensity ratios are mostly consistent with the existing literature. The estimation results show that trade barriers are positively and, in most specifications, significantly associated with growth, especially for developing countries. Mattoo *et al.,* (2001) has explains how the impact of liberalization of service sectors on output growth differs from that of liberalization of trade in goods. Second, it suggests a policy-based rather than outcome-based measure of the openness of a country's services regime. Such openness measures are constructed for two key service sectors, basic telecommunications and financial services. Edwards (1998) tested the robustness of the openness-growth relationship to the use of nine existing indicators including the Sachs-Warner indicator and other trade policy indicators. Harrison (1996) studied the effect of trade openness on growth using panel data and compared prediction of several measures of trade openness. According to Granger causality test results, openness and growth indicated bi-directional causality.

In short review of literature indicates that most of study shows the relationship between trade openness and growth. Many empirical findings suggested a positive relationship between openness and economic growth although the size and welfare gains are different.

Objectives of Study

The main objective of this study is examined trade openness and economic growth in BRICS nations in post reform era.

1. To analysis the growth of export, import and GDP gross at aggregated and disaggregated level of BRICS nations.
2. To calculate the trade openness index of BRICS nation's during 1991-2016.
3. To analyse the relationship between trade and GDP at aggregated and disaggregated level in selected countries.
4. To provides some suggestions for further policy implication.

Research Methodology

Data and Variables: The analysis is based on panel data for BRICS nation (N= 1... 6), namely Brazil, Russia, India, China and South Africa for the time period 1991 to 2016 to analyse the effect of trade openness on economic growth. The study used Gross domestic product as dependent variable, hereafter it will be referred as GDP and trade openness as the independent variable (export + import/ GDP). For carrying out the estimations in the study, the GDP data-set and trade openness data-set are converted into their log forms.

Source of Data: The data and other relevant information required for the study have

been collected from the various national and International sources. The main source of Data have been IMF'S" International Financial Statistics", "Economic Survey of India", RBI Bulletin and Report(s) on Currency and Finance, Indian Foreign Trade Review and Indian Economic Journal (Various Issues). The method applied in the study is essentially descriptive. In addition to this, we have also used econometric and statistical techniques relevant to the data. We have taken absolute time series data for our analysis. Since one of our objectives is to analyse trend and pattern in growth of trade (import and export at aggregated level) we calculated compound growth of trade in BRICS nations at aggregated level and disaggregated level. The another objective is to analyze the elasticity of trade at aggregated level and disaggregated, so elasticity is calculated with respect to GDP (Gross Domestic Product) of BRICS Nations in US$.

Model Specification

Compound Growth Rate

When the time series data relating to a variable increases or decreases by a constant percentage per annum, it is said to grow at a compound rate. The growth rate is called compound growth rate. The compound growth rate is computed by fitting an exponential function to the available data. We have the following model to compute the compound growth rate of trade at aggregated and disaggregated level an exponential trend equation is defined as:

$Y= a\ b^t$
Y= Trade (Import, Export,GDP)
b= 1+g and g is the compound growth rate
t= Time Period (1991, 1992, 1993 1994, - - - - - - - - 2016)
The logarithmic transformation of this function gives:
Log Yi= Log a+ t Log b
The compound annual rate of growth (CARG) is computed by using the following formula:
CARG (g%)= (Anti- log b -1). 100
We have the following model to check the relationship of trade with respect to GDP from 1991 to 2016.
$Yi= bo\ Xi^{b1}e^{ui}$
Taking natural log both sides
Ln Yi= Ln bo+ b1 Ln Xi+ ui
Y= Trade at aggregated and dis- aggregated level of BRICS nations
Xi= GDP (Gross Domestic Product) in US$ of BRICS nations
Ui= error term that satisfy the all the OLS assumption
bo and b1 is regression coefficient
bo is intercept term which explains what will be value of dependent variable when independent variable assume zero.
Assume, bo*= Ln bo
As we know, Ln e= 1
Ln Yi= bo*+ b1 Ln Xi+ ui

Results and Discussion

Table 1: Compound Growth Rate of Trade (Import & Export) in BRICS Nations

Year	Compound Growth Rate (CAGR %)					
	Brazil	China	India	Russia	South Africa	World
Sub- Period1 (1991-2000)	9.3	16.6	11.7	3.4	4.5	6.8
Sub- Period2 (2001-2010)	16.7	21.5	23.6	19.0	14.0	11.4
Sub Period3 (2011-2016)	-4.7	4.7	-1.6	-7.6	-5.4	-0.8
Entire Period (1991-2016)	10.2	17.6	15.6	10.7	7.9	7.9

Source: Author Calculation

Table 1 represents the compound growth rate of trade at aggregated and disaggregated level in three sub period after reform as 1991-2000, 2001-2010 and 2011-2016 and for entire period i.e., 1991-2016 in BRICS nations. Results show that in third sub period growth of trade is badly hampered in all BRICS nation and reached to negative except China. With this second sub period achieved higher growth rate and reached to double digit in all BRICS nation and India is on top of growth following china whereas Russia is on last in this category. For entire period china and India is two leading economies achieving highest growth rate under this association. In short decade of 2001-2010 is boom period in which compound growth rate of trade is reached to double digit in all BRICS nations and world.

Table 2: Compound Growth Rate of Export in BRICS Nations

Year	Compound Growth Rate (CAGR %)					
	Brazil	China	India	Russia	South Africa	World
Sub- Period1 (1991-2000)	6.2	17.3	11.1	6.7	3.6	6.8
Sub- Period2 (2001-2010)	16.1	22.2	22.5	18.6	12.9	11.6
Sub Period3 (2011-2016)	-5.8	5.4	0.04	-7.7	-6.0	-0.7
Entire Period (1991-2016)	10.0	17.7	15.5	11.4	7.4	7.9

Source: Author Calculation

Table 2 shows the compound growth rate of export at aggregated and disaggregated level in three sub period after reform as 1991-2000, 2001-2010 and 2011-2016 and for entire period i.e., 1991-2016 in BRICS nations. Analysis explores that China is on top with highest growth of export among BRICS nations at both aggregated and disaggregated level and followed by India. With this figure also reveals that second sub period is showing not only drastic decrease in growth of export but reached to negative except India and China whereas in India it is very low. For whole period growth of export is significant and again lead by China and more than twice in world average.

Table 3: Compound Growth Rate of Import in BRICS Nations

Year	Compound Growth Rate (CAGR %)					
	Brazil	China	India	Russia	South Africa	World
Sub- Period1 (1991-2000)	12.7	15.8	12.2	2.1	5.4	6.8
Sub- Period2 (2001-2010)	17.5	20.6	24.5	19.7	15.2	11.2
Sub Period3 (2011-2016)	-3.8	3.8	-2.9	-7.6	-4.7	-0.7
Entire Period (1991-2016)	10.6	17.4	15.8	10.4	8.5	7.9

Source: Author Calculation

Table 3 provides the compound growth rate of import at aggregated and disaggregated level in three sub period after reform as 1991-2000, 2001-2010 and 2011-2016 and for entire period i.e., 1991-2016 in BRICS nations. Figures show that growth of import is also rising over time and reached highest in second sub period in all countries of association with more than double growth rate but again reached to negative in all three countries except India and China and very low is even in world also. Whole period is depicting a positive and significant growth of import and again china is on top with same competitor.

Table 4: Compound Growth Rate of Gross Domestic Product in BRICS Nations

Year	Compound Growth Rate (CAGR %)					
	Brazil	China	India	Russia	South Africa	World
Sub-Period1 (1991-2000)	8.5	12.6	6.4	-7.8	0.8	3.6
Sub-Period2 (2001-2010)	18.9	19.4	15.5	21.9	12.9	8.5
Sub-Period3 (2011-2016)	-8.1	10.7	4.2	-8.2	-6.6	1.0
Entire Period (1991-2016)	7.9	15.1	10.1	8.6	5.6	5.5

Source: Author Calculation

Table 4 reveals the compound growth rate of Gross Domestic Product at aggregated and disaggregated level in three sub period after reform as 1991-2000, 2001-2010 and 2011-2016 and for entire period i.e., 1991-2016 in BRICS nations. Analysis explore that compound growth rate of GDP is highest in second sub period in all nations of selected association and Russia is on top in this growth followed by Brazil whereas GDP is declining in all three nations except China and India and turned to positive and significant for all BRICS nations.

Table 5: Elasticity of Trade (Import & Export) in BRICS Nations

Year	Elasticity					
	Brazil	China	India	Russia	South Africa	World
Sub-Period1 (1991-2000)	0.7 (0.001)	1.3 (0.00)	1.7 (0.00)	-0.08 (0.7)*	1.7 (0.01)	1.8 (0.00)
Sub-Period2 (2001-2010)	0.9 (0.00)	1.1 (0.00)	1.5 (0.00)	0.9 (0.001)	1.0 (0.00)	1.0 (0.00)
Sub-Period3 (2011-2016)	0.7 (0.008)	0.5 (0.039)	-0.5 (0.15)*	0.9 (0.00)	0.8 (0.008)	1.1 (0.29)*
Entire Period (1991-2016)	1.1 (0.00)	1.2 (0.00)	1.5 (0.00)	0.9 (0.00)	1.3 (0.00)	1.4 (0.00)

Source: Author Calculation

1. *Represents the significance of parameter at 5 % level of significance
2. Value in parenthesis shows p- value.

Table 5 reveals the trade with respect to GDP at aggregated and disaggregated level in three sub period after reform as 1991-2000, 2001-2010 and 2011-2016 and for entire period i.e., 1991-2016 in BRICS nations. As elasticity measure the responsive change in trade of all countries with one unit change is GDP of nation reveals that in first sub period elasticity of trade is highest in India and South Africa with more than

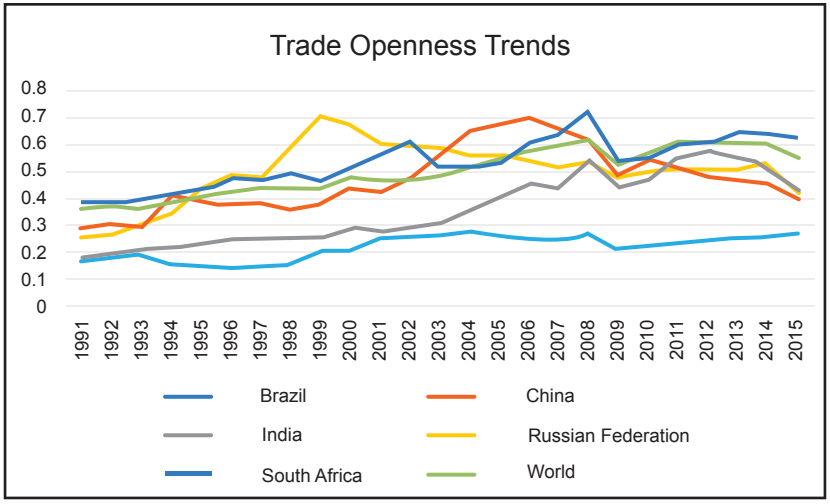
one unit change and significant as p value is low in comparison to alpha value (0.05) in all nations except Russia. In second sub period all nations is showing greater than equal to one elasticity and significant as p value is less than alpha value in all nation with lead of India whereas in third sub period India trade elasticity is not only negative but insignificant also. Entire period is also revealing positive, significant and more than one trade elasticity for all nations of group except Russia.

Table 6: Trade Openness Index of BRICS Nations

Year	Brazil	China	India	Russian Federation	South Africa	World
1991	0.16691	0.290652	0.17626	0.259861	0.380242	0.364956
1992	0.187138	0.309367	0.191527	0.270693	0.37534	0.367923
1993	0.192785	0.298485	0.207368	0.303906	0.390801	0.360058
1994	0.159356	0.408837	0.217709	0.348723	0.407448	0.378315
1995	0.149005	0.384724	0.238256	0.442525	0.435977	0.408034
1996	0.139502	0.376949	0.251474	0.486369	0.466092	0.422552
1997	0.152371	0.386378	0.248615	0.47915	0.468007	0.439758
1998	0.155985	0.360623	0.252191	0.59849	0.489638	0.437401
1999	0.199713	0.376433	0.256987	0.705412	0.468616	0.43958
2000	0.210049	0.438616	0.290053	0.679585	0.513857	0.477173
2001	0.25002	0.426904	0.281854	0.612037	0.550961	0.464835
2002	0.257138	0.472073	0.295686	0.594448	0.599898	0.464466
2003	0.263363	0.562554	0.306648	0.593357	0.516129	0.480839
2004	0.282443	0.648064	0.352749	0.565999	0.511642	0.518688
2005	0.260414	0.676062	0.410097	0.566673	0.528602	0.543937
2006	0.250711	0.695674	0.450667	0.549178	0.597491	0.575825
2007	0.245274	0.670879	0.439922	0.519571	0.628992	0.593351
2008	0.264744	0.616667	0.540615	0.535937	0.719971	0.622032
2009	0.213691	0.481613	0.449064	0.488357	0.538643	0.524614
2010	0.216363	0.543759	0.471662	0.505766	0.547621	0.570763
2011	0.227356	0.515428	0.552847	0.516329	0.600329	0.607441
2012	0.242464	0.486145	0.577595	0.513103	0.60741	0.60369
2013	0.253012	0.470227	0.555332	0.510629	0.642324	0.604378
2014	0.248351	0.458823	0.529511	0.536534	0.64375	0.600922
2015	0.268425	0.401026	0.432748	0.520429	0.623957	0.555305

Source: Author Calculation

Figure 1: Trade Openness Trend in BRICS Nations



Trade openness index shows the ratio of trade and GDP in BRICS nations in selected period. In the pre reform period trade openness is not more but after the Post reform period Trade openness also increased in the form of liberalization. The trend of trade openness is increasing in BRICS countries in all over the time period. Trade openness index shows that there is less liberalization in Brazil but in South Africa is more liberalized in the world.

Conclusions and Policy Implication

Inferences of study explores that decade of 2001-2010 is boom period in which compound growth rate of trade is reached to double digit in all BRICS nations and world. China is on top with highest growth of export among BRICS nations at both aggregated and disaggregated level of time period and followed by India. For whole period growth of import is significant and again lead by China and more than twice in world average. Whole period is depicting a positive and significant growth of import and again china is on top with same competitor. In second sub period all nations is showing greater than equal to one elasticity and significant as p value is less than alpha value in all nation with lead of India whereas in third sub period India trade elasticity is not only negative but insignificant also. The import elasticity is also more than one in first sub period in all nation except Russia which is showing significant value of import elasticity as p value is more than common alpha value under BRICS nations whereas in second sub period India is leading with highest import elasticity and all nations representing positive and significant value but in third sub period China is representing not only very low value of import elasticity but insignificant also and showing self-dependence in terms of trade. Whole period is exhibiting positive and significant value of import elasticity for all BRICS countries.

Policy Implication of the Study- The policy implication of this study also indicates that post liberalization era has certainly helped to BRICS nations in achieving high growth in the economy. The increased integration with the world economy can potentially reduce poverty through the creation of new jobs in export industries. However, greater openness also brings increased competition from imports for previously protected industries.

References

Anthony P., Thirlwall (2000). Trade, Trade Liberalisation and Economic Growth: Theory and Evidence, Economic Research Papers No. 63.

Ahluwalia, M.S.(2002). Economic reforms in India since 1991: Has Gradualism Worked? *Journal of Economic Perspectives*, 16 (3), pp: 67-78.

Alcala, F. & Ciccone (2004). Trade and Productivity, *Quarterly Journal of Economics*, 119(2), pp: 613-46.

Arora, A. & Gambardella (2004). The Globalization of the Software Industry: Perspectives and Opportunities for Developed and Developing Country, *NBER Working Paper No. 10538*.

Andriamananjara, S. & Nash, J. (1997). Have Trade Policy Reforms Led to Greater Openness in Developing Countries?, *World Bank Working Paper No. 1730*, Washington DC: The World Bank.

Anwer, M. S. & Sampath, R.R. (2001). Exports and Economic Growth, *Indian Economic Journal*, 47(3), pp: 79-88.

Chang R., Kaltani L. & Loayza, N.V. (2009). Openness Can be Good for Growth: The Role of Policy Complementarities, *Journal of Development Economics,* 90(8), pp: 33-49.

Dollar, D. & Kraay, A. (2002). Institutions Trade and Growth". Paper Prepared for the Carnegie- Rochester Conference Series on Public Policy, World Bank, Washington D.C.

De long, B. (2004). India Since Independence, an Analytic Growth Narrative, D. Rodrik (ed.) "In Search of Prosperity", Princeton, NJ, Princeton University press, pp: 184-204.

Dash, R. K & Sharma, C. (2008). Government Expenditure and Economic Growth in India, *IUP Journal of Public Finance,* 6(4), pp: 60-69.

Edwards, S. (1993). Openness, trade liberalization, and growth in developing countries, *Journal of Economic Literature,* 31(2), pp: 1358-1393.

Edwards, S. (1998). Openness, Productivity and Growth: What Do We Really Know? *The Economic Journal,* 108 (1), pp: 383-398.

Eckhard, Siggel & Agrawal, P. (2009). The Impact of Economic Reforms on Indian Manufacturers: Evidence from a Small Sample Survey, *Asian Profile*, 37, August 2009.

Freund, C. & Bolaky, B. (2008). Trade, Regulations, and Income, *Journal of Development Economics*, 87(1), pp: 309-321.

Hrushikesh, Mallick (2008). Government Spending, Trade Openness and Economic Growth in India: A Time Series Analysis, *Working Paper 403.*

Kohli, A. (2006). Politics of Economic Growth in India: 1980-2005, *Economic and Political Weekly*, 6(2), pp: 45-52.

Lucas, Robert (1988). On the Mechanics of Economic Development, *Journal of Monetary Economics*, 22(1), pp: 3-12.

Priyanka, Bharali & Deb Kumar Chakraborty (2016). Impact of Trade Openness on Economic Growth: The Case of BRICS, *Vidyasagar University Journal of Commerce,* 21(2), pp: 67-74.

Qazi, Muhammad, Adnan, Hye & Wee-Yeap Lau (2015). Trade Openness and Economic Growth: Empirical evidence from India, *Journal of Business Economics and Management,* 16 (1), pp: 45-56.

Romer, D. (1993). Openness and Inflation: Theory and Evidence, *Quarterly Journal of Economics*, 108(5), pp: 869-903.

Sachs, Jeffrey D. & Andrew, Warner (1995). Economic Reform and the Process of Global Integration, *Brookings Papers on Economic Activity*, pp: 1-18.

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An Econometric Analysis of Invisibles in India's Balance of Payments

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During the last two and half decades, the developments in India's Balance of Payments have been marked by strong growth in invisible receipts, which has provided the sustained support to the current account balance. Due to higher imports than exports, India faced the huge trade deficit and current account deficit which was always financed by the capital account surplus. The heavy dependence on the capital account surplus to finance the trade deficit is not a healthy and long term solution for Indian Balance of Payments. The capital account balance which mainly comprises of foreign investment which are highly volatile in nature and opportunistic as experienced in 1991 and 2009. Hence it is very risky to depend on capital account to finance the trade deficit. Due to structural reforms in the year 1991 there was huge growth in Invisibles which became an important mitigation to avoid the current account risk of the Indian BOP. This paper attempts to highlight the role of Invisibles in Indian Balance of Payment under the new economic regime. After employing descriptive analysis in more disaggregate level, we observe that post global financial crisis,India experienced a stable growth in the Invisibles balance. It is found that Modern services and Investment income are more sensitive to the external disturbances compare to private transfers and traditional services. By observing the visible role of Invisibles, the paper concludes that invisible not only play an important role in India's balance of payments to maintain CAD at sustainable level, but also reduces our dependences on external assistance to finance our trade deficit.

Keywords: Invisible Receipts, Invisible Payments, Balance of Payments, Exports, Imports, Domestic and World GDP

Introduction

One of the most striking features of the Indian economy in the 1990's was the rapid growth of the International service along with trade. In fact the crisis which took place

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in the year 1991 was boom in disguise for the Indian economy. Our country has turned out into one of the growing economics in the world over the last two and half decades, agreeable aided in this performance by the economic reforms. One of the important phenomena of the high growth rate (nearly double digit) prior to world economic crisis was the dynamism of the service sector particularly in the information technology and the IT enable services despite of the high trade imbalance in while in contrast the manufacture sector has been less reboots.

Due to the rapid growth in IT sector, software and communication along with the private transfers, there was the consistent huge surplus in the Invisibles balance. This surplus in the Invisible balance is helping since after the crisis to finance the trade deficit and curtail the current account deficit. In the fiscal year 2000-01 the Invisibles surplus financed the 82 percentage of the trade deficit. From 2001-04 it not only covered the trade deficit but during these three years our current account was also in surplus because earning from Invisibles exceeded the deficit on trade account. In the last fiscal year i.e., 2013-14 also Invisible covered 78% of trade deficit due to which CAD came down to 1.7% of the GDP form 4.7% in 2012-13.

Looking at the data of Invisibles receipts and payments both at aggregate and disaggregate level we observed that there was no sudden rise immediately after the reforms. First 5 years there was a smooth growth of invisible receipts, but due to boom in software industry it started increasing heavily. Prior to the growth of modern services the main sources of the invisible receipts were private remittances and traditional items especially tourism. In the same way there was no quick rise in Invisible payments. Observing at a disaggregate level it is found that growth in the transfers receipts were stable which came across only one year of negative growth rate i.e., after the East Asian crisis (1998-1990). Both services and the income experienced the volatile growth rate. Investment income receipts were primarily determined by the amount of Forex reserves which came down by almost US $ 50 billion after the global crisis. Growth of investment income affected heavily due to fall in reserves. On the other side around 60% of the Indian modern services were consumed by United States. The services which were around 60% of growth in 2005-06, at present started facing difficulties even to maintain 30% of growth due to slow down of US economy in particular and recession in the world economy in general.

Despite of fall in growth rate of software exports and Investment income receipts, the overall invisible balance are playing an excellent role in financing the trade deficit of current account. Traditionally we used invite lots of risk when we used to finance the major part of the trade deficit by the capital account of BOP. With the structural change of the economy in 1991 there was sustain and rapid growth of Invisible surplus. The huge surplus of invisible receipts became an alternative and save source of financing the current account deficit. Apart from financing the trade deficit and CAD, it also provides ample opportunities for the job creation. It was only after the 2nd generation of reforms, the role of invisible became visible.

Objective of the Study

- To highlight the role of Invisibles receipts and payments in Indian Balance of payments.
- To analyse the trends and growth rate of various item which appears in Invisible receipts and payments at a disaggregate level.
- To identify the determinants of invisible receipts and payments at aggregate and disaggregate level.

Accumulated Wisdom

Though the study in the invisibles are limited but the contribution made by the various scholar's and experts in this field are really praise worthy. Here the review of the few studies done by that scholar's which are closely related to the present study i.e., Invisible's in the Indian Balance of payments under the new economic regime are included here.

In identifying the growth which county experienced within a decade after the crisis Venkataramanan (2001) though the condition of the India's Balance of Payments, which is built up of a large trade deficit maintained by large positive invisibles receipts, is like a miracle of the new service-oriented global economy. Reddy (2005) in his lecture on the topic overcoming challenges in a globalizing economy: Managing India's external sector has highlighted the role of invisibles in balancing the Balance of payments by controlling the current account deficit. The trends of Invisibles in India's BOP was highlighted by Limba (2011) and found that before the economic reforms i.e., ever since independence India has never come across such surplus in Invisibles. He also explains the importance of growth in Invisibles trade in curtailing the deficit in India's Balance of Payments.

A study on the trends and challenges of the India's BOP was made Mathew (2013) and he found that the economic crisis of the 1991 was primarily due to the large fiscal imbalances over the 1980's it also suffered from the capital account problem due to a loss of investor's confidence. Chanda (2001) trade in health services of commission on macroeconomics and health (CMH) provides an overview of the nature of International trade in health services and the lesson that can be learnt from the national, regional and multilateral in this context. The study also highlights the various ways in which health services can be traded, the main global players in this trade, and the positive as well as negative implications of this trade for equity, efficiency, quality and access to health services.

In connection with explaining the growth of service experts Eichengreen and Gupta (2012) talks about the complementarity between merchandise exports particularly manufacturing exports, and exports of services, trade in exports of goods has positive externalities of service exports. They suggested that merchandise exports exert a positive influence on service exports due to network effects wherein a country with high penetration in goods market can use its networks to export in services, similar effect is obtained even when exports of merchandise is replaced with total trade in

goods. Banga and Kumar (2011) Explore the role played by the demand side and supply side factors in growth of exports of services for the period from 1970 to 2008. They expound that most studies show that conventional model of merchandise trade can also be successfully applied to trade in services.

There exists complementarity relation between invisibles imports and exports and this was examined by Sachdeva and Ghosh (2009) they come up with eclectic exports and import functions for invisibles, combining both supply and supply side factors. In the "IEG-DSE" structural model for India by Krishnamurthi (2004) Invisibles have been disaggregated into private transfers, non-factor services and investment income including service payments on foreign loans and credit, all components being determined in net terms. Acharya (2012) In his article opines that it is the surges in services exports and private remittance which are main contributors to the improvement in the balance of payment situation in India. One of the pioneering study was recently undertaken by Poonam Gupta (2006). Gupta analyses the determinants of remittances to India and finds that their growth over time can be explained by the increase in migration and total earnings of migrants.

World economic crisis and its affects on the Invisibles items of India's Balance of payments was examined by Viswanthan (2010). Specially, export oriented sectors, software and IT enables services also suffered along with the textiles, gems and jewellery, chemical and informational technology. The non-factor service receipts especially software and IT enables accounted 60 percent fall from United States due to the revenue declines in their country. Joseph (2002) explains that there is an increasing realization of the potential that IT offers for human welfare, IT- induced productivity and growth are confined to the developed world. Mohapatra (2003) explains that the role of India's IT industry has in India's technology based economic development even in the face of global recession has caught the attention of the policy makers, academicians and industry experts.

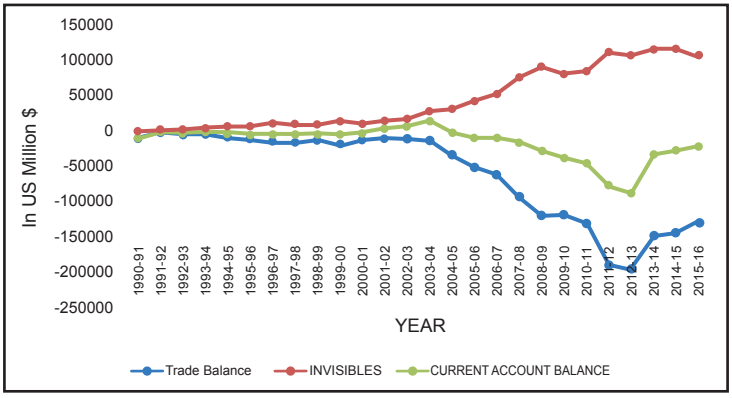
Invisibles also consist of miscellaneous part in which trade in services, consultancy services, financial services, health services etc., play a very important role. Disusing on such items Hoekman (1997) centres on the contributions that examines the determinants of international trade and investment in services, the potential gains from greater trade and effort to cooperate to achieve such liberalization through trade agreements. Evidence in the increasing services liberalization is a major potential source of source of welfare gain, and the performance of the service sectors, and thus on the service policies, may be an important determinant of trade volumes, the distributional effects of trade, and economy wide-growth. Services can be engine of growth for some countries, but more important is that they are a key determinant of the competitiveness of all firms in open economics, no matter what they produce.

Analysis of Invisibles in India's BOP

The invisibles account of the BOP represents the combined effect of transactions relating to international trade in services, income associated with non-resident assets and liabilities, property and labour, and cross-border transfers, comprising both public

and private transfers. In the last two and half decades the India's Balance of Payments developments have been market by strong growth in invisibles receipts, which has provided the sustained support to the current account position. In fact it was the constant support of the Invisibles the Indian Balance of Payments has recorded the large and persistent surpluses except in 1995-96, 2008-09, & 2011-12 with foreign exchange reserves at around $ 318 billion under the new economic policy regime (liberalization, Globalization and Privatization). The persistent high earning from the Invisibles has also helped the country to minimize the current account deficit below threshold level i.e., 2% of GDP for nearly two decades. The India's balance of payments, which is built up of a huge trade deficit is mainly sustained by large positive invisible inflows, is truly a miracle of the new service-oriented global economy. We can show the visible role of Invisibles with the simple graph.

Figure 1: India's Trade, Invisible and Current Account Balances



Source: RBI Handbook of Statistics on Indian Economy 2015-16.

Since from the 1991 the contribution of Invisibles was very much visible which significantly minimizes the risk of the external payment caused by the huge trade deficit. The above graph shows that our trade was never positive which in turn paved way for the high CAD. But it was Invisibles visible support which provided a cushion to maintain the sustainable CAD by the huge receipts. In the year 2012-13 the trade deficit was $-195656 million but the current account was only $-88163 million due to the $ 107493 million surplus in Invisibles. Before that the trade deficit was $189 billion which was 10.2% of GDP, out of this 6% of GDP was supported by the Net invisibles surplus and we witnesses the historical high CAD of 4.2% of GDP since after the economic reforms. In other words that year 58.8% trade deficit of the GDP was covered by the Invisibles. Again with the increase in the net invisibles from the $ 107 billion to $ 115 billion we were able to bring back the CAD below threshold level i.e., 1.7% of the GDP. The increase in the Net invisibles is largely contributed by the increase in the Non-factor services exports, mainly rising prominence of the Business service receipts reflecting the high skill intensity of the Indian workforce and buoyant inflows of private transfers. The receipts in the nonfactor-service increased

to $151 billion in the year 2013-14 from $ 145 billion in 2012-13 and there was fall in the payments from $ 78 billion in 2013-14 to $ 80 billion in 2012-13. The table clearly shows the contribution of the invisibles in the Indian balance of payments.

Table 1: Contribution of Invisibles to Trade Deficit

Year	Percentage of Trade Deficit Covered by Invisibles
1993-94	71
1994-95	63
1999-00	74
2000-01	82
2010-11	65
2011-12	59
2012-13	55
2013-14	78
2014-15	81
2015-16	82

Source: RBI Handbook of Statistics on Indian Economy 2015-16.

Not only in the fiscal year 2012-13 but right from the economic reforms Invisibles is playing a vital role to curtail the CAD by covering the large percentage of the trade depict. In the year 1993-94 71.4 % of the trade deficit was covered by the invisibles which made the country to depend less on the capital to finance the current account deficit. This earning from invisibles even exceeded the deficit on trade account as a result in the year 2001-02, 2002-03 & 2003-04 we had surplus current account.

- In the year 2001-02 current account was 0.7 % of the GDP.
- In the year 2002-03 current account was 1.2 % of the GDP.
- In the year 2003-04 current account was 2.3 % of the GDP.

This was mainly due to the strong earning of the invisibles in these 3 years. This current account surplus was accompanied by the capital surplus. But in the very next year the CAD was 0.4% of the G.D.P. Since then the current account situation of India is turning worst and in 2011-12 it not only cross the threshold level but was more than what we had during the time of the BOP crisis (1991).

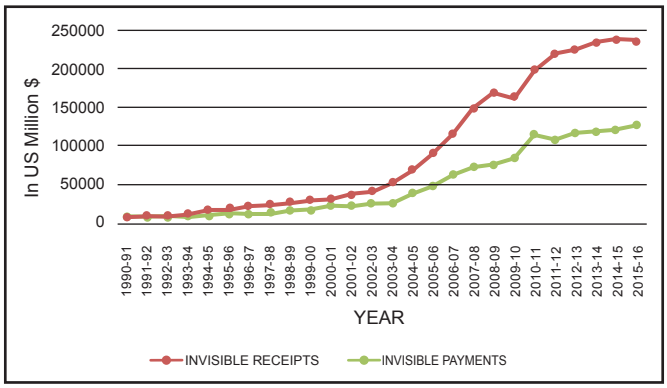
The Surplus in the net invisibles grew rapidly the second generation of the economic reforms i.e., from 2000-01. In the year 2001-02 82% of the trade deficit was covered by the invisibles surplus. Despite of significant surpluses in Invisibles trade, current account deficits have been widening due to steady worsening trade deficit. As the Table clearly shows increase in invisibles from the 2.1% of GDP in 2000-01 to 6.2% of GDP in 2012-13. But at the same time the merchandise trade deficit of India widened steadily from 2.1% of GDP in 2002-03 to 10.4% in 2012-13, an unprecedented level in India's post- independent history. Because of this huge trade deficit of 189 billion and 195 billion in the year 2011-12 and 2012-13 the CAD was above the threshold level. Even though the CAD has crossed the 3% threshold level in year 2011-12 for

the first time since after the BOP crisis, the only difference in 2012 is that we have the sizeable reserves to cover the import bill for nearly 7 months. The reserves which were able to cover the import bill of the country for 16 months in 2003-04 came down to the 7 months. Therefore the situation demand immediate action as it will not take much time for the import coverage offered by India's reserves to deplete further, especially in the view of the rate at which imports bill of goods are increasing. And the sad part of our reserves is primarily made up of highly volatile short term capital flows. Hence the past experience of the country tells us that too much of dependence on reserves and capital account is not a healthy and long-term elucidation. In this context the growing role of the invisibles can be a saviour as it has done in the past. Depending on Invisibles earning to solve the problem of Trade deficit is not only reliable but also safe in both long and short term.

Invisibles Receipts and Payments

With trade deficit continuing to be elevated and widening somewhat net invisibles balance going down, the CAD widened from US$ 78.2 billion in 2011-12 to US$ 88.2 billion in 2012-13. As a Proportion of GDP, the CAD widened from 4.2 per cent in 2011-12 to a historic peak of 4.7 per cent in 2012-13. But due to the increase in the invisibles receipts from $ 224 billion to $ 233 billion the CAD came down to the 1.7% of the GDP in 2013-14 compare to 4.7% of GDP as previous year. The increase in this invisibles receipt is mainly contributed by the huge private remittances from the abroad and growth of the services. Though the Invisibles receipts has sharply increased from $7.4 billion in the year 1990-91 to $ 233 billion the payments is also shooting up at the same magnitude to reduce the net invisibles surplus. The increase in the payments of the invisibles not only reduces the net invisibles surpluses but also leads to the high CAD. In the year 2012-13 the net invisibles decrease to the $ 107 billion from the $ 111 billion in the previous year 2011-12. So along with growing trade deficit, increasing in the payments of Invisibles was the chief factors for the high current account deficit.

Figure 2: India's Invisible Receipts and Payments



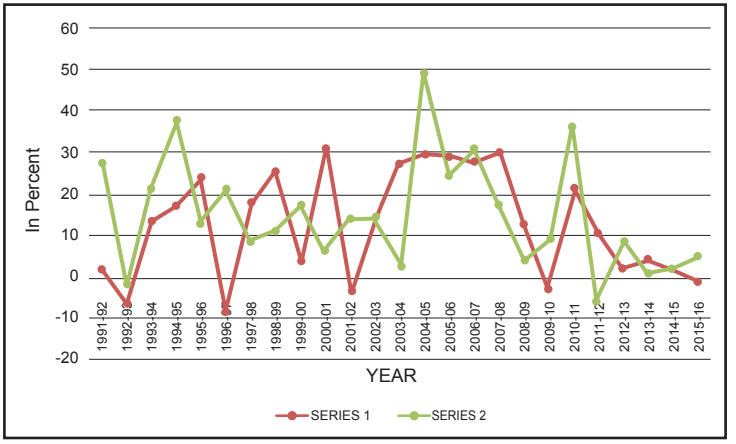
Source: RBI Handbook of Statistics on Indian Economy 2015-16.

Invisible Payment recorded a sensible increase of about 5% in 199-00 to $17.39 billion from $ 16.56 billion in 1998-99 and further $34 billion in the year in 2013-14.This was due to the reasonable rise in payments on account of interest and payments, financial services, royalties advertising, licenses fees. Gross invisibles payments recorded sharp increase of about 32% in 2000-01 to $ 22.66 from $ 17.39 billion in 1999-00. Payment for financial service, management service, royalties advertising, licenses fees, office expense and out go on account of the technological payment was main reason for the increase in Invisibles payments. This increase in the Invisibles payments is mainly caused by the rise in the payments of the investment income components of the invisibles.

Invisible Receipts and Payments Growth Rates

As shown in figure the growth rates of both invisible receipts and payments are volatile in general. Payments are more volatile than the receipts. For the invisibles to play a much stronger role in India's BoP, the invisible receipts need to grow at a constant growth rate.

Figure 3: Growth Rates of India's Invisible Receipts and Payments



Source: RBI Handbook of Statistics on Indian Economy 2015-16.

Table 2: Compositions of the Invisibles Receipts

Year	Non-Factor Services	Income	Transfers
1990-95	48.34	4.23	47.44
1995-00	44.88	6.70	48.42
2000-05	53.12	7.73	39.15
2005-10	61.92	8.38	29.70
2010-16	65.11	4.73	30.16

Source: RBI Handbook of Statistics on Indian Economy 2015-16.

The above table clearly depicts, India invisibles receipts was more from the transfers mainly private transfers till the late 1990's. In fact from the 1995-00 the contribution of transfer receipts was more with more than the 48% of the total invisibles compare to Non-factor services 44.8%. But after the second generation of the economic reforms due to the growth in the software services and the IT enabled Non-factor services receipts started picking up surpassing the transfers. And among the Non-factor services the miscellaneous services has contributed a lot to increase the receipts of the invisibles. To see the contribution of the miscellaneous services receipts to total invisibles receipts a five year average analysis has been done of the components of Non-factor services.

Table 3: Compositions of the Non-Factor Receipts

Year	Travel	Transportation	Insurance	G.N.I.E	Misc.
1990-95	39.37	23.47	2.54	0.57	34.05
1995-00	27.35	17.75	2.05	2.90	49.95
2000-05	17.42	11.77	1.78	1.69	67.33
2005-10	12.05	11.04	1.63	0.41	74.87
2010-16	12.66	12.07	1.65	0.38	73.23

Source: RBI Handbook of Statistics on Indian Economy 2015-16.

While the period up to the 1980s was dominated by tourism earnings, the second half of the 1990s witnessed an unprecedented jump in India's earnings from newer activities like software service exports and other IT-related skill-intensive exports. In the above graph we can see that in the year 1990-95 about 40 % of the total non-factor services receipts was contributed by the Travel. But after the 1995 the miscellaneous services compromising financial services, communication services, software services, construction services, royalties copyright and license fees, news agency, software services and business services started contributing more with the rapid increase in their receipts from the 34% in 1990-95 to 73.2% in 2010-14.

Table 4: Compositions of the Invisibles Payments

Year	Non-Factor Services	Income	Transfers
1990-95	51.46	48.31	0.23
1995-00	64.02	35.61	0.37
2000-05	67.65	30.21	2.14
2005-10	70.70	26.47	2.83
2010-16	71.42	25.46	3.12

Source: RBI Handbook of Statistics on Indian Economy 2015-16.

The table find depicts that over the period of times same as receipts the payments in the Non-factor services has increased rapidly. In the year 1990-95 out of the total invisibles payments, 51.46 were from the Non-factor services. It increased to 71.42 in the year 2010-14. Though the payment in the income rose rapidly over the period of time but as a contributor to the total invisibles payments its share decreased from

48.31 in 1990-95 to 25.46% in 2010-14. But this decrease has to come down further low because its receipt is only 4.73 % in 2010-14. Like the non-factor services payment the payments on the transfers share has also increased to the total payments. The main reason for the increase in the transfer payments from 0.23% in 1990-95 to 3.12% in 2010-14 was largely because of the significant rise in the official transfer payments. To see the rise in the Non-factor services payments as to total invisibles payments a five year average analysis has been done on the components of Non-factor services.

Table 5: Compositions of the Non-Factor Payments

Year	Travel	Transportation	Insurance	G.N.I.E	Misc.
1990-95	12.03	35.27	3.47	3.35	45.89
1995-00	16.30	27.01	1.58	2.55	52.55
2000-05	20.00	19.06	2.15	1.61	57.18
2005-10	17.06	21.73	2.15	1.08	57.97
2010-16	15.28	18.81	1.80	1.01	63.10

Source: RBI Handbook of Statistics on Indian Economy 2015-16.

In the above table we can infer that the payments on the miscellaneous services were more as compare to the other components of the non-factor services. The table also shows that the in 1990-95 along with the miscellaneous, transportation payments was also more i.e., 35.27% out of total payments in Non-factor payments. Along with the receipts the share of the payments of miscellaneous services has significantly increased from 45.8% in 1990-95 to 63.1% in 2010-14 out of the total non-factor receipts payments. Along with miscellaneous service only the share of the travel increased from 12% in 1990-95 in 15.2% in 2010-14. But the increase in the payments of the travel was not that high like the miscellaneous service. This is due to growing demand for the service items and other commodities which are linked to it.

Empirical Analysis

Unit root tests

To avoid spurious results, it is necessary to check the time series data for stationarity using unit root tests. Keeping this in mind the unit root test has been carried out for each series.

Table 6: Unit Root Tests with Trend and Intercept: (1990 – 2016)

Variable	Level	Inference	1st Difference	Inference
LnWGDP	-1.515	Nonstationary	-3.567	Stationary
LnGDP	-3.210	Nonstationary	-5.105	Stationary
LnINVREC	-0.621	Nonstationary	-3.596	Stationary
LnEXPO	-1.943	Nonstationary	-3.596	Stationary
LnINVPAY	-2.391	Nonstationary	-4.958	Stationary
LnIMPO	-2.269	Nonstationary	-3.892	Stationary
LnSERRECP	-1.521	Nonstationary	-3.660	Stationary

Variable	Level	Inference	1st Difference	Inference
LnSERPAYM	-1.973	Nonstationary	-5.609	Stationary
LnPVTTRANRECP	-3.156	Nonstationary	-6.499	Stationary
LnOPECGDP	-1.660	Nonstationary	-3.649	Stationary
LnROI	-1.533	Nonstationary	-4.274	Stationary
LnINVINCREC	-1.003	Nonstationary	-6.044	Stationary
LnFCA	-1.548	Nonstationary	-5.062	Stationary
LnUSTBRATE	-1.230	Nonstationary	-3.880	Stationary
LnINVINCPAY	-2.391	Nonstationary	-4.958	Stationary
LnEXTDEBT	-0.986	Nonstationary	-4.310	Stationary
LnFORINV	-3.145	Nonstationary	-1.27	Stationary

Source: Based on Authors Calculation.

1% critical value* = –4.416, 5% critical value = -3.622, 10% critical value = --3.248

From the above table, we infer that all the variables used in the models are nonstationary at levels, since, all are nonstationary at levels, we have gone for first differencing. After the first differencing, all the variables turn to out to be stationary. Thus we see that most of the variables are stationary at the first difference, i.e., these variables are integrated of order one.

Aggregate Invisibles

Invisible Receipts

Equation 1: Invisible Receipts = World Income (World GDP as Proxy) + Exports

D(LnINVREC) = 0.076 + 0.955*D(LnWGDP) + 0.211*D(LnEXPO) + 0.077*DUM

(3.42) (1.92) (1.06)

(R^2 = 0.56 D.W: 1.55)

At aggregate level the total invisible receipts would include the services receipts, transfer receipts and investment income receipts. The total invisible receipts are explained by the level of world income and volume of our exports. As world income increase, the foreigners would prefer to hire or use most of our services, thus we see a positive relation between the two. Similarly as volume of our exports rises, the services which are linked to exports such as insurance, transportation would also rise, thus as exports rise, the invisible receipts on these export earnings also rise.

Invisible Payments

Equation 2: Invisible Payments = Gross Domestic Product + Imports

D(LnINVPAY) = 0.020 +0.608*D(LnGDP) + 0.299*D(Ln IMPO(-1)) + 0.196*DUM

(0.81) (3.06) (3.11)

(R^2 = 0.73 D.W: 2.59)

The invisible payments are explained by the domestic income level, measured by domestic GDP and volume of imports. When there is a rise in these two variables, the invisible payments would also rise, thus there is a positive relation between the two. Essentially invisible payments would include the various services payments and payments made on investment income. Both the explanatory variables are significant. Around 70 per cent of variation in the payments are explained by these variables.

Dis-Aggregate Invisibles

Services Receipts

Equation 3: Services Receipts = World Gross Domestic Product + Volume of Exports

$$D(LnSERRECP) = 0.040 + 0.809*D(LnWGDP) + 0.480*D(LnEXPO) + 0.199*DUM$$
$$(2.21) \quad (2.15) \quad (2.86)$$
$$(R^2 = 0.83 \quad D.W: 1.57)$$

Invisible receipts which include rest of items on receipts side (include services like travel, transportation, insurance) are influenced by the merchandise exports that we export to the rest of world and world income. As the export volume increase, higher would be the receipts we earn in the form of transportation and insurance. Increase in the world income leads to increase in the opportunity for the foreigners to visit our country as tourists and as a result our earnings increase in the form of travel receipts. Both the variables have positive coefficient. Of the two variables, the world GDP is not significant.

Services Payments

Equation 4: Services Payments = Gross Domestic Product + Volume of Imports

$$D(LnSERPAYM) = 0.060 + 0.655*D(LnGDP(-1)) + 0.326*D(LnIMP) + 0.252*DUM$$
$$(2.44) \quad (3.18) \quad (2.62)$$
$$(R^2 = 0.78 \quad D.W: 2.23)$$

Service payments in India are explained by the income level in India, which is measured by domestic GDP and the volume of India's imports. Both these variables are significant in explaining the service payments. Of the two variables, it is the GDP which is more significant. This is true because, in general, as the income level rises, the desire to hire services would increase. Around 80 per cent of variation in services payments is explained by these two explanatory variables.

Private Transfer Receipts

Equation 5: Private Transfer Receipts = GDP of OPEC Countries + Domestic Rate of Interest

$$D(LnPVTTRANRECP) = 0.085 + 0.953*D(LnOPECGDP) + 0.083*D(LnROI) + 0.283*DUM$$
$$(2.93) \quad (1.82) \quad (0.57)$$
$$(R^2 = 0.72 \quad D.W: 2.16)$$

The private transfer receipts i.e., remittances from Indian workers working abroad into India are determined by gulf activity (GDP of OPEC as proxy) and domestic rate of interest. Of these two variables the significant variable turns out to be the OPEC GDP. As the gulf activity increases, we expect an increase in the inflows of private transfer receipts. We can infer that interest rate is not that influencing the transfers. Around 70 percent of variation in transfer receipts is being explained by these two explanatory variables. In the above estimated equation is no problem of autocorrelation either, as the D.W. Stat is 2.16

Investment Income Receipts

Equation 6: Investment Income Receipts = Foreign Currency Assets + US Treasury Bill Rate

D(LnINVINCREC) = 0.054 + 0.993*D(LnFCA(-1)) + 0.309*D(LnUSTBRATE)

(1.34) (6.47) (4.80)

+ 0.427*DUM

(R^2 = 0.79 D.W: 2.42)

The investment income receipts i.e., earnings on deployment of foreign currency assets of the RBI are dependent upon the level of foreign currency assets and US government bond rate. Both the variables are related positively to the dependent variable. Higher the level of foreign currency assets, higher would be the opportunity for investing the assets and earn income. As the bond rate increases, higher the motivation for us to invest in the US bond market and earn more income. Foreign currency assets are more significant in influencing the receipts.

Investment Income Payments

Equation 7: Investment Income Payments = External Debt + Foreign Investments

D(LnINVINCPAY) = 0.039 + 0.672*D(LnEXTDEBT) + 0.018*D(LnFORINV(-1))

(1.77) (3.32) (1.03)

+ 0.184*DUM

(R^2 = 0.71 D.W: 2.39)

The investment income payment dealing with servicing of capital account transactions in the form of interest, profits, and dividend are influenced by the amount of external debt and the foreign investment. As the volume of external debt increases, higher would be the payment. Similarly higher the inflow of foreign investment, more the investment payments because we need to pay for the returns on these investment. It is observes that, external debt is more significant than the foreign investments.

Forecasting from the Equations

To examine how good the estimated equations are we subject it to a validation test. This is undertaken by in-sample forecasting for the estimated equations. Forecasts are based on dynamic simulation.

Table 7: RMSE and TIC Values for Estimated Equations

Eq.	Root Mean Squared Error (RMSE)	Theil Inequality Coefficient (TIC)
1	0.245	0.011
2	0.082	0.003
3	0.166	0.008
4	0.168	0.008
5	0.164	0.008
6	0.142	0.008
7	0.070	0.003

Source: Based on Authors Calculation.

We go for testing the accuracy of the model by calculating Root mean squared error and Theil inequality coefficient. For a good model the Root mean squared error should always be less than two percent. Here in our model the Root mean squared error for all equations is less than 0.24 percent, which tells that the forecasted model is satisfactory.

The Theil inequality coefficient should be 0 to 1, in our equations, the Theil inequality coefficient is maximum of 0.016, which is really very low and suggests us that the predictive performance of the models are very satisfactory. Implying that the forecasted series in models are very close to the actual series and there is no systematic tendencies to over/under estimate the actual data.

Conclusion

After doing rigorous descriptive analysis of the invisibles, it brings clearly the impressive role of the invisibles in the Indian balance of payments since 1991. The positive earning of the invisibles was always there since from the 1991 to cover heavy deficit of the trade account. The high BOP risk of the country caused by the huge merchandise deficit to the external payment is significantly minimized by the sustained rise of Invisibles. The main contributing factor to the rise in the invisibles receipts are the non-factor services and private transfers. As far as the non-factor service is concerned, the main development has been the rapid increase in the exports of software services. In fact in the period of just nine years, 2003-04 to 2011-12 software exports increased from $ 12.8 billion to the $ 69.3 billion. Along with the service exports, in last three years business service has played an effective because of its rising performance, high skill intensity of the Indian work force. The government is so optimistic regarding the growth of software services that it wants to make India IT super power in near Future. But due to the fall in US economy and recession across the globe recently its growth got decreased by 50%. Despite the fall in its growth rate due to high receipts compare to payments, Software services still enjoys the place of appreciate. In the case of the private transfers the main contributor are the workers' remittances from abroad. Over the period of one decade it increased $ 22 billion to $70 billion from 2003-04 to 2013-14. India was the largest recipient of private remittances in the world followed by china $ 66 billion. Besides this, the invisibles receipts have also provided the degree of

stability to the current account receipts as the invisible balances always witnessed the relative stability. So in order to boost this invisibles surplus the sound transport system with proper insurance of exports and imports should be facilitate, which in turn led to the current account surplus. In fact it is the infrastructure which is not only affecting the invisibles but also to the visible items.

Looking the trend of both capital account and invisible balance we can infer that the growth in invisible balance is very sustainable whereas capital account is highly volatile in nature. In the year 2008-09 we came across with the deficit BOP because of the sudden fall of capital account from $107 billion to $7 billion. But the capital flows also plays an important role for the growth of economy. At this point studies suggest using the capital flows for development of infrastructure; this in turn will promote the exports of the country. In fact in the above analysis we found that the growth in modern services exports is also influenced by the foreign investment. If this capital is used for the export promotion programme then it is also called foreign investment spill over otherwise it will become burden for current account in the form of investment income payments. Lastly we can conclude that to maintain the healthy balance of payments, it demands growth of surplus invisible balance.

References

Atherye, Suma S. (2005). The Indian Software Industry and its evolving service capability, Industrial and corporate change, Advance Access published, pp: 319-418.

Mehta, Mehernosh. (2014). Effect of India's current account deficit on external debts and foreign exchange rates, *IOSR Journal of Economics and Finance*, pp: 54-65.

Bajpai, Nirupam. (2011). Global Financial Crisis, its impact on India and the policy response. Columbia Global Centres.

Banga, Rashmi. (2005). Critical Issues in India's service-led growth. Indian council for research on International economic relations Working Paper Series No. 171.

Chanda, Rupa. (2005). Trade in financial services: India's opportunities and constraints. Indian council for research on International economic relations Working Paper Series, No. 152.

Deb Kusum Das, Abdul Azeez Erumban and Suresh Aggarwal. (2005). Revisiting the Service-led Growth in India Understanding India's service sector productivity growth. IARIW-UNSW special conference on productivity management, Sydney.

Deshpande, Atul R. (2013). Is India's current account deficit Problem? Truly Global, *Journal of Economic Development*.

Eischen, Kyle. (2005). Working Through Outsourcing: Software practice, Industry organization, *CGIRS Working Paper Series No.111*.

Gupta Poonam and James Gordon. (2004). Understanding the Indian Software Revolution, *IMF working paper WP/04/171*.

Gupta, Pooonam and Eichengreen Barry. (2010). The Service Sector as India's Road to Economic Growth. Indian council for research on International Economic Relations, *Working Paper Series No.249.*

Jadhav, Narendra. (2007). Maximising Developmental Benefits of Migrant Remittances, *Journal of Economic Development*.

Jhamb, Rajesh Kumar. (2011). Contribution of the software Industry in the growth of the Indian economy in the last decade, *International Journal of Business Economics and Management Research,* pp: 97-111.

Korattysswaroopam, John Pucher and Nisha. (2004). The Crisis of Public Transport in India: Overwhelming Needs but Limited Resources, *Journal of Public Transportation,* pp: 1-20.

Limba, Goud S. (2011). An Analysis Of Invisibles in Indian Balance of Payments, *International Journal of Business Economics and Management Research*, pp: 1-11.

Panda, Pushpa Trivedi and Devi Prasad (2013). Macroeconomic determinants of private transfers to India, *Journal of Quantitative Economics,* pp: 51-76.

Venkitaramanan, S. (2001). Invisibles in India's Balance of Payments. The Hindu group of publication.

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Impact of Trade Costs on Export Performance of Ethiopia – A PPML Panel Gravity Equation Approach

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This paper is an attempt to examine the impact of trade costs on export performance of Ethiopia. We have estimated a panel gravity model using a balanced panel data gathered for the period of 2010-2015. A sample of 10 major trading partners of Ethiopia has been used in the analysis. Whilst two types of panel data models: pooled model and importers and exporter fixed effects model have been used,the Poisson Pseudo Maximum Likelihood (PPML) estimation procedure has been employed in the estimation. The results indicate that trade costs proxied by distance had a significant negative impact on exports of Ethiopia, implying that Ethiopia will be better off if it sends its exports to neighbouring countries. In contrast, tariff rate and GDP of Ethiopia had no impact on its exports. The empirical result also suggests that Ethiopia trades more with landlocked countries than coastal countries. In view of these findings, it is suggested that the country would be better off if it exports to its neighbouring countries and participates in regional linkages with them. The study also recommends that focusing on trade facilitation measures such as making trade information available, harmonization and simplification of documents help reduce trade costs.

Keywords: Ethiopia, Exports,Trade Costs, Gravity Model, PPML Estimation

Introduction

Developing countries including Ethiopia have been striving hard to promote economic development and alleviate poverty. Liberalized international trade in the form of encouraging exports is seen as one of the important factors for promoting growth in these countries (IMF, 2001). Ethiopia is also following liberal trade policies to promote exports. As a result, Ethiopia's external trade performance has been increasing substantially. The value of both exports and imports have improved significantly

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since the implementation of Plan for Accelerated and Sustained Development to End Poverty (PASDEP) in 2004/05 (Kebede, 2014). According to the World Bank (2014) Ethiopia has been one of the world's fastest growing economies over the past decade. The report also mentioned that positive external conditions and the rise of its exports contributed to this growth.

However, with such increase in the volume of exported goods, the costs that are related to sending goods abroad have become one of the major concerns for Ethiopia. These costs are termed as trade costs. Trade costs are broadly defined to include all costs incurred in getting a good to a final user other than the production cost of the good itself (Anderson and Wincoop, 2004).

Moreover, the effect of trade costs becomes much higher for countries that are landlocked than coastal countries. As Ethiopia is a landlocked country and relies heavily on neighbouring countries particularly Djibouti and Kenya for accessing the sea, it suffers from considerably high trade costs in exporting its products as well as importing key inputs (Aschenaki, 2004). According to the World Bank (2016) Ethiopia's cost of export per container was $2380 in 2014.[1] This could possibly be one of the factors for the low competitiveness of Ethiopia's products in the world market.

Contrary to this, there are some studies that show the reduction of trade costs globally. According to WTO (2008) there have been considerably large reductions in the cost of transportation and communication which makes trade between countries very simple.[2] In this regard, given the net benefit of trade remains positive, the question of whether the rising costs of trade actually matter for countries export or not could be raised.

In line with these, this paper explores whether trade costs have been a setback for Ethiopia's export or not. In particular, in order to address the objective of the study, this paper assesses the following research questions; what determines exports of Ethiopia? And do trade costs have any effect on the export performance of Ethiopia?

The rest of the paper is organized as follows: the next section presents review of theoretical and empirical evidence followed by model specification and data sources. Data analysis and empirical findings are presented in the succeeding section. Finally, policy implication and suggestion are presented in the conclusion section.

Review of Theoretical and Empirical Evidences

Many studies in trade costs have been conducted by Anderson and Van Wincoop (2001, 2003, and 2004). These authors broadly defined trade costs as "all costs

1 This figure is much higher compared to other neighbouring countries. For instance, export cost of Eritrea was $1850 while it was only $885 for Djibouti in the same period.

2 More efficient telecommunications, from telephone to internet interaction have allowed companies to exchange goods more efficiently and exchange information between potential buyers and sellers which lowered the costs of international integration (WTO, 2008).

incurred in getting a good to a final user other than the production cost of the good itself. Among others this includes transportation costs (both freight costs and time costs), policy barriers(tariffs and non-tariff barriers), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail)" (Anderson and Wincoon, 2004). Similarly, Ali (2015) defined trade costs to include all factors that drive a wedge between producers' price in the country of origin and consumers' price in the country of destination.Trade costs (in the absence of information) are also narrowly defined to include costs related to border procedures, transportation and logistics (WTO, 2015).

Trade costs can be classified in to two: border costs and non-border trade costs. Border costs are costs that are related to national borders and generate trade costs that involve real resources, such as gathering information about foreign regulations, hiring lawyers familiar with foreign laws, learning foreign languages, and adjusting product designs to make them consistent with foreign customs and regulations while non-border costs are largely natural trade costs that arise from distance and geological irregularity interacting with the most efficient transport and communication technology (Anderson and Wincoon, 2001).

Trade costs matter because they have significant effect both on consumers and producers welfare. From consumer's side, the high price of goods due to high trade costs hampers their ability to take advantages of comparatively low priced goods from abroad. From producer's side, trade costs matter because they obstruct production by denying firms the access to high quality of foreign inputs (Portugal & Wilson, 2008). On top of that, although trade costs may not guarantee why some countries are poor, in combination with other factors like corruption, underdeveloped institutions, constraints on business competition, and weak governance make international trade (export) and investment very costly (Porturgal & Wilson, 2008).

There are several empirical evidences that have been provided by different researchers on the effect of trade costs on exports of goods. McCallum (1995) estimated the loss of trade volume when goods are shipped from US to Canada and makes a comparison to the losses incurred when products cross the provincial borders within Canada. The study found that beyond the border trade costs are higher than behind the border trade costs even for countries that are highly integrated through the North American Free Trade Agreement (NAFTA). However, McCallum's study has raised numerous questions with regard to trade costs and the empirical measures used to analyse the study, which lefts large unexplained about trade costs. Subsequently, Anderson and Van Wincoop (2003) have tried to solve the 'border puzzle' using McCallum's data via gravity model by including other multilateral resistance factors. The authors managed to explain larger border puzzle and reduced McCallum's unexplained border effects to 44 percent.

Similarly, Suresh and Aswal (2014) have studied the determinants of India's manufactured exports to its southern (developing countries) and northern (developed countries) markets using an augmented gravity model. Their findings confirmed that India's export was explained by total GDP, GDP similarity and difference in per capita income. In that study, it was found that trade costs such as distance had more negatively affected India's exports to north than the southern market as proximity to the southern market was crucial.

On the other hand, some studies show the reduction of trade costs lead to increase in exports of countries products. For instance, Khan and Kalirajan (2011) used gravity model to examine the impact of trade costs in Pakistan. The analysis in their study includes tariff rate and bilateral exchange rates in addition to the traditional gravity model variables. Their findings confirmed that the growth of exports in Pakistan between 1994 and 2004 was mainly due to the reduction of trade costs in its partner countries. Similarly, De (2007) found that trade in Asia is gaining high momentum partly because of low level of trade costs. The author confirmed that the reduction of tariff and transport costs by 10 percent, each would increase bilateral trade by about 2 and 6 per cent, respectively. Likewise Bernard *et al.,* (2006) examined the response of U.S. manufacturing industries and plants to changes in trade costs on industry-level tariff rates and transportation. Their results indicate that industries that experience relatively large declines in trade costs exhibited relatively strong productivity growth and the tendency of high export.

In Ethiopian context, Mohammed (2008) studied the impact of Ethiopia's COMESA membership on its export using gravity model. In this study trade costs (proxied by distance between Ethiopia and its trading partners) had been incorporated as one of the explanatory variables The estimation result of the coefficient of distance variable was negative implying that Ethiopia would be better off if it exports to neighbouring countries. Similarly, Bekele (2011) has studied the impact of real exchange rate on export of Ethiopia. In addition, variables that explain trade cost like distance and importers trade policy were also included in the estimation. The result confirmed that real exchange rates are not in a position to exert significant effect on bilateral exports of the country. On the other hand, internal transport, infrastructure and trade policy of importing countries had been found to be an important determinant of supply side factors of Ethiopia's export.

Studying the bilateral trade of Ethiopia and east African community countries, Tebekew (2014) analysed the determinants of Ethiopia's export using an augmented gravity model over the nine years panel data (2004 -2012). The author found that trade costs such as distance and nominal exchange rate had significant negative impact on Ethiopia's bilateral trade. The study had also found a negative relationship between Ethiopian export and trade agreement for preferential trade.

From the above discussion, it can be concluded that the empirical evidences have been rather mixed. While some studies find the negative effect of trade costs on export, others found that the increase of volume of exports due to reduced trade costs specifically transportation and communications costs. This probably is due to difference in estimation techniques, choice of variables, study period, and level of development of the country under study. By the same token, the costs of exports to a certain country may be significantly higher than others due to specific bilateral factors like lack of infrastructure, road and communication network or they may be lower due to preferential trade agreements and regional integration. Therefore, it is important to empirically assess the impact of trade costs on exports of Ethiopia involving some of these variables in order to reach a conclusion.

On the other hand, the reviewed literature in the context of Ethiopia did not address the effect of trade costs in a specific way rather it is related to export growth or determinants of exports which includes trade costs as one of the variables. Therefore, this present study is an attempt to specifically address the impact of trade costs on exports of Ethiopia. In this regard, our study applied gravity model and incorporated the impact of trade costs on export of Ethiopia by extending the gravity model to include the effect of other factors.

Model Specification and Data

The determinants of international trade of a country in relation to its partners are usually explored using the gravity equation approach. Although, the traditional approach is based on multi-country models or bilateral trade which usually studies a huge trade panel data sets, this study aims at the analysis of one-way trade flow of home country so that the relationships in the gravity model can be studied in a more specific way. Defining Ethiopia as a single 'home country', the analysis is based on an econometric estimation of export function from home country to its trading partners. To get the parameter estimates of the model, we used Poisson Pseudo Maximum Likelihood (PPML) estimation method which has not been used by the earlier studies on Ethiopia.

We have used panel data for 10 major trading partners of Ethiopia (China, Japan, Germany, Saudi Arabia, United Arab Emirates, United Kingdom, Italy, India, Sudan and Switzerland) over the period of 2010-2015 based on their importance in exports and availability of data on the variables for the model estimation. The countries are chosen on the basis of their share in Ethiopia's trade and on the availability of required data. After listing 20 trading partners of Ethiopia, 10 countries with available data have been chosen. The time period is also chosen based on availability of data for the included countries.

Model Specification

The model specification in this study emanates from the basic gravity model. The concept of gravity model was originally introduced by Tinbergen in 1962 analogous

to Newton's law of gravity.[3]In this traditional gravity model, trade (exports) between two countries is directly related with their economic sizes (GDP/GNP) and is inversely related to the distance between them. This forms the basis of gravity model and would typically take the following form:

$$Xij = \beta(GDPi.\,GDPj)/Disij \quad \text{.....1}$$

Where X_{ij}= trade (export) from country i to j, β = constant, GDP_i/GDP_j= Gross Domestic product of the respective countries, Dis_{ij}= distance between country i &j. An intuitive gravity model follows from the above mentioned equation in a linear outline

$$logXij = \beta 0 + \beta 1 logGDPi + \beta 2 logGDPj + \beta 3 logDisij + \varepsilon ij \quad \text{.....2}$$

However, distance is found to be a poor proxy of trade costs because trade encompasses several costs in terms of policy and environmental facilities. Consequently, various economists tried to explain trade costs by including other variables. Anderson and Wincoop (2003)included two additional variables, namely, outward and inward multilateral resistance[4]. Likewise, most studies estimate the gravity model by adding a number of dummy variables like being a member of a trade agreement, sharing a common land border, speaking the same language and so on to test for specific effects.

Econometric Strategy

The empirical analysis of gravity equation has traditionally been analysed using cross-sectional data which can not sufficiently account for heterogeneity among countries which in turn can lead to an estimation bias (Kareem, 2013). To alleviate this problem, researchers have turned towards panel data, which allows taking into consideration of more general types of heterogeneity and makes it easier to identify the specific time or country effects like institutional, economic, cultural or population-invariant factors. Moreover, the problem of potential multicollinearity that sometimes arises from cross-section data might be avoided with panel data (Baltagi, 1995, Hsiao, 2014).

However, the logarithmic transformation of the model for its estimation still causes problems even with panel data estimation methods. This is because the estimation results based on the logarithmic transformed model could be significantly misleading in the presence of heterodscedasticity because of Jensen's inequality[5] (Silva& Tenryero, 2016).

This can be explained as follows:

$$\ln(Xij) = ln\beta 0 + \beta 1 \ln(GDPi) + \beta 2 \ln(GDPj) + \beta 3 \ln(Disij) + \ln(\varepsilon ij) \quad \text{.....3}$$

3 Just like Newton's law of gravity that states the gravitational attraction between any two objects is proportional to the product of their masses and diminishes with distance, trade between any two countries is proportional to the product of their GDPs and diminishes with distance (Krugman et.al. 2012).

4 According to these authors the inward multilateral resistance emanates from the existing infrastructural and institutional inefficiencies and rigidities in home country and the outward resistance arises from tariffs and exchange rate on which home country does not have any control.

5 Jensen's inequality states that the expected value of a logarithm of random variables does not equal to the logarithm of expected value.

The expected value of the above log-linearized equation would be:

$$E[lnXij] = E[ln\beta 0 + \beta 1 lnGDPi + \beta 2 lnGDPj + \beta 3 lnDisij + ln\varepsilon ij] = \quad \text{.....4}$$

$$E[lnXij] - E[(ln\beta 0)] + \beta 1E[\ln(GDPi)] + \beta 2E[\ln(GDPj)] + \beta 3E[\ln(Disij)] + E[(ln\varepsilon ij)] \quad \text{.....5}$$

Since $\ln E[\varepsilon ij] \neq E[\ln(\varepsilon_{ij})]$ (which is Jensen's inequality), the conditional distribution of X_{ij} is misrepresented and estimation through OLS will result in misleading and inconsistent estimates.[6]On the other hand, the data of export may involve zero or missing values due to the nature of the data itself. The logarithmic transformation in this case is then improper because logarithm of zero is undefined[7](Westerlund & Wilhelmsson, 2009).

Due to the above facts, log- linearized model is not an appropriate model. The alternative approach to the estimation of log- linearized model then lies in the direct estimation of the multiplicative form of the gravity equation using Poison Pseudo Maximum Likelihood (PPML).

$$X_{ijt} = \beta_0 GDP_{it}^{\beta 1} GDP_{jt}^{\beta 2} Dis_{ij}^{\beta 3} DGDPPC_{ijt}^{\beta 4} TR_{jt}^{\beta 5} e^{\theta j} e^{\theta i} \varepsilon_{ijt} \quad \text{.....6}$$

Santos Silva and Tenreyro (2006) underlined that this is the most natural method without any further information on the pattern of heteroscedasticity. Since there is no need of undertaking the logarithmic transformation of the dependent variable and the variable is measured in level, the problem of handling zero trade flows is no more an issue in this process.

Thus in this study, a panel data model has been used for the estimation of gravity equation taking in to account of the above justifications. To measure the parameter estimates of the model, this paper applies the Poisson Pseudo Maximum Likelihood (PPML) estimator. The equation can be written as in the following function:

$$Xijt = \beta 0 + \beta 1 \ln(GDPit) + \beta 2 \ln(GDPjt) + \beta 3 \ln(Disij) + \beta 4 \ln(DGDPPCijt) + \beta 5 \ln(TRjt) + Contig + Landlock + Comlang\_off + \varepsilon ij \quad \text{.....7}$$

6 *"the log linearization of the empirical model in the presence of heteroskedasticity leads to inconsistent estimates because the expected value of the random variable depends on higher- order moments of its distribution"* (Sillva & Tenreyro, 2006, p.653).

7 To solve the problem of zero- valued trade flows, adding some small positive values to all observations or get rid of the zero-valued observations from the trade matrix have been suggested in the literature (Mohammed, 2008).However, in the case of adding some small value, the resulting estimation varies highly with the chosen of such a small number (Flowerdew & Aitkin, 1982). On the other hand, omitting the observations causes serious problems as well like losing of information that are encompassed in the deleted data (Eichengreen & Irwin, 1996). Besides, according to Burger *et al.*, (2009) the estimation will very likely suffer from a sample selection bias caused by omitted zero-valued trade flows observations which are probably non-randomly distributed.

Table 1: Definition of Variables

Variables	Definition	Expected sign	Source
X_{ijt}	Denotes the total value of exports from country i (Ethiopia) to country j at time t.		Ethiopian Revenues and Customs Authority
GDP_{ijt}	Denotes GDP of exporting and importing countries. (GDP_{it}) and (GDP_{jt}) are used to control for the supply and demand side respectively.	+	World Bank, WDI database
Distance (Dis_{ij})	Measures the distance between trading partners.	-	www.distancecalculator.net
$DGDPPC_{ijt}$	The per capita GDP differential between two countries.	+/ -	World Bank, WDI database
TR_{jt}	Denotes the tariff rate of importing countries at time t.	-	World Bank data base
Contig	*Contig* is a dummy variable signifying whether country i and j share a common border or not.	+	
Comlang_ off	*Comlang_off* is a dummy variable that signifies whether country i and j share a common language or not.	+	
Landlocked	*Landlocked* is another dummy showing whether the importing country j is landlocked or not.	-	

Model Estimation and Findings

Panel Unit Root Test

It is very important to test the existence of unit root and examine the order of integration for each variable beforehand, so as to avoid the spurious correlation problems, if any.

Table 2: Test Result for Panel Unit Root

Ho: panel data has unit root(not stationary) Ha: panel data has not unit root (stationary)			
Variables	**Summary Statistic**	**p-values**	**Test for unit root in level**
ln_Export	-72.1493	0.000	I(0)
ln_GDPi	-51.4163	0.000	I(0)
ln_GDPj	-3.4963	0.000	I(0)
ln_DGDPPC	-3. 894	0.000	I(0)
ln_TR	-2.531	0.000	I(0)

Source: Computed

We have employed the Levin- Lin- Chu(2002) panel unit root test to examine whether the series contains a unit root. As the output above indicates, all variables are found to be stationary in levels.

Choosing between Fixed and Random Effect Model

In order to choose between fixed and random effect models Hausman (1978) test has been used in this study. This test answers whether there is a significant correlation between the unobserved country-specific random effects and the regressors.

Table 3: Test for Choosing between Fixed and Random Effect Model

Test summary	
Chi-sq statistic (4)	31.06
Prob.	0.0000
Appropriate model	Fixed effect model

Source: Computed

The null hypothesis states that random effect model is appropriate and the alternative hypothesis states that fixed effect model is appropriate. From the above result we reject the null hypothesis since the probability is less than 0.05 and conclude that fixed effect model is the appropriate model.

Diagnostic Tests

- **Test For Cross Sectional Dependence**

  We test a cross sectional dependence to assess whether the residuals are correlated across entities or not. Cross sectional dependence can lead to bias in tests results (also called contemporaneous correlation). The null hypothesis is that residuals are not correlated. In this study we used Pesaran CD test (2004) to test whether there is cross sectional dependence or not. The results are as follows:

  Pesaran's test of cross sectional independence = 0.600, Pr = 0.5483

  Average absolute value of the off-diagonal elements = 0.339

  The probability for this test is 0.5483 which is greater than 5 percent which means we cannot reject the null hypotheses. Therefore, we conclude that there is no cross sectional dependence.

- **Test for Multicollinearity**

  In order to identify the correlation between explanatory variables and to avoid the double effect of independent variable from the model, multicollinearity test has been conducted in this study.

Table 4: Correlation Matrix

e(V)	ln_GDPi	ln_GDPj	ln_Dis	ln_DGD~C	ln_TR	Contig	Comlan~f	Landlock	_cons
ln_GDPi	1.0000								
ln_GDPj	-0.4826	1.0000							
ln_Dis	0.4976	-0.8583	1.0000						
ln_DGDPPC	0.1832	-0.0979	0.1694	1.0000					
ln_TR	0.4896	-0.0979	0.4115	0.5530	1.0000				
Contig	-0.2031	0.3340	-0.0741	0.3684	-0.0797	1.0000			
Comlang_off	-0.0805	0.1334	-0.1807	0.3932	0.0267	0.2999	1.0000		
Landlock	-0.2713	0.5850	-0.5375	-0.2641	-0.1659	0.1147	0.1106	1.0000	
_cons	-0.5960	-0.1821	-0.1790	-0.4643	-0.5988	-0.3506	-0.0853	-0.0309	1.0000

Source: Computed

As indicated in the correlation matrix the correlations among explanatory variables are weak; indicating the non-existence of multicollinearity problem in the data. According to Hailer *et al.,* (2006) correlation coefficient below 0.9 may not cause serious multicollinearity problem.

- **Test for Heteroscedasticity**
  In this study we have tested for heteroskedaticity using Breuch pagan test. The null hypothesis is homoskedasticity (or constant variance of error) and the alternative hypothesis is that there is heteroskedasticiy.

  Breusch-Pagan / Cook-Weisberg test for heteroskedasticity results are as follows:

  Ho: Constant variance

  Variables: fitted values of ln_export

  chi2 (1) = 0.07

  Prob.>chi2 = 0.7979

  We fail to reject the null hypothesis of homoskedasticity hence;the assumption of homoskedasticity is satisfied.

- **Test for Autocorrelation**
  The autocorrelation test is performed to verify whether the error term is serially correlated. For this purpose we have used Wooldridge test.

  Wooldridge test for autocorrelation in panel data:

  H0: no first-order autocorrelation

  F (1, 9) = 3.861

  Prob.> F = 0.0810

  From the test, it is clear that the probability of F statistic is greater than 0.05. Therefore, we cannot reject the null hypotheses implying that there is no autocorrelation.

Estimation Results and Interpretation

The econometric model of gravity equation contains many time invariant or nearly time-invariant variables. For instance, in our model variables such as distance, common border, common languages and land locked manifest no within variation in the data sets. Therefore, using the traditional fixed effects method of estimation would result in omitting these variables during the estimation. To solve this problem, we have used a dummy variable regression as fixed effects model with importers and exporter effects as a possible appropriate estimator. This procedure is based on the concept that the fixed effects of partner's countries could be proxied by a bunch of country specific dummy variables. With this assumption, we have estimated the gravity equation using PPML.

To verify the correct specification of fixed effects and pooled models, we used the traditional RESET (Ramsey Regression Equation Specification Error Test) test. In this test we first predicted the fitted values for each specification and then we included a

higher order of fitted values into the regression. If the model is correctly specified, the fitted values term would become insignificant.

Pooled Model Estimation using PPML

Once the pre estimation tests are accomplished the next step is estimation the model. In this study we first estimate the pooled model using PPML method as below.

Table 5: Regression Results of Pooled Model Using PPML

Number of parameters: 9
Number of observations: 60
Number of observations dropped: 0
Pseudo log-likelihood: -558660.61
R-squared: .78607811

(Std. Err. adjusted for 10 clusters in Dis)

Variables	Coefficients	S.E	Z –test	Prob.
ln_GDPi	.1358125	.2091069	0.46	0.647
ln_GDPj	1.582369*	.3270501	4.69	0.000
ln_Disij	-3.005792*	.4243438	-4.65	0.000
ln_DGDPPCij	.2938851	.2967988	1.25	0.210
ln_TRj	.2858186	.1687998	0.66	0.511
Contig	.2858186**	.7584001	2.21	0.027
Landlocked	1.851038*	.457262	4.24	0.000
Comlang_off	-.5198697	.0565518	-1.52	0.129
Cons	-14.06297	10.04258	-1.40	0.161

Source: Computed
*The *, ** Indicates one and five per cent statistical significant respectively*

As we can see in the above table the coefficient of importers GDP has a positive sign and is significant at 1 per cent level. The interpretation goes as: a 1 percent increase in the importers GDP increases export of Ethiopia by 1.5 per cent. On the other hand, GDP of Ethiopia is found to be insignificant in explaining its export.

The Distance coefficient on the other hand is negative and significant at 1 percent level. Thus, a 1 percent increase in distance between Ethiopia and its trading partner decreases export by about 3 percent. The coefficient of common border is also statistically significant and affects export of Ethiopia positively. The effects of GDPPC difference, tariff rate and common language are found to be insignificant in explaining exports of Ethiopia. However, the variable Landlocked is able to impact Ethiopia's exports, as it has a statistically significant positive impact. This means that countries that are landlocked trade more than the coastal countries.

RESET Test

The RESET test has been used to verify whether the model is correctly specified. Prob.> chi2 = 0.52 which implies that adding other variables to the model is irrelevant.

chi2 (1) = 0.41
Prob.> chi2 = 0.5238

Adding importers and exporter fixed effect into the model presented the results that are shown in table 6.The estimation results are better than the PPML model as all the coefficients of the variables except tariff rate, GDP of Ethiopia and common border have become significant at 1 per cent level. Furthermore, the coefficient of Common official language becomes positive and significant at 1 per cent level as per our expectation.

Exporter and Importers Fixed Effect Model Estimation using PPML

Now let's add exporters and importers fixed effect and estimate our model as it is shown in table 6 below:

Table 6: Regression Results of Exporter and Importers Fixed Effect Model Using PPML

Number of parameters: 14
Number of observations: 60
Number of observations dropped: 0
Pseudo log-likelihood: -179579.2
R-squared: .92051004

(Std. Err. adjusted for 10 clusters in Dis)

Variable	Coefficients	S.E	Z –test	Prob.
ln_GDPi	.3186194	.2091069	1.52	0.128
ln_GDPj	2.036159*	.3270501	6.23	0.000
ln_Disij	-2.00359*	.4243438	-4.72	0.000
ln_DGDPPCij	-1.632555*	.2967988	-5.50	0.000
ln_TRj	.3127604	.1687998	1.85	0.064
Contig	-1.36363	.7584001	-1.80	0.072
Landlocked	4.607744*	.457262	10.08	0.000
Comlang_off	.1996714*	.0565518	3.53	0.000
Cons	-20.42435	4.191719	-4.87	0.000

Source: Computed
*The * and ** Indicates one and five per cent statistical significant respectively*

RESET Test

chi2 (1) = 1.25

Prob.> chi2 = 0.2640

The RESET test for the PPML with importers and exporters fixed effect shows that the model is correctly specified. Therefore, including additional variables to the model is not relevant.

Conclusion, Policy Implication and Suggestions

Conclusion

Trade costs play a key role in determining the level of trade that occurs between countries. In spite of its importance, less attention has been paid on its impact on exports in the literature with regard to Ethiopia. It is in this context, the present study is

pursued to specifically address the impact of trade costs on exports of Ethiopia using panel data for the period of 2010 – 2015.The paper addressed the following research questions; what determines the exports of Ethiopia? And do trade costs have any impact on the export performance of Ethiopia? Based on the Hausman test, fixed effect model has been found to be appropriate and the study has provided estimation of two types of panel data models: pooled model and importer and exporter fixed effects model using the Poisson pseudo maximum likelihood (PPML) estimation technique.

The empirical results indicate that GDP of importing countries is statistically significant and affects exports of Ethiopia positively whereas, GDP of Ethiopia is found to be statistically insignificant in explaining its exports. The Distance variable affects exports of Ethiopia negatively in both models. Similarly, landlocked variable is found to be statistically significant in both models apart from its unexpected sign. On the other hand, Tariff rate is found to be statistically insignificant in explaining exports of Ethiopia. The other variables; common border, GDPPC difference among the trading partners and common languages have inconsistent outcomes in terms of sign and significance.

Policy Implications

The analysis carried out in this paper has provided evidence that trade costs have significant influence on exports of Ethiopia. The distance component of trade costs has an absolute significant negative effect on exports. This could be due to the fact that most of the trading partners of Ethiopia are countries from Europe and Asia which are relatively distant. Therefore it is better for Ethiopia to trade with its neighbouring countries so as to reduce the negative effect of transportation and other related hindrances.

Besides, the country should participate in regional linkages to shift from landlocked to land-linked economy along with its neighbouring countries in order to ship goods more smoothly. Since the purpose of Regional trade agreements is to reduce tariffs and trade costs among their members, Ethiopia will be better off if it joins regional trade unions and exports its products to those unions.

Furthermore, it is important to focus on the most significant trade facilitation measures that help reduce trade costs such as making trade information available, harmonization and simplification of documents. Improving infrastructures that are necessary to ship products abroad might also reduce trade costs.

Finally, trade policies should be transparent in their regulations and procedures, and consistent, predictable and non-discriminatory in their applications. Most of all, good governance and impartiality helps reduce trade costs to a greater extent.

Suggestion

The landlocked variable is positive and statistically significant in explaining exports of Ethiopia implying that the country trades more with countries that are landlocked than coastal countries. This might be due to the fact that the landlocked countries included in the sample have low tariff rates compared to other countries. Therefore,

even though being landlocked increases the cost of trade in the form of transportation costs, the low tariff rate may compensate this and still encourages Ethiopia to send its products to this country. Nevertheless, this is the area where further research is needed.

References

Alekaw Kebede (2014).Determinants and Potential of Foreign Trade in Ethiopia: A Gravity Model Analysis, Ethiopian Development Research Institute.

Andrew B., Bernard et.al. (2006). Trade costs, firms and productivity, *Journal of Monetary Economics.*

Anderson. James (2001). Borders, Trade, and Welfare, Brookings Trade Forum.DOI: 10.1353/btf.2001.0002, Brookings Institution Press.

Anderson, J.E. & Eric van Wincoop (2003). Borders, Trade and Welfare, *Brookings Trade Forum*, 2001, pp: 207-243.

Anderson, J.E. & Eric van Wincoop (2004). Trade Costs,*Journal of Economic Literature,* Vol. 42 pp: 691-751.

Baltagi, B.H. (1995). Econometric Analysis of Panel Data, Chichester.

Bemnet Aschenaki (2004). Transport cost in Ethiopia: An Impediment to Export?

Burger M. F. van Oort & G.J. Linders (2009). On the Specification of the Gravity Model of Trade: Zeros, Excess Zeros and Zero-Inflated Estimation, *Spatial Economic Analysis*, 4(2), pp: 167-90.

Cheng Hsiao (2014). Analysis of Panel Data, Third Edition, New York: Cambridge University Press.

Eichengreen, B. & Bayoumi, T. (1995). Is Regionalism Simply A Diversion? Evidence from the Evolution of the EC and EFTA, Centre for Economic Policy Research.

ERCA(2016) Annual Report.

Flowerdew, R. & M. Aitkin (1982). A Method of Fitting the Gravity Model Based on the Poisson Distribution,*Journal of Regional Science*, 22, pp:191-202.

Fatima Olanike Kareem (2013).Modelling and Estimation of Gravity Equation in the Presence of Zero Trade: A Validation of Hypotheses Using Africa's Trade Data.

Fitsum Zewdu Mulugeta (2013). The Contribution of Major Export Commodities of Ethiopia to the Volatility of the Country's Export Earnings.

Hausman, J. A. (1978). Specification Tests in Econometrics, *Econometrica*, 46(6), pp: 1251-71.

Husen Mohammed (2008). The Impact of Ethiopia's COMESA Membership on Its Exports: An Augmented Gravity Modelling Approach.

I. U. Khan & K. Kalirajan (2011). The impact of trade costs on exports: An empirical modelling, *Economic Modelling* 28, pp:1341-1347.

IMF (2001). Global Trade Liberalization and the Developing Countries.

Kebede Bekele (2011). Does Real Exchange Rate Matter for Ethiopia's Exports?, A Gravity Model Analysis.

Krugman Paul R., Obstfeld Maurice & Marc J. Melitz (2012). International Economics Theory & Policy, Ninth edition, Pearson education Inc.

Lakew, B. (2003). Prospects for Export Diversification in Ethiopia, *NBE Staff Working Paper*, ERD/SWP/007/2003.

Levin, A., C.-F. Lin, & C.-S. J. Chu. (2002).Unit root tests in panel data: Asymptotic and finite-sample properties, *Journal of Econometrics*, 108, pp: 1-24.

McCallum, J. (1995). National Borders Matter: Canada-U.S. Regional Trade Patterns, *American Economic Review*, 85(3), pp: 615-23.

National Bank of Ethiopia (2015). Annual Report.

Pesaran, M. H. (2004). General Diagnostic Test for Cross Section Dependence in Panels,*Working Paper*, University of Cambridge & USC.

Portugal-Perez, A. & J. S. Wilson (2008). Trade Costs in Africa: Barriers and Opportunities for Reform, *Policy Research Working Paper 4619*, World Bank Research Development Group Trade Team.

Prabir De. (2007). Impact of Trade Costs on Trade: Empirical Evidence from Asian Countries. Asia-Pacific Research and Training Network on Trade,*Working Paper Series No. 27.*

Salamat Ali (2015). Trade Costs and Trade Composition: Firm-level Evidence from Pakistan, *Working paper*, International Growth Center.

Silva, J. M. C. & S. Tenreyro (2006). The log of gravity,*The Review of Economics and Statistics Forthcoming*.

Suresh K G and NeerajAswal (2014). Determinants of India's Manufactured Exports to South and North: A Gravity Model Analysis, *International Journal of Economics and Financial Issues,* 4(1), pp:144-151.

Westerlund J, Wilhelmsson F (2009) Estimating the gravity model without gravity using panel data. Appl Econ 43: 641-649.

Westerlund J, Wilhelmsson F (2009) Estimating the gravity model without gravity using panel data. Appl Econ 43: 641-649.

Westerlund J, Wilhelmsson F (2009) Estimating the gravity model without gravity using panel data. Appl Econ 43: 641-649.

Westerlund J, Wilhmsson F. (2009). Estimating the gravity model without gravity using panel data, *Appl Econ*, 43, pp: 64-649.

Wondwosen, Tebekew (2014). A Panel Data Analysis for Bilateral Trade of Ethiopia and East African Community countries: The Gravity Model Approach. Addis Ababa.

World Bank (2014).Unleashing the Potential of Ethiopia's Export Industry.

World Bank (2016).Project Information Document, Integrated Safeguards Data Sheet (PID/ISDS).

World Bank (2017). World Development Indicators.

WTO (2008). Trade, the Location of Production and the Industrial Organization of Firms.

WTO (2015). Why trade costs matter for inclusive, sustainable growth.

www.distancecalculator.net (accessed on 24 April, 2017)

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Global Integration of Indian Financial System and Vulnerability to External Shocks: Empirical Evidence from Capital Market

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A study of international linkages and integration of financial markets is important for comprehending the nature of transmission mechanism for maintaining financial stability in domestic markets. In this paper attempt has been made to measure nature and extent (degree) of integration of equity market in India with international financial market in the form of stock return and volatility spillovers. While taking G-20 countries, it was found that national markets including India are not independent ones and some of these are more integrated with India than others. The influence of 2008 financial crises has also been studied because strong global linkages always increase the exposure to external shocks.

Keywords: Volatility Spillover, Stock Market, Globalization, Financial Crisis

Introduction

A study of international linkages and integration of financial markets is important for comprehending the nature of financial crises and their transmission mechanism for maintaining financial stability in domestic markets (Louzis, 2013). Strong global financial linkages increase the exposure of the emerging markets to external shocks of both global and local nature. This interdependence limits the scope for independent monetary policy for any country (Prashant, 2014). With the increasing cross-border relationships and global financial integration, changes in one market create spillover effects in others, both in terms of returns and volatility. Many studies (Fratzscher (2001), Baele (2005), Chancharoenchai and Dibooglu (2006), Bhar and Nikolova (2007), Diebold and Yimaz (2009), Prasarnsith (2010), Dimpfle and Jung (2011), Padhi and Lagesh (2012), Grosvenor and Greenidge (2013) etc) have focused on return and volatility spillovers around the global capital markets for measuring international financial integration. These studies investigated international financial integration in the form of stock return and volatility spillover using various non-linear approaches. The present study contributes to the fast-growing body of literature in

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empirical financial economics dedicated to the investigation of international financial market integration. An attempt has been made to measure nature and extent (degree) of integration of equity market in India with international financial market in the light of external shock of 2008. This comprises four sections. The section titled 'Database and Methodology' analyses descriptive statistics and other econometric properties of data along with database and methodology. The section titled 'Empirical Estimates of Univariate Analysis' presents univariate analysis for the stock return series of all the considered countries and examines the nature of volatility present in all the return series. Measurement of global financial integration in the form of return and volatility spillover and vulnerability to financial crisis in 2008 is presented in the section 'Empirical Estimates of Bivariate Analysis (Spillover Model)'. The following section 'Variance Decomposition Analysis' reveals short run dynamics of the volatility spillover models using variance decomposition analysis and impulse response functions. Finally, the section titled 'Conclusion, Policy Implications and Suggestions' concludes the whole discussion.

Database and Methodology

Sample Selection

To represent the global market, group of G-20 countries has been selected. The rationale is that the group represents a mix of both developed as well as emerging markets and contributes sufficient geographical diversification as it includes nations from North and South America, Asia, Middle East as well as Europe. Also, more than 80% of world Gross Domestic Product (GDP) is produced by these countries. Thus, global economy can be best represented by G-20 countries.

Database

The stock markets investigated are those of India and 16 other G20 countries[1]. The data covers the weekly closing (Friday to Friday) stock prices from July 1, 1997 to June 2, 2014. The dataset for analysis comprises benchmark stock indices obtained from the major stock exchanges of these countries[2]. The advantage of using country data instead of world indices (to represent international market) is that specific events or factors that caused large market movements in an economy could be adequately traced.

The data are sampled such that if any of the market was closed for trading on Friday, closing data on the previous working day has been utilized. Friday-to-Friday weekly log returns for the stock prices of all the countries are calculated with help of following formula.

$$R_t = \ln(P_t) - \ln(P_{t-1})$$

where ln is for natural logarithm

1 Three (Soudi Arabia, South Africa and Turkey) out of G-20 countries are not included in the sample due to non availability of data.

2 The list of all the indices used for domestic as well as foreign markets along with symbols and data range has been given in Appendix A.

Methodology Used

Unit Root Test

Both Augmented Dickey Fuller and Philip-Perron tests (see Gujrati (2007) for details) have been utilized to discern whether stock-return series of all countries are stationary, or unit root is present in the series.

Modeling Conditional Volatility

The traditional measure of volatility represented by variance or standard deviation is unconditional and does not capture the interesting and important patterns in volatility like time varying and clustering properties of stock returns. Researchers in financial time series have developed various models to depict and predict these patterns in volatility. There are a variety of models used to test the existence of time-varying volatility and spillover effects in returns and volatility across markets.

In the present study, estimation of volatility in returns and its co-movements in India and other G20 countries is based on using (i) univariate GARCH model and (ii) bivariate GARCH model with asymmetric extensions. Asymmetric GARCH (E-GARCH) models allow for asymmetry in the distribution which is found present in most of the financial series.

Following models have been used to estimate conditional volatility, volatility clustering, and return and volatility spillover in order to measure global integration of Indian financial system.

Univariate E-GARCH Model

Asymmetric GARCH (E-GARCH) model proposed by Nelson (1991) has been used to estimate volatilities in returns of individual markets. Under the E-GARCH methodology, in general, two distinct specifications for mean and variance are as follows:

Mean Specification

$$X_t = c + \mu_t \quad (1)$$

Variance Equation

$$\log\left(\sigma^2{}_t\right) = \omega + \sum_{i=1}^{p} \alpha_i \left|\mu_{t-i} / \sigma_{t-i}\right| + \sum_{j=1}^{m} \gamma_j \mu_{t-j} / \sigma_{t-j} + \sum_{K=1}^{q} \beta_k \log\left(\sigma^2{}_{t-k}\right) \quad (2)$$

In this specification, α is the ARCH term that measures the effect of news about volatility from the previous period on current period volatility. β is the GARCH term that measures the impact of previous periods' variance. "A positive β indicates volatility clustering implying that positive price changes are associated with further positive changes and vice versa" (Verma and Mahajan, 2012). As per the study, "Basically, ARCH and GARCH measure the effects of new and old news respectively or indicate how volatility is affected by current and past information respectively". γ measures the leverage effect and it is expected to be negative implying that bad news has a bigger

impact on volatility than the good news of the same magnitude. This is an additional feature attained by E-GARCH[3] model. The values of p, m and q are determined on the basis of Akaike Information Criterion (AIC)".

The model used in present study is given below with mean and variance specifications. The basic E-GARCH model discussed so far has been augmented in equations (3) and (4) by Dummy variable (Dum) in order to examine impact of U.S. based 2008 financial meltdown.

$$R_{it} = c_i + \delta_i R_{t-1} + \theta_i \text{ Dum} + \mu_{it} \quad (3)$$

$$\log(\sigma^2_t) = c_{i0} + \alpha_i |\mu_{t-1}/\sigma_{t-1}| + \beta_i (\mu_{t-1}/\sigma_{t-1}) + \gamma_i \log(\sigma^2_{t-1}) + \theta_i \text{Dum} + \omega_{it} \quad (4)$$

In above model, R_{t-1} is used to find impact of previous period returns, and α is for ARCH effect, β for leverage (asymmetric) effect and γ for GARCH effect.

Bivariate E-GARCH (Spillover Model)

Bauwens et. al. (2006) suggested that "the most appropriate use of multivariate GARCH models is to model the volatility of one market with regard to the co-volatility of other markets. According to Kanas (2000) "The multivariate econometric technique normally employed by researchers to capture information transmission and spillover effect that account for conditional Heteroskedasticity is through class of GARCH Models".

In present study bivariate E-GARCH[4] models have been formulated for fulfilling the desired objective. In an attempt to measure return and volatility spillover from Indian market to foreign market (individual countries), following model has been developed.

$$R^D_t = \alpha_0 + \alpha_1 R^D_{t-1} + \alpha_2 R^f_{j,t} + \alpha_3 H^f_{j,t} + \alpha_4 \text{DUM} + \mu_t \quad (5)$$

$$H^D_t = \gamma_0 + \gamma_1 \left|\frac{\mu_{t-1}}{\sigma_{t-1}}\right| + \gamma_2 \frac{\mu_{t-1}}{\sigma_{t-1}} + \gamma_3 \log(\sigma^2_{t-1}) + \gamma_4 H^f_{j,t} + \gamma_5 \text{DUM} + \epsilon_t \quad (6)$$

In the above model, R^D_t and H^D_t are the terms for t-period return and volatility respectively in the domestic market. While $R^f_{j,t}$ and $H^f_{j,t}$ are contemporaneous spillover variables from the foreign (j^{th}) market in terms of return and conditional variance. However, term R^D_{t-1} is to capture the impact of returns of previous period in domestic market. Moreover, $\gamma_1, \gamma_2, \gamma_3$ depict the properties of conditional volatilities in India with respect to foreign markets. Dummy variable (DUM) has been incorporated in the model for capturing the effect of 2008 crisis on return and volatility spillover.

In a similar but separate model, which captures the transmission of return and volatility from India to foreign markets, the following mean and variance equations have been specified.

3 For more information on Nelson's (1991) E-GARCH model see Eviews User Guidelines, Version 7)
4 Bivariate E-GARCH model is one version of multivariate GARCH model.

$$R^{f}_{j,t} = \propto_0 + \propto_1 R^{f}_{t-1} + \propto_2 R^{D}_{t} + \propto_3 H^{D}_{t} + \propto_4 \text{DUM} + \mu'_t \quad (7)$$

$$H^{f}_{j,t} = \gamma_0 + \gamma_1 \left|\frac{\mu_{j,t-1}}{\sigma_{j,t-1}}\right| + \gamma_2 \frac{\mu_{j,t-1}}{\sigma_{j,t-1}} + \gamma_3 \log(\sigma^2_{j,t-1}) + \gamma_4 H^{D}_{t} + \gamma_5 \text{DUM} + \epsilon'_t \quad (8)$$

Apart from above models, impulse response function and variance decomposition analysis under the VAR (Vector Autoregressive) framework have been used for short run dynamics.

Preliminary Analysis

While plotting weekly closing stock prices in seventeen countries included in the study, it was found that each index suffered trough in 2008 when the U.S. financial crisis occurred[5]. During this period, minimum returns have been observed in all the countries. Therefore, a structural break in the data has been considered at a point (October 6, 2008) after the collapse of Lehmen Brothers, when most of the indices observed minimum returns.

The basic properties such as mean, variance, skewness, kurtosis and Q-statistic of return series from the seventeen markets of G20 countries, including India, have been analyzed to know the tendencies of stock returns compiled. It has been found that there is presence of linear as well as substantial nonlinear dependencies in the data. According to Li and Glies (2013), GARCH models are capable of dealing with data comprising these features.

Unit Root Test Results

The regular ADF test tends to discover unit roots that are not actually there, when there are breaks in the data (Perron (1989)). Thus in order to find order of integration or unit root in return series, both ADF and Phillip-Perron tests have been applied. Results of both the tests are reported in Table 1. All the return series are satisfying the condition of stationarity to perform further analysis.

Empirical Estimates of Univariate Analysis

Parameter estimation results of univariate model to examine clustering properties of volatility in all the sample countries are given in Table 2. Given by estimates of mean equation, it is clear that, except India, Russia, U.K and U.S, returns of the previous periods are not making significant impact on the present period. Another co-efficient (θ) in mean equation for dummy variable is insignificant for the return series of all the countries, except U.K and U.S. which suggests that mean returns of only these countries were affected by subprime crisis. However, significant coefficients for dummy in variance equation in case of India, Argentina, Brazil, Canada, China, Indonesia, Mexico, Russia, South Korea, U.K signify that volatility in the stock markets of these economies were affected by crisis in 2008. But, in U.S itself, this break has shown insignificant effect. It may be because of the reason that markets of U.S.

5 The troughs in the indices of U.K and Argentina are not so obvious.

were already experiencing high volatility due to early detection of financial crunch among the investors in the economy. But, after mid-September 2008, worldwide markets including India[6] could have borne the brunt of these crises. Moreover, as per the estimates of univariate analysis of all the return series, coefficients of ARCH (α), GARCH (γ) and Leverage (β) for all the countries are significant which indicates the presence of conditional volatility in the concerned return series. Therefore, series of weekly conditional volatility[7] for all the return series have been computed from univariate model given in equations 3 and 4.

Appendix B presents graphs of these conditional series derived from the univararite model for all the countries and it is observed that in all the countries (except Argentina), volatility is either higher (compared to other periods) or maximum during the period surrounding the collapse of Lehman Brothers on September 2008 which clearly justifies the incorporation of structural break at the given point.

Empirical Estimates of Bivariate Analysis (Spillover Model)

Transmission of return and volatility around the globe is one of the measures of degree of international financial integration or interdependence (Bhar and Nikolova (2007), Prasarnsith (2010), Dimpfle and Jung (2011), Padhi and Lagesh (2012), Grosvenor and Greenidge (2013)). Since from univariate analysis it is clear that, properties of volatility clustering is present in the stock returns of all countries. Therefore, it is worthwhile to measure the extent of volatility spillover from India to other economies (and vice versa) using E-GARCH model.

Estimated results for the model given in equations 5 and 6 are presented in Table 3. In the Table, α_1 shows the effect of last period's return on current period whereas values of α_2 and α_3 are the contemporaneous spillover coefficients from foreign markets in terms of return and volatility respectively. All of these three coefficients are significant which suggests the foreign influence on mean returns of India. γ_4 is the coefficient that shows volatility spillover from foreign markets to domestic market which is significant from all countries except Brazil and European countries (E.U, France, Germany, Italy and U.K). The magnitude of spillover varies from 142.09 (for Australia) to 3.4757 (for Argentina). This coefficient of cross volatility persistence is 78.2965 for Japan, followed by 76.1899 in case of U.S, and 42.5040 in case of Canada, thereby suggesting that Indian financial sector is integrated with global financial system where Australia, Japan, U.S and Canada are the most influential markets. Thus, it goes with theory that dominant markets are likely to exert greater influence on the relatively smaller markets. The negative and significant (except for Argentina and South Korea) coefficients of dummy variable signifies that crisis in 2008 had contagion impact on all the countries included in the sample. Moreover, the insignificant ARCH-LM test statistic shows that standardized residuals did not exhibit additional ARCH effect. Thus, indicating that variance equations are well specified.

6 In India, the most immediate and considerable effect of crisis was seen as an outflow of foreign institutional investment from its equity market and sharp depreciation of rupee in foreign exchange market (see Verma and Mahajan, 2012).

7 In the subsequent bivariate model of volatility spillover, conditional volatility derived from univariate GARCH model has been used.

The results discussed so far give the one facet of the whole scenario. In other words, it is giving the unidirectional spillover effects from foreign markets to Indian financial system. Table 4 shows the results for return and volatility spillover from India to foreign markets. As per estimates of equation 7, it has been found that returns in all foreign markets (except Argentine, China, Indonesia and South Korea) respond to return in Indian market. As far as volatility transmission is concerned, foreign markets' returns are not getting affected by volatility in Indian market that conveys the unidirectional relation in this case. The only significant case is that of Argentina which too have negative (-6.8802) coefficient that signifies volatility in Indian market affects stock returns in Argentina negatively. Thus, it is the only case of Argentina in which two way relationships (bidirectional) exists[8].

In contrast to the shock spillovers, the volatility spillovers model given by equation 8, shows different trends. The coefficient γ_4' in this model shows the extent of spillovers from Indian market to other national markets. The results point out significant volatility spillovers or asymmetric effects from Indian market to all foreign markets except U.S., Brazil, France, China and Italy[9]. Moreover, this coefficient is highest in case of Indonesia (82.9787), followed by Canada (77.8702), Japan (75.9510), and Australia (73.57). The least value assumed by this parameter is for E.U i.e., 20.6938. In addition, the significant coefficients of ARCH, GARCH and leverage term for all (almost) the countries suggests that investors in all the markets (domestic as well as foreign) should not follow information on only current local or international movements to guide their investment related decisions but they must take into consideration news in the past.

It, thus, can be concluded that if volatility spillover is taken as a mechanism to measure financial integration then Australia, Canada, U.S, Japan and Indonesia are more integrated with India and there is information flow (transmission) between Indian and these markets.

Variance Decomposition Analysis

As depicted by above models, the inter-relationships exist among various national financial markets. For transmission dynamics of these relationships, there is need to analyse the extent to which multi-lateral interaction exists between these markets. In order to know such dynamic interactions, the structure of interdependence among the stock markets of all countries has been analyzed in VAR system[10].

In Table 5 and 6 details of decomposition of variations (into fractions) are given which are caused by the innovations either in domestic or in foreign markets after 1 to 5 and 10 periods (weeks). Table 5 gives the main channels of influence (through foreign markets) in the Indian financial system. Although, the major proportion of variations in Indian market is explained by innovation in domestic market only but, a substantial amount of interaction is detected between India and other national markets.

8 The impact of volatility on returns for Argentina is significant in the previous model.
9 France, Brazil and Italy are the countries for which this coefficient is insignificant in previous volatility spillover model.
10 Vector Autoregressive (VAR) model represents the correlations among a set of variables. Therefore, these are often used to analyze certain aspects of the relationships between the set of variables

Data reveals that Brazilian market is explaining maximum (2.39%) variation in Indian market in first period. However, percentage of error variance explained by Australia is maximum, which is 13.12% on second week and 12.11% and 12.04% on fifth and tenth week, respectively. Moreover, variations in Indian market are enough explained by the markets of Argentina, Canada, E.U and Germany. But U.S. seems not to explain the Indian market substantially which does not go well with theory that comparatively less developed markets are influenced by dominant market and this is also not in align with results of many studies like Baele (2005), Bhar and Nikolova (2007), Li and Giles (2013) etc[11].

Table 6 on the other hand, tells the influence of domestic innovations on the foreign markets i.e., how much Indian market is accounted for variations in other national markets? Although Indian stock market is not explaining enough the foreign market but, Japan, U.K, China and Argentina among others are explained by innovation in Indian markets in the short period. Thus, it may be concluded that national markets (considered in the study) are not independent and Indian market is not the exogenous one in the international financial system in the short period too.

Impulse Response Function

Following the analysis of variance decomposition, the pattern of dynamic responses of each of the seventeen markets to the shocks given in Indian market and vice versa has been examined using the simulated responses under VAR framework. The normalized impulse responses of India to the shock given to other markets and responses of others to innovation in Indian stock market are presented in Tables 7 and 8.

Table 7 presents that after how long innovations originating in each of these national markets persist to impact the returns in India. It is observed that foreign market shocks are generally weak and responses do not persist for long. Their impact on Indian returns has been observed till five weeks and after that these are almost negligible. Further, examination of responses of foreign markets to shocks to innovations in Indian markets has been made from Table 8. It is observed that responses of all the foreign markets die out after fifth week.

Thus, it can be concluded that all the considering markets are affecting and getting affected by domestic market (India) in short period too.

Conclusion, Policy Implications and Suggestions

The study examines the nature and extent of global integration of Indian capital market in the form of volatility spillover. While using the returns from the stock markets of seventeen of G-20 countries, first preliminary analysis has been made which unravels the non-normality, conditional volatility and unit root properties of and unit root in the data. In a subsequent attempt, conditional volatilities have been derived from the univariate analysis (using E-GARCH model) of all the countries.

11 Bala and Premaratne (2003) in contrast to these, evidenced the volatility spillover from smaller to dominant market which is contradictory to other studies.

In bivariate analysis, it has been found that Australia, Canada, U.S. Japan and Indonesia are more integrated with India if volatility spillover is taken as a mechanism to measure financial integration. All these are having bidirectional relation with Indian capital market except U.S which does not bear any influences of volatility in Indian returns. Thus, it is confirmed that U.S. market as the central one in the global market has unidirectional volatility spillovers to Indian market. Moreover, Russia and South Korea are the other markets having bidirectional re1ation with India in long run. Dummy variable for 2008 U.S financial meltdown in the considered model has been found significant for Australia, Mexico, Brazil, China, Indonesia, Russia, South Korea and U.K thereby suggests that contagion impact was there on the relationship of India with these countries.

Further, the empirical results of both variance decomposition analysis and impulse response function exhibits that national capital markets including Indian market are not independent ones in the short period also.

It is well established in literature that with greater degree of market integration, potential benefits of portfolio diversification gets reduced. Thus, for achieving the higher level of efficiency and hence economic growth, it is suggested that more prominent financial relations should be maintained with the countries which are found less or not integrated with India.

The results found from the study have significant implications for the policy makers of the domestic economy. Globally integrated financial market of any nation is always vulnerable to external changes like financial meltdown and financial policies in international market which are conformed by present analysis. Therefore, no independent monetary policy will be fruitful until the responses of uncertain shocks from foreign markets are incorporated.

To conclude with it is suggested that one needs to take more cautious view of the way the policies tend to work. To exploit the potential benefits, in terms of macro-economic growth and stability which can be desired from greater integration of international financial markets, appropriate and precise measures need to undertake.

References

Baele, L. (2005). Volatility Spillover Effects in European Equity Markets, *The Journal of Financial and Quantitative Analysis*, Vol. 40, pp:373-401.

Bala, L. & G. Premaratue (2003). Volatility spillover and Co-movement: Some New Evidence from Singapore, National University of Singapore, *Working paper 2003*.

Bauwens, L., S. Laurent, J. V. K. Rombouts (2006). Multivariate GARCH Models: A Survey, Journal of applied economics, Vol. 21, pp:79-109.

Bhar, R. (2001). Return and Volatility Dynamics in the Spot and Futures Markets in Australia: An Intervention Analysis in a Bivariate EGARCH-X Framework, *Journal of Futures Markets*, Vol. 21, pp:833-850.

Bhar, R., and B. Nikolova (2007). Analysis of Mean and Volatility Spillovers using BRIC Countries, Regional and World Equity Index Returns, *Journal of Economic Integration*, Vol. 22, pp:369-381.

Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroskedasticity, *Journal of Econometrics*, Vol. 31, pp:307-327.

Burbridge, J. and A. Harrison (1985). Testing for the Effects of Oil-Price Rises Using Vector Auto regressions, *International Economic Review*, Vol. 25, pp:459-484.

Chan, K. C., G. A. Karolyi, and R. Stulz (1992). Global Financial Markets and the Risk Premium on U.S. Equity, *Journal of Financial Economics*, Vol. 32, pp:137-167.

Chan, K., K. C. Chan, and G. A. Karolyi (1991). Intraday Volatility in the Stock Index and Stock Index Futures Markets, *Review of Financial Studies*, Vol. 4, pp:657-683.

Chancharoenchai, K., and S. Dibooglu (2006). Volatility Spillovers and Contagion during Asian Crisis: Evidence from Six Southeast Asian Stock Markets, *Emerging Markets Finance and Trade*, Vol. 42, pp:4-17.

Chen, G-M, F. Michael, and R. Oliver (2001). The Dynamic Relation between Stock, Return, Trading Volume and Volatility, *The Financial Review*, Vol. 36, pp:153-174.

Christiansen, C. (2007). Volatility-Spillover Effects in European Bond Markets, *European Financial Management*, 13(5), pp:923-948.

Diebold, F. X., and K. Yilmaz (2009). Measuring Financial Asset Return and Volatility Spillovers, with Application to Global Equity Markets, *The Economic Journal*, Vol. 119, pp:158-171.

Dimpfl, T., and R. Jung (2011). Financial Market Spillovers Around the Globe, *Working Paper on Global Financial Markets*, No. 20, pp:1-28.

Engle, R. (1982). Autoregressive Conditional Heteroskedasticity with Estimates of United Kingdom Inflation, *Econometrica*, 50(4), pp:987-1008.

Engle, R., and R. Susmel (1993). Common Volatility in International Equity Markets, *Journal of Business & Economic Statistics*, Vol. 11, pp:167-176.

Eviews User Guidelines, Version 7.

Fratzscher, M. (2001). Financial Market Integration in Europe: On the Effects of EMU on Stock Markets, European Central Bank, *Working Paper Series No. 48*, pp:1-41.

Perron, P. (1989). The great crash, the oil price shock and the unit root hypothesis, Econometrica, 57, pp:1361-1401.

Grosvenor, T., and K. Greenidge (2013). Stock Market Volatility Spillover from Developed Markets to Regional Markets, *Business, Finance and Economics in Emerging Economies*, Vol. 8, pp:45-61.

Kanas, A. (2000). Volatility Spillovers Between Stock Returns and Exchange Rate Changes: International Evidence, *Journal of Business, Finance and Accounting*, Vol. 27, pp:447-467.

Li. Y., and D. E. Giles (2013). Modelling Spillover Effects Between Developed Stock Markets and Asian Emerging Stock Markets, *Econometric Working Paper EWP1301*, Department of Economics, University of Victoria, pp:1-39.

Ljung, G. M., and G. E. P. Box (1979), On a measure of lack of fit in time series models, *Biometrika,* Vol. 65, pp:297-303.

Louzis, D. P. (2013). Measuring Return and Volatility Spillovers in Euro Area Financial Markets, *Working Paper No. 154*, Economic Research Department, Bank of Greece.

Manganelli, S., and R. F. Engle (2001). Value at Risk Models in Finance, *Working Paper No. 75*, European Central Bank, pp:1-36.

Nelson, D. B. (1991). Conditional Hetrokedasticity in Asset Returns: A New Approach, *Econometrica*, Vol. 59, pp:347-370.

Ng, A. (2000). Volatility Spillover Effects from Japan and the U.S to the Pacific-Basin, *Journal of International Money and Finance*, Vol. 19, pp:207-233.

Padhi, P., and M. A. Lagesh (2012), Volatility Spillover and Time Varying Correlation Among the Indian, Asian and U.S Stock Markets, *Journal of Quantitative Economics*, Vol. 10, pp:78-89.

Prasarnsith, W. (2010). Return and Volatility Transmissions in International Financial Markets: Non Linear Approaches, A Ph.D. Thesis submitted in the graduate College of the University of Illinois at Chichago in 2010.

Rui, M. (1997). An Empirical Research of Stock Prices and Trading Volumes, A Ph.D Thesis submitted to faculty of college of Business Administration at University of Houston.

Schwert, G. W., and P. J. Seguin (1990). Heteroscedasticity in Stock Returns, *Journal of Financ*e, Vol. 45, pp:1129-1156.

Verma, S., and N. Mahajan (2012), Stock Return, Volatility and Global Financial Meltdown: The Behaviour of Indian Stock Market, *International Journal of Arts and Commerce*, Vol. 1, pp:166-178.

Table 1: Unit Root Test Results for the Return Series of Respective Countries

Return Series	ADF Statistic (At Level)	Philip-Perron Test statistics (At Level)	Result
India	-28.7509* (0.0000)	-28.7847*(0.0000)	Stationary
Argentina	-28.0824* (0.0000)	-28.1944*(0.0000)	Stationary
Australia	-30.7022* (0.0000)	-30.7167* (0.0000)	Stationary
Brazil	-19.2375* (0.0000)	-31.3779* (0.0000)	Stationary
Canada	-32.6662* (0.0000)	-32.5301* (0.0000)	Stationary
China	-28.1704* (0.0000)	-28.5808* (0.0000)	Stationary
E.U	-31.5708* (0.0000)	-31.5397* (0.0000)	Stationary
France	-31.9361* (0.0000)	-31.9072* (0.0000)	Stationary
Germany	-30.6030* (0.0000)	-30.5935* (0.0000)	Stationary
Indonesia	-30.8131* (0.0000)	-30.9967* (0.0000)	Stationary
Italy	-29.3347* (0.0000)	-29.3473* (0.0000)	Stationary
Japan	-30.4569* (0.0000)	-30.4476* (0.0000)	Stationary
Mexico	-30.7896* (0.0000)	-30.7885* (0.0000)	Stationary
Russia	-17.9891* (0.0000)	-27.9063* (0.0000)	Stationary
South Korea	-32.5151* (0.0000)	-32.4024* (0.0000)	Stationary
U.K	-30.7993* (0.0000)	-31.0465* (0.0000)	Stationary
U.S	-31.8378* (0.0000)	-31.8411* (0.0000)	Stationary

Note: *p-values in parentheses. '*' indicates significant value of test statistics*
Source: *Authors' Calculations*

$R_t = c + \delta R_{t-1} + \theta Dum + \mu_t$

$\log(\sigma^2_t) = c_0 + \alpha |\mu_{t-1}/\sigma_{t-1}| + \beta (\mu_{t-1}/\sigma_{t-1}) + \gamma \log(\sigma^2_{t-1}) + Dum + \omega_t$

Table 2: Estimates for E-GARCH Model for all countries

Country	c	δ	θ	c_0	α	β	γ	θ	ARCH-LM Test F-Statistics and N* Observations
India	0.0027* (0.0420)	0.0778* (0.0265)	-0.0011 (0.5862)	-0.3062* (0.0000)	0.1636* (0.0000)	-0.0582* (0.0003)	0.9730* (0.0000)	-0.025* (0.0068)	0.0036 (0.9520) 0.0036 (0.9520)
Argentina	0.0007 (0.8515)	-0.0174 (0.5512)	0.0047 (0.2374)	-0.3335* (0.0000)	0.2719* (0.0000)	0.0799* (0.0000)	0.9679* (0.0000)	-0.0729* (0.0000)	0.2614 (0.6093) 0.2619 (0.6088)
Australia	0.0011 (0.1132)	-0.0067 (0.8522)	-0.0007 (0.5908)	-0.7739* (0.0000)	0.2026* (0.0000)	-0.1330* (0.0000)	0.9233* (0.0000)	0.0201 (0.1949)	0.0000 (0.9965) 0.0000 (0.9965)
Brazil	0.0029 (0.1107)	-0.0291 (0.3779)	-0.0039 (0.1141)	-0.2072* (0.0000)	0.0681* (0.0014)	-0.0864* (0.0000)	0.9753* (0.0000)	-0.0262* (0.0036)	0.0889 (0.7656) 0.0891 (0.7653)
Canada	0.0013 (0.1376)	-0.0488 (0.2140)	0.0001 (0.9193)	-0.4979* (0.0000)	0.2161* (0.0000)	-0.1142* (0.0000)	0.9556* (0.0000)	-0.0338* (0.0038)	0.1089 (0.7414) 0.1092 (0.7411)
China	0.0006 (0.6205)	0.0233 (0.4886)	-0.0019 (0.3162)	-0.1796* (0.0033)	0.1165* (0.0000)	-0.0152* (0.0986)	0.9861* (0.0000)	-0.0212* (0.0025)	0.9345 (0.3340) 0.9357 (0.3334)
E.U	0.0006 (0.5496)	-0.0356 (0.3403)	-0.0006 (0.7394)	-0.3893* (0.0000)	0.1359* (0.0000)	-0.1468* (0.0000)	0.9605* (0.0000)	-0.0091 (0.4393)	0.6446 (0.4223) 0.6456 (0.4217)
France	0.0006 (0.5693)	-0.0469 (0.2291)	0.0004 (0.8356)	-0.4280* (0.0000)	0.1697* (0.0000)	-0.1384* (0.0000)	0.9586* (0.0000)	-0.019 (0.1809)	0.7384 (0.3904) 0.7395 (0.3898)
Germany	-0.0012 (0.3182)	-0.0037 (0.9166)	0.0006 (0.7385)	-0.7547* (0.0000)	0.1980* (0.0001)	-0.2019* (0.0000)	0.9146* (0.0000)	-0.0214 (0.2369)	0.0175 (0.8948) 0.0176 (0.8946)
Indonesia	0.0035* (0.0071)	-0.0273 (0.4410)	0.0010 (0.5227)	-0.9003* (0.0000)	0.3227* (0.0000)	-0.0826* (0.0002)	0.8977* (0.0000)	-0.0882* (0.0001)	0.0431 (0.8356) 0.0432 (0.8354)
Italy	-0.0001 (0.9539)	0.0469 (0.1823)	-0.0005 (0.7933)	-0.5055* (0.0000)	0.2331* (0.0000)	-0.1366* (0.0000)	0.9556* (0.0000)	0.0111 (0.5120)	1.3162 (0.2516) 1.3173 (0.2511)
Japan	-0.0009 (0.4257)	0.0158 (0.6882)	0.0022 (0.3058)	-2.2269* (0.0000)	0.2031* (0.0000)	-0.2153* (0.0000)	0.7076* (0.0000)	0.0314 (0.4059)	0.4355 (0.5095) 0.4363 (0.5095)
Mexico	0.0035* (0.0002)	-0.0254 (0.4766)	-0.0024 (0.1976)	-0.3288* (0.0000)	0.1544* (0.0000)	-0.0974* (0.0000)	0.9689* (0.0000)	-0.0315* (0.0017)	0.5001 (0.4797) 0.5009 (0.4791)
Russia	0.0038* (0.0526)	0.0858* (0.0112)	-0.0030 (0.3292)	-0.3342* (0.0000)	0.2132* (0.0000)	-0.0754* (0.0000)	0.9702* (0.0000)	-0.0215* (0.0340)	1.8677 (0.1721) 1.8679 (0.1717)
South Korea	0.0017 (0.2736)	-0.0441 (0.2038)	-0.0011 (0.5763)	-0.5359* (0.0000)	0.2595* (0.0000)	-0.0863* (0.0000)	0.9467* (0.0000)	-0.0608* (0.0007)	0.1523 (0.6964) 0.1527 (0.6960)
U.K	-0.0021* (0.0948)	0.0933* (0.0036)	0.0079* (0.0020)	-6.8289* (0.0000)	1.1039* (0.0000)	0.2792* (0.0000)	0.0711* (0.0681)	0.3271* (0.0001)	0.1679 (0.6821) 0.1682 (0.6817)
U.S	0.0001 (0.8784)	-0.0789* (0.0191)	0.0024* (0.0095)	-0.6706* (0.0000)	0.1967* (0.0000)	-0.2047* (0.0000)	0.9316* (0.0000)	-0.0246 (0.1426)	4.6009 (0.3322) 4.5873 (0.3322)

Note: *p-values in the parentheses. '*' indicates significance at 10% level.*
Source: *Authors' Calculations*

$$R_t^D = \alpha_0 + \alpha_1 R_{t-1}^D + \alpha_2 R_{j,t}^f + \alpha_3 H_{j,t}^f + \alpha_4 \text{DUM} + \mu_t$$

$$H_t^D = \gamma_0 + \gamma_1 \left|\frac{\mu_{t-1}}{\sigma_{t-1}}\right| + \gamma_2 \frac{\mu_{t-1}}{\sigma_{t-1}} + \gamma_3 \log(\sigma_{t-1}^2) + \gamma_4 H_{j,t}^f + \gamma_5 \text{DUM} + \epsilon_t$$

Table 3: Estimates of Bivariate E-GARCH Model (Spillover Effect from Foreign Countries to India)

Country	α_0	α_1	α_2	α_3	α_4	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	ARCH-LM Test F-statistics and N*Obs
U.S.	0.0102* (0.0000)	0.0364 (0.3084)	0.0736* (0.0643)	-13.6989* (0.0000)	-0.0028 (0.1464)	-0.7017* (0.0000)	0.1861* (0.0000)	-0.0721* (0.0015)	0.9248* (0.0000)	76.1899* (0.0002)	-0.0456* (0.0079)	0.1604 (0.6889) 0.1607 (0.6885)
Australia	0.0100* (0.0000)	0.0433 (0.2314)	0.0809* (0.0934)	-24.5289* (0.0000)	0.0018 (0.3726)	-0.6737* (0.0000)	0.1718* (0.0000)	-0.0771* (0.0003)	0.9274* (0.0000)	142.09* (0.0018)	-0.0743* (0.0014)	0.1601 (0.6891) 0.1605 (0.6887)
Argentina	0.0059* (0.0048)	0.0883* (0.0133)	0.0096 (0.4245)	-0.3341* (0.0864)	-0.0046* (0.0387)	-0.6215* (0.0000)	0.2167* (0.0000)	-0.0867* (0.0000)	0.9381* (0.0000)	3.4757* (0.0114)	-0.0071 (0.6825)	0.0867 (0.7685) 0.0869 (0.7681)
Brazil	0.0078* (0.0009)	0.0421 (0.1673)	0.3178* (0.0000)	-2.9596* (0.0028)	-0.0034* (0.0962)	-0.3043* (0.0002)	0.1255* (0.0000)	-0.0508* (0.0037)	0.9720** (0.0000)	8.1494 (0.1721)	-0.0205 (0.0156)	2.0743 (0.1501) 2.0742 (0.1498)
Canada	0.0040* (0.0103)	0.0747* (0.0206)	0.6561* (0.0000)	-5.0549* (0.0090)	-0.0009 (0.5813)	-0.4360* (0.0010)	0.1185* (0.0000)	-0.0480* (0.0161)	0.9536* (0.0000)	42.5040* (0.0189)	-0.0389* (0.0025)	0.4647 (0.4956) 0.4655 (0.4951)
China	0.0070 (0.1055)	0.0749* (0.0321)	0.0471 (0.1329)	-3.9447* (0.0975)	-0.0029 (0.1562)	-0.4237* (0.0000)	0.1591* (0.0000)	-0.0720* (0.0002)	0.9604* (0.0000)	30.2179* (0.0025)	-0.0255* (-0.0249)	0.0040 (0.9494) 0.0040 (0.9493)
E.U.	0.0045* (0.0035)	0.0661* (0.0394)	0.4460* (0.0000)	-2.1690* (0.0487)	-0.0008 (0.6619)	-0.2576* (0.0020)	0.1275* (0.0000)	-0.0305* (0.0547)	0.9774* (0.0000)	5.7769 (0.4236)	-0.0255* (0.0255)	0.8215 (0.3650) 0.8226 (0.3644)
France	0.0047* (0.0029)	0.0719* (0.0229)	0.4488* (0.0000)	-2.3035* (0.0379)	-0.0009 (0.5855)	-0.2692* (0.0007)	0.1301* (0.0000)	-0.0339* (0.0318)	0.9762* (0.0000)	8.2234 (0.3005)	-0.0289* (0.0133)	0.5115 (0.4747) 0.5115 (0.4741)
Germany	0.0047* (0.0031)	0.4770 (0.1480)	0.4352* (0.0000)	-2.1231* (0.0153)	-0.0017 (0.3529)	-0.2451* (0.0019)	0.1114* (0.0000)	-0.0259* (0.0763)	0.9777* (0.0000)	6.2926 (0.3611)	-0.0229* (0.0104)	0.7853 (0.3758) 0.7864 (0.3752)
Indonesia	0.0055* (0.0131)	0.0664* (0.0602)	0.0337 (0.2699)	-1.5741 (0.1413)	-0.0036 (0.1089)	-0.3173* (0.0000)	0.1382* (0.0000)	-0.0494* (0.0029)	0.9717* (0.0000)	11.4665* (0.0513)	-0.0140 (0.1539)	0.0581 (0.8096) 0.0582 (0.8093)
Italy	0.0039* (0.0075)	0.0689* (0.0355)	0.3919* (0.0000)	-1.3508 (0.1308)	0.0002 (0.9283)	-0.3737* (0.0007)	0.1522* (0.0000)	-0.0378* (0.0474)	0.9641* (0.0000)	12.6191 (0.1139)	-0.0407* (0.0248)	0.2049 (0.6509) 0.2053 (0.6505)
Japan	0.0127* (0.0000)	0.0559 (0.1036)	0.0686* (0.0320)	-10.4808* (0.0000)	-0.0014 (0.4811)	-0.5346* (0.0000)	0.1854* (0.0000)	-0.0431* (0.0424)	0.9530* (0.0000)	78.2965* (0.0028)	-0.0412* (0.0013)	0.0692 (0.7926) 0.0693 (0.7923)
Mexico	0.0047* (0.0229)	0.0702* (0.0269)	0.4239* (0.0000)	-3.1191* (0.0309)	-0.0018 (0.3549)	-0.4755* (0.0013)	0.0904* (0.0016)	-0.0274 (0.1666)	0.9469* (0.0000)	32.6545* (0.0145)	-0.0269* (0.0098)	1.7563 (0.1854) 1.7568 (0.1850)
Russia	0.0049* (0.0033)	0.0664* (0.0570)	0.0977* (0.0000)	-0.6928* (0.0447)	-0.0029 (0.1256)	0.4496* (0.0000)	0.1499* (0.0000)	-0.0728* (0.0001)	0.9541* (0.0000)	5.5914* (0.0272)	-0.0213* (0.0567)	0.0789 (0.7787) 0.0792 (0.7784)
South Korea	0.0109* (0.0000)	0.0548 (0.1229)	-0.0199 (0.4274)	-4.1969* (0.0000)	-0.0077* (0.0003)	-0.8038* (0.0000)	0.2349* (0.0000)	-0.0808* (0.0006)	0.9188* (0.0000)	33.5385* (0.0003)	-0.0000 (0.9987)	0.0002 (0.9878) 0.0002 (0.9878)
United Kingdom	0.0029* (0.0428)	0.0768* (0.0236)	0.1442* (0.0000)	-0.0062 (0.9653)	-0.0009 (0.6356)	-0.2493* (0.0000)	0.1389* (0.0000)	-0.0421* (0.0071)	0.9787* (0.0000)	0.0416 (0.8956)	-0.0229* (0.0035)	0.0063 (0.9366) 0.0063 (0.9365)

Note: *Figures in the parentheses are p-values. '*' indicates significance at 10% level.*
Source: *Authors' Calculations.*

$$R^{f}_{j,t} = \propto'_0 + \propto'_1 R^{f}_{t-1} + \propto'_2 R^{D}_{t} + \propto'_3 H^{D}_{t} + \propto'_4 \text{DUM} + \mu_{j,t}$$

$$H^{f}_{j,t} = \gamma'_0 + \gamma'_1 \left|\frac{\mu_{j,t-1}}{\sigma_{j,t-1}}\right| + \gamma'_2 \frac{\mu_{j,t-1}}{\sigma_{j,t-1}} + \gamma'_3 \log(\sigma^2_{j,t-1}) + \gamma'_4 H^{D}_{t} + \gamma'_5 \text{DUM} + \epsilon_t$$

Table 4: Estimates of Bivariate E-GARCH Model (Return and Volatility Spillover Effect from Domestic Country to Foreign Countries)

Country	$\propto'_0$	$\propto'_1$	$\propto'_2$	$\propto'_3$	$\propto'_4$	γ'_0	γ'_1	γ'_2	γ'_3	γ'_4	γ'_5	ARCH LM(1) F-statistics N*Obs
U.S.	-0.0008 (0.6795)	-0.1087* (0.0019)	0.0648* (0.0018)	0.4554 (0.7288)	0.0032* (0.0454)	-0.8035* (0.0000)	0.1684* (0.0000)	-0.2159* (0.0000)	0.9155* (0.0000)	23.7081 (0.2226)	-0.0198 (0.2877)	3.7096 (0.0544) 3.7024 (0.0543)
Australia	0.0021 (0.1186)	-0.0301 (0.4322)	0.0413* (0.0247)	-0.9569 (0.3515)	-0.0006 (0.6590)	-1.6434* (0.0001)	0.2044* (0.0000)	-0.1865* (0.0000)	0.8282* (0.0000)	73.5700* (0.0207)	0.0746* (0.0174)	0.0014 (0.9704) 0.0014 (0.9703)
Argentina	0.0072 (0.1958)	-0.0029 (0.9363)	-0.0051 (0.9317)	-6.8802* (0.0647)	0.0023 (0.5997)	-0.5591* (0.0000)	0.2779* (0.0000)	0.0715* (0.0017)	0.9363* (0.0000)	48.4641* (0.0001)	-0.0990* (0.0000)	0.3318 (0.5647) 0.3325 (0.5642)
Brazil	-0.0016 (0.5855)	-0.0936* (0.0003)	0.5160* (0.0000)	1.7471 (0.3630)	-0.0011 (0.6617)	-0.1770* (0.0003)	0.0402* (0.0271)	-0.0955* (0.0000)	0.9782* (0.0000)	6.0709 (0.3512)	-0.0274* (0.0083)	2.3142 (0.1286) 2.3135 (0.1283)
Canada	0.0008 (0.6186)	-0.1011* (0.0027)	0.2724* (0.0000)	-0.4282 (0.7312)	0.0003 (0.8339)	-1.0215* (0.0000)	0.1806* (0.0000)	-0.1074* (0.0000)	0.8995* (0.0000)	77.8702* (0.0019)	-0.0181 (0.2719)	0.0514 (0.8207) 0.0515 (0.8204)
China	-0.0011 (0.6599)	0.0272 (0.4280)	0.0354 (0.2262)	1.1694 (0.4726)	-0.0010 (0.6396)	-0.2278* (0.0042)	0.1323* (0.0000)	-0.0163 (0.1555)	0.9812* (0.0000)	1.6776 (0.7991)	-0.0229* (0.0072)	0.7283 (0.3937) 0.7293 (0.3931)
E.U.	-0.0016 (0.4530)	-0.0968* (0.0047)	0.3264* (0.0000)	1.0172 (0.4974)	0.0008 (0.6689)	-0.3537* (0.0001)	0.1100* (0.0000)	-0.0927* (0.0000)	0.9671* (0.0000)	20.6938* (0.0284)	0.0013 (0.8949)	0.2329 (0.6295) 0.2333 (0.6291)
France	-0.0007 (0.7356)	-0.1094* (0.0027)	0.3054* (0.0000)	0.3771 (0.8056)	0.0010 (0.5792)	-0.3522* (0.0004)	0.1330* (0.0000)	-0.0814* (0.0000)	0.9695* (0.0000)	19.5316 (0.2226)	-0.0198 (0.2877)	0.2325 (0.6298) 0.2329 (0.6294)
Germany	0.0007 (0.7408)	-0.0561 (0.1006)	0.3402* (0.0000)	-0.5539 (0.7192)	0.0014 (0.4640)	-0.7841* (0.0000)	0.2083* (0.0000)	-0.1487* (0.0000)	0.9184* (0.0000)	27.7300* (0.0790)	-0.0098 (0.5912)	0.1596 (0.6897) 0.1599 (0.6893)
Indonesia	0.0053* (0.0405)	-0.0315 (0.3850)	0.0221 (0.4957)	-1.7049 (0.4001)	-0.0013 (0.4955)	-1.3183* (0.0000)	0.2935* (0.0000)	-0.1059* (0.0000)	0.8473* (0.0000)	82.9787* (0.0013)	-0.1046* (0.0003)	0.0586 (0.8088) 0.0587 (0.8085)
Italy	-0.0012 (0.5214)	0.0007 (0.9829)	0.2894* (0.0000)	0.0463 (0.9736)	0.0011 (0.9468)	-0.4532* (0.0001)	0.1942* (0.0000)	-0.1153* (0.0000)	0.9621* (0.0000)	15.2517 (0.2290)	0.0178 (0.3066)	1.4529 (0.2284) 1.4538 (0.2279)
Japan	-0.0001 (0.9563)	0.0078 (0.8440)	0.0678* (0.0112)	-1.2093 (0.4378)	0.0029 (0.1841)	-2.6589* (0.0000)	0.2018* (0.0000)	-0.2189* (0.0000)	0.6600* (0.0000)	75.9510* (0.0461)	0.0387 (0.3969)	0.4444 (0.5052) 0.4452 (0.5046)
Mexico	0.0031 (0.1443)	-0.0972* (0.0040)	0.3712* (0.0000)	-0.9231 (0.5749)	-0.0019 (0.2816)	-0.3881* (0.0012)	0.1118* (0.0001)	-0.0839* (0.0001)	0.9614* (0.0000)	25.8090* (0.0793)	-0.0284* (0.0106)	0.7676 (0.3812) 0.7686 (0.3806)
Russia	0.0025 (0.4783)	0.0804* (0.0204)	0.2225* (0.0000)	0.1666 (0.9531)	-0.0014 (0.6616)	-0.6415* (0.0000)	0.2242* (0.0000)	-0.1083* (0.0000)	0.9290* (0.0000)	43.6490* (0.0493)	-0.0279* (0.0615)	0.7415 (0.3894) 0.7426 (0.3888)
South Korea	-0.0013 (0.6522)	-0.0388 (0.2818)	-0.0068 (0.8396)	2.6464 (0.2311)	0.0004 (0.8631)	-0.7858* (0.0000)	0.2387* (0.0000)	-0.1035* (0.0000)	0.9126* (0.0000)	37.0309* (0.0911)	-0.0940* (0.0002)	0.0577 (0.8103) 0.0578 (0.8100)
United Kingdom	-0.0039 (0.1215)	0.0737* (0.0702)	0.2136* (0.0000)	1.4923 (0.4272)	0.0076* (0.0027)	-7.5633* (0.0000)	0.9517* (0.0000)	0.3330* (0.0000)	0.0293 (0.5067)	44.3893* (0.0000)	0.2011* (0.0461)	0.0937 (0.7596) 0.0939 (0.7596)

Note: *Figures in the parentheses are p-values. '*' indicates significance at 10% level.*
Source: *Authors' Calculations.*

Table 5: Variance Decomposition of Indian Return by the Innovations in other Markets

Innovations in	Market Explained: India					
	Period I	Period II	Period III	Period IV	Period V	Period X
India	93.91	76.03	70.64	66.63	65.49	65.09
Argentina	0.20	2.96	3.31	3.15	3.12	3.12
Australia	0.01	13.38	12.45	12.16	12.11	12.04
Brazil	2.39	2.06	1.93	1.82	1.88	1.88
Canada	1.75	1.43	1.79	1.73	1.72	1.72
China	0.07	0.01	0.46	1.04	1.22	1.25
E.U	1.36	1.09	1.70	1.60	1.59	1.58
France	0.29	0.24	0.23	0.22	0.22	0.24
Germany	0.00	0.03	1.17	1.11	1.14	1.41
Indonesia	0.00	0.00	0.03	0.07	0.10	0.11
Italy	0.00	0.15	0.16	0.15	0.15	0.18
Japan	0.00	0.03	0.53	4.37	4.32	4.53
Mexico	0.00	0.36	0.50	0.49	0.51	0.52
Russia	0.00	0.02	2.60	2.54	2.53	2.53
South Korea	0.00	0.23	0.59	0.99	1.96	2.11
U.K	0.00	0.03	0.19	0.18	0.19	0.19
U.S	0.00	1.79	1.71	1.73	1.75	1.77
Standard Error	0.0879	0.0896	0.0910	0.0913	0.0913	0.0913

Source: *Authors' calculations*

Table 6: Variance Decomposition of Foreign Markets by Innovations in Indian market

	Innovations in Indian market		
Market Explained	**Period I**	**Period II**	**Period X**
Argentina	0.00	**0.55**	0.55
Australia	0.00	0.09	0.10
Brazil	0.00	0.16	0.17
Canada	0.00	0.07	0.10
China	0.00	**0.28**	0.28
E.U	0.00	0.12	0.05
France	0.00	0.03	0.07
Germany	0.00	0.03	0.06
Indonesia	0.12	0.25	0.25
Italy	0.03	0.04	0.07
Japan	0.19	**0.74**	0.74
Mexico	0.27	0.19	0.21
Russia	0.07	0.10	0.10
South Korea	0.03	0.09	0.09
U.K	0.63	**0.52**	0.53
U.S	0.00	0.06	0.07

Source: *Authors' Calculations*

Table 7: Impulse Responses of Indian Market to the Unit Shock to Other Markets
Impulse Responses in Indian Market

A Unit Shock given to	Period I	Period II	Period III	Period IV	Period V	Period X
India	0.2889	-0.0012	0.0008	-0.00009	0.0004	-0.00001
Argentina	0.0014	0.0056	0.0026	0.0006	-0.0006	0.00004
Australia	0.0003	0.0121	-0.0005	0.0023	-0.0014	0.00007
Brazil	0.0046	0.0012	0.0002	-0.00002	0.0011	0.00002
Canada	0.0039	-0.0004	0.0023	-0.0008	0.0004	-0.00002
China	0.0008	-0.0008	0.0028	0.0028	0.0016	0.00002
E.U	0.0035	0.0003	0.0028	-0.000006	0.0003	-0.00002
France	-0.0016	0.00009	-0.0002	-0.0002	-0.0003	0.00001
Germany	0.0001	0.0005	-0.0037	-0.0003	-0.0008	0.00002
Indonesia	0.0000	0.0002	-0.0006	0.0006	0.0007	0.00001
Italy	0.0000	-0.0013	0.0004	0.00002	-0.0003	-0.000006
Japan	0.0000	0.0006	0.0024	0.0069	0.0006	0.00009
Mexico	0.0000	0.0019	-0.0014	0.0004	0.0007	0.000006
Russia	0.0000	-0.0004	0.0055	0.0010	0.0007	-0.00002
South Korea	0.0000	-0.0016	0.0021	0.0024	0.0035	-0.00002
U.K	0.0000	0.0006	0.0014	0.0002	-0.0004	0.000002
U.S	0.0000	0.0044	0.0007	0.0013	-0.0007	0.00004

Source: *Authors' Calculations*

Table 8: Impulse Responses of Foreign Markets to the Unit Shock to Indian Market
Unit Shock Given to Indian Market

Impulse Responses in	Period I	Period II	Period III	Period IV	Period V	Period X
Argentina	0.000	-0.0027	0.0062	0.0002	-0.0002	-0.00001
Australia	0.000	0.0002	-0.00009	0.0004	-0.0005	0.00001
Brazil	0.000	0.0007	0.0016	0.0001	0.0004	-0.00002
Canada	0.000	-0.0002	0.0006	-0.00007	0.0003	-0.00002
China	0.000	0.0014	0.0011	0.00019	-0.00007	0.000009
E.U	0.000	-0.00007	0.00008	0.000006	0.0004	-0.00002
France	0.000	-0.0003	-0.0003	0.00005	0.0004	0.00003
Germany	0.000	-0.0001	0.0003	0.000003	0.0005	-0.00002
Indonesia	-0.0013	-0.0006	0.0011	0.0004	0.0007	-0.00001
Italy	0.0004	-0.0004	0.00007	0.0002	0.0004	-0.00001
Japan	0.0013	0.0013	-0.0019	0.0008	-0.0001	0.00002
Mexico	0.0015	0.00003	0.00006	0.0004	0.0002	-0.00002
Russia	0.0015	-0.0006	0.0003	0.0003	0.0010	0.0000003
South Korea	-0.0007	0.0002	0.0011	0.0003	0.000001	0.000002
U.K	-0.0032	-0.0004	0.0007	0.0003	-0.0002	-0.00002
U.S	-0.00004	-0.0003	0.0004	0.0002	-0.0003	0.000009

Source: *Authors' Calculations*

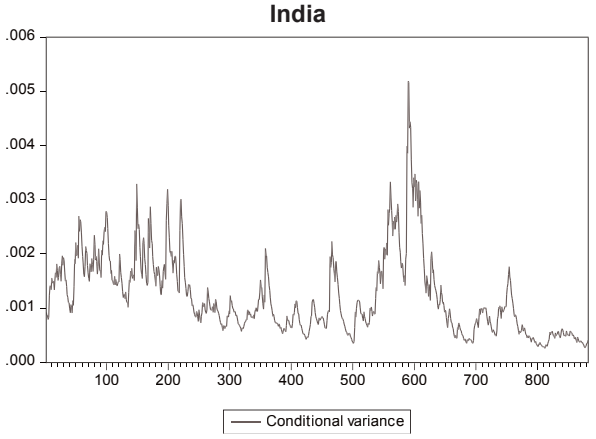
Appendix A

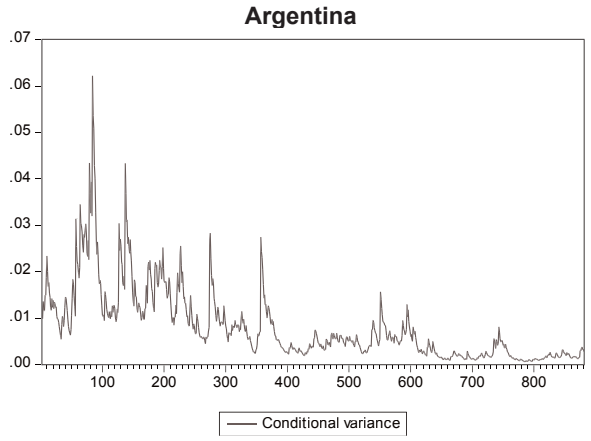
List of Stock Indices used along with Respective Symbols and Data Range

Country	Index	Symbol	Data used
India	S&P/BSE-Sensex	^BSESN	July 7,1997 to June 2, 2014
Argentina	MERVAL25	IM25.BA	July 7,1997 to June 2, 2014
Australia	S&P/ASX200	^AXJO	July 7,1997 to June 2, 2014
Brazil	IBOVESPA	^BVSP	July 7,1997 to June 2, 2014
Canada	S&P/TSX	HXU.TO	July 7,1997 to June 2, 2014
China	SSE C.I	000001.SS	July 7,1997 to June 2, 2014
France	CAC40	^FCHI	July 7,1997 to June 2, 2014
Germany	DAX	^GDAXI	July 7,1997 to June 2, 2014
Indonesia	Composite Index	^JKSE	November 10, 1997 to June 2, 2014
Italy	FTSEMIB	FTSEMIB.MI	January 5, 1998 to June 2, 2014
Japan	Nikkei 225	^N225	July 7,1997 to June 2, 2014
Mexico	IPC	^MXX	July 7,1997 to June 2, 2014
Russia	RTSI Index	RTS.RS	July 7,1997 to June 2, 2014
South Korea	KOSPI	^KSII	July 7,1997 to June 2, 2014
United States	S&P 500	^GSPC	July 7,1997 to June 2, 2014
European Union	ESTX50EURP	^STOXX50E	July 7,1997 to June 2, 2014
Unites Kingdom	FTSE 100	^FTSE	July 7,1997 to June 2, 2014

Appendix B

Plots of Conditional Volatility in Return Series

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.01
.00
100
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300
400
500
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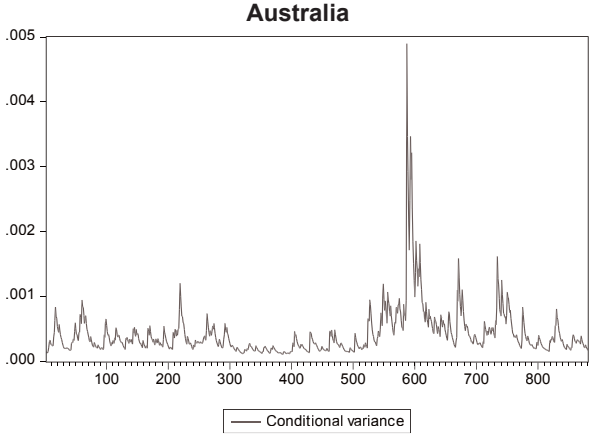
700
800
Conditional variance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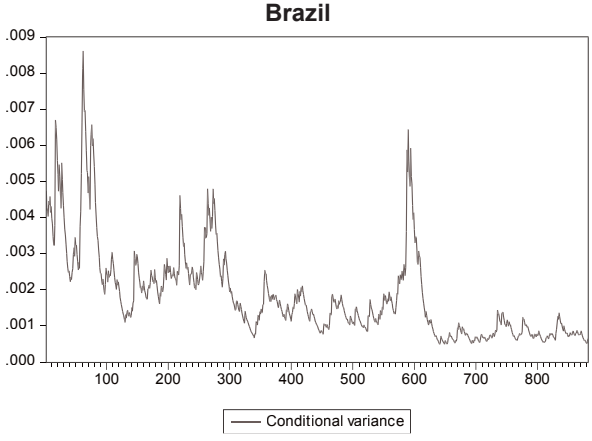
Conditional variance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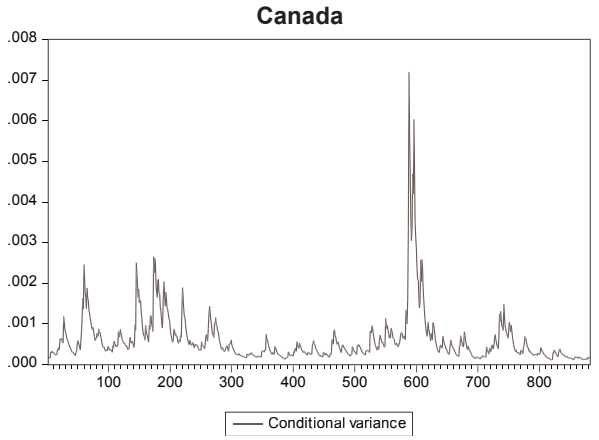
Conditional variance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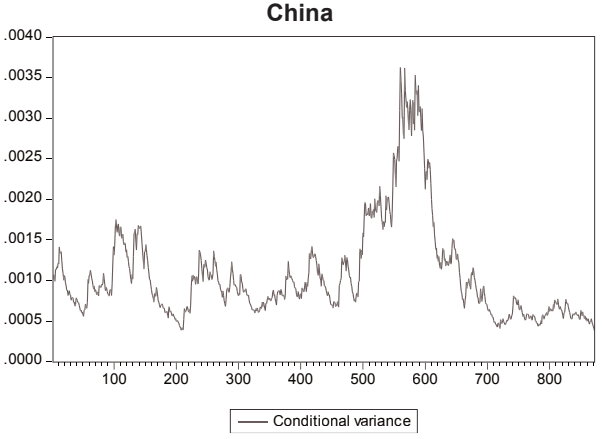
Conditional variance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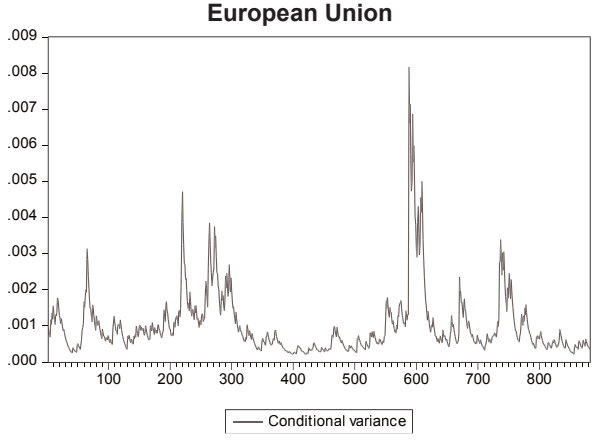
Conditional variance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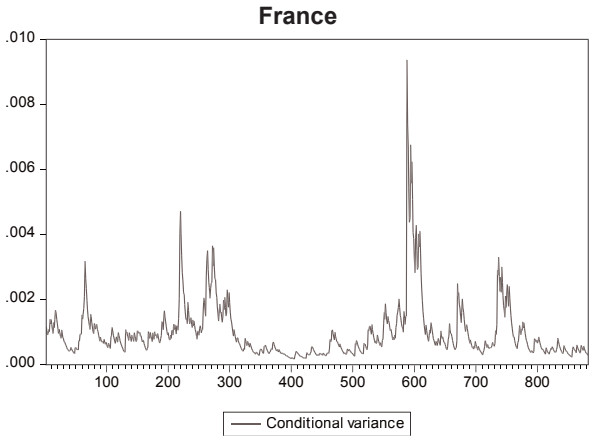
Conditional variance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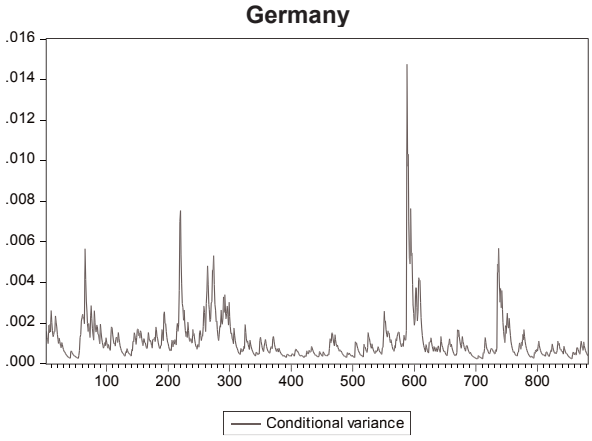
Conditional variance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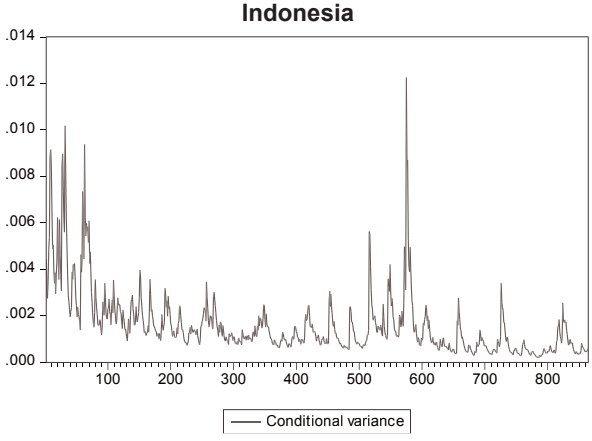
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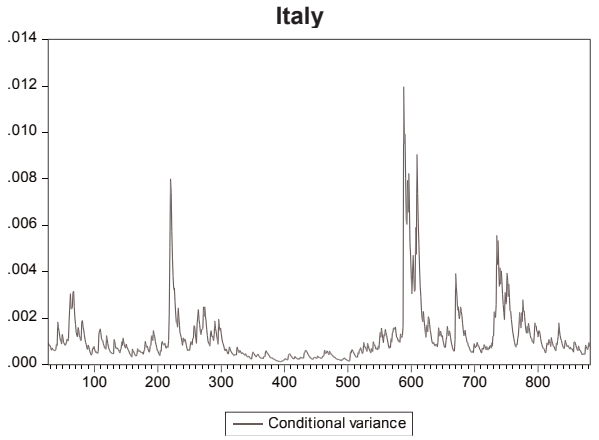
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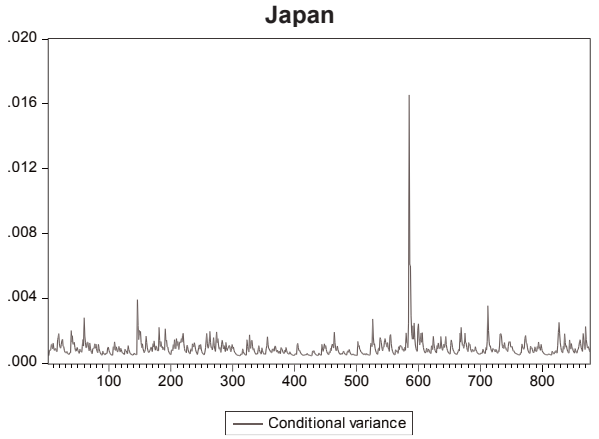
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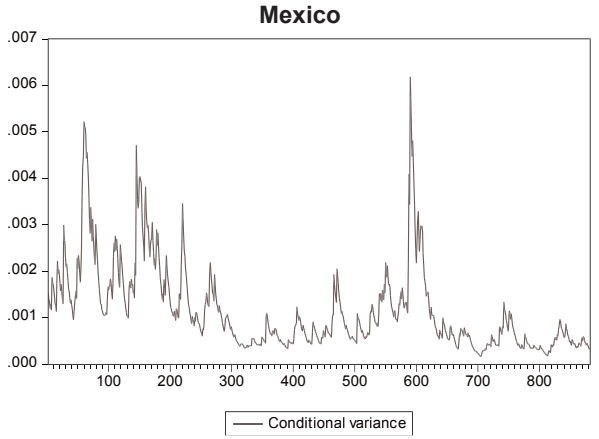
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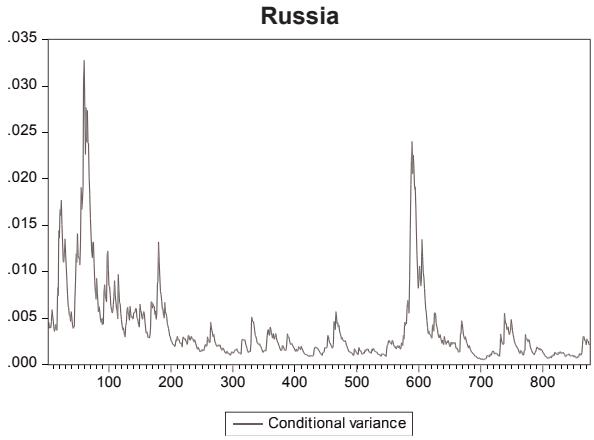
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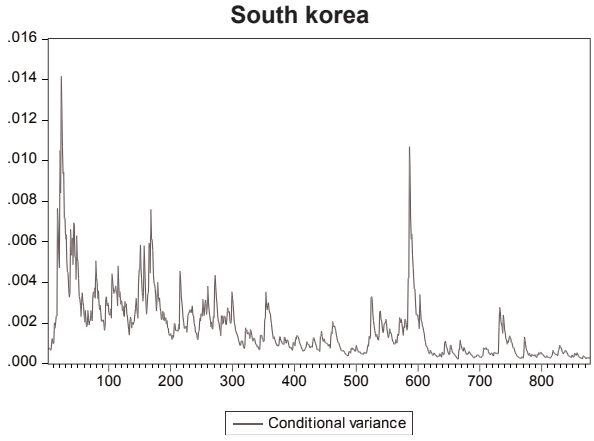
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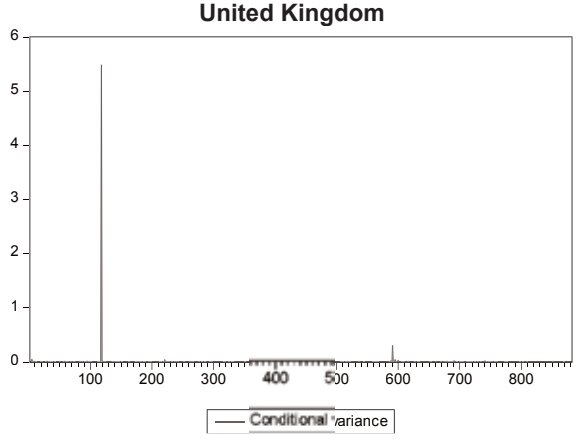
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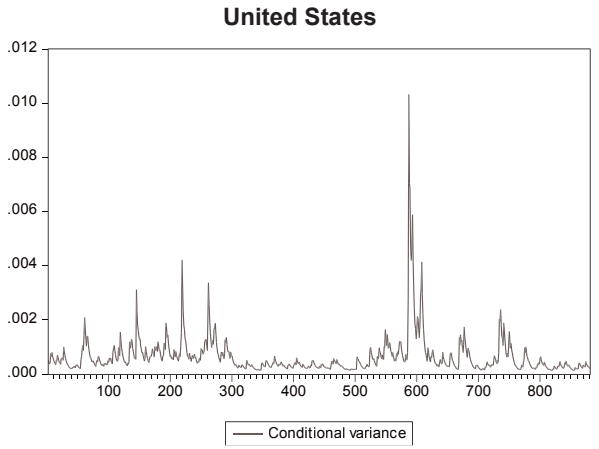
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A Panel Gravity Model Analysis of India's Export to Gulf Cooperation Council (GCC) Countries

Imran Alam[1] and **Shahid Ahmed**[2]

Exports have played a very crucial role in an economy and in the last decade India's trade with GCC countries have been in deficit. So, in this context, present paper has investigated determinants of India-GCC export flow with the help of augmented gravity model. Panel data has been used for the period 2001 to 2015. Further with the help of coefficient value of trade flow determinants, India's trade potential with all six GCC countries has been calculated for the latest year i.e., 2015. In the last section, tariff simulation has also been done. Results show that India-GCC bilateral export is positively determined by size of economies, trade openness and two binary variables namely common colony and Diaspora, while it is negatively determined by distance between them and tariff imposed by importing country. Result of export potential shows that India has significant export potential with all six countries. Further, results of tariff simulation suggest that tariff reduction will improve India's export potential with all GCC countries. At the end, paper concluded that proposed India-GCC free trade agreement (FTA) will be win-win situation for both side.

Keywords: India-GCC Export, Gravity Model, Panel Data, Export Potential, Tariff Simulation

Introduction

Exports have played a very crucial role in an economy. Many research suggested that for a country, performance of export is directly and positively related to its growth. It is also known as Exports Led Growth Hypothesis (ELGH). After adopting economic reform in 1991, India also opened its economy and adopted number of measures to improve foreign trade as well as export activities. Empirical study of P. Agrawal (2014) suggested that Exports Led Growth Hypothesis (ELGH) is valid for India for the post-trade liberalisation period.

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India's trade relation with Gulf Cooperation Council (GCC) Countries, which is a group of six countries namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE existed ever since the time of barter system. After oil-discovery in 1960s and 1970s it had reached a new height in the forms of oil and gas imports, labour migration and remittance. This relation started becoming stronger in the form of growing trade, joint ventures and investment opportunities. In 2005, to improve the relation with GCC nations India launched 'Look West Policy'. On the other side, to acknowledge the growing importance of Asian economies, GCC countries have also initiated 'Look East Policy' to improve their economic relation with them. Recently, both the sides are trying to explore the possibilities of free trade agreement (Alam & Ahmed, 2017).

Labour migration and remittance is another aspect of India-GCC relation. According to United Nations, India stand on first place on the list of remittance receipt countries, while GCC countries are main source of remittance in the world. Further, according to United Nations, 8.2 million Indians (largest expatriate community in every GCC countries)[1] are working in GCC countries. As a result of this migration, India receives maximum remittance from these regions.

Brief Profile of India-GCC Trade Performance – During the last decade, India's total trade with the GCC countries has risen from US$ 5,485.01million in 2001-02 to US$ 97,469.19 million in the year 20015-16 (see table 1). Volume of exports and imports has rise, but after 2005-06, volume of exports was less than volume of imports. So, trade balance became negative after 2005-06. This is because of increase in oil prices in international market and oils plays a very crucial role in India's imports basket especially from GCC countries. Trade balance was in surplus till 2005-06 and then went in deficit and in 2015-16 it was US $ 14,111.76 million.

Table 1: India's Trade with GCC Countries (in US $ million)

Year	Export	Export (% share of GCC)	Import	Import (% share of GCC)	Total Trade	Trade (% share of GCC)	Trade Balance
2001-02	3,798.06	8.67	1,686.95	3.28	5,485.01	5.76	2,111.11
2003-04	7,067.03	11.07	3,252.53	4.16	10,319.56	7.27	3,814.50
2005-06	11,775.30	11.42	7,805.04	5.23	19,580.34	8.41	3,970.26
2007-08	21,760.24	13.34	45,089.79	17.92	66,850.03	16.12	-23,329.55
2009-10	30,479.97	17.05	53,497.43	18.55	83,977.40	17.98	-23,017.46
2011-12	45,360.29	14.83	102,181.94	20.88	147,542.23	18.55	-56,821.65
2013-14	48,221.20	15.34	101,799.42	22.61	150,020.62	19.63	-53,578.22
2015-16	41,678.72	15.89	55,790.47	14.64	97,469.19	15.15	-14,111.76

Source: DGCIS, Ministry of Commerce, Government of India, 2017

Above figures clearly show that GCC region is playing a very important role in India's global trade. Further, it also revealed that from 2005-06 onwards; India's trade balance is always in negative. So, in this context; it is very important to know that how trade

1 United Nations, Department of Economic and Social Affairs (2015). Trends in International Migrant Stock: Migrants by Destination and Origin

deficit has to improve or how export performance with GCC countries has to increase. Hence, present paper will try to find out the determinants which affect India-GCC bilateral export with the help of augmented panel gravity model. Later, with the help of augmented gravity model results, India's trade potential with all six GCC countries will also be calculated. In the final section, we will see the impact of tariff reduction in India-GCC export.

Literature Review

Main theme of present paper is to analyse export determinants and trade potentials with the help of gravity model of trade. There are numerous literatures which deal with this. Both cross- sectional and panel data has been used to analyse trade determinants and potentials.

S. Kumar and S. Ahmed (2015): objective of this paper was to find out the factors which influence trade flow among all Asian countries by use of panel gravity model. Panel data has been used for 27 years (1985-2011). Result depicted that GDP, population, distance and tariff are crucial variable which determine trade among this region. Further, result shows that South Asia Free Trade Agreement (SAFTA) made a positive impact to enhance intra-regional trade among SAARC countries.

Bulent Miran *et. al.,* (2013): The main objective of the research was to inspect the trade flow from Turkey and other exporters of raisin to the countries that buy it. Augmented gravity model has been used in this process. The "econometric model" is applied to the six major countries[2] under discussion. These six nations combined boasts of more than 90 per cent of the export of raisin throughout the globe. The result of the observation shows that geographical distance between the exporter and importer is vital in determining the trade volume. The distance affects the trade volume. In the raisin trade, there is a requirement to reduce the transportation charges and the lag in time. This is ensured by countries importing it from the nearest possible exporter. So, the countries that want to enhance their trade of raisin must focus on finding the opportunities in their neighbouring regions. Also, they need to come up with innovative and alluring prices to enhance the exports. They can even introduce newer variety of raisin like raisin grown organically. Additionally, if the sea routes are used for transportation of goods, it will be a boon for the raisin trade.

Assem Abu Hatab *et. al.,* (2010): main aim of this paper was to evaluate the important factors that affected the export of agricultural goods in the international market for a period of fifteen years (1994-2008) by use of gravity model of trade. The relation between the national GDP and the agricultural exports is exponentially related. A rise of 1% in the GDP of Egypt leads to around a 5% (5.42% to be exact) increase in the exports. However, the table turns when one analyzes the per capita increase in the Gross Domestic Product of the country. The inversely proportional relation results in diminished exports. This can be explained in a way that population also increases with the growth in economy. This increased population results in an increased demand for

2 The six countries are US, Turkey, South Africa, Iran, Greece and Chile.

the exportable goods within the country. Hence, domestic growth leads to reduced exports. The exchange volatility has a significant positive coefficient, indicating that depreciation in Egyptian Pound against the currencies of its partners stimulates agricultural exports. Transportation costs, proxy of distance, are found to have a negative influence on agricultural exports.

Prabir De (2010): This paper estimates the impact of global crisis on India's trade potential with the help of gravity model. The estimates of global trade potential of India suggest that India is exploring the maximum possible trade potential with the countries in the Asia-Pacific region. India also has a good trade volume with Africa and Latin America. However, there is a lot of scope for trade expansion with China in the post-crisis period. In a large part of the world, India still can emerge as a major player as there are huge scopes and opportunities even in the condition of slowdown in global demand. Nonetheless, according to the research, trade facilitation and tariff liberalization can help in enhancing the trade potential in the period of crisis.

Silvio H. T. Tai (2009): The objective of the analysis was to search for the link between migration and trade and their market structure. The research demonstrated statistically, how the trade of Switzerland was affected by migration. The goods differentiation was taken into account. A "monopolistic model" is estimated mathematically, with a multi-sector economy. The results show that the structure of the market explains the various means via which migration can affect the trade.

Houcine Boughanmi (2008): The main objective of this research was to analyze the trade potential of the states belonging to GCC. These countries fall within the context of the old and the emerging trade preferential arrangements in the region of MENA[3]. The gravity trade model was used based on pooled time series-cross-sectional data of the regions' trade with their partners in trade. It is a known fact that the GCC intra-trade share is minor in the complete terms. Still, it is opined through this research that it surpass the expectations if the major factors affecting the trade are considered. However, it is worth noting that the level of the change in the GCC intra-trade is not considerable over time. It may be said that it has matured to exploring the possible potential in about a decade since the formation of GCC. Trade with the East has surpassed the prediction whereas it has yet not reached the predicted volume for the West even when GAFTA was implemented about a decade ago. The exception to the dismal performance in trade with West, there exist an unofficial intensive trade with US and EU. This to say that there does not exist any formal trade arrangement between the two factions during the time period undertaken for this research. It is suggested that the newly signed trade agreements have a vision of a hopeful future with an enhanced trade relationship in the GCC region.

Javad Abedini and Nicolas Peridy (2008): This paper reviews the way the GAFTA agreement has affected trade. This study is built on the gravity equation, and estimates a panel data model. The study takes care of the trade within the GAFTA area. It also

3 It stands for Middle East and North African Countries.

considers thirty-five other reference countries for a period of eighteen years (1988-2005). The inference from this analysis shows that importance of traditional factors (geographical distance and the GDP) of international trade as well as new issues like expectations, sunk costs and border effects. Also, it is found that the GAFTA agreement has drastically affected the trade effects. The calculation of gross trade creation shows that regional trade has increased by 20 per cent since GAFTA has been implemented.

Filip Abraham and Jan van Hove (2005): The main objective of this paper was to find out the China's trade performance with its regional trading partners in the light of various RTA's and trade liberalization. The scope of this research is widened by equating twenty-three countries from Asia-Pacific region. The data collected is for a period of nine years (1992-2000). The model used is gravity equation. It concludes that Asia-Pacific Economic Cooperation (APEC) and Association of Southeast Asian Nations has yet to affect the exports in the Asia-Pacific region appreciably. The export volume is actually determined by growth of the countries, the existing trade barriers, and a common language. It has been deduced that if China participates in regional agreements, it will give a boost to the export potentials, with respect to ASEAN as well as in a broad agreement including South and East Asian countries.

Dionysios Chionis *et. al.,* (2002): The main aim of the study was to analyze the actual trade potential and the estimated potential between Greece and nine Balkan nations. The researchers have used the gravity model. The results exhibits that the potential of trade is under-explored in the region. Also, there is still great amount of possibilities of trade between the member nations of EU and the Balkan states. However, the exports from Greek (to Balkan countries) overtake the imports from them. The same scenario exists for the exports of the European Union nations. However, when this phenomenon is compared between, Greek and EU, the affect is heightened in the case of former. "Seemingly Unrelated Regression" method is used to reach a conclusion that there is still great potential for Greece in their trade with the Balkans. The ratio of actual trade volume and the potential trade volume in all cases is less than one, which means the actual is below the estimated potential. The imports are extremely under-traded. It is deplorable as the actual trade is only 2% of the calculated potential. Given the very low levels of Greek imports from the Balkans this result is not surprising.

Quoc-Phuong Le *et. al.,* (1996): The aim of this research was to scan the major determinants influencing the trade of Vietnam with ASEAN and APEC. The gravity model is used to measure the trade partnership between Vietnam and seventeen APEC nations. The results highlight that Vietnam has improved a lot in a period of five year *i.e.,* 1989 to 1994. On a global scale, it can be said that it has improved from the status of "under-performer" to reach a level of "average". The common traditional factors (Gross National Product, per capita GNP and geographical distance) affecting international trade are applicable here as well. The artificial barriers that posed as an obstacle for trade in Vietnam before 1990 has lost its importance and has consequently given a boost to the trade relationship.

From the above, it is clear that gravity model of trade is widely used to find out the determinant of trade flow and trade potential. But as per my knowledge, in case of India-GCC very little study is available. To keep in the mind of GCC countries role in India's global trade pattern, present study will investigate determinants of India-GCC export flow and India's export potential with all six GCC countries.

Methodology and Data Source

This paper is based on gravity model of trade which is used to find out the determinants which influence bilateral trade between two regions. Basically, gravity model of trade is derived from Isaac Newton's law of universal gravitation (1687) which states that in the universe every particle attract to another particle with a force which is directly proportional to the multiplication of their masses and inversely related to the square to distance between them. Application of this law is also used in number of discipline in all over the world including international trade. In international trade this model was first used by J. Tinbergen in 1962. Like Newtonian universal gravity model, gravity model of trade also predict bilateral trade flows between two regions which is directly proportional to multiplication of economic size (often using GDP or GNP) and inversely related to distance between these two regions. Here distance is taken as proxy of trade cost which means as the distance between two regions will increase trade cost will also increase and that's impact will be negative in bilateral trade. So, the equation of basic gravity model of trade will be-

$$Trade_{ij} = \alpha\left[\frac{GDP_i \times GDP_j}{Distance_{ij}}\right] \quad .....(1)$$

Where,

$Trade_{ij}$ is bilateral trade between country *i* and country *j*

GDP_i is Gross Domestic Product of country *i*

GDP_j is Gross Domestic Product of country *j*

$Distance_{ij}$ is distance between country *i* and country *j*

α is constant

For the regression analysis equation (1) often transform into linear form after taking logarithms. So the new equation will be-

$$log\ (Trade_{ij}) = \alpha + \beta_1 log\ (GDP_i) + \beta_2 log\ (GDP_j) + \beta_3 log\ (DIST_{ij}) + e_{ij} \quad ...(2)$$

Where, α, β_1, β_2 and β_3 are coefficient and e_{ijt} is error term. This equation is known as basic gravity equation of trade to predict a bilateral flow between two sides.

Traditionally, many researchers have used cross-sectional data to find out the bilateral trade flow by using gravity data. But cross-sectional data creates biased gravity model

estimates due to heterogeneity (Chang & Wall, 2005). However, panel data estimation shows many advantages over cross-sectional and time series data due to its control for individual heterogeneity. Panel data framework increases the efficiency of econometric estimates by reducing collinearity among independent variables through large degree of freedom (Sultan & Munir, 2015). Another advantage is that panel data can capture the relevant relationships among variables over time (Kumar &Ahmed, 2015).

Among the various number of panel data estimation technique, fixed effect model (FEM) and random effect model (REF) are most common. Fixed effect model is used for time variant variables effect only while random effect model can see the effect of both time variant and time invariant variables. So, random effect model will be preferred over fixed effect model if we want to check the impact of (both time variant and time invariant variables (Ozdeser & Ertac, 2010). In this study, gravity model will check the impact of time invariant variable like distance and dummy variables along with time variant variables. So, we have random effect model has been chosen. Further, the probability (Prob. > chi2) of LM is 0.000 (result of Breusch–Pagan Lagrange multiplier) indicated that random effect is appropriate.

This study estimates augmented gravity model for India's bilateral export with all six GCC countries for the period of 2001 to 2015. Estimation of India-GCC countries bilateral export has been calculated with following augmented gravity model:

$$\boldsymbol{log\ (EX_{ijt})} = \beta_0 + \beta_1 log\ (GDP_{it}) + \beta_2 log\ (GDP_{jt}) + \beta_3 log\ (POP_{it}) + \beta_4 log\ (POP_{jt}) + \beta_5 log\ (DIST_{ij}) + \beta_6 log\ (TAR_{jit}) + \beta_7 log\ (IO_{jt}) + \beta_8 log\ (LANG_{ij}) + \beta_9 log\ (COL_{ij}) + \beta_{10} log\ (DIASPORA_{ij}) + e_{ijt} \quad \ldots. (3)$$

Where *i* refers country *i, j* refers country *j* and *t* refers time period (year).

EX (bilateral Export) – In this model real bilateral export between country *i* and country *j* at time *t* is dependent variable. Bilateral export data in US Dollar at current price has taken from World Integrated Trade Solution (WITS), UNCOMTRADE Database. Then with help of GDP deflator, it is converted into real trade data in US Dollar at constant price 2010. GDP deflator data has been taken from WDI, World Bank.

GDP (Gross Domestic Product) - Basically in gravity model of trade, for the purpose of measuring the economic size of a country either GDP or GNP has taken. But here GNP data is not available for 2001 to 2015. So, GDP data has been taken from WDI, World Bank in US Dollar at constant price 2010. As the GDP of a country will increase, export will also increase. So, expected sign of coefficient of GDP for both country (β_1 and β_2) is positive.

POP (Population) – population data of country *i* and country *j* is taken from WDI, World Bank. Expected sign of coefficient of population (β_3 and β_4) is either positive or negative. If a country has big population and they enjoy economies of scale effect than expected sign of population will be positive. On the other side, due to absorption effect if country export is less than expected sign of population coefficient will be negative.

DIST (Distance) – it is distance between trade centre of country *i* and country *j.* Data source is Centre D' Etudes Prospectives et D' Informations Internationales (CEPII).[4] Here distance is taken as a proxy of trade cost. So, as the distance between two countries will increase export cost will also increase. So, expected sign of coefficient of distance (β_5) is negative.

TAR (Tariff) –Here applied tariff data imposed by country *j* on country *i* is taken from WTO: IDB with the help of UNCOMTRADE Database. Tariff is another form of trade restrictiveness, so, expected sign of coefficient value of tariff (β_6) will be negative.

IO (Import Openness) – it is also known as import GDP ratio. Data source is WDI, World Bank. If a country removes trade restriction or opens its economy, trade will increase. So, expected sign of coefficient of Import Openness for countries *j* (β_7) is positive.

DIASPORA – study of S. B. Kayail (2007) suggested that large number of Indian immigrants in gulf countries positively impact in India's bilateral export to Gulf region. So, in this context a dummy variable is developed by us. If average numbers of country *i* Diaspora population in country *j* is more than one per cent of total population of country *j* for the period of 2001 to 2015, dummy value will be one otherwise it will be zero. Source of migrant data is department of economic and social affairs, population division, United Nation (2015).[5] Expected sign of Diaspora is positive.

Comlang (common language) – if country *i* and country *j* share common language (official or commercial) and ethnicity than it will be one otherwise zero. Data source is Centre D' Etudes Prospectives et D' Informations Internationales (CEPII). It is expected that common language will help to improve trade negotiation and further it will reduce transaction cost. So, expected sign of common language is positive.

Comcol (common colony) – if country *i* and country *j* were colonies with the same colonizer than it will be one otherwise zero. Data source is Centre D' Etudes Prospectives et D' Informations Internationales (CEPII). Expected sign of common colony is positive.

This study estimates augmented gravity model for India's bilateral export with all six GCC countries for the period of 15 year (2001 to 2015). All data are annual. Total observation in this dataset is 180. Software Stata 14 has used for all calculation.

Export Potential - Another useful aspect of gravity model is to predict future trade flows between two sides. India-GCC Export Potential has been calculated by using the coefficient value from augmented gravity model. The study has estimated the total export potentials for the latest period *i.e.,* 2015. Ratio of computed export value from augmented model (P) and actual export value between India and GCC countries (A) defines India's export potential with GCC countries. In others words, if P/A value is

4 www.cepii.fr/CEPII/en/publications/wp/abstract.asp?NoDoc=3877

5 Data is available with five year gap. So, for the calculation of dummy variable Diaspora, average of migrant population for the year of 2000(in place of 2001), 2005, 2010 and 2015 has taken.

greater than one, it means India has export potential with that country. To see the export potential in absolute number, difference between computer export value (P) and actual export value (A) *i.e.,* P-A has also been calculated.

Empirical Results

Determinants of India-GCC Export – Result of augmented gravity model is displayed in figure 1. Here a bilateral export is dependent variable. The goodness of fit of the model (R^2) is 0.86. Result shows that all independent variables sign are as expected. Population of country *i* is positively insignificant and binary variable common language is also positively insignificant. Remaining all other explanatory variables and binary variables are significant with expected sign.

The estimated coefficient of GDP_i and GDP_j is positively significant at the 1 per cent level and 10 per cent level respectively. The coefficient of GDP_i is 0.84, which means that if all the other things are constant; 1 per cent increase in *GDP* of country *i* will leads to increase in its total bilateral exports with country *j* by approximately 0.84 per cent. Here coefficient value is less than one, which means with the increase of $GDP_{i,}$ total bilateral exports will increase but with decreasing rate if all the other things are constant. Further, coefficient of GDP_j is 0.46, which means that if all the other things are constant; 1 per cent increase in GDP of country *j* will increase total bilateral exports between country *i* and *j* by approximately 0.46 per cent.

As earlier discussed, coefficient of population could be positive or negative. In case of a country enjoys economies of scale effect than it will be positive otherwise in case of absorption effect it will be negative. Here population of country *i* is positively insignificant while population of country *j* is positively significant at 1 per cent level. Positive sign of country's *j* population coefficient indicates that country *j* enjoys economies of scale effect. Which means higher size of population creates more opportunities for trade. Coefficient value of country's *j* population is 0.88, which means 1 per cent increase in population of country *j* would increase total bilateral trade between *i* and *j* by 0.88 per cent if all other things are constant. Here coefficient value is less than one, so we can say that with the increase of country *j* population bilateral trade between country *i* and *j* will also increase but at decreasing rate.

Coefficient of distance between two nations which is proxy of trade cost is negatively significant at 1 per cent level. Size of distance coefficient is very high i.e., -2.98. It implies that 1 per cent increase in distance between these two sides will decrease total bilateral trade approximately three per cent i.e., 2.98 per cent if all other things are constant.

Tariff imposed by country *j* on *i* is negatively significant at 1 per cent level. Coefficient value of $Tariff_{ji}$ is -0.75. It means 1 per cent increase in tariff (imposed by country *j* on *i*) will lead to decrease in bilateral exports by 0.75 per cent if all the other things are constant.

Coefficient of import openness of country *j* is positively significant at 1 per cent level. Coefficient value of country *j* import openness is 0.88, which suggests that 1 per cent increase in country *j* import openness will increase total bilateral exports by 0.88 per cent if all other things are constant. Here import openness coefficient value is less than one, it means due to increase in import openness of country *j* bilateral exports will increase but at decreasing rate.

Among binary variables common language is positively insignificant. Remaining common colony and number of Diasporas is significant at 1 per cent and 10 per cent level respectively. Study of S. B. Kayail (2007) also suggested that large number of Indian immigrants in gulf countries positively impact in bilateral trade between these two sides. Coefficient of Diaspora is 0.86. It suggested that with the increase of immigrants bilateral exports will increase with decreasing rate if all other things are constant.

Figure 1: Estimated Result of Augmented Gravity Model for Bilateral Exports

```
ndom-effects GLS regression                     Number of obs      =       180
oup variable: Code                              Number of groups   =        12

sq:  within  = 0.7734                           Obs per group: min =        15
     between = 0.9414                                          avg =      15.0
     overall = 0.8636                                          max =        15

                                                Wald chi2(10)      =    651.22
rr(u_i, X)   = 0 (assumed)                      Prob > chi2        =    0.0000
```

LRealEXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LTariffji	-.7506503	.2550106	-2.94	0.003	-1.250462	-.2508386
LDistance	-2.978162	.8852002	-3.36	0.001	-4.713122	-1.243201
LGDPCONSi	.8406034	.2085277	4.03	0.000	.4318966	1.24931
LGDPCONSj	.4609757	.2758701	1.67	0.095	-.0797199	1.001671
LPopi	.1721431	.273816	0.63	0.530	-.3645263	.7088125
LPopj	.8835762	.3266839	2.70	0.007	.2432874	1.523865
LIOj	.8854268	.2799325	3.16	0.002	.3367692	1.434084
ComLang	.0956432	.1380439	0.69	0.488	-.1749178	.3662042
ComCol	.5817268	.1699765	3.42	0.001	.248579	.9148746
Diaspora	.8630799	.4596496	1.88	0.060	-.0378168	1.763977
_cons	-5.51131	3.150572	-1.75	0.080	-11.68632	.663698
sigma_u	.13999276					
sigma_e	.20319176					
rho	.32188579	(fraction of variance due to u_i)				

Source: Author's calculation

So, determinants for bilateral exports between India and GCC countries are GDP of both sides, distance between them, Population of country *j*, import openness of country *j,* tariff imposed by country *j* on *i* and two binary variables namely common colony and Diaspora. All the variables are positively significant except tariff and distance.

India-GCC Export Potential – Table 2 shows the exports potential of India with all six GCC countries. Table clearly shows that India has exports potential with all six GCC countries.

Table 2: India-GCC Export Potential ($ millions)

	P	A	(P-A)	((P-A)/A)*100	P/A
Bahrain	855	602	253	42	1.42
Kuwait	4,326	1,331	2,996	225	3.25
Oman	2,797	2,248	549	24	1.24
Qatar	2,543	1,061	1,482	140	2.40
Saudi Arabia	7,713	7,635	779	1	1.01
UAE	34,353	32,849	1,504	5	1.05

Source: Author's calculation

India has highest exports potential with Kuwait where P/A value is 3.25. It means India's trade potential could increase 225 per cent with Bahrain. After this, Qatar comes at second position with P/A value 2.40, which means India's trade potential could increase 140 per cent with Oman. Next country is Bahrain with P/A value 1.42, which implies that India's trade potential could increase 42 per cent with Bahrain. Oman came at fourth position with P/A value 1.24, which implies that India's trade potential could increase 24 per cent with Oman. Among all GCC countries, UAE and Saudi Arabia has very little exports potential with India whose P/A vale is 1.05 and 1.01 respectively, which means UAE has 5 per cent and Saudi Arabia has only one per cent exports potential to increase with India.

In case of absolute numbers, India has maximum exports potential with Kuwait US$ 2,996 million. UAE came at second position with US$ 1,504 million than followed by Qatar with US$ 1,061 million, Saudi Arabia with US$ 779 million, Oman with US$ 549 million and Bahrain with US$ 253 million.

Result of Tariff Simulation – In the first section, we saw that tariff is an important determinant of India-GCC exports cases. So, in the present section, we will analyse the impact of tariff on bilateral exports and imports potentials between these two sides. First, we will analyse the impact of 50 per cent of tariff reduction on exports potential. Then we will analyse the impact of 100 per cent of tariff reduction (no tariff) on exports potential.

Table 3 shows applied tariff rate imposed by India on all six GCC countries from 2001 to 2015. Figure shows that over the year tariff rate were reduced by India and result is that India-total trade with all GCC countries has increased. At present (2015), tariff imposed on all GCC countries lies in between nine to eleven per cent.

Table 3: India imposing tariff on GCC countries (Applied Rate)

	2001	2005	2010	2015
Bahrain	29.13	16.31	9.96	10.23
Kuwait	28.49	15.12	10.37	9.26
Oman	31.46	17.3	9.18	8.96
Qatar	26.67	15.24	11.88	8.38
Saudi Arabia	29.72	16.05	9.74	9.1
UAE	32.04	17.75	10.72	11.23

Source: WTO: IDB

Table 4 shows applied tariff rates imposed were by GCC countries on India from 2001 to 2015. Figure shows that over the year tariff rate reduced by all six GCC countries and result is that India-total trade with all GCC countries has increased. Another noticeable thing is that all GCC countries have imposed less tariff compared to India. At present (2015), tariff imposed on India by all GCC countries lies in between four to five per cent, while in case of India it is approximately nine to eleven per cent.

Table 4: GCC countries imposing tariff on India (Applied Rate)

	2001	2005	2010	2015
Bahrain	7.52	5.06	4.93	4.54
Kuwait	3.44	4.91	4.65	4.56
Oman	5.43	4.75	5.13	4.54
Qatar	3.86	4.7	4.75	4.55
Saudi Arabia	12.26	6.08	5.3	5.08
UAE	4.88	4.88	4.75	4.88

Source: Source: WTO: IDB

Results of 50 per cent Tariff Reduction – In this section, we will see the impact of 50 per cent reduction of tariff on exports potential. As we already saw in the first section that coefficient value of tariff is - 0.75 in the case of exports determinants. It means 1 per cent decrease in tariff will leads to increase in bilateral exports by 0.75 per cent, if all the other things are constant. So, to check the impact of 50 per cent reduction of tariff on exports, by applying the simple mathematics; we multiplied P value by 1.375.

Table 5 shows the result of exports potential with 50 per cent reduction in applied rate. If we compare this result with applied tariff rate result (Table 2), we came to know that as a result of 50 per cent tariff reduction; India's exports potential with all GCC countries will increase. In absolute numbers, India-Bahrain exports potential will increase up to $ 574 million from actual exports which means it will increase 95 per cent from actual exports. India-Kuwait exports potential will increase up to $ 4617 million from actual exports which means it will increase 347 per cent from actual exports. India-Oman exports potential will increase up to $ 1598 million from actual exports which means it will increase 71 per cent from actual exports. India-Qatar exports potential will increase up to $ 2436 million from actual exports which means it will increase 230

per cent from actual exports. India-Saudi Arabia exports potential will increase up to $ 2970 million from actual exports which means it will increase 39 per cent from actual exports. India-UAE exports potential will increase up to $ 14386 million from actual exports which means it will increase 44 per cent from actual exports. So, we can say that reduction in tariff will boost India-GCC exports.

Table 5: Export Potential- 50% Reduction in Tariff ($ millions)

	P	A	(P-A)	((P-A)/A)*100	P/A
Bahrain	1175.63	602	573.625	95.29	1.95
Kuwait	5948.25	1,331	4617.25	346.90	4.47
Oman	3845.88	2,248	1597.88	71.08	1.71
Qatar	3496.63	1,061	2435.63	229.56	3.30
Saudi Arabia	10605.4	7,635	2970.38	38.90	1.39
UAE	47235.4	32,849	14386.4	43.80	1.44

Source: Author's calculation

Results of 100 per cent Tariff Reduction (no tariff) – In this section, we will see the impact of 100 per cent reduction of tariff (no tariff) on exports potential. As we already saw in the first section that coefficient value of tariff is - 0.75 in the case of exports determinants. It means 1 per cent decrease in tariff will leads to increase in bilateral exports by 0.75 per cent, if all the other things are constant. So, to check the impact of 100 per cent reduction of tariff (no tariff) on exports, by applying the simple mathematics; we multiplied P value by 1.75.

Table 6 shows the result of exports potential with 100 per cent reduction in applied rate. If will compare this result with applied tariff rate result (table 2), than we came to know that as a result of 100 per cent tariff reduction India exports potential with all GCC countries will increase. In absolute numbers, India-Bahrain exports potential will increase up to $ 894 million from actual exports which means it will increase 149 per cent from actual exports. India-Kuwait exports potential will increase up to $ 6240 million from actual exports which means it will increase 469 per cent from actual exports. India-Oman exports potential will increase up to $ 2647 million from actual exports which means it will increase 118 per cent from actual exports. India-Qatar exports potential will increase up to $ 3389 million from actual exports which means it will increase 319 per cent from actual exports. India-Saudi Arabia exports potential will increase up to $ 5863 million from actual exports which means it will increase 77 per cent from actual exports. India-UAE exports potential will increase up to $ 27,269 million from actual exports which means it will increase 83 per cent from actual exports. So, we can say that reduction in 100 per cent tariff will boost India-GCC exports.

Table 6: Export Potential - 100% Reduction in Tariff ($ millions)

	P	A	(P-A)	((P-A)/A)*100	P/A
Bahrain	1496.25	602	894.25	148.55	2.49
Kuwait	7570.5	1,331	6239.5	468.78	5.69
Oman	4894.75	2,248	2646.75	117.74	2.18
Qatar	4450.25	1,061	3389.25	319.44	4.19
Saudi Arabia	13497.8	7,635	5862.75	76.79	1.77
UAE	60117.8	32,849	27268.8	83.01	1.83

Source: Author's calculation

Conclusion

GCC countries are playing a very important role in India's global trade. On the other side, since 2005-06; India's trade balance has been in negative with GCC countries. So in the light of these facts, present paper find out India-GCC export determinants with the help of augmented gravity model of trade. Result shows that determinants for bilateral exports between India and GCC countries and GDP of both sides, distance between them, Population of country *j*, import openness of country *j,* tariff imposed by country *j* on *i* and two binary variables namely common colony and Diaspora. All the variables are positively significant except tariff and distance.

Result of export potential for year 2015 shows that India has maximum export potential with Kuwait and followed by Qatar, Bahrain, Oman, UAE and Saudi Arabia. Further, result of tariff simulation shows that both scenarios (50 per cent tariff reduction and 100 per cent tariff reduction) will improve India's export potential with all six GCC countries.

It the end, this paper suggest that except tradition gravity model of trade variables; import openness, Diaspora and tariff are key variables which effect India-GCC export. So, both sides should open their economy as much as possible and remove all kind of trade barriers. In case of India-GCC export as well as remittance is concern Diaspora is a very crucial variable. Hence, Indian government should take extra care of their workers in GCC countries. Tariff is also a key factor to boost India-GCC export. Paper suggested that any reduction will improve India's export potential with all GCC countries. So, in this context we propose India-GCC free trade agreement (FTA) will be win-win situation for both sides.

References

Abedini, J. & Péridy, N. (2008). The Greater Arab Free Trade Area (GAFTA): an Estimation of Its Trade Effects, *Journal of Economic Integration*, 23(4), pp:848-872.

Abraham, F. & Hove, J. (2005). The Rise of China: Prospects of Regional Trade Policy, *Review of World Economics*, 141(3), pp: 486-509.

Agrawal, P. (2014). The Role of Exports in India's Economic Growth, *IEG working paper number 345.*

Alam, I. & Ahmed, S. (2017). Prospects of India-GCC trade relations: an empirical investigation, *Foreign Trade Review,* 52(2), pp:106–117.

Boughanmi, H. (2008). The Trade Potential of the Arab Gulf Cooperation Countries (GCC): A Gravity Model Approach, *Journal of Economic Integration,* 23(1), pp:42-56.

Cheng. I.H., & Wall (2005). Controlling for heterogeneity in gravity models of trade integration, *Federal Reserve Bank of St. Louis Review*, 87(1), pp:49-63.

Chionis, D., Liargovas, P. & Zanias, G. (2002). Greece's Trade With The Balkan Countries: Is It Too Little?, *Journal of Economic Integration*, 17(3), pp:608-622.

Hateb, A.A., Roamstad, E. & Huo, X. (2010). Determinants of Egyptian Agricultural Exports: A Gravity Model Approach, *Modern Economy*, 1, pp:134-143

Karayil, S.B. (2007). Does Migration Matter in Trade? A Study of India's Exports to the GCC Countries, *South Asia Economic Journal*, 8(1).

Kumar, S. & Ahmed, S. (2015). Gravity Model by Panel Data Approach: An Empirical Application with Implications for South Asian Countries, *Foreign Trade Review*, 50(4), pp:233–249.

Le, Q.P., Nguyen, D.T. & Bandara, J.S. (1996). Vietnam's Foreign Trade in the Context of ASEAN and the Asia-Pacific Region: A Gravity Approach, *ASEAN Economic Bulletin*, 13(2), pp:185-199.

Miran, B., Atis, E., Bektas, Z., Salali, E. & Cankurt, M. (2013). An Analysis of International Raisin Trade: A Gravity Model Approach. (Available at: http://ageconsearch.umn.edu/record/152200/files/SP%20Miran.pdf) (Accessed on 14 May 2017)

Newton, I. (1687). Philosophiæ Naturalis Principia Mathematica. (Retrieved 14 July 2014 from University of Cambridge–Cambridge Digital Library. Retrieved from http://cudl.lib.cam.ac.uk/view/PR-ADV-B)

Ozdeser, H. & Ertac, D. (2010). Turkey's trade potential with euro zone countries: A gravity study, *European Journal of Scientific Research*, *43*(1), 15–23.

Prabir De, (2010). Global Economic and Financial Crisis: India's Trade Potential and Prospects, and Implications for Asian Regional Integration, *Journal of Economic Integration*, Vol. 25, No. 1, pp. 32-68

Sultan, M. & Munir, K. (2015). Export, Import and Total Trade Potential of Pakistan: A Gravity Model Approach, (Retrieved 14 May 2017 from https://mpra.ub.uni-muenchen.de/66621/)

Tai, S.H.T. (2009). Market Structure and the Link between Migration and Trade, *Review of World Economics,* Vol. 145, No. 2, 225-249

Tinbergen, J. (1962). Shaping the world economy: Suggestions for an international economic policy, New York: Twentieth Century Fund.

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Factor Substitution and Returns to Scale in Indian Manufacturing Under Globalization

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The study makes an attempt to estimate elasticity of substitution between capital and labour and returns to scale in Indian manufacturing across states under various policy regimes since 1980. This study used ASI data for the period 1980-13. To study regional imbalance, the ten major states of India namely Maharashtra, Gujarat, Tamil Nadu, Uttar Pradesh, Karnataka, Andhra Pradesh, Haryana, Madhya Pradesh, Punjab and Rajasthan have been selected. Constant Elasticity of Substitution (CES) production function has been used to estimate factor substitution and returns to scale in Indian manufacturing industry. The study period (1980-81 to 2012-13) has been trifurcated into sub-periods as a phase of piecemeal and ad hoc policy changes (1980-81 to 1990-91), a phase of major changes in economic policy (1991-92 to 2000-01) and a period of consolidation of economic reforms (2001-02 to 2012-13). The performance of Indian manufacturing in terms of returns to scale has been found credible during the period of consolidation of economic reforms 2001-13 as has been cheerful in most of the states and at aggregate level. The elasticity of substitution has been found to be either unity or less than unity in Indian manufacturing during a period of consolidation of economic reforms. This was due to a significant labour-saving technical change in Indian manufacturing during 2001-13. The elasticity of substitution has exposed a distressed in labour surplus economy like India during the period of study 1980-13. This study concludes that the performance Indian manufacturing in terms of returns to scale has been appreciable and has not been up to the standard in terms of elasticity of substitution between labour and capital during 2001-13.

Keywords: Returns to Scale, Elasticity of Substitution, Constant Elasticity of Substitution (CES) Production Function

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Introduction

Elasticity of substitution between the inputs plays a key role in the realm of research in industrial economics. According to Andreas Irmen (2010), the elasticity of substitution between capital and labour is a second-order parameter of the production function but has a first-order effect on economic growth. He also argued that although the importance of elasticity has long been recognized in several branches of economics, it has not received much attention in the growth literature. de La Grandville (1989) and Klump and de La Grandville (2000) have attempted to investigated the link between the elasticity of substitution and economic growth using CES production function and conclude that the degree of factor substitution is a powerful engine of economic growth in the sense that a higher elasticity of substitution between capital and labor leads to a higher growth rate along with the transition and a higher steady-state level of output per worker. This assessment has been also empirically tested by Miyagiwa and Papageorgiou (2003) and Irmen (2003). Pui Kiew Ling (2010) examined how the inputs substitutability between capital and labour in the particular sector could affect production, unemployment, balanced growth path, steady state and economic growth in Malaysia. The estimate of factor substitution elasticity has wide applicability including their use in policy making since the fast growing factor may be substituted for slow growing factor or the factor having higher productivity may be substituted for factor having low productivity (Goldar *et al.,* 2013).

Many important growth issues depend on the precise value of elasticity of substitution. It affects the possibility of perpetual growth or decline, the growth rate and level of steady state income per capita, the speed of convergence to the steady state, the rate of return on capital, the impact of biased technical change, and the relative role of productive factors and technical efficiency in explaining differences in per capita income. The fact that economic growth in rapidly developing countries is commonly characterized by a steeply rising capital-labour ratio implies that diminishing returns to capital input may pose a challenge to the sustainability of growth. How serious this problem will turn out to be, depends crucially on the elasticity of substitution between capital and labour.

In rapidly developing countries such as India and China, the growth rate in capital input is commonly well above the growth rate in labour input which may trigger challenge by diminishing returns to capital input to the sustainability of growth. The magnitude of this problem depends crucially on the elasticity of substitution between capital and labour. If the elasticity of substitution between capital and labour is high, meaning thereby that labour can easily be substituted by capital, it may be possible to sustain a relatively high rate of economic growth even in the face of shaping increasing capital intensity of production. Thus, the elasticity of substitution between capital and labour is a crucial parameter for the sustainability of economic growth, making it important to study. The following other factors make the study of elasticity of substitution for the Indian economy more useful: (a) it will help in understanding the trends in income share of labour and capital, and (b) a fresh set of estimates of elasticity of substitution

for different sectors would provide useful parameters for building computable general equilibrium models for the Indian economy.

Returns to scale plays a vital role in the field of research in industrial economics. Economies of scale and diseconomies of scale are interrelated terms that forecast the outcome where the scale of production increases. A the optimal and equilibrium size of firms which designs and determines the structure of industries and their prices and output levels as well as influenced by the concepts of returns to scale. The clear understanding of these concepts is the pre-requisite and they provide major implications for public policy. Charles I. Jones's (2005) book 'Growth and Ideas' investigates between that there is direct relationship between economies of scale and long run economic growth.

The measures initiated in the 1980s and 1990s aim to enhance productivity and efficiency in Indian manufacturing industries through privatization and globalization process which could expedite growth and development so that India can move from Incredible India to Innovative India. Hence, it is useful and essential to assess the performance of Indian manufacturing industry under various policy regimes. The study therefore makes an attempt to analyze elasticity of substitution and returns to scale in Indian manufacturing for the period of 1980-2013.

Statement of the Problem

Goldar *et al.,* (2013) point out that the estimate of factor substitution elasticity has wide applicability including their use in policy making since the fast growing factor may be substituted for slow growing factor or the factor having higher productivity may be substituted for factor having low productivity. The studies [Goldar *et al.,*(2013), Upender (2009), Venkata Seshaiah and Sarma (2007)] on substitution possibilities between capital and labour in Indian manufacturing industries clearly indicate that there exists variation in the magnitude of elasticity across industries. This was due to the dynamic composition of the relationship among the factors of production in Indian industries. Naturally the question arises in the minds of all researchers in the realm of Industrial Economics that what is the actual magnitude of elasticity of substitution between labour and capital in manufacturing industry across States in India under various policies adopted since the introduction of mild liberalization Policy of 1980, subsequent policies of further and globalization. So, the study makes an attempt to estimate elasticity of substitution between capital and labour and returns to scale in Indian manufacturing across states under various policy regimes since 1980.

Review of Literature

The number of studies have been attempted to analyze elasticity of substitution in Indian manufacturing. Goldar *et al.,* (2013) have attempted to estimate elasticity of substitution for 22 manufacturing industries in India on the basis of CES production function by SURE and ADRL regression methods. In a majority of Indian manufacturing industries, elasticity of substitution between labour and capital is relatively low which

leads to substantial variation in elasticity of substitution across different industries. This study concludes that the manufacturing industry has been adopting labour saving technical change with the CES production function rather than the Cobb-Douglas production function.

Upender (2009) examined the extent of substitution possibilities between labour and capital across twenty six major industries in India during 2004-05. The numerical value of elasticity of substitution obtained from constant elasticity of substitution production function based on cross section data is more than unity evincing the fact that the substitution possibilities are relatively more in favour of labour across the major Indian industries.

Venkata Seshaiah and Sarma (2007) have attempted to analyze the cost structure of Indian manufacturing sector for the period of 1970-2003. Separate analysis has been carried out for the post (1991-2003) as well as pre (1970-1990) liberalization periods. This analysis is carried out by estimating a translog cost function in which capital, labour, energy, materials and liberalization index (a proxy for technology, reduced trade restrictions, technology penetration) are the input determinants. The elasticity of substitution between labour and capital has been observed that 0.84, 1.30 and 1.28 during pre-liberalization, post-liberalization and overall periods respectively. It indicates that the substitution possibility between capital and labour has increased during the post-liberalization period compared to the pre-liberalization period.

Kaz Miyagiwa and Chris Papageorgiou (2006) have analyzed Endogenous Aggregate Elasticity of Substitution in Indian manufacturing. The idea that the aggregate elasticity of substitution (AES) between capital and labor evolves with the process of economic development goes back to Arrow *et. al.,* (1961). To evaluate this conjecture, the study has constructed a multi-sector model of economic growth, in which AES is endogenously determined and varies as the economy grows. The study has then applied new modeling and numerical approximation techniques to solve this highly non-linear model. The results support the ACMS conjecture generally. More importantly, it is found that AES is positively related to the level of economic development which leads to the following conjecture: the results which are independent of the Solow growth model and robust with other growth models, in which capital accumulation is the engine of growth. The basis for our belief is that how AES changes as an economy's capital-labor ratio grows is not a property of the Solow growth model but a property of the underlying general equilibrium model

Sunil Kumar (2001) has attempted to analyzed elasticity of substitution in Indian manufacturing for the period 1965-95 by using developed specification of CES production by Bairam (1989). The study observed that the estimate of elasticity of substitution has been high in aggregate Indian manufacturing.

Methodology of the Study

Sources of Data

The data of the present study have been collected from the various volumes of Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO), Government of India. This study has used gross value added at constant prices (2004-05=100) as a measure of output and total number of persons engaged as a measure of labour input. Based on the study of India KLEMS Research Team (2014), the study period (1980-81 to 2012-13) has been trifurcated into sub-periods of a phase of piecemeal and ad hoc policy changes (1980-81 to 1990-91), a phase of major changes in economic policy (1991-92 to 2000-01) and a period of consolidation of economic reforms (2001-02 to 2012-13).

Besides the ASI data, the required data have been procured from the other secondary sources. In this context, for making price corrections to the reported data on output, whole sale price index for manufactured products was collected from the Office of the Economic Advisor, Ministry of Industry, and Government of India. For constructing the capital input series, whole sale price index of machine and machine tool industry has been collected from various issues of Economic Survey of India.

To study regional imbalance, the ten major states of India namely Maharashtra, Gujarat, Tamil Nadu, Uttar Pradesh, Karnataka, Andhra Pradesh, Haryana, Madhya Pradesh, Punjab and Rajasthan have been selected on the basis of their contribution more than 60 per cent of Indian registered manufacturing gross value added in every year of the study period.

Model used for estimating Factor Substitution and Returns to scale parameter

The following Constant Elasticity of Substitution (CES) production function has been used to find out factor substitution and returns to scale in Indian manufacturing industry. The specification of the CES production function is denoted by $Q = A(\delta K^{-\rho} + (1-\delta)L^{-\rho})^{\frac{-m}{\rho}}$ Where, Q = output, K= capital and L= labour, A>0, 0< δ < 1, m and ρ are efficiency parameter, Substitution parameter, returns to scale parameter and distribution parameter respectively and elasticity of substitution σ = $\frac{1}{1+\rho}$

As the CES function is non-linear in parameters and it is not possible to estimate it with the usual linear estimation techniques. The CES function is therefore often approximated by the so-called Kmenta (1967) approximation, which can be estimated by linear estimation techniques.

The estimation evolved by Kmenta (1967) approximation to the CES production function is as follows:

$$ln\ Q = lnA - \frac{m}{\rho} ln\ (\delta K^{-\rho} + (1-\delta)L^{-\rho})^{\frac{-m}{\rho}}$$

$$ln\ Q = lnA + m\ \delta lnK + \ \mathrm{m}(1-\delta)\mathrm{lnL} - \mathrm{m}\delta\frac{1}{2}(1-\delta)\ln\ [lnK - lnL]^2$$

It can be written as, $ln\ Q = \beta_1 + \beta_2 lnK + \ \beta_3 \mathrm{lnL} + \beta_4\ [lnK - lnL]^2$

where $A = antilog\beta_1$. Based on the above, the labour coefficients and capital coefficients, substitution and distribution parameters have been estimated

$m = \beta_2 + \beta_3$, $\delta = \frac{\beta_2}{\beta_2+\beta_3}$, $= \frac{-2\beta_4(\beta_2+\beta_3)}{\beta_2\beta_3}$ and $\sigma = \frac{1}{1+\rho}$.

Variable Construction

In empirical estimation of measures of productivity and efficiency, the major problem encountered by the researchers is that of specification and measurement of output and inputs. This section discusses the conceptual problems and issues related to measurement of output and inputs.

Measurement of Output

In the measurement of output, the important choices between value added and physical output of which physical output is the best measure of output. But this is not practicable, because most of the industries produce more than one output. Generally each output is expressed in different units and dissimilar products can be aggregated by appropriate weights. Weights are computed on the basis of the relative share of overall output and separate price indices which are needed for adverse set of products. So the measuring output in terms of physical output is cumbersome. In such case aggregation of output could be measured only in terms of value. This study has used gross value added at constant prices (2004-05=100) as a measure of output.

Here are two distinct approaches to get the figures of real value added namely single deflation method and double deflation method. In the former, the value added at constant prices has been obtained by subtracting raw materials from that of gross output at constant prices, and then the value is deflated by the respective wholesale price index. While in the later, the value added at constant prices has been obtained from deducting the value of gross input at constant prices from the value of gross output at constant prices.

Measurement of Labour

Labour input is generally measured in terms of the total number of man-hours or the average number of persons employed. The use of 'man-hours worked' is often regarded as a better measure as it includes number of workers as well as working hours in a day. It has been however pointed out that the consumption of man-hours in ASI is carried out by multiplying the number of workers in a shift by eight and both by the actual duration of shift and then aggregating such products across factories.

So, the resultant series do not measure the actual man-hours worked. Total number of persons engaged has been used as the measure of labour.

Measurement of Capital

The measurement of capital stock is inherently difficult and has been controversial in the literature. Capital is made up of productive equipment, machinery, rolling stock, tools, buildings and other structure. The heterogeneous nature of the variables creates the difficulty of finding a common measurement. An important question is whether or not to use gross or net capital stock or services rendered by gross fixed capital stock in production.

Perpetual inventory method has been used for measuring capital stock. For the construction of capital stock series, the bench mark year has been taken as 1973-74. In order to construct the time series of gross fixed capital stock, the study assume that the value of finished equipment of a balanced age composition would be exactly half the value of equipment when it was new. Hence, in the present analysis, twice the book value of the base year has been taken as a rough estimate of the replacement value of fixed capital. For obtaining estimate of fixed capital, bench mark year of fixed capital has been deflated by gross fixed capital formation index and gross investment at constant prices have been added cumulatively. This has been computed in the following way.

$K_t = K_{t-1} + I_t - d.K_{t-1}$, where

K_t = Gross fixed capital at 2004-05 prices by the end of year t;

I_t = Gross real investment in fixed capital during the year t; and

d = Annual rate of discard of capital.

Five per cent has been taken as annual rate of discard of capital in the present study.

The gross real investment I_t is computed by following expression:

$I_t = (B_t – B_{t-1} + D_t) / P_t$ where

B_t = Book value of fixed capital in the year t;

D_t = Depreciation in the year t; and

P_t = Price index of gross fixed capital formation at 2004-05 prices.

Results and Discussion

Returns to Scale and Factor Substitution between Labour and Capital In Indian Manufacturing: 1980-13

From the table 1, it is observed that the returns to scale has been 1.78 during 1980-13 at the aggregate level with substantial variation in returns to scale has been seen across the States. The performance of returns to scale in Indian manufacturing has

been healthy during the entire period of study as increasing returns to scale has been found during the whole period of study. Returns to scale has been the highest in Karnataka (2.70), followed by Haryana (2.41) and Tamil Nadu (2.13) while it has been the lowest in Madhya Pradesh (0.17) and followed by Gujarat (1.32) during the entire study period. Increasing Returns to scale has been found in all the ten states except Madhya Pradesh during entire period of the study. The performance of Indian manufacturing during entire period of study in terms of returns to scale was found encouraging.

Table 1: Estimated Parameters of CES Production Function: 1980-13

Model: $ln\ Q = \beta_1 + \beta_2 lnK + \beta_3 \ln L + \beta_4 [lnK - lnL]^2$

Parameters / State	Returns to scale $m = \beta_2 + \beta_3$	Substitution Parameter $\rho = \frac{-2\beta_4(\beta_2+\beta_3)}{\beta_2\beta_3}$	Elasticity of substitution $\sigma = \frac{1}{1+\rho}$
All India	1.78	1.11	0.47
Maharashtra	1.47	-0.73	3.71
Gujarat	1.32	0.003	0.99
Tamil Nadu	2.13	0.81	0.55
Uttar Pradesh	1.58	-0.71	3.57
Andhra Pradesh	1.69	-0.01	1.01
Karnataka	2.70	0.42	0.70
Madhya Pradesh	0.17	0.00	1.00
Haryana	2.41	0.32	0.75
Punjab	1.98	0.15	0.86
Rajasthan	1.61	0.36	0.93

Source: Computed using ASI Data

The elasticity of substitution has been 0.47 during 1980-13 at the aggregate level and substantial variation in elasticity of substitution has been witnessed across the States. The performance of elasticity of substitution in Indian manufacturing has been an unhealthy one during the entire period of study as elasticity of substitution has been found very low in all the states under study except Maharashtra. Elasticity of substitution has been the highest in Maharashtra (3.71), followed by Andhra Pradesh (1.01) and Madhya Pradesh (1.00) during the entire study period. This indicates that the flexible technology has been adopted only in Maharashtra as the substitution

possibility between labour and capital has been found low in other states. The elasticity of substitution has been found 0.99, 1.01 and 1.00 in Gujarat, Andhra Pradesh and Madhya Pradesh respectively during the period 1980-13. This shows that the Cobb-Douglas production has been appropriate technology in the manufacturing states of Gujarat, Andhra Pradesh and Madhya Pradesh. The elasticity of substitution has exposed a distressed in labour surplus economy like India during the period of study 1980-13.

Returns to Scale and Factor Substitution between Labour and Capital In Indian Manufacturing 1980-91

The returns to scale has been 1.86 during 1980-91 at the aggregate level with substantial variation in returns to scale has been seen across the States. The performance of returns to scale in Indian manufacturing has been encouraging in eight states of the ten states selected for the study namely Gujarat, Tamil Nadu, Uttar Pradesh, Andhra Pradesh, Karnataka, Haryana, Punjab and Rajasthan while in the remaining two states namely Maharashtra and Madhya Pradesh presented a distressing picture during the phase of piecemeal and ad hoc policy changes. Returns to scale has been the highest in Uttar Pradesh (3.00), followed by Tamil Nadu (2.19), Gujarat (1.97) and Haryana (1.96) during the phase of piecemeal and ad hoc policy changes. Increasing Returns to scale has been found in all the states except Maharashtra and Madhya Pradesh during entire period of the study. Returns to scale has been the lowest in Madhya Pradesh (0.75), followed by Maharashtra (0.93) during entire period of the study. The performance of Indian manufacturing in terms of returns to scale has revealed enjoyable during the phase of piecemeal and ad hoc policy changes.

The elasticity of substitution has been 3.21 during 1980-91 at the aggregate level and substantial variation in elasticity of substitution has been seen across the States. The performance of elasticity of substitution in Indian manufacturing has been joyful during the phase of piecemeal and ad hoc policy changes as elasticity of substitution has been found very high at the aggregate level. Elasticity of substitution has been the highest in Gujarat (7.46), followed by Karnataka (3.39) and Uttar Pradesh (1.36) during the phase of piecemeal and ad hoc policy changes. This indicates that the flexible technology has been followed only in Gujarat, Karnataka and Uttar Pradesh as the substitution possibility between labour and capital has been greater in these states during the phase of piecemeal and ad hoc policy changes during the period 1980-91. The elasticity of substitution has been found 1.00 in Maharashtra which indicates that the Cobb-Douglas production has been appropriate technology in the manufacturing state of Maharashtra. The elasticity of substitution has exposed a distressed in labour surplus economy like India during a phase of piecemeal and ad hoc policy changes as the substitution possibility between labour and capital has been lower in most of the states in Indian manufacturing.

Table 2: Estimated Parameters of CES Production Function: 1980-91

Model: $ln\ Q = \beta_1 + \beta_2 lnK + \beta_3 \ln L + \beta_4 [lnK - lnL]^2$

Parameters / State	Returns to scale $m = \beta_2 + \beta_3$	Substitution Parameter $\rho = \frac{-2\beta_4(\beta_2+\beta_3)}{\beta_2\beta_3}$	Elasticity of substitution $\sigma = \frac{1}{1+\rho}$
All India	1.86	-0.68	3.21
Maharashtra	0.93	-0.05	1.06
Gujarat	1.97	-0.87	7.46
Tamil Nadu	2.19	1.45	0.40
Uttar Pradesh	3.00	-0.27	1.36
Andhra Pradesh	1.38	0.327	0.75
Karnataka	1.16	-0.70	3.39
Madhya Pradesh	0.75	0.40	0.71
Haryana	1.96	0.22	0.81
Punjab	1.48	0.09	0.91
Rajasthan	1.60	0.29	0.79

Source: Computed using ASI Data

Returns to Scale and Factor Substitution between Labour and Capital In Indian Manufacturing: 1991-01

The returns to scale has been 1.38 during 1991-01 at the aggregate level and substantial variation in returns to scale has been seen across the States. The performance of returns to scale in Indian manufacturing has been robust in five states namely Maharashtra, Tamil Nadu, Andhra Pradesh, Madhya Pradesh and Haryana and depressing in the remaining five states namely Gujarat, Uttar Pradesh, Karnataka, Punjab and Rajasthan during a phase of major changes in economic policy. Returns to scale has been the highest in Karnataka (2.08), followed by Andhra Pradesh (1.35), during the phase of major changes in economic policy. Returns to scale has been the lowest in Punjab (0.45), followed by Gujarat (0.62) during the phase of major changes in economic policy. The efficiency performance of Indian manufacturing in terms of returns to scale remained inconclusive during the phase of major changes in economic policy 1991-01 as returns to scale in Indian manufacturing has been encouraging in five states and depressing in the remaining five states. However, Increasing Returns to scale has been found at aggregate level and in five manufacturing states during a phase of major changes in economic policy.

The elasticity of substitution has been 1.00 during 1991-01 at the aggregate level and substantial variation being found across the States. The performance of elasticity of substitution in Indian manufacturing has been supporting during the phase of major changes in economic policy as elasticity of substitution has been found unity at the aggregate level. Elasticity of substitution has been the highest in Haryana (4.12), followed by Karnataka (2.74), Andhra Pradesh (2.34) and Tamil Nadu (1.84) during

the phase of major changes in economic policy. The elasticity of substitution has been found to be more than unity in nine states. This indicates that the flexible technology has been adopted in Indian manufacturing as the substitution possibility between labour and capital has been higher in these states during the phase of major changes in economic policy. The elasticity of substitution has been found 1.00 in Gujarat, Uttar Pradesh and Madhya Pradesh indicates that the Cobb-Douglas production has been found to be appropriate technology in these manufacturing states The elasticity of substitution has been encouraging in labour surplus economy like India during the phase of major changes in economic policy showing that the substitution possibility between labour and capital has been more than unity in most of the states in Indian manufacturing.

Table 3: Estimated Parameters of CES Production Function: 1991-01
Model: $ln\ Q = \beta_1 + \beta_2 lnK + \beta_3 \ln L + \beta_4 [lnK - lnL]^2$

Parameters / State	Returns to scale $m = \beta_2 + \beta_3$	Substitution Parameter $\rho = \frac{-2\beta_4(\beta_2+\beta_3)}{\beta_2\beta_3}$	Elasticity of substitution $\sigma = \frac{1}{1+\rho}$
All India	1.38	0.00	1.00
Maharashtra	1.18	-0.11	1.13
Gujarat	0.62	-0.11	1.01
Tamil Nadu	1.04	-0.45	1.84
Uttar Pradesh	0.71	-0.03	1.03
Andhra Pradesh	1.35	-0.57	2.34
Karnataka	0.98	-0.63	2.74
Madhya Pradesh	1.18	-0.07	1.07
Haryana	2.08	-0.75	4.12
Punjab	0.45	0.03	0.96
Rajasthan	0.95	-0.34	1.53

Source: Computed using ASI Data

Returns to Scale and Factor Substitution between Labour and Capital In Indian Manufacturing: 2001-13

The returns to scale has been 2.09 during 2001-13at the aggregate level and considerable deviation in returns to scale has been found across the States. The performance of returns to scale in Indian manufacturing has been found healthy as increasing returns to scale has been found at aggregate level and all the states except Madhya Pradesh and Haryana during the period of consolidation of economic reforms. Returns to scale has been the highest in Karnataka (2.42), followed by Andhra Pradesh (2.41) and Rajasthan (1.94) while it is at the lowest in Madhya Pradesh (0.61) followed by Haryana (0.60) during the period of consolidation of economic reforms. The efficiency performance of Indian manufacturing in terms of returns to scale has been found credible during the period of consolidation of economic reforms 2001-13

as returns to scale in Indian manufacturing has been strong in most of the states and at aggregate level.

Table 4: Estimated Parameters of CES Production Function: 2001-13
Model: $ln\ Q = \beta_1 + \beta_2 lnK + \beta_3 \ln L + \beta_4 [lnK - lnL]^2$

Parameters / State	Returns to scale $m = \beta_2 + \beta_3$	Substitution Parameter $\rho = \frac{-2\beta_4(\beta_2+\beta_3)}{\beta_2\beta_3}$	Elasticity of substitution $\sigma = \frac{1}{1+\rho}$
All India	2.09	0.28	0.77
Maharashtra	1.50	-0.01	1.01
Gujarat	1.46	0.02	0.98
Tamil Nadu	1.34	0.11	0.89
Uttar Pradesh	1.76	-0.06	1.07
Andhra Pradesh	2.41	0.14	0.87
Karnataka	2.42	0.35	0.74
Madhya Pradesh	0.61	-0.13	1.15
Haryana	0.60	3.90	0.20
Punjab	1.73	0.23	0.80
Rajasthan	1.94	-0.01	1.01

Source: Computed using ASI Data

The elasticity of substitution has been 0.77 during 2001-13 at the aggregate level and significant deviation has been found across the States. The performance of elasticity of substitution in Indian manufacturing has been not up to the mark during the period of consolidation of economic reforms for the reason that elasticity of substitution has been found lower at the aggregate level. Elasticity of substitution has been the highest in Madhya Pradesh (1.15) followed by Uttar Pradesh (1.07) during the period of consolidation of economic reforms. The elasticity of substitution has been found to be either one or less than one in Indian manufacturing. This indicates that the substitution possibility between labour and capital has been relatively lower during the period of consolidation of economic reforms compared other sub periods. The elasticity of substitution has been encouraging in labour surplus economy like India during the phase of major changes in economic policy showing that the substitution possibility between labour and capital has been more than unity in most of the states in Indian manufacturing.

Policy Implications

The study makes an attempt to estimate elasticity of substitution between capital and labour and returns to scale in Indian manufacturing across states under various policy regimes since 1980. The performance of Indian manufacturing in terms of returns to scale has been found to be healthy during the entire period of study and the phase of piecemeal and ad hoc policy changes. Increasing Returns to scale has been found at

aggregate level and in five manufacturing states during the phase of major changes in economic policy while it has been inconclusive during the phase of major changes in economic policy 1991-01 as returns to scale has been impressed in five states and depressing in the remaining five states. The returns to scale has been revealed credible in most of the states and at aggregate level during the period of consolidation of economic reforms 2001-13.

The elasticity of substitution has exposed a distressed condition in labour surplus economy like India during the entire period of study 1980-13. It has been showing cheerful during the phase of major changes in economic policy seeing that the substitution possibility between labour and capital has been more than unity in most of the states in Indian manufacturing and it has been found to be either unity or less than unity in Indian manufacturing during the period of consolidation of economic reforms. That is, the degree of elasticity of substitution has been falling in aggregate manufacturing and observed to be relatively low in all the states during the process of intensive-liberalization in Indian industries since 1991. This was due to a significant labour-saving technical change in Indian manufacturing during the period 2001-13. The low elasticity of substitution implies a low absorption of surplus labour in response to changes factor prices appropriately. The policy implication of this result is that the labour-saving technology may lead to further unemployment problem in the labour abundant country of India. Thus present study suggested that the planners should stress the policy of promoting labour intensive technologies in Indian manufacturing which apt to domestic factor endowments. In order to promote the adoption of labour intensive technologies in Indian industries, government should support financially the technological development for the invention and diffusion of appropriate labour intensive techniques of production. Further, government should make appropriate changes in factor prices for removal of distortions in factor markets to tempt a reinstate from the existing capital-intensive techniques to the labour intensive techniques.

References

Bishwanath Goldar (2008). Trade Liberalization and Labour Demand Elasticity In Indian Manufacturing, *Journal of International Economics*, 55(2), pp: 391-409.

Bishwanath Goldar, Basantha K. Pradhan & Akhilesh K. Sharma (2013). Elasticity of Substitution between Capital and Labour Inputs in Manufacturing Industries of the Indian Economy, *The Journal of Industrial statistics*, 2 (2), pp: 169-194.

Charles I. Jones, (2005). Growth and Ideas**,** *Handbook of Economic Growth*, Volume 1B. Edited by Philippe Aghion & Steven N. Durlauf, Elsevier B.V.

de La Grandville, O. (1989). In Quest of the Slutsky Diamond**,** *American Economic Review*, 79(3), pp: 468-481.

Gupta (2012). Impact of Elasticities of Substitution, Technical Change, and Labour Regulations on Labour Welfare in Indian Industries, *ASARC Working Paper 2012/10.*

Kaz Miyagiwa and Chris Papageorgiou (2006). Endogenous Aggregate Elasticity of Substitution, *Working paper 2006-06*, Department of Economics, Louisiana State University.

Klump, R., and O. de La Grandville (2000). Economic Growth and the Elasticity of Substitution: Two Theorems and Some Suggestions, *American Economic Review,* 90(1), pp: 282-291.

Kmenta J (1967). On Estimation of the CES Production Function**,** *International Economic Review*, 8, pp: 180-189.

Miyagiwa, K., and C. Papageorgiou (2003). Elasticity of Substitution and Growth: Normalized CES in the Diamond Model, *Economic Theory*, 21(1), pp: 155-165.

Pui Kiew Ling (2010). Elasticity of Substitution and Economic Growth, *PROSIDING PERKEM V, JILID 2*, 15 -17 October, pp: 392-420.

Romer, P.M. (1986). Increasing returns and long-run growth, *Journal of Political Economy*, 94, October, pp: 1002-1037.

Sunil Kumar (2001). ***Productivity and Factor Substitution: Theory and Analysis*****,** Deep and Deep Publications Private Limited, New Delhi.

Upender, M (2009). Elasticity of Substitution between Labour and Capital across Twenty Six Major Industries in India during 2004-05**,** *International Journal of Applied Econometrics and Quantitative Studies*, 6(1), pp: 101-111.

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Book Review

Black Money and Tax Havens

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Plumbing the World of Black Money and Tax Havens

Professor R. Vaidyanathan, a person who serves as a director of several companies, a person with more than three decades of teaching experience at IIM Bangalore and an individual who had been a member of regulatory bodies such as RBI, SEBI, PFRDA and IRDA has in his avatar as an author turned out 'Black Money and Tax Havens'. Published by Westland publications, the book lays out in most of the twelve chapters what the title proclaims. While the first two chapters of the book discusses the nature and magnitude of black money, the remaining chapters, (3 to 12) deal with tax havens, with Blood Money featured in chapter 5, Indian case studies in chapter 6 and the Panama Papers in chapter 11. Why the author chose to wade in to and out of tax havens from chapter 3 is inexplicable.

'Black Money and Tax havens' is essentially a rework from the numerous articles the author had penned over several years in numerous publications including The New Indian Express and The Hindu Business Line.

Professor Vaidyanathan states that establishing probity in public life and elevating global investments is impinged by corruption. Therefore to attain those twin objectives steps need to be taken to reduce the scourge of black money if not eliminate it as corruption invariably generates black money. The book enlightens readers that the modus of generating black money include 'corruption of public resources, trade based black money due to non reporting of incomes or profits and inflation of expenses through a host of criminal activities such as illicit manufacturing of counterfeit goods, smuggling, extortion, cheating and financial frauds, illicit narcotics trade, printing and

circulation of fake currency, illicit manufacturing and trade in arms, ammunition and explosives' (page 4).

Writing on 'domestic black money', the author avers that it is primarily dependent on the cash economy and that it tries to avoid formal transactions through banks fearing capture of the same by electronic systems and the tax authorities. Every attempt is made to ensure that no money trail is left.

The author holds that illicit money stashed abroad by Indians in tax havens is indicative of 'a lack of confidence on India, its stability and its people'. Such money cannot be leveraged for domestic purposes unless it is round tripped through share markets or foreign direct investment to domestic operations. A vivid explanation of what came to be known as the 'Mauritius route' helps the reader to comprehend 'round tripping' of funds. However the positive side of the flow of such illicit money to the country that serves as a tax haven is that it stimulates economic activity. Ireland is an example of a country that has immensely benefited by serving as a tax haven. Between 1982 and 1999, the Irish economy grew at 3.3% whereas the world average was a measly 1.4 per cent during the same period.

The cover page of the book with the words 'BLACK MONEY AND TAX HAVENS' emblazoned, which in turn is ensconced in chains, that surprisingly appear brittle (see exhibit), makes one wonder why a serious assault has not been made on it hitherto. The mindboggling amount of black money that has been generated and the deleterious consequences that it can create has made governments think of adopting a global approach to the challenge. IMF estimates global black money to be around $18 trillion, roughly a third of the global GDP.

Transfer of huge sums of out of developing countries illegally is particularly worrying. This is so because the resources would have otherwise been used to fund public services from security and justice to basic social services such as health and education. Between 2003 and 2012, the developing countries alone have lost $6.6 trillion in illicit outflows. Juxtapose this with the total official development assistance to the developing countries during the same period (2003-2012) which was a mere $809 billion and one gets a sense of the ducks and drakes that illicit money plays. Truth be told, for every one dollar that developing countries obtained, ten dollars flowed out of developing countries illegally.

The book could serve as a primer for anyone wishing to know the diverse features of black money and tax havens. Besides management students, the lay public too would find it a useful read, given that the theme, thanks to novels and movies, evokes visuals of smoke and mirrors and cloak and dagger. Do read it to unravel the mystery and know the author's recipe to stymie the mountain of black money.

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The Institute of Public Enterprise (IPE) was established in 1964 as an autonomous non-profit society with the objective of furthering studies, research and consultancy in Management Sciences. IPE functions under the aegis of Indian Council of Social Science Research, Ministry of HRD, Govt of India.

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Prof RK Mishra

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