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MIGRATION AND BILATERAL TRADE FLOWS: EVIDENCE FROM INDIA AND OECD COUNTRIES

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Abstract

Migration from developing countries to developed countries is not a new phenomenon. The causes of migration has been well explained by many authors. The rate of population growth and the proportion of youth in the population, their education and training, employment opportunities, income differentials in society, communication and transportation facilities, political freedom and human rights and the level of urbanization are the important causes of migration (Samuel and George 2002). According to Kaur (2013), among developing countries, South Asia is considered the hub of migrant workers because of populated countries like India, Bangladesh etc. These migrant workers help make up for the shortage of labour in the developed world and their remittances are major sources of foreign exchange reserves for South Asian countries. The study revealed that during the study period (1980-2010), remittances did not result in a reduction in poverty. Although remittances are considered as a tool of poverty reduction, the slow trickle down effects in these countries may be the one of the reasons for the negative relation.

1. Introduction

According to the World Bank (2010), three South Asian countries, namely India, Bangladesh and Sri Lanka, are amongst top 10 counties receiving the highest remittances (Fig 1 in Appendix 4.1). According to Mack (2006), 61 per cent of migrants live in developed countries such as the United States, France, Germany and Australia, which are OECD countries. Asian migration to OECD countries has been rising with increasing diversification in the categories of entries. (Terradaily 2006)

OECD Migration Outlook (2012) found that 17% of all migrants over age 15 has come from Asia to OECD countries in the mid-2000s. These migration movements have been strengthening and a widening range of destination countries, immigrant nationalities and the categories under which they enter (OECD, 2001). Most Asian migrants select certain OECD countries like United States, Canada, Australia, France and United Kingdom. Amongst the other economies of Asia, India has a third place for migrant flows to OECD countries in 2010 (OECD, 2012). According to 2001 estimates of high level committee of Indian Diaspora, 18.5 million-strong Diaspora (including descendants of Indian migrants) are widely dispersed. The Indian government claims that three-quarters of the diaspora population live in 12 countries. Asia has the maximum Indian emigrants (35%) followed by Gulf countries (19%), Northern America (14%), Africa (13%) and Europe (10%).

OECD countries are important trade partners of India. In 2010, these countries accounted for 37% of India's exports followed by Asia (28%), OPEC (22%) and EU region at 21% .In the same year, its imports from the OECD and OPEC countries amounted to 32%, followed by other Asian countries at 26% (DGCI&S,2011). Thus, it is necessary to examine the migration trade relation in the context of these countries. The main objective of the study is to examine the impact of Indian migrant networks on India's international trade empirically. The paper is divided into four sections,

including present one. Section two provides a review of literature on the issue. Section III examines trade and emigrant trends of India with ten OECD countries. Section IV explains the results of the migration-trade relation by using the gravity model of trade for the period 2000-2010 and discusses some policy implications.

2. Review of Literature

For India, migration has become a serious concern. Rural Indians and skilled labour migrate due to lack of employment opportunities. Unskilled or semi-skilled workers migrate to the Middle East and Southeast Asia on temporary contracts while technically skilled Indians migrate to countries such as the United States, Canada, United Kingdom and Australia. According to Naujoks (2009), India has most diverse and complex migration history in the world. The study points out that ethnic Indian communities, especially those in United States and United Kingdom, have become known for their economic success. Migration has led to strengthen trade relations with many countries. During colonial rule, Indian emigrants established trade relations with various countries as foreign trade was in the hands of both local and foreign merchants. Thus relation between migration and trade has been working since colonial period.

According to traditional trade theories, trade and migration are substitutes. This is true if assumptions like homogeneous factors, identical production technologies, constant returns to scale, perfect competition, full employment, and complete knowledge of markets hold true but according to standard trade theory, trade and migration are complementary when these assumptions do not hold (Martin, 2004). Therefore, countries that are dissimilar tend to gain most from trade (Winters 2003). Therefore, North-South trade is explored nowadays which may be cause of high level of migration between them. Gould (1994) explains the relationship between migration and trade flows. He points out that migration creates a group, which has knowledge of the demand and availability of products in two countries. This, according to him, results in trade flows through two channels, i.e., an information channel which helps reduce transaction costs of trade and a preference channel through which migrants foster trade flows by demanding domestically produced goods. These two channels are collectively known as direct immigrant links and affect trade flows either to or from their country of origin. Rauch (2001) has also presented similar arguments on the migration-trade relation by examining the importance of business contacts and social networks. According to Rauch and Trindade (2002), third-party migrants, the ethnicity of which is neither of the importing or exporting nation, may also promote bilateral trade flows. Felbermayr, Jung and Toubal (2009) refer to them as indirect effects.

There are certain theories that tried to explain trade pattern between exporter and importer countries. Traditional theories have proved inadequate in explaining trading patterns. Also, the Neo-Classical Heckscher-Ohlin-Samuelson theory, based on the proposition of dissimilar factor endowments could not explain this pattern. Alternate to this theory, Linder (1961) has elucidated the reasons of growing South–South trade by using the preference similarity theory which postulates that similarities in tastes between nations are important in explaining trade patterns. In the case of with comparable levels of income, this factor assumes greater significance. However, the role of similar preferences in promoting trade between countries can be diluted by factors such as geographical proximity and lack of long-standing social, economic and

cultural links between them. In looking at the trade pattern between India and OECD countries, one needs to kept in mind that there is no similarity in preference and no geographical proximity; there are large differences in size and income and, in the case of most OECD countries, no long-standing social, economic and cultural links. In North-South trade, therefore, the migration-trade link is said to come either through preference similarity or through market information brought in by migrants (Girma and Yu, 2002).

To analyse this relation, many authors have used the gravity model approach. The gravity model of trade was first developed to study global trade among countries by Tinbergen (1962) and Poyhonen (1963). This has been used for migration trade relation by many researchers for a single country with its trading partners. These include Head and Ries (1998) for Canada, Dunlevy and Hutchinson (1999, 2001) for the United States, Girma and Yu (2002) for UK, Bryant et al (2004) for New Zealand, Blanes-Cristobel (2003) for Spain, White (2007b) for Denmark and Hatzigeorgiou (2010) for Sweden, Karayil (2007) for India, Akbari and Haider (2010) for Pakistan etc. A few studies have analysed the relation with groups of countries for a single year (Hatzigeorgiou (2009) for 75 countries in 2000, Felbermayr and Toubal (2008) for OECD for 2000 and Felbermayr and Jung (2009) for 1990 and 2000 for different countries). Some of the studies have analysed panel data (Ehrhart et al (2012) for African countries for 1980 - 2010, Casi (2009) for EU 17 Countries for 1997-2006 etc. (Appendix Table A.1). Similarly, the present paper has also examined India's migration-trade relations with 10 OECD countries for the period 2000-2010 using the gravity model.

3. Data Base

Many Indians migrated to countries with which India has strong trade and investment linkages. Due to paucity of data of Indian migrants residing in these countries, the study cannot assess the relation between migration and trade for all of them. The study has selected ten OECD countries, as data for these countries are available for selected variables for 2000-2010. Thus, the study has panel data, i.e., 10 cross sections, for 2000-2010. Data on Indian exports to these countries have been taken from the United Nations Statistics Division's Comtrade Database. Estimates of the foreign-born population in these ten countries have been come from OECD Statistics. It is hard to get consistent data on annual emigration from Indian data sources. OECD publishes the data of immigrant flows and population (stocks) into OECD countries from all over the world. Therefore, the study has selected 10 OECD countries (Australia, Austria, Belgium Finland, Israel, Netherlands, Norway, Spain, Sweden and USA**)**. Surprisingly, Canada, which has one of the largest pool of migrant Indian, has data on the stock of immigrants available after each census year. Therefore, it has not been taken into account in the study. Similarly, the UK has not been included due to the dearth of data on its immigrant population for some years of the selected period. The study has taken only ten OECD countries to assess the impact of Indian migrants on trade.

Trends of India's Migrants and Trade with OECD Countries

The share of ten OECD countries in India's trade is shown in Table 4.1. According to DGCI&S, 34 OECD countries accounted for 37 per cent of India's exports in 2010.

Of this, 20 per cent is accounted by 10 OECD countries covered in this study. Since 2000, the share of India's exports as well as imports from these countries has declined, but exports declined at a faster rate than imports. It has declined from 31.82 per cent in 2000 to 19.81 per cent in 2010. India had a surplus balance of trade. But it has turned into a deficit since 2002, although this accounted for only 3.88 per cent of India's total deficit in 2010.

Table 4.1: Trends of India's Trade with selected OECD Countries (US $ millions)

Year	Exports	Share	Imports	Share	Trade Balance	Share
2000	13477.1	31.82	8765.97	16.56	4711.14	44.52
2001	12517.84	28.53	8620.23	17.01	3897.62	57.38
2002	15165.2	30.27	10822.98	18.84	4342.22	59.03
2003	16918.78	28.50	13552.79	18.71	3365.99	25.75
2004	20136.48	26.53	17576.61	17.76	2559.87	11.09
2005	26065.65	25.97	23119.11	16.41	2946.54	7.27
2006	29437.97	24.29	28258.92	15.86	1179.05	2.07
2007	34229.34	23.46	35117.03	16.06	-887.69	-1.22
2008	40094.28	22.05	49827.35	15.78	-9733.07	-7.27
2009	35328.84	19.99	42698.36	16.03	-7369.52	-8.22
2010	43657.46	19.81	48686.50	13.91	-5029.04	-3.88

Source: Calculations from Handbook of UNCOMTRADE Database 2011

The country wise analysis in Table 4.2 shows that India's average trade intensity[1] was the highest with Israel (2.86), followed by United States (1.05), Belgium (0.96) and Australia (0.74).

Table 4.2: Trade Intensity Index of India with Selected OECD Countries

Country	2003	2004	2005	2006	2007	2009	2010	2012	Average
Australia	0.89	0.81	0.77	0.72	0.72	0.69	0.65	0.67	0.74
Austria	0.13	0.13	0.11	0.10	0.10	0.14	0.32	0.11	0.14
Belgium	1.02	1.02	1.00	1.03	1.02	0.79	0.98	0.85	0.96
Spain	0.56	0.59	0.58	0.57	0.52	0.50	0.51	0.62	0.56
Finland	0.25	0.27	0.30	0.24	0.23	0.22	0.22	0.23	0.25
Israel	2.95	2.71	2.71	2.78	2.67	2.49	3.33	3.21	2.86
Netherlands	0.57	0.53	0.64	0.55	0.78	0.98	0.82	0.88	0.73
Norway	0.24	0.24	0.25	0.26	0.20	0.26	0.17	0.17	0.23
Sweden	0.30	0.28	0.29	0.30	0.31	0.29	0.29	0.32	0.30
United States	1.18	1.14	1.09	1.04	1.02	0.93	0.91	1.05	1.05

Source: World Integrated Trade Solution Data Base, 2012

Table 4.3 shows that the largest number of emigrants is in the United States followed by Australia and Spain. It has been noted that these are the countries with which India has a higher trade intensity as compared to other countries. To analyse migration-trade relations between India and the OECD countries, there is need to find

[1] It is defined as a ratio of the share of one country's trade with another country to the other country's share of the world trade given by Frankel (1997).

out if there is a structural similarity between the trading partners. Appendix Table A.2 shows the average share of exports of India's top 10 export products to these countries and world for the period 2003-2010. India's exports to the world matches the imports of these countries from India. India's top 10 export products to the world such as pearls, precious stones, metals, coins, etc.; nuclear reactors, boilers, machinery etc.; iron and steel; electrical, electronic equipment; vehicles other than railway, tramway, etc., match the top 10 imports of these countries from India. The demand pattern of Indian migrants in OECD countries may be an important source of demand for Indian goods.

Table 4.3: India's Stock of Foreign Born Population towards OECD Countries

Year	Australia	Austria	Bel gium	Fin land	Israel	Netherl ands	Nor way	Spain	Sweden	United States
2000	95.72	9.45	8.779	1.172	18.131	11.074	5.244	8.817	11.11	1072.491
2001	103.58	8.689	9.778	1.345	18.117	11.421	5.444	11.041	11.474	1205.204
2002	114.45	9.557	10.515	1.484	18.073	11.616	5.682	14.051	11.838	1238.036
2003	126.35	10.104	11.158	1.638	18.052	11.829	5.775	15.642	12.349	1297.916
2004	140.62	10.604	11.739	1.843	18.08	11.62	5.63	13.578	11.887	1247.052
2005	157.9	11.219	12.477	2.138	17.725	12.664	6.005	23.296	13.593	1410.731
2006	180.13	11.215	13.076	2.479	17.8	13.76	6.37	24.47	13.979	1505.351
2007	216.11	11.41	13.773	2.815	17.848	14.828	7.155	28.557	14.415	1513.953
2008	264.53	11.551	14.673	3.2	17.689	16.47	7.941	33.23	15.263	1626.906
2009	323.23	11.68	15.229	3.624	18.113	17.321	8.243	36.25	16.457	1665.055
2010	340.61	11.764	14.55	3.955	18.019	18.213	8.496	37.175	17.863	1796.467

Source: OECD International Migration Data Base, 2012. Thousand

The Gravity Model of Trade

In empirical trade research, the gravity model has been accepted as being 'extremely successful empirically,' in its ability to explain variance in bilateral trade volumes and is one of the most commonly used analytical frameworks (Deardoff 1984 cited from Law et al. (2009)). Tinbergen (1962) first used the gravity model to explain international trade patterns, and economists have consistently found that it explains a large proportion of the variation in international trade flows, making the model attractive for testing the marginal influence of other hypothesized variables on international trade. Among them, some prominent economists are Linnemann (1966), Anderson (1979), Bergstrand (1985, 1989) Deardorff (1998), Helpman and Krugman (1985), Anderson and Van Wincoop (2003), Helpman et al. (2008) etc.

According to Newton's Law, the gravitational attraction between two objects is proportional to their mass and inversely related to their distance (Zhang and Kristensen (1995) and Chritie, (2002)). The gravity model is expressed as follows:

$$F_{ij} = G\left(\frac{M_i M_j}{D_{ij}^2}\right) \qquad (1)$$

F_{ij} is the gravitational attraction. M_i and M_j are the mass of the two objects. D_{ij} is the distance.

(1) The logarithmic form is:

$$\mathrm{Ln}(F_{ij}) = \mathrm{Ln}(G) + \mathrm{Ln}(M_i M_j) - 2\mathrm{Ln}(D_{ij}) \qquad (2)$$

(2) can be also written as

$$\text{Ln}(^{F_{ij}}) = a_{0+}a_1 \text{Ln}(M_iM_j)^{+}a_2\text{Ln}(D_{ij}) \quad (3)$$

In trade models, the physical bodies are the exporting and importing countries, and their "mass" is their economic mass. In other words, the idea is that the bigger the size of the economies, the larger its trade, and the greater the distance, the lower the trade. The gravity model of trade specifies trade as a positive function of the attractive "mass" of the two economies and a negative function of distance between them. Therefore, equation (1) can be re-written as equation (4)

$$\text{Trade}_{ij} = f\,[(\text{GDP}_i \cdot \text{GDP}_j)/\text{Dist}_{ij}] \quad (4)$$

where trade_{ij} is the total trade between countries *i* and *j*, Dist_{ij} is the distance between the two countries, and the gravitational "mass" is the product of gross domestic products of countries *i* and *j*.

Following (3), (4) can be written like this

$$\text{Trade}_{ij} = a_0 + a_1(\text{GDP}i \cdot \text{GDP}j) + a_2(\text{Dist}ij) + u_{ij} \quad (5)$$

Researchers have started to include many other independent variables in gravity model of trade such as prices, real exchange rates, common languages, common borders, membership of trade blocs, and colonial ties.

$$\text{Trade}ij = a_0 + a_1(\text{GDP}i \cdot \text{GDP}j) + a_2(\text{Pop}_i \cdot \text{POP}_j) + a_3\text{Dist}_{ij} + a_4\text{Bloc}_{ij} + a_5\text{Lang}_{ij} + a_6\text{Cont}_{ij} + a_7\text{Link}_{ij} + u_{ij} \quad (6)$$

In (6), Bloc, Lang, Cont, and Link are dummy variables for pairs of countries that share membership in a free trade area, a common language, a contiguous border, and colonial links, respectively, and $\text{POP}_i \cdot \text{POP}j$ is the log of the product of the populations of exporter and importer country. The present study's approach, like previous econometric tests of the effect of migration on trade, is based on the gravity model. The study has estimated the following model to estimate the effect of Indian emigrants on Indian exports:

$$\text{LnEx}_{ij} = a_0 + a_1\text{Ln}(\text{GDP}i \cdot \text{GDP}j) + a_2\text{Ln}(\text{PC}_i\text{PC}_j) + a_3\text{Ln}(\text{EM}) + a_3\text{Ln}(\text{Dist}_{ij}) + u_{ij} \quad (7)$$

Ln stands for natural logarithms.

To examine emigrant-link effects on India's bilateral export flows both over time and across OECD countries, the study has used panel data estimation technique. The estimation results of bilateral exports of India with ten OECD members (Australia, Austria, Belgium Finland, Israel, Netherlands, Norway, Spain, Sweden and USA) are given in Table 4.4. The main hypothesis of this analysis is that networks of emigrants have a favourable effect on trade.

The expected signs of the coefficients in the gravity model laid out in equation (7) are as follows.

Gross Domestic Product *(*GDP) – It measures the size of the exporter as well as importer country and it is expected to have a positive effect on bilateral trade.

Per capita GDP (PC): It is a proxy for the wealth effect (Mathur (1999), Karayil(2007), etc.). Its sign depends upon the nature of the commodity exported or imported. In other words, it can be said that preference similarity or preference dissimilarity works between two trade partners

Emigrant (EM): There is a positive relationship between migration and bilateral trade flows through the network effect; therefore, the coefficient should have a positive sign as emigrant preferences can have a positive impact on the value of bilateral trade flows, via the preference effect or the information effect.

Distance *(D)*: Distance is expected to have a negative effect on trade, as the cost of transportation could be considered a barrier to trade. As a result, overall transaction costs of bilateral trade increase with distance. Therefore, its coefficient is expected to have negative sign.

4. Results of Gravity Equation

Selected data were checked for multicollinearity using simple correlations and Klein's rule of thumb. Multicollinearity may be found when correlation coefficients are more than 0.8 (Gujrati, 1995). Annexure Table A.2 shows that all correlation coefficients are well below the 0.8 threshold value. Therefore, the present data does not have multicollinearity. And, because the sample is small, there are fewer chances of autocorrelation and heteroscedasticity. The estimation results of India's bilateral exports with ten OECD members have been reported in Table 4.4. The gravity model has been estimated by the restricted (pooled) model[2], the fixed effect model[3], and the random effect model[4] by Gujrati (2010).

The equation on exports equation has run through the three estimation methods mentioned here. However, the magnitudes of the coefficients in pooled effect estimation were notably different from those in the fixed effect method, suggesting that the results may have been biased because individual country effects have been ignored in the pooled estimation. Even F-test[5]had also supported the same argument for the present data. In Table 4.4, the value of F test was 291.23 at (9, 97) d.f., which was far larger than the tabulated value and supported the alternate hypothesis i.e. fixed effects model gives reliable results as compared to pooled model. In other words, the pooled estimation gives biased results due to omitted variables.

The present data has been fitted by random effect which depends upon Gaussian distribution. The Hausman test[6] had a value of 4.82 at 3 d.f. which was also far larger than the critical value. This suggested that the random effect is a better choice than the fixed effect. Next, specification test by Breusch Pagan Test was also conducted for the present data. The specification test suggests that the coefficients of fixed and random

[2] The restricted model is the pooled model with the restrictive assumptions of single intercept and with the same parameter over time and across trading partners.

[3]The unrestricted model (fixed effect model), however is the same behavioral equation but allows the intercept to vary across trading partners. In present case, a fixed effects model has constant slopes but intercepts differ according to cross-sectional, i.e. country. While there are no significant temporal effects, there are significant differences among countries in this type of model

[4] Random effects model considers the intercept as a random variable and based on the assumptions that the individual error components are not correlated with each other and are not auto correlated across sections and time series units

[5] Through F- test, country effects are tested by the null hypothesis i.e. all dummy parameters except one are zero. If the null hypothesis is rejected, the fixed group effect model is better than the pooled model.

[6] It compares the fixed and random effect estimators given by (Verbeek, 2004) explained in Appendix B.

estimators did not turn out to be significantly different. This test also suggested the same that it is proper specification (given in Appendix 4.3). Therefore, the direction of the study focuses on the random effects estimation only.

Table 4.4 shows that the regressions carried out have all yielded the expected signs for the coefficients except for the GDP. The coefficient of GDP bears a negative sign, but not statistically significant. This may be due to demand of Indian commodities from only Indian migrants residing in OECD countries, not from the OECD population. Per capita GDP proxied for wealth effect depends upon the nature of commodity imported as explained by Mathur (1999). The coefficient of per capita GDP is positive and highly significant showing with increase in income of OECD countries, the demand for Indian commodities increases as they have some special advantage or some preference similarity. The composition of India's exports towards these countries (explained in previous section) has clearly indicated its significance. Karayil (2007) also tried to explain its importance in the context of India-GCC migration trade relations. In their migration trade relations, North-South trade works while in the case of (India-OECD) migration compensates for the income gap between the two regions and generates preference similarity.

Table 4.4: Results of Gravity Model of Exports

Variable	Restricted/ Pooled Estimation		Fixed Effects Estimation		Random Effects Estimation	
	Coefficient	Z Value	Coefficient	Z Value	Coefficient	Z Value
Constant	7.19	1.70(0.09)	-5.42*	4.55(0.000)	-3.60	0.53(0.596)
Gross Domestic Product	-0.04	1.12(0.26)	-0.01	1.38(0.170)	-0.01	1.41(0.161)
Per Capita GDP	1.60*	4.12(0.00)	1.99*	10.70(0.00)	1.99*	11.07(0.00)
Migration	0.17	1.27(0.20)	0.13	0.81(0.421)	0.14	0.87(0.382)
Distance	-2.41*	3.36(0.00)			-2.36	1.41(0.159)
Restricted F-test			291.23** (9,97)			
Hausman Test					4.82(3)	

Source: Author's calculations, '*' indicates significance at 1 percent level.

The coefficient of migration stock is positive but not significant, showing that with increase in Indian emigrants residing in these countries Indian exports to these countries enhance. The demand of these exports is done by Indian emigrants only. This may be one of the reasons of this variable's insignificance. A 10 per cent increase in immigrant stock has the effect of India's exports by only 3 per cent. The coefficient of distance is negative showing that exports flows fall due to geographical distance between two trading partners.

5. Conclusion

Thus it is clear that Indian emigrants have a positive impact on India's exports through network effect or preference similarity effect. The insignificant impact is observed due to their engagement in import substitution industries in India as they may access to the necessary capital required to establish these industries. This point has been raised by Akbari and Hyder (2011) for Pakistan's case. There is need to more

liberal policies for encouraging exports towards these countries. Moreover, these countries have skilled emigrants and it will be well experienced for India to establish technical skills in business through Indian emigrants, which will further enhance trade. Further, there is need to study in detail as well as for particular cases to find out the preference similarity for certain commodities brought by emigrants.

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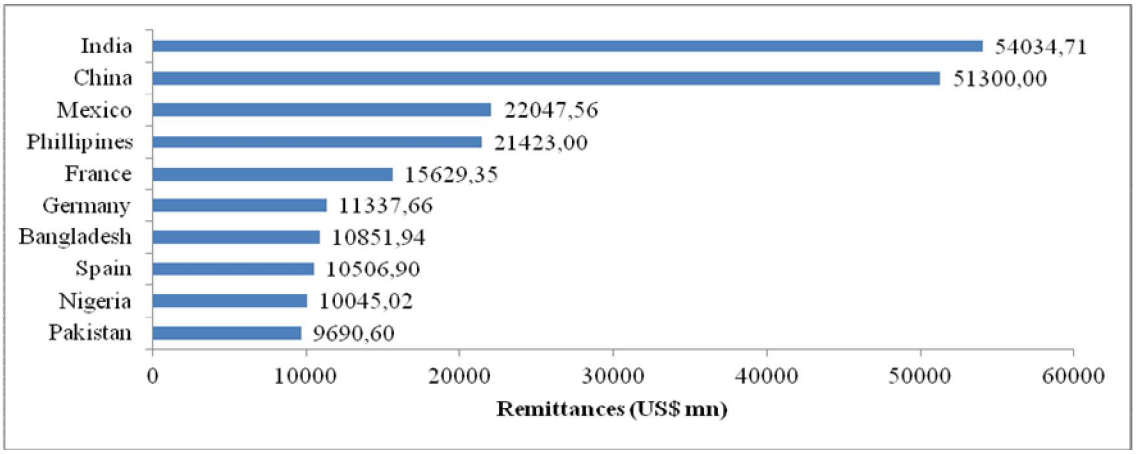
Appendix 4.1

Fig. (1): Remittances of Top 10 Countries



Source: World Bank

Annex Table A.1. Some Previous Studies for the Effect of Immigration on Trade

Gould (1994) US and 47 trade partners; 1970-1986
Helliwell (1997) Trade between Canadian provinces and Usstates, 1990
Head and Ries (1998) Canada and 136 trade partners; 1980-1992
Dunlevy and Hutchinson (1999,2001) US and 17 trade partners; 1870-1910
Girma and Yu (2002) UK and 48 trade partners; 1981-1993
Rauch and Trindade (2002) 63 countries; 1980, 1990
Wagner, Head, and Ries (2002) 5 Canadian regions and 160 foreign countries;1992-1995
Co et al. (2004) US state exports, 1993, 28 countries
Bardhan and Guhatkakurta (2004) US state exports, 1994-1996
Blanes (2005) Total trade between Spain and 42 trade partners, 1991-1998
Combes*et al* (2005) 94 French "departments", 1993
Herander and Saavedra (2005) US state exports, 1993-1996,
Mundra (2005) US with 47 trade partners, 1973-1980
Blanes and Martín-Montaner (2006) Spain and 48 non-EU trade partners, 1988-1999
Dunlevy (2006) US average state exports, 1990-1992
Hong and Santhapparaj (2006) Malaysia and 16 trade partners, 1998-2004
White (2007a) Denmark and 170 trade partners, 1980-2000
White (2007b) US and 73 trade partners, 1980-2000
White and Tadesse (2007) Australia and 101 trade partners, 1989-2000
Bandyopadhyay et al. (2008) US state exports, 29 countries, 1990, 2000
Tadesse and White (2008a) US state exports, 75 countries, 2000
White and Tadesse (2008) US state exports, 75 countries, 1998-2001
Ehrhartet. al. , African countries, 1980 to 2010

Haider, Bangladesh , 1980-2004
Bruder and rostock, Germany, 1970-1998,
Casi , EU 17 Countries, 1997-2006
Bacarreza Ehrlich, Bolivia, 1990-2003
Karayil, India –GCC , 1990-2000
Parsons(2005) EU-15 & 15 Euexpansion countries,1994–2001
Law et al(2009), New Zealand, 1981-2006
Akbari and hyder (2011), Pakistan , 1990-2003

Source : Some part from Law et. al. (2009)

Table A.2. India's Top 10 Exports Commodities to OECD Countries and World

(Australia)

Commodity Code	Commodity Description	Average Share
71	Pearls, precious stones, metals, coins, etc	12.03
85	Electrical, electronic equipment	6.91
84	Nuclear reactors, boilers, machinery, etc	5.79
73	Articles of iron or steel	5.02
63	Other made textile articles, sets, worn clothing etc	4.72
87	Vehicles other than railway, tramway	4.19
62	Articles of apparel, accessories, not knit or crochet	3.48
09	Coffee, tea, mate and spices	3.30
42	Articles of leather, animal gut, harness, travel goods	3.28
30	Pharmaceutical products	3.27
29	Organic chemicals	2.84

(Austria)

Commodity Code	Commodity Description	Average Share
85	Electrical, electronic equipment	17.55
30	Pharmaceutical products	9.58
87	Vehicles other than railway, tramway	6.92
29	Organic chemicals	6.33
64	Footwear, gaiters and the like, parts thereof	6.15
84	Nuclear reactors, boilers, machinery, etc	4.74
42	Articles of leather, animal gut, harness, travel goods	4.31
57	Carpets and other textile floor coverings	3.72
63	Other made textile articles, sets, worn clothing etc	3.35
62	Articles of apparel, accessories, not knit or crochet	3.00
52	Cotton	2.92

(Belgium)

Commodity Code	Commodity Description	Average Share
71	Pearls, precious stones, metals, coins, etc	47.98
72	Iron and steel	9.60
03	Fish, crustaceans, molluscs, aquatic invertebrates nes	3.52
29	Organic chemicals	3.30
62	Articles of apparel, accessories, not knit or crochet	2.58
27	Mineral fuels, oils, distillation products, etc	2.51
61	Articles of apparel, accessories, knit or crochet	2.20
24	Tobacco and manufactured tobacco substitutes	1.98
87	Vehicles other than railway, tramway	1.97
84	Nuclear reactors, boilers, machinery, etc	1.74
73	Articles of iron or steel	1.57

(Canada)

Commodity Code	Commodity Description	Average Share
61	Articles of apparel, accessories, knit or crochet	32.71
62	Articles of apparel, accessories, not knit or crochet	23.63
29	Organic chemicals	21.10
73	Articles of iron or steel	10.31
71	Pearls, precious stones, metals, coins, etc	9.82
63	Other made textile articles, sets, worn clothing etc	9.26
03	Fish, crustaceans, molluscs, aquatic invertebrates nes	7.27
84	Nuclear reactors, boilers, machinery, etc	6.43
52	Cotton	6.31
30	Pharmaceutical products	4.57
39	Plastics and articles thereof	4.28

(Finland)

Commodity Code	Commodity Description	Average Share
30	Pharmaceutical products	13.46
61	Articles of apparel, accessories, knit or crochet	11.46
85	Electrical, electronic equipment	7.34
29	Organic chemicals	6.29
62	Articles of apparel, accessories, not knit or crochet	5.12

63	Other made textile articles, sets, worn clothing etc	5.07
73	Articles of iron or steel	5.02
21	Miscellaneous edible preparations	4.61
84	Nuclear reactors, boilers, machinery, etc	4.57
71	Pearls, precious stones, metals, coins, etc	2.75
57	Carpets and other textile floor coverings	2.72

(Israel)

Commodity Code	Commodity Description	Average Share
71	Pearls, precious stones, metals, coins, etc	56.09
27	Mineral fuels, oils, distillation products, etc	11.91
29	Organic chemicals	7.32
39	Plastics and articles thereof	3.31
52	Cotton	3.09
87	Vehicles other than railway, tramway	1.32
85	Electrical, electronic equipment	1.27
88	Aircraft, spacecraft, and parts thereof	1.05
84	Nuclear reactors, boilers, machinery, etc	1.02
90	Optical, photo, technical, medical, etc apparatus	0.99
72	Iron and steel	0.96

(Netherlands)

Commodity Code	Commodity Description	Average Share
27	Mineral fuels, oils, distillation products, etc	38.36
62	Articles of apparel, accessories, not knit or crochet	5.31
85	Electrical, electronic equipment	5.28
61	Articles of apparel, accessories, knit or crochet	4.70
29	Organic chemicals	4.62
84	Nuclear reactors, boilers, machinery, etc	3.50
08	Edible fruit, nuts, peel of citrus fruit, melons	3.41
72	Iron and steel	3.02
87	Vehicles other than railway, tramway	2.88
38	Miscellaneous chemical products	2.02
15	Animal,vegetable fats and oils, cleavage products, etc	1.88

(Norway)

Commodity Code	Commodity Description	Average Share
71	Pearls, precious stones, metals, coins, etc	9.90
70	Glass and glassware	5.75
62	Articles of apparel, accessories, not knit or crochet	4.79
13	Lac, gums, resins, vegetable saps and extracts nes	4.12
61	Articles of apparel, accessories, knit or crochet	3.98
29	Organic chemicals	3.07
84	Nuclear reactors, boilers, machinery, etc	2.92
67	Bird skin, feathers, artificial flowers, human hair	2.85
37	Photographic or cinematographic goods	2.79
72	Iron and steel	2.61
30	Pharmaceutical products	2.59

(Spain)

Commodity Code	Commodity Description	Average Share
62	Articles of apparel, accessories, not knit or crochet	11.10
63	Other made textile articles, sets, worn clothing etc	10.80
61	Articles of apparel, accessories, knit or crochet	7.62
73	Articles of iron or steel	7.01
87	Vehicles other than railway, tramway	5.43
84	Nuclear reactors, boilers, machinery, etc	5.31
42	Articles of leather, animal gut, harness, travel goods	5.07
57	Carpets and other textile floor coverings	4.46
71	Pearls, precious stones, metals, coins, etc	4.35
85	Electrical, electronic equipment	4.21
64	Footwear, gaiters and the like, parts thereof	2.11

(Sweden)

Commodity Code	Commodity Description	Average Share
62	Articles of apparel, accessories, not knit or crochet	12.47
29	Organic chemicals	8.83
61	Articles of apparel, accessories, knit or crochet	6.64
03	Fish, crustaceans, molluscs, aquatic invertebrates nes	6.29
42	Articles of leather, animal gut, harness, travel goods	6.25
72	Iron and steel	5.70
87	Vehicles other than railway, tramway	4.64
85	Electrical, electronic equipment	4.59
64	Footwear, gaiters and the like, parts thereof	3.80
63	Other made textile articles, sets, worn clothing etc	3.35
84	Nuclear reactors, boilers, machinery, etc	2.87

(USA)

Commodity Code	Commodity Description	Average Share
71	Pearls, precious stones, metals, coins, etc	52.68
62	Articles of apparel, accessories, not knit or crochet	17.64
63	Other made textile articles, sets, worn clothing etc	10.47
61	Articles of apparel, accessories, knit or crochet	9.42
84	Nuclear reactors, boilers, machinery, etc	8.53
73	Articles of iron or steel	7.99
72	Iron and steel	7.75
29	Organic chemicals	6.87
30	Pharmaceutical products	6.64
85	Electrical, electronic equipment	6.54
57	Carpets and other textile floor coverings	4.79

(World)

Commodity code	Commodity Description	Average Share
71	Pearls, precious stones, metals, coins, etc	15.59
27	Mineral fuels, oils, distillation products, etc	13.95
29	Organic chemicals	4.322
62	Articles of apparel, accessories, not knit or crochet	4.053
84	Nuclear reactors, boilers, machinery, etc	4.041
72	Iron and steel	3.867
85	Electrical, electronic equipment	3.58
26	Ores, slag and ash	3.309

87	Vehicles other than railway, tramway	3.251
61	Articles of apparel, accessories, knit or crochet	2.954

Source: Calculations from Handbook of UNCOMTRADE Database 2011

Table A.3.Correlation Coefficients among Variables

Variable	GDP (MILLION US $)	Exports	Per capita GDP	Migration
GDP (MILL. US $)	1.00	-0.1838	-0.0656	0.2162
Exports	-0.1838	1.00	0.3761	-0.171
Per capita GDP	-0.0656	0.3761	1.000	0.1672
Migration	0.2162	-0.1709	0.1672	1.000

Appendix 4.2

Hausman Test (Verbeek, 2004)

H_o: Explained variables are uncorrelated with individual effects

H_1: Explained variables are correlated with individual effects

$$\boldsymbol{H} = \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)' \left[\hat{V}\left(\hat{\beta}_{FE}\right) - \hat{V}\left(\hat{\beta}_{RE}\right)\right]^{-1} \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)$$

Where $\hat{\beta}_{FE}$, $\hat{\beta}_{RF}$ are estimated coefficients from the fixed and random effect estimators. $\hat{V}$'s are the covariance matrices of fixed and random effect. If the computed statistic H is larger than a chi-squared distribution with k degrees of freedom (*k* is the number of elements inβ), then we reject the null hypothesis and conclude that random effect is not appropriate and it is better to use fixed effect.

Appendix 4.3

Breusch and Pagan Lagrangian multiplier test for random effects

Exports[cross,t] = Xb + u[cross] + e[cross,t]

Estimated results:

	Varsd = sqrt(Var)
exports	.4700907 .6856316
e	.0148875 .1220143
u	.4406966 .6638499

Test: Var(u) = 0

chibar2(01) = 491.66

Prob> chibar2 = 0.000